Communications Processors: Market Overview

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Synopsis

Editor's Note
This report examines the communications processor market. For information on the technology, see "Communications Processors: Technology Overview"; for comparison columns detailing the features of key products, see "Communications Processors: Comparison Columns."

Report Highlights
The communications processor industry still exists, not as a shining star in the communications firmament, but as a reliable source of light. Although IBM, NCR, Unisys, and Amdahl dominate the market, other vendors have managed to infiltrate it. The major vendors continue to enhance their products, while NCR and Unisys have added new models.

IBM recently announced that by the middle of 1991, it will be adding DS3, FDDI, and ESCON networking support to the 3745 Communication Controller, making the 3745 front-end processor a vital part in IBM's networking strategy.

NCR added one new system, the 5645-B, and enhanced all the A models to B models. All the B models have been substantially reduced in physical size, number of components, and power and cooling requirements.

Amdahl enhanced the 4745 Series by expanding the memory capacity to 8M bytes, allowing the 4745 to connect up to four 4M bps token-ring networks. Amdahl also expanded the channel connectivity to support four active channel adapters in the base frame and extended the 4745's Integrated Switching Architecture (ISA).

Unisys added three new models: the DCP/25, DCP/35, and DCP/55. Enhancements include support for power-on-pluggable line modules, input/output module (IOM) power supplies, three input/output processors (IOPs) in a single IOM (DCP/50 and DCP/55 models only), the newly designed Maintenance Control Feature (MCF), and an improved power control feature.

—By Barbara Rinehart
Associate Editor/Analyst

Analysis

Market Overview

Although communications processors do not generate bold headlines, the products sustain a steady revenue stream for the four industry leaders: IBM, NCR, Unisys, and Amdahl. The technology is mature, but it still fills a need for these market segments: IBM and plug-compatible communications processors for the IBM mainframe environment, communications processors dedicated to the mainframe architectures of vendors other than IBM, and intelligent concentrators designed to serve in transparent network architectures.

Vendors did not allow their products to stagnate. Instead, the communications processors of the '90s support the hot items of today's communications marketplace: T1, LANs, SNA, TCP/IP, and IBM's NetView.

In 1990, IBM and Amdahl did not introduce new communications processor lines but dusted off existing ones and made them shinier and more up to date with token-ring and T1 capabilities. Amdahl made an announcement in April 1990 about supporting T1, but as of February 1991, this major feature was not available.

Vendor Survey Results

Twenty-eight vendors of communications processors responded to this year's survey requests. They provided details on the principal characteristics of 65 products. The data collected indicates that the communications processors are most widely used as remote line concentrators. Forty-two of the sixty-four products serve in that capacity, and five vendors did not respond to the question. Forty-seven processors can function as front-end processors. In last year's survey, 17 of the 42 communications processors were used as distributed processing nodes; in this year's survey, 27 of the 65 products perform that function. All of the processors perform protocol conversion.

IBM's Systems Network Architecture (SNA) is the company's master plan for communications with and among IBM computers, terminals, and office systems. It is also the company's vehicle for interconnection with other industry-standard networks, such as X.25. Without the capability to communicate with IBM equipment, a product starts its life cycle at a disadvantage. Aware of the importance of penetrating the IBM world, vendors have incorporated support for SNA into 44 of the 64 products included in the survey (see Figure 1).

Open Systems Interconnection (OSI) emerged in the late '70s as an attempt by the International Organization for Standardization (ISO) to resolve compatibility issues. The OSI model for open architecture consists of seven layers. Many vendors have released products that conform to OSI requirements. In the communications processor field, however, OSI conformity does not appear to be a driving force. Of the 64 products in the survey, only 23 adhere to OSI specifications.

The X.25 Recommendation of the CCITT was developed in response to the need for a standard interface between packet-switching networks. The X.25 standard enables terminals and computers to be connected to public and private packet-switching networks. More than half of the communications processors in the survey conform to X.25.

Vendor Strategies

Amdahl

In April 1990, Amdahl enhanced both 4745 models with 4M bps token-ring adapters, extended the memory capacity to a total of 8M bytes, extended the channel connectivity of both models to support up to four active channel adapters in the base frame, and extended the Integrated Switching Architecture (ISA) with automatic backup capabilities. The base prices of the 4745 models have not changed since November 1989.

IBM

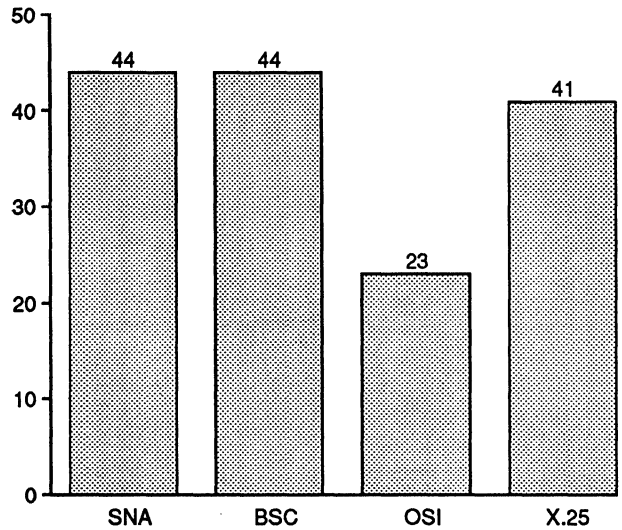
The IBM product line currently consists of the 3745 Models 130, 150, 170, 210, and 410.

IBM 3745 Models 130, 150, and 170 complete IBM's front-end processor line at the low end. Model 130 accommodates four 4M bps or 16M bps

Token-Ring interfaces, two T1 lines, and four host-channel links. Model 150, a remote line concentrator, supports 16 communications ports operating at speeds up to 256K bps, two 4M bps or 16M bps Token-Ring interfaces, and one T1 line. Model 170, a general-purpose controller, supports up to 112 lines at speeds up to 256K bps, two 4M bps or 16M bps Token-Ring interfaces, and two T1 lines.

IBM 3745 Model 210 and Model 410 are high-end models. The Model 210 has a single Central Control Unit (CCU) and is field upgradable to the Model 410. The Model 410 has two independent CCUs, each capable of running a separate Network Control Program (NCP). Both the Model 210 and 410 support 16 or 256 hosts with token-ring simultaneously, and up to 896 medium- and high-speed lines. In the third or fourth quarter of 1991, IBM is expected to add DS3, FDDI, and ESCON networking support to the 3745 Communications Controller, making the 3745 front-end processor a key piece in IBM's networking strategy. Other enhancements to the 3745 are expected sometime during 1991.

Figure 1.
Standards and Architectures



Indicates the number of communication processors, scored on this year's survey, that comply to the standards and architectures featured above.

NCR Network Products Division

In 1990, NCR added one new system and replaced all the A models with B models.

The new model, the NCR 5645-B, was announced in August 1990. This new communications processor supports up to four T1 links, 128 lines, four channel-connected hosts, 4M to 16M bytes of main storage, 80M bytes of fixed disk storage capacity, and support for up to 12 TCP/IP Ethernet LANs and up to 16 token-ring LANs. All of the line, LAN, and host connectivity maximums cannot be achieved simultaneously.

The product line now consists of the *NCR 5645-B, NCR 5655-B, NCR 5665-B, and NCR 5675-B.* NCR enhanced the models by changing the physical size, number of components, and power and cooling requirements.

NCR also improved the processors' hardware design: Instruction Execution Unit (IEU) has been added on a single, 60,000-gate VLSI CMOS chip; cache and main storage are now on a single Printed Circuit Board (PCB); the total number of PCB components has been reduced from 36 to 6; the system cabinet size has been reduced from 9.9 to 4.67 square feet; the bulk power supply is now silicon-based technology; and a Local Communication Interface (LCIF) allows direct attachment of rack-mount, 16-line communications bases and network interface adapters for low-end systems that have no switching requirement.

Unisys

The newest models to Unisys' communications processors product line include the *DCP/25, DCP/35, and DCP/55.* In 1990, Unisys enhanced the DCP/5, DCP/15, DCP/30, and DCP/55. The enhancements made to communications processors include support for power-on-pluggable line modules, redundant IOM power supplies, high-performance IOM capability, three input/output Processors (IOPs) in a single input/output Module (IOM) (DCP/50 and DCP/55 systems only), a newly designed Maintenance Control Feature (MCF), and an improved power control feature.

Future Directions

As long as vendors prime their products for the needs of the '90s, the communications processor market will experience a steady but not spectacular growth. As front-end processors, these machines perform important tasks. As remote concentrators and nodes in networks, they perform functions that are not about to become obsolete.

It is doubtful that many newcomers will arrive on the communications processor scene. Most of the market belongs to IBM, NCR, Unisys, and Amdahl. Taking on these giants is not likely to appeal to start-up companies, which would probably prefer entering a more dynamic field with more possibilities.

Most of the activity in the communications processor field will come from the big four. Currently, NCR and IBM appear to be sparring with each other for supremacy, while Amdahl appears to be banking on the ongoing success of its 4745 communications processor. ■

Communications Processors: Market Overview

In this report:

Synopsis

Editor's Note

This report examines the communications processor market. For information on the technology, see Report C13-010-201; for comparison columns detailing the features of key products, see Report C13-010-301.

Report Highlights

Communications processors date back to the early '70s, tracing their ancestry to the venerable and effective IBM 3705 Communications Controller. The 3705 functioned as a front-end or remote full-service communications processor for the IBM mainframe environment.

Aware of the potential in the industry, Amdahl, NCR Comten, and Unisys also produced equipment that served as front-end processors, remote concentrators, and network nodes. Relieving the mainframe of the burden of communications created a new industry.

The industry still exists, not as a shining star in the communications firmament but as a reliable source of light. Although IBM, NCR Comten, and Amdahl dominate the market, other vendors have managed to infiltrate it. The major news last year emanated from the NCR Comten camp when the company introduced a new line of communications processors: the 5655, 5665, and 5675. In addition to the new line, NCR Comten released several products for the 5660 communications processor, introduced complementary software, and added TCP/IP and Ethernet interfaces to its offerings.

IBM added three lower-level models to its 3745 communications controller and enhanced the 3745, Models 210 and 410. Amdahl released a software migration tool that allows its 4745 to run IBM networking software releases on its machines.

Unisys incorporated the DCP/5 into its Distributed Communications Processors (DCP) Series. Designed for small sites, the DCP/5 supports up to seven lines.

Most of the activity in the market reflects vendors' successful efforts at making their products compatible with current communications standards and protocols. Vendors have also integrated support for T1, fractional T1, and LANs into their products.

Analysis

Market Overview

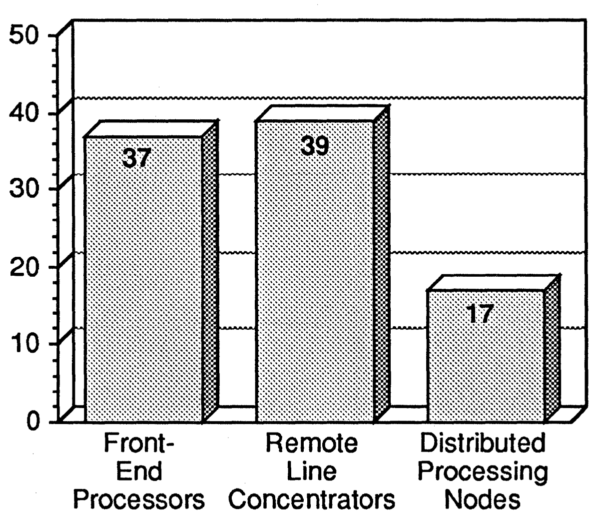
Although communications processors do not generate bold headlines, the products sustain a steady revenue stream for the three industry leaders: IBM, NCR Comten, and Amdahl. The technology has been around for a while, but it still fills a need for these market segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; and intelligent concentrators designed to serve in transparent network architectures.

Vendors did not allow their products to stagnate. Instead, the communications processors of the '90s support the hot items of today's communications marketplace: T1, fractional T1, LANs, SNA, TCP/IP, and IBM's NetView.

NCR Comten stole the spotlight in 1989 by introducing three new communications processors: Comten 5655, Comten 5665, and Comten 5675. Designed for SNA and multivendor networks, the processors offer up to 2½ times the performance of an IBM 3745. The systems feature direct termination of up to 24 T1 lines and up to 16 concurrently active mainframes. In addition, the systems occupy 50 percent less floor space, consume 26 percent less power, and generate 26 percent less heat than the vendor's earlier systems.

In 1989, IBM and Amdahl did not introduce new communications processor lines, but dusted off existing ones and made them shinier and more up to date with Token-Ring and T1 capabilities. IBM rounded out the 3745 processor line with the Models 130, 150, and 170, each of which features additional Token-Ring support. The Model 130 also handles high-speed host-to-host or host-to-LAN chores over T1 lines.

Figure 1.
Applications



Vendor Survey Results

Sixteen vendors of communications processors responded to this year's survey requests. They are:

- Amdahl Communications
- Bull HN Worldwide Information Systems
- Chi Corporation
- Computer Communications, Inc.
- Computer Network Technology Corporation
- Computerm Corporation
- Control Data Corporation
- Infotron Systems Corporation
- International Business Machines Corporation (IBM)
- Lemcom Systems, Inc.
- NCR Comten
- NTX Communications Corporation
- Periphonics Corporation
- SBE
- Thomas Engineering Company
- Unisys Corporation

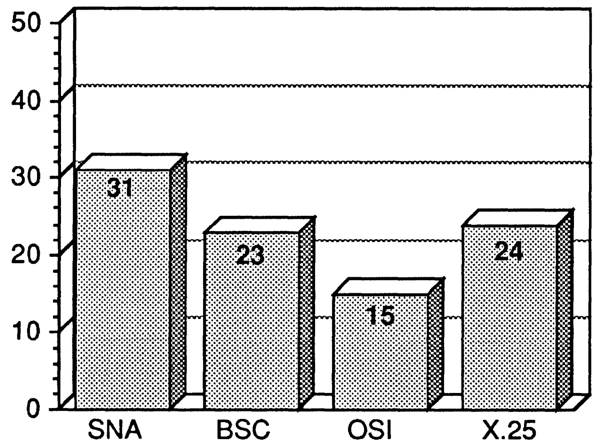
The vendors provided details on the principal characteristics of 42 products. The data collected indicates that the communications processors are most widely used as remote line concentrators. Thirty-nine of the forty-two products serve in that capacity. Thirty-seven processors can function as front-end processors. The number of communications processors used as distributed processing nodes is dwindling. Only 17 of the 42 products perform that function. All of the processors perform protocol conversion.

IBM's System Network Architecture (SNA) is the company's master plan for communication with and among IBM computers, terminals, and office systems. It is also the company's vehicle for interconnection with other industry-standard networks, such as X.25. Without the ability to communicate with IBM equipment, a product starts its life cycle at a disadvantage. Aware of the importance of penetrating the IBM world, vendors have incorporated support for SNA into 31 of the 42 products included in the survey.

Open Systems Interconnection (OSI) emerged in the late seventies as an attempt by the International Organization for Standardization (ISO) to resolve compatibility issues. The OSI model for open architecture consists of seven layers. Many vendors have released products that conform to OSI requirements. In the communications processor field, however, OSI conformity does not appear to be a driving force. Of the 42 products in the survey, only 15 adhere to OSI specifications.

The X.25 Recommendation of the CCITT was developed in response to the need for a standard interface between packet-switching networks. The X.25 standard enables terminals and computers to be connected to public packet-switching networks. More than half of the communications processors in the survey conform to X.25.

Figure 2.
Standards and Architectures



IBM 3745 Models 130, 150, and 170. These models complete IBM's front-end processor line at the low end. Model 130 accommodates four 4M bps or 16M bps Token-Ring interfaces, two T1 lines, and four host-channel links. Model 150, a remote line concentrator, supports 16 communications ports operating at speeds up to 256K bps, two 4M bps or 16M bps Token-Ring interfaces, and one T1 line. Model 170, a general-purpose controller, supports up to 112 lines at speeds up to 256K bps, two 4M bps or 16M bps Token-Ring interfaces, and two T1 lines.

Upgrades to 3745 Model 210 and Model 410. IBM upgraded these high-end models by including connections for up to 896 medium- and high-speed lines. IBM also added fractional T1 capabilities, line-interface and Token-Ring port swapping capabilities, and PS/2 attachments.

Vendor Strategies

Amdahl

In May 1989, Amdahl enhanced its 4745 front-end communications processor with a software migration tool that allows users to run IBM networking software releases on the 4745. The 4745 Model 210 and Model 110 can run IBM's Network Control Program (NCP) Version 5 and Release 5.2.

Amdahl increased prices by 10 percent. The 4745-210 costs $132,000, and the 4745-110 with NCP-5 costs $100,650.

IBM

In May 1989, IBM added three lower level models to its 3745 communications controller product line and enhanced the 3745 Models 210 and 410.

NCR Comten

NCR introduced new products and upgraded existing models.

Comten 5655, 5665, and 5676 Communications Processors. This new family of communications processors supports up to 24 T1 lines, 1,024 full-duplex lines, 64 token-ring LANs, 16M bytes of main storage, and 80M bytes of fixed disk storage. The systems support NetView and the following protocols: SDLC/SNA, LU6.2, BSC, X.25, and X.21.

Comten 16-Line Communications Base (16-Line CB). Residing in the Comten 5660 and 3695 communications processors, the 16-Line CB enables field engineers to perform routine or emergency services on a single 16-line module without disrupting system operation. The 16-Line CB terminates up to 16 communications lines. The product consists of multiple processors that can handle specific protocols or line speeds for cost-effective line termination in mixed-protocol environments. Based on complementary metal oxide semiconductor (CMOS) ASIC technology, the 16-Line CB requires less power and cooling features.

The base price for 16-Line CB is $7,035.

Comten Universal Communications Adapter (UCA). NCR Comten endowed UCA, which also resides in Comten 5660 and 3695 communications processors, with expanded switching options. Users can back up all or portions of their communications processors and attached communications lines for increased network uptime. UCA users can switch among multiple communications processors, thereby making full use of all their equipment. This switching flexibility offers benefits to users because they do not have to pay for infrequently used backup systems. When backup is necessary, users can switch network traffic from the system in trouble to active systems.

UCA concentrates data from NCR Comten communications line termination equipment, such as communications bases, and routes it through input/output channels on one or more attached NCR Comten processors. For maximum network availability, each UCA supports data routing through two online and two backup channel connections, thereby increasing users' options for data routing during routine or emergency maintenance and for load balancing during peak traffic periods. UCA's aggregate throughput is 512K characters per second.

The purchase price for UCA starts at $21,000.

High Performance Feature (HPF) for Comten 5660. HPF provides 50 percent more processing power for the Comten 5660 communications processor than 5660 models without the feature. The processing power of the Comten 5660 with HPF can lower network operating costs in some networks by allowing more users to join the existing network without adding more communications lines. In networks where the communications processor is operating at near capacity, HPF can reduce networking costs by eliminating the need for additional communications processors, while allowing more throughput and improved response time. HPF costs $60,000 for new Comten 5660 orders. A field-installed HPF upgrade for already-installed 5660s costs $75,000.

Advanced Communications Function/Network Control Program (ACF/NCP) Version 5. NCR Comten supports SNA networking through the Comten Advanced Communications Function/ Network Control Program (ACF/NCP), a network routing and control software program residing in NCR communications processors. In October 1989, the company expanded its SNA networking capabilities with Version 5 of ACF/NCP, which expands support for distributed peer-to-peer networking that reduces host processing costs, produces value-added network statistics to assist in lowering costs, and improves performance.

Through ACF/NCP Version 5's distributed processing capability, users can access applications in intelligent workstations or SNA hosts without monopolizing host resources. ACF/NCP Version 5 enables Node Type (NT) 2.1 devices to use Logical Unit (LU) 6.2 protocol to conduct peer-to-peer sessions over wide area SNA networks with minimal host intervention. Users can initiate and collect host-independent network statistics through the NCR Comten console, Comten Support Facility, or IBM's NetView.

A licensed software product residing in a Comten 5620 or 56X5 communications processor, ACF/NCP Version 5 is compatible with earlier Comten communications processors and with previous ACF/NCP releases. Version 5 is functionally compatible with, and provides features found in, IBM's ACF/NCP Version 5 Release 1 and Release 2. Release 2 Version 5 debuted in second-quarter 1990.

Comten TCP/IP and *Comten Ethernet LAN Interface.* Designed for communications processors, the software supports interoperability among devices in SNA and TCP/IP networks, enabling users to share communications lines and to interoperate among various software applications in the network. By implementing these capabilities in a multipurpose networking system, such as a communications processor, users can integrate their existing SNA and TCP/IP networks into a single, multipurpose network. The resulting TCP/IP/SNA network provides two-way interoperability among Ethernet LANs using TCP/IP and SNA devices.

Comten Open Systems Interconnection/ Communications Processor (OSI/CP). This offering adds OSI software to the TCP/IP and SNA networking software for Comten communications processors. OSI/CP enables users with OSI desktop applications, like file transfer and electronic mail, to interoperate with each other over a wide area network, independent of the mainframe. With the addition of OSI/CP software, Comten's 56X5 communications processors can form the backbone of a multipurpose, wide area network that routes OSI, TCP/IP, and SNA data traffic over a single network.

Unisys

Unisys introduced the DCP/5 into its Distributed Communications Processors (DCP) Series. Designed for small sites, the DCP/5 supports up to seven lines, as well as BSC, HDLC, UDLC, X.21, and X.25. Unisys bundled the DCP/5 with its PW Model 500 personal computer. The communications processor board ranges in price from $9,800 to $14,300.

Future Directions

As long as vendors prime their products for the needs of the '90s, the communications processor market will experience a steady, but not spectacular growth. As front-end processors, these machines perform important tasks. As remote concentrators and nodes in networks, they perform functions that are not about to become obsolete.

It is doubtful that many newcomers will arrive on the communications processor scene. Most of the market belongs to IBM, NCR Comten, and Amdahl. Taking on these giants is not likely to appeal to start-up companies, who would probably prefer entering a more dynamic field with more possibilities.

Most of the activity in the communications processor field will come from the big three. Currently, NCR Comten and IBM appear to be sparring with each other for supremacy. At the time NCR Comten released the 5655, 5665, and 5675, IBM enhanced Models 210 and 410 of the 3745, adding fractional T1 and Token-Ring port swapping capabilities, and increasing line attachments. In the future, the two companies will continue battling for the greater share of the communications processor market.

Amdahl appears to be banking on the ongoing success of its 4745 communications processor. As indicated by its announcement this year of a software migration tool enabling users to run IBM networking software releases on the 4745, Amdahl is turning its attention to software and will pursue this avenue more vigorously in the future. ■

Communications Processors

Multifunctional products make it increasingly difficult to pigeonhole equipment into specific categories. It used to be simple: Devices converting signals from digital to analog were modems, units combining data from many channels onto one were multiplexers, and so forth. But integration is now the goal of the communications industry, and manufacturers have begun to combine many functions in one system. Modems incorporate multiplexing and/or protocol conversion; terminals contain modem chips; and larger systems integrate switching and multiplexing, as well as providing gateways to other networks.

The definition of a communications processor varies greatly, depending upon who is defining it. Different processors have different capabilities, and while network designers have one view of what a communications processor does, equipment manufacturers have another. Everything from an IBM 3745 to a four-port packet assembler/disassembler (PAD) has been called a "communications processor."

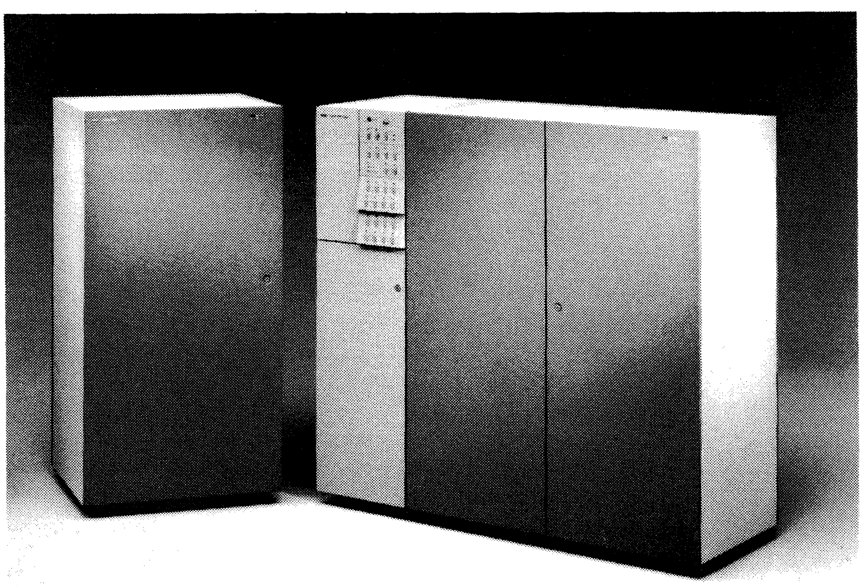
From a network designer's point of view, a communications processor should be capable of setting up connections to transmit and receive data, multiplex and demultiplex data, frame and unframe messages, perform error correction and protocol conversion, choose transmission routes, and collect performance and traffic statistics. This designer's definition has led many manufacturers to classify their protocol converters, PADs, terminal controllers, and stat muxes as communications processors. They consider devices that connect terminals to communications networks and maintain control through changing network conditions

"Communications processor" not only describes a specific category of equipment, but also includes a broad array of systems that performs communications processing functions and provides other services. Our definition of communications processors includes multifunctional, intelligent systems that are dedicated to communications and can serve as nodes in the network. These systems generally include three basic types of products: front-end processors, intelligent switches, and remote concentrators.

In addition to defining communications processing, this report discusses communications processor design, its place in modern network architectures, the evolution of the communications processor, general advantages and restrictions of today's systems, and the state of the communications processor marketplace.

This report also includes comparison columns outlining the major characteristics of communications processors from vendors.

REPORT HIGHLIGHTS: PAGE



Designed for large network users, the NCR Comten 5660 Communications Processor is a powerful data communications processor that offers high levels of network control, processing capacity, and device support.

TABLE 1. COMMUNICATIONS PROCESSORS FUNCTIONS

Physical transmission and reception of data
Data buffering and queuing
Multiplexing
Message framing and unframing
Control of transmission errors
Message sequencing
Protocol conversion
Message pacing and flow control
Message or packet assembly and disassembly
Route selection
Session establishment and disconnection
Formatting of data for use by specific host or terminal applications
Reporting and logging of device or transmission errors or failures
Fallback switching in case of host, device, or transmission line failure
Gather and record network performance and traffic statistics

to be communications processors. While marketing departments develop effective advertisements around this concept, it clouds the definition of the equipment. Marketing impact aside, an IBM 3745 and a protocol converter do not belong in the same category.

Several years ago, in an attempt to narrow the field of devices that would be included in this survey, we placed PADs and terminal controllers in a Protocol Conversion Systems tab, which also included black-box protocol converters, terminal emulators, and code and speed converters. This was in keeping with our premise that true communications processors, concentrators included, are involved in a *dynamic* process involving feedback from other intelligent devices in the network. Protocol converters, PADs, and statistical multiplexers perform basically *static* processes that remain constant as network conditions change. This year we have further refined our communications processor coverage by identifying equipment that is clearly defined as packet switches and channel extenders and moving them to separate tabs.

Datapro defines a communications processor as a multifunctional, intelligent device dedicated to communications and serving as a control point, or node, in a data communications network. It serves as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. As a *front-end processor (FEP)*, the communications processor serves as a peripheral device locally attached to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management, either under the control of a master (usually front-end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches. (Table 1 lists the major functions of a communications processor in the typical network.)

The network designer's definition would qualify two devices as communications processors: the front-end processor and the network processor. While the front-end processor connects directly to the host processor's block/byte multiplexer or selector channels, the network processor is a standalone unit that is not host dependent and has a large degree of operating autonomy. Its primary function is to provide a link between user terminal devices and the front-end processor and/or other network processors. Communications with the FEP is on the data link level. While the network processor does not carry on a dialog with the FEP, it does respond to FEP-initiated network signals.

While the above definitions seem black and white, some equipment still falls into a gray area. Packet switches, for example, often fit quite nicely into our definition but we cannot classify them only as communications processors. We have concluded that communications processing must actually be classified in terms of application and/or functionality.

We also recognize, however, that there is a small but important class of equipment that belongs to the traditional communications processing realm. This class includes IBM 372X/374X, NCR Comten, and Amdahl front-end processors. IBM controls a majority of this market, and only a handful of vendors manufacture competing systems. Unisys also manufactures communications processors for its mainframes. Full product reports on these systems are included within this tab.

Front-end processing is the most complex task a communications processor can perform. In a large, complex network governed by one or more mainframe hosts, a front end must do all but the last three functions listed in Table 1 in the normal course of its operations.

Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialog with a host computer and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions in the table. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators. It must also change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch merely establishes an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor performs, and communications processors acting as concentrators are easily confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, PADs, and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change in the network.

An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly. These changes include accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached devices. Some sophisticated terminal controllers, notably IBM's 3174s, perform some or all of these functions.

A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy. A concentrator concentrates data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3725 acting as a remote node (concentrator) and an IBM 3174 within that concentrator's domain. A user builds an entire network from intelligent concentrators communicating with one another as peers, but does not do the same with cluster controllers.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices.

Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, and Unisys' BNA and DCA. Open architectures include the CCITT X.25 packet-switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standardization (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most often as a front end and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies, depending on the architecture. In Unisys' DCA, the DCP-Series front end controls many Presentation layer functions, while in IBM's SNA, the host's access method (along with software residing in the terminal controllers) handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all mainframe architectures, the same communications processor models that serve as front ends also function as intelligent switches and as remote concentrators. In these functions, the communications processors usually appear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture also perform intelligent gateway functions. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet switched data networks using the X.25 protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers via a uniform set of complementary protocols. Designed specifically for public data networks, X.25 protocols ultimately establish virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices—computers or terminals—at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols.

In a public network, the network provider is responsible for network management. The X.25 communications processors in such a network, therefore, carry a heavy load of access, error, and class-of-service control, along with provisions for statistically recording traffic and usage data to be sorted by individual users. Communications processors designed to function as switches in public networks are

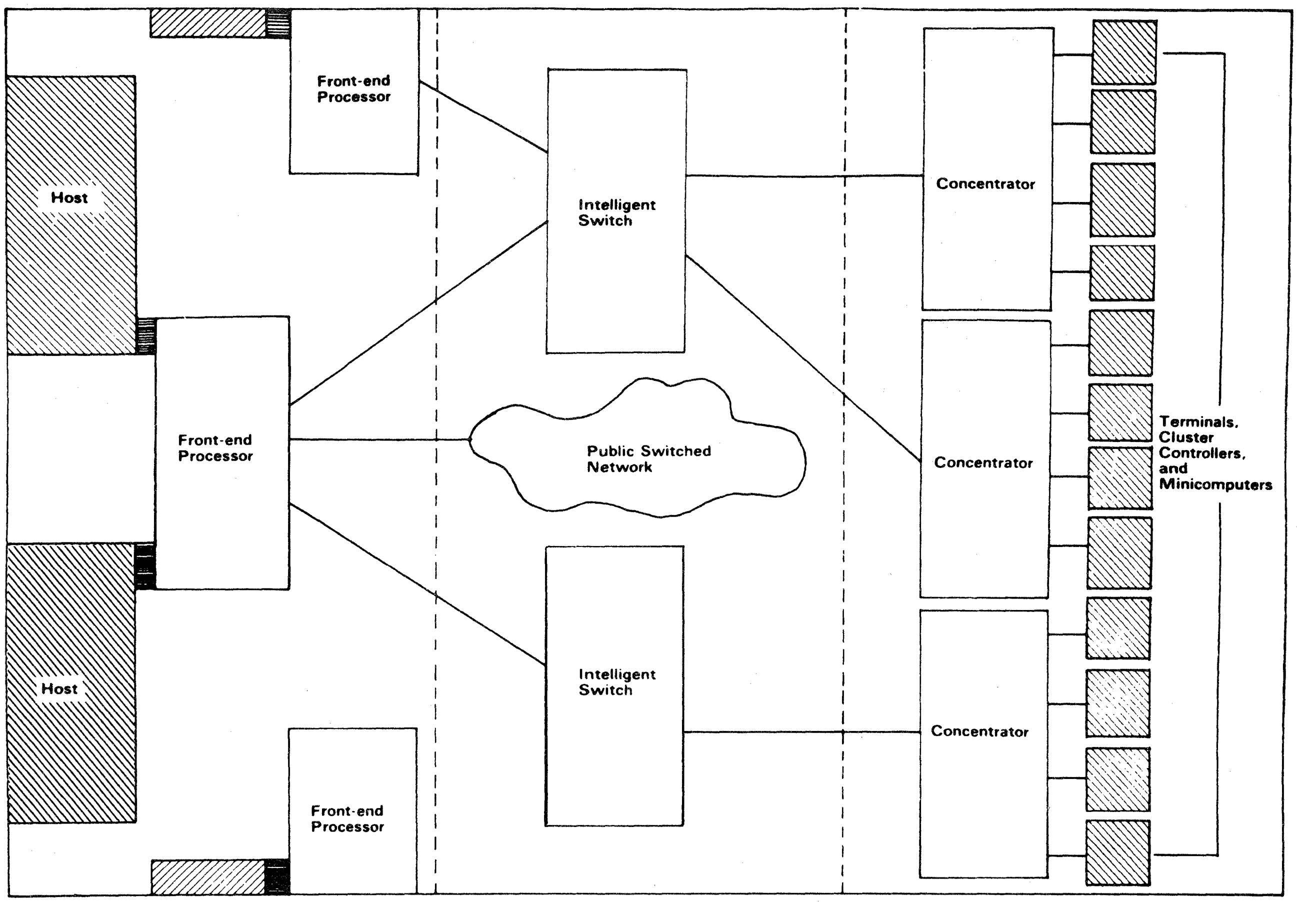


Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

the most likely to support high-capacity, attached storage devices such as disk and tape drives.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture. Table 2 shows the protocols supported by various vendors' communications processors.

Transparent architectures are offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some of these products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system for these functions.

COMMUNICATIONS PROCESSOR DESIGN

The basic design of almost all communications processors follows the same three-tiered, hierarchical plan—a plan that they share in common with their close cousins, the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy, along with its associated main memory. It controls the communications processor's operation according to the rules and parameters of its operating software and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session

Communications Processors

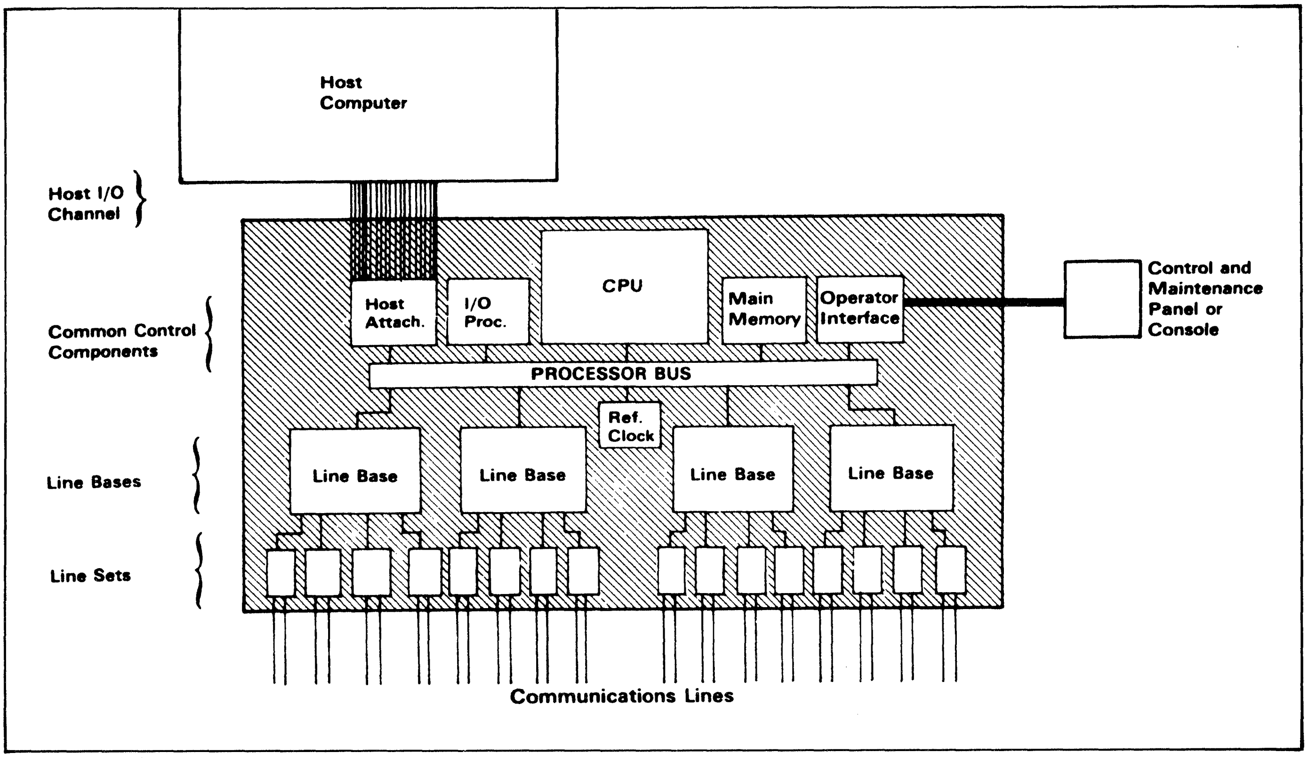


Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor can contain more than one host interface, several I/O processors, and many line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific, physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

establishment, application-level formatting, and error logging. It also delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the reference clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to the attached host channel, and transmits it up the channel to the host. For data coming from the host, it performs the same process in reverse. The host interface's principal function is to convert data from the communications processor's internal word size to that of the host computer.

Some communications processors contain one or more input/output processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generated by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for timing signals at different data rates.

The operator interface allows an operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the aforementioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor and a group of attached communications lines that shares a common synchronization pattern, line speed, and (sometimes) protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommodate from 8 to 32 line bases, each of which handles from 2 to 8 line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the backplane or a side plane of the processor's cabinet. The physical bus architecture, popularized by minicomputer design, provides easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, the bus also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might only need to replace one line base and eight line sets, rather than swapping out an entire front-end processor. The hierarchical design extends the communications processor's functionality over time and helps to protect the user's investment in the face of changing technology. Figure 2 shows the hierarchical configuration of a generalized communications processor.

THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it was born in the mid-1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hardwired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and perform simple error notification.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform a number of functions more efficiently than a mainframe and supplied the bus architecture that gives communications processors their modularity and flexibility. ARPAnet, the first large-scale packet switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the intelligent virtual circuit switch, the first functional communications processor.

A later development in minicomputer applications created the distributed processor, a small computer dedicated to part of a larger application that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications-handling under software control. Indeed, network architectures from such minicomputer vendors as Digital Equipment Corporation and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the higher cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications-handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures and, to a large extent, made such architectures possible.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing; they defined the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

One further development produced the communications processor as we know it today: the microprocessor. The advent of inexpensive silicon intelligence allowed designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger, more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization for each. Some newer systems comprise entirely redundant, microprocessor-controlled modules that perform the functions of other modules, using the proper software load.

Communications Processors

The advent of the microprocessor has blurred the distinction between traditional communications processors and less broadly functional devices, such as multiplexers and terminal controllers, creating a new class of intelligent protocol converters dedicated to tasks that were once economically performed by multifunctional communications controllers. Now, even modems detect; report; and, in some cases, correct transmission errors and sense the conditions of transmission lines. The old definition of a communications processor as a computer programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3745.

In answer to this shifting definition, Datapro offers Tab C23, Volume 2, Protocol Conversion Systems; Tab C20, Volume 2, Packet Switching Equipment; and Tab C14, Volume 2, Channel Extenders, in *Datapro Reports on Data Communications*. There, the reader will find information on many product categories formerly covered in this report, including protocol converters, intelligent terminal controllers (with conversion capabilities), PADs, packet switches, and channel extenders.

ADVANTAGES AND RESTRICTIONS

The communications processor's principal advantage as a networking tool is the physical and logical separation of the networking function from the applications of its end users. Whatever its architecture, such a network functions for any application; grows in size without qualitative change to accommodate new applications; and accommodates new applications through the installation of relatively standard, intelligent components. The user need not redesign and rebuild a modular network to change the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design survives breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

In operation, a network controlled by communications processors survives the total failure of one or more of its host processors. In a multihost network, front-end processors switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows service to degrade gracefully in the event of a host failure, sometimes allowing users to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

The communications processor still fulfills its original purpose: relieving the host of the overhead generated by keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid-1970s when the first communications processors appeared. Thanks to the declining cost of memory and processing power, many of today's communications processors are faster and more powerful than that era's mainframes.

Complexity and incompatibility are among the restrictions of today's communications processors. In an environment of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer should meddle. Most require programs written in an arcane, Assembler-level language, sometimes (but not always) with the benefit of pregenerated macros in the host access method.

THE CURRENT MARKETPLACE

The market for full-scale communications processors can be broken down into three segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; and intelligent concentrators designed to serve in transparent network architectures.

IBM remains the leader in the communications processor market in terms of market share. NCR Comten is second, while Amdahl rounds out the Big Three of the FEP market. The other mainframe vendors, such as Unisys and Bull HN Informations Systems Inc., do not really compete with one another in the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Bull HN's Datanet 8 Series features a broad array of compatibility software, while the Unisys DPC Series goes further than most in providing host-independent networking. A number of vendors offer intelligent concentrators, often at the high end of a line of statistical multiplexers.

Competition among the Big Three vendors heated up in the past year as IBM rolled out its 3745, now offered in five models; NCR introduced an optional processor upgrade, the High Performance Feature (HPF) for its 5660; and Amdahl enhanced and emphasized its position of high performance and competitive pricing, 10 percent to 15 percent lower than IBM's. As these vendors vie for a larger chunk of the high-end market, users might expect such enhancements and price reductions to continue.

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async/ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Advanced Computer	Yes	Yes	Yes	HDLC	No	DMI
Amdahl	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Chi Corporation	Yes	Yes	No	Yes	Yes; host PAD connector, terminal PAD connection; DDN, GET, AT&T, Globenet terminal protocol detection for NTR, 2780, 3780, HASP, REM1	TELNET (TCP/IP), automatic
Computerm Corporation	Yes (1052/2741 emulation)	Yes	Yes	No	No	No
Digital Communications	Yes	Yes	Yes	—	Yes	—
Computer Network Technologies	Yes	Yes	Yes	—	No	—
Bull HN Info Systems Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3725	Yes	Yes	Yes	No	GTE Telenet	—
3745	Yes	Yes	Yes	No	GTE Telenet	—
Infotron						
990NP Network Processor	Yes	Yes	Yes	Yes	Yes	Virtually all are supported
892NP Network Processor	Yes	Yes	Yes	Yes	Passthru only	Not applicable
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	RPQ	Request price quotation
Distributed Network Processor Series	Yes	Yes	Yes	RPQ	RPQ	Request price quotation
NCR Comten 5620	Yes	Yes	Yes	Yes	Yes, HPADs & TPADS—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS Telenet, Transpac, Tymnet	—

**Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.*

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII async/ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
3690	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	Telenet, Transpac, Tymnet
3695	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	Telenet, Transpac, Tymnet
5660	Yes	Yes	Yes	Yes	Yes, HPADS & TPADs—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS	Telenet, Transpac, Tymnet
Netlink Inc. Network SNA-Hub	No	No	Yes	No	No	Token Ring
NTX Model 3800	—	No	No	No	No	NDLC (extended HDLC)
Periphonics						
VoicePac	Yes	Yes	Yes	Special order	Special order	PARS
VoiceBox	Yes	Yes	Yes	Special order	No	—
VoiceStar 40XX	Yes	Yes	Yes	Special order	No	—
VoiceStar 42XX	Yes	Yes	Yes	Special order	Yes, host or terminal PAD—Telenet, Infonet	PARS
VoiceStar 46XX	Yes	Yes	Yes	Special order	Yes, host or terminal PAD—Telenet, Infonet	PARS
VoiceStar 47XX	Yes	Yes	Yes	Special order	Yes, host or terminal PAD—Telenet, Infonet	PARS
Unisys CP2000	Yes	Yes	Yes	Yes	DTE, Tymnet, Telenet, various PTT	—
Unisys DCP/15, DCP/40, & DCP/50	Yes	Yes	Yes	Yes	Yes, X.29 PAD	PARS, DDN TELNET

Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

Communications Processors

THE COMPARISON COLUMNS

Following this report are comparison columns listing the device specifications of many communications processing systems. While compiling this report in January 1989, Datapro sent requests to firms known or believed to manufacture communications processors. *The absence of any company from the columns means that the company either failed to respond to our request by the deadline or chose not to be listed.*

The KEY TO THE COMMUNICATIONS PROCESSOR COMPARISON COLUMNS provides a complete description of the comparison column entries.

KEY TO THE COMMUNICATIONS PROCESSOR COMPARISON COLUMNS

The comparison columns that follow this report list the major characteristics of 68 commercially available communications processors. The text below explains the column entries, in order of their appearance.

COMMUNICATIONS SYSTEMS INTERFACED

Manufacturer/Model. For processors that serve IBM and plug-compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug compatibles. For processors operating in open network architectures, we list "Most major vendors."

Direct Attachment to Host. This is one indication of whether the device is a true front-end processor. Network processors do not connect directly to the host.

FUNCTIONAL CHARACTERISTICS

Front-End Processor. This entry indicates whether the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously.

IBM Emulation. This entry lists the degree of IBM emulation the processor can perform.

PU Type within Network. This entry indicates the PU (physical unit) type found within the network.

Remote Line Concentrator. A "yes" for this entry indicates whether the processor in question can serve as a line concentrator remote from any host processor in its network. The next entry lists the number of hosts the concentrator can serve at one time.

Host-Independent Network Processor. This entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Host Channel Extender. This entry indicates that the processor can function as a host channel extender within its architecture.

Terminal Controller. This entry indicates that the processor in question can function as a terminal controller within its architecture.

Store-and-Forward Message-Switching Processor. This entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Level of Data Unit Transferred Across I/O Channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte or block).

Type of Data Transfer Supported between Memory and a) Communications Lines, b) Mass Storage, and c) Other Peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors, must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components share control of main memory with the CPU and can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, Backup, and Diagnostic Peripherals Supported. Most communications processors interact only with their attached hosts and terminals and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information and feature diagnostic consoles for direct operator intervention.

Support for Remote Console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Support X.25 Level 3 Capabilities. This entry indicates that the processor supports X.25 capabilities.

Communications Operating Software:

Operating System Implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) on-board the processor, or in some combination of these.

IPL Method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from on-board read-only memory.

Additional Software Supported. This entry lists any network control or applications software that the processor in question can support.

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSOR COMPARISON COLUMNS (Continued)

User Programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an Assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native Assembler language.

Software Separately Priced. This entry indicates whether the communications processor's operating software is included in the cost of the hardware.

Approximate Proportion of Currently Installed Systems Supplied as Turnkey Systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

NETWORK MANAGEMENT/CONTROL CAPABILITIES

Diagnostic Tests Supported. Some processors now offer management functions, such as running diagnostic tests. Examples include remote and local loopback, port/link status, and internal diagnostics.

Data Collected. In gathering performance data, the processor can collect traffic statistics, line failures, error records, etc.

PRICING AND AVAILABILITY

Entries under this header list purchase, lease (or rental) and maintenance pricing, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product.

Vendor Phone Number. The vendor's phone number is supplied at the bottom of each comparison column as a courtesy to the reader.

Comments. Comments at the end of the columns describe significant or unusual features, capabilities, or applications that are not reflected in the standard entries.

Distributed Processing Node. Most true communications processors cannot perform applications processing; however, some (including a few intelligent concentrators) can support distributed applications in addition to their principal networking function. This class of communications processor is growing more scarce.

Network Architecture Compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device or it may support the prearchitectural protocols of the vendor(s) whose hosts it supports.

Communications Line Capacity. The first section of this entry deals with the number of lines a communications processor can support. The next entry lists the highest data rate the processor can support. The last entry lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

COMMUNICATIONS FEATURES/FUNCTIONS

Entries under this heading list the major functions a communications processor performs, but that not all communications processors **do** perform.

Multiplexing/Demultiplexing. This entry indicates that the processor in question can function as a multiplexer.

Terminal-Initiated Application Switching. This entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications Processor Initiated Dynamic Line Reconfiguration. Dynamic line configuration is another name for fallback switching. This entry indicates that the processor in question can switch without operator intervention a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure.

Interface to Ethernet LAN. This entry indicates that the processor offers an interface to an Ethernet LAN.

Protocol Conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code Conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error Control. This entry specifies which of the available schemes for error detection (e.g., parity, LRC, or CRC) the processor in question uses.

Automatic Transmission Speed Detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic Disconnect of Inactive Dial-Up Terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON COLUMNS (Continued)

SYSTEM CHARACTERISTICS

Processor Type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Main Memory Word Size (bits). In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main Memory Storage Capacity (bytes). This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a timeshared or interrupt basis. □

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose products are shown in the comparison columns that follow this report.

Advanced Computer Communications
720 Santa Barbara Street
Santa Barbara, CA 93101 (805) 963-8801

Amdahl Communications
1250 E. Arques Avenue, MS 200
Sunnyvale, CA 94088 (408) 746-6000

Bull HN Information Systems Inc.
200 Smith Street
Waltham, MA 02154 (508) 671-6000, (800) 999-2181

Chi Corp.
26055 Emery Road
Cleveland, OH 44128 (216) 831-2622, (800) 828-0311

Computer Network Technology Corp.
9440 Science Center Drive
Minneapolis, MN 55428 (612) 420-4466

Computer Corp.
100 Wood Street
Pittsburgh, PA 15222 (412) 391-7804

Digital Communications Associates, Inc.
1000 Alderman Drive
Alpharetta, GA 30201 (404) 442-4000

Infotron Systems Corp.
9 N. Olney Avenue
Cherry Hill, NJ 08003 (609) 424-9400

International Business Machines Corp. (IBM)
Old Orchard Road
Armonk, NY 10504
Contact your local IBM representative.

Lemcom Systems, Inc.
2104 W. Peoria Avenue
Phoenix, AZ 85029 (602) 944-1543

NCR Comten
2700 Snelling Avenue North
St. Paul, MN 55113 (612) 638-7944

Netlink, Inc.
3214 Spring Forest Road
Raleigh, NC 27604 (919) 878-8612

NTX Communications Corp.
508 Tasman Drive
Sunnyvale, CA 94089 (408) 747-1444

Periphonics Corp.
4000 Veterans Highway
Bohemia, NY 11716 (516) 467-0500

Unisys Corp.
Post Office Box 500
Blue Bell, PA 19422 (215) 542-4011 □

Communications Processors Comparison Columns

MANUFACTURER	Advanced Computer Communications	Advanced Computer Communications	Amdahl Communications	Amdahl Communications
MODEL	ACP 5100	ACP 6640	Amdahl 4745-110	Amdahl 4745-210
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	DEC MicroVAX II, MicroVAX 3000	DEC VAX	All IBM- and Amdahl-compatible mainframes	All IBM- and Amdahl-compatible mainframes
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. Hosts attachable to FEP	Not applicable	Not applicable	4	8
Max. Hosts Supported Simultaneously	1	1	2	6
IBM Emulation	HDLC	Vendor did not specify	270X/370X, EP, 370X/37X5, NCP, SNA/SDLC	270X/370X, EP, 370X/37X5, NCP, SNA/SDLC
PU Type within Network	Vendor did not specify	Vendor did not specify	PU Type 4	PU Type 4
Remote Line Concentrator	No	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	Not applicable	1	NCP standard	NCP standard
Host-independent Network Processor	No	No	No	No
Host Channel Extender	No	No	No	No
Terminal Controller	No	Yes	No	No
Store-and-Forward Message Switching	No	No	No	No
Distributed Processing Node	Yes	No	No	No
Network Architecture Compliance	HDLC	DMI/ISDN	SNA, BSC, OSI, X.25	SNA, BSC, OSI, X.25
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	Vendor did not specify	Vendor did not specify	64	256
Highest Line Speed Supported (bps)	T1 (1.544M)	T1 (1.544M)	256K	256K
Effect on Line Capacity, All Lines Full Duplex	Vendor did not specify	Vendor did not specify	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	No	Yes	Yes	Yes
Terminal-Initiated Applications Switching	No	Yes	Yes	Yes
Dynamic Line Reconfiguration	No	No	No	No
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	Vendor did not specify	DMI	NCP standard	NCP standard
Code Conversion	None	Vendor did not specify	NCP standard	NCP standard
Error Control	Vendor did not specify	Vendor did not specify	Parity check w/retransmit on error, LRC & CRC detection/correction, parity	Parity check w/retransmit on error, LRC & CRC detection/correction, parity
Automatic Transmission Speed Detection	Vendor did not specify	Yes	NCP standard & COMMPRO	NCP standard and Commpro
Auto. Disconnect of Inactive Terminals	Vendor did not specify	Vendor did not specify	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Motorola 6800	Motorola 6800	Proprietary	Proprietary
Main Memory Word Size (bits)	Vendor did not specify	Vendor did not specify	32	32
Main Memory Storage Capacity (bytes)	512K	1M	4M	4M
Data Unit Transferred Across I/O Channel	Byte	DMI	Byte, block	Byte, block
Data Support, Memory and Comm. Lines	DMA	DMA	Both	Both
Mass Storage	Vendor did not specify	Vendor did not specify	Interrupt, block	Interrupt, block
Other Peripherals	Vendor did not specify	Vendor did not specify	Interrupt, floppy	Interrupt, interrupt
I/O, Backup, and Diagnostic Peripherals Supported	Vendor did not specify	Vendor did not specify	FEP console, diskette, disk, control panel	FEP console, diskette, disk, control panel
Support for Remote Console	No	No	Yes	Yes
Support for X.25 Level 3 Capabilities	No	No	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Hardware	Firmware	Software, firmware	Software, firmware
IPL method	Vendor did not specify	Internal self-load	Download from host, disk load	Download from host, disk load
Additional Software Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	No	No
Software Separately Priced	All	Vendor did not specify	All, NCP from IBM	All
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics	Vendor did not specify	Local/remote loopback, internal diagnostics, problem determination, port/line status	Local/remote loopback, internal diagnostics, problem determination, port/line status, NCP/NetView support
Data Collected	Node/link/software status, port statistics	Vendor did not specify	Traffic loading, node/link/software status, line outages/hits, port stats., trace, error rates, events, link ldg., NCP/Netview support	Traffic loading, node/link/software status, line outages/hits, port stats., trace, error rates, events, link ldg., NCP/NetView support
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	4,200.00	10,000.00	91,500.00	12,000.00
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	294.00	310.00
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of Announcement	Vendor did not specify	Vendor did not specify	May 1988	May 1988
Date of First Commercial Delivery	Vendor did not specify	Vendor did not specify	June 1988	June 1988
Number of Systems Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serviced by	Vendor did not specify	Vendor did not specify	Amdahl	Amdahl
VENDOR PHONE NUMBER	(805) 963-8801	(805) 963-8801	(408) 746-6000	(408) 746-6000
COMMENTS	—	—	Runs both NCP-4 for 3725 and NCP-5 for 3745; backup architecture part of base design; upgradeable to 4745-210	Runs both NCP-4 for 3275 and NCP-5 for 3745; backup architecture part of basic design

Communications Processors Comparison Columns

MANUFACTURER	Bull HN Information Systems	Bull HN Information Systems	Bull HN Information Systems	Bull HN Information Systems
MODEL	DATANET 8/05 DPS 7000	DATANET 8/10	DATANET 8/20	DATANET 8/30
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	Bull DPS 7000	Bull DPS7, DPS7000, DPS8, DPS8000, DPS88, DPS90, DPS9000	DPS7, DPS7000, DPS8, DPS88, DPS90, DPS8000, DPS9000	Bull DPS7, DPS7000, DPS8, DPS8000, DPS88, DPS90, DPS9000
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. Hosts attachable to FEP	1	1 or 2	4	4
Max. Hosts Supported Simultaneously	1	1 or 2	4	4
IBM Emulation	370X/37X5, NCP	370X/37X5, NCP	370X/37X5, NCP	370X/37X5, NCP
PU Type within Network	PU Type 5,DSA node/FE to host	DSA node	PU Type 2, PU Type 4, DSA node	PU Type 2, PU Type 4, DSA node
Remote Line Concentrator	No	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	1000	1000	1000	1000
Host-independent Network Processor	No	Yes	Yes	Yes
Host Channel Extender	No	No	No	No
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching	No	No	No	No
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	BSC, OSI, X.25, DSA	BSC, OSI, DSA	SNA, BSC, OSI, X.25, DSA	SNA, BSC, OSI, X.25, DSA
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	15	31	127	127
Highest Line Speed Supported (bps)	64K	64K	2.5M	2.50M
Effect on Line Capacity, All Lines Full Duplex	Load dependent, protocol dependent	Load dependent, protocol dependent	Load/protocol dependent	Load dependent, protocol dependent
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Dynamic Line Reconfiguration	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	Async, VIP, DSC, RCI	Async, VIP, DSC, RSI	SDLC to X.25	SDLC to X.25, async, VIP, BSC, RCI
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	Parity check w/retransmit on error, LRC & CRC detection/correction, parity	Parity check w/retransmit on error, LRC & CRC detection/correction, parity	Parity check w/retransmit on error, LRC & CRC detection/correction, parity	Parity check w/retransmit on error, LRC & CRC detection/correction, parity
Automatic Transmission Speed Detection	300 to 4600	300 to 9600	300 to 9600	300 to 9600
Auto. Disconnect of Inactive Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Proprietary	Proprietary	Proprietary	Proprietary
Main Memory Word Size (bits)	16	16	16	16
Main Memory Storage Capacity (bytes)	2M	2M	2M	2M
Data Unit Transferred Across I/O Channel	Word, 36 bit	Word (36 bit)	Word (36 bit)	Word (36 bit)
Data Support, Memory and Comm. Lines	Both	DMA, interrupt, both	Both	DMA, interrupt, both
Mass Storage	Vendor did not specify	Vendor did not specify	Not applicable	Vendor did not specify
Other Peripherals	DMA	DMA	DMA	DMA
I/O, Backup, and Diagnostic Peripherals Supported	FEP console, diskette, host/mainframe	FEP console, host/ mainframe	FEP console, diskette, host/mainframe	FEP console, diskette, host/mainframe
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Software, firmware	Software, firmware	Software, firmware	Software, firmware
IPL method	Download from host, IPL diskette, tele-load	Download from host, tele-load	Download from host, IPL diskette, tele-load	Download from host, IPL diskette, tele-load
Additional Software Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
User Programmability	No	No	No	No
Software Separately Priced	All	All	All	All
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics, problem determination, port/line status, network management	Local/remote loopback, internal diagnostics, problem determination, port/line status, network management	Local/remote loopback, internal diagnostics, problem determination, port/line status, network management	Local/remote loopback, internal diagnostics, problem determination, port/line status, network management
Data Collected	Traffic loading, node/link/software status, accounting, line outages, port statistics, trace, error rates, events, link loading	Traffic loading, node/link/software status, accounting, line outages, port statistics, trace, error rates, events, link loading	Traffic loading, node/link/software status, accounting, line outages, port statistics, trace, error rates, events, link loading	Traffic loading, node/link/software status, accounting, line outages, port statistics, trace, error rates, events, link loading
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	12,000.00	33,890.00	47,990.00	47,990.00
Monthly Maintenance ($)	150.00	244.00	329.00	329.00
Monthly Lease/rental ($)	Vendor did not specify	1,160.00	1,640.00	1,640.00
Maintenance Bundled with Lease/rental	Vendor did not specify	No	No	No
Date of Announcement	April 1987	September 1985	September 1985	September 1985
Date of First Commercial Delivery	September 1987	September 1985	September 1985	September 1985
Number of Systems Installed to Date	32	58	167	167
Serviced by	Bull Worldwide Info Sys	Bull Worldwide Info Sys	Bull Worldwide Info Sys	Bull Worldwide Info Sys
VENDOR PHONE NUMBER	(508) 671-6000	(508) 671-6000	(602) 862-8000	(508) 671-6000
COMMENTS	—	—	—	—

Communications Processors Comparison Columns

MANUFACTURER	Chi Corp.	Computer Network Technology Corp.	Computer Corp.	Digital Communications Associates, Inc.
MODEL	3205/3212	CHANNELlink 5000	3800/3890	DCA/Series 300
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	Unisys 1100 series	IBM S/370 & compat., Cray Supercomputers, DEC/VAX-BI Bus	IBM S/370, 43XX, 30XX & compatibles	Most vendors
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	No
Max. Hosts attachable to FEP	2	8/unit	4	Vendor did not specify
Max. Hosts Supported Simultaneously	2	255/network	4	Vendor did not specify
IBM Emulation	None	CTCA	Not applicable	3270 BSC, SNA/SDLC, 2780/3780/HASP
PU Type within Network	PU Type 2	Channel attached	Not applicable	PU Type 2
Remote Line Concentrator	Yes	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	Unlimited	255	4	114
Host-independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	No	Yes	Yes	Vendor did not specify
Terminal Controller	Yes	Vendor did not specify	No	Yes
Store-and-Forward Message Switching	No	Yes	No	No
Distributed Processing Node	No	Vendor did not specify	No	No
Network Architecture Compliance	OSI, X.25	TCP/IP	Transparent	SNA, DECnet, BSC, OSI, X.25,802.3
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	24	16	8 full-duplex	114
Highest Line Speed Supported (bps)	64K	4.0M	1.544M	72K
Effect on Line Capacity, All Lines Full Duplex	None	None	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	No	Yes
Terminal-Initiated Applications Switching	Yes	No	Yes	Yes
Dynamic Line Reconfiguration	Yes	Yes	No	Yes
Interface to Ethernet LAN	Yes	Yes	No	Yes
Protocol Conversion	Async to uniscope	Yes	No	Async to 3270 BSC, SDLC to X.25, async to X.25
Code Conversion	ASCII/EBCDIC/XS3	None	None	ASCII to EBCDIC, Baudot to ASCII
Error Control	LRC & CRC detection/correction	LRC & CRC detection/correction	LRC & CRC detection/correction	Parity check w/retransmit on error, LRC & CRC detection/correction, parity, ARQ-CRC
Automatic Transmission Speed Detection	110-19.2K	Up to 4.0M	No	300 to 19.2K
Auto. Disconnect of Inactive Terminals	Yes	No	No	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Concurrent computer 3205	MC68020	Z80B, IBM Series/1	Z80B, MC68010
Main Memory Word Size (bits)	32	32	16	8
Main Memory Storage Capacity (bytes)	8M	10M	512K	512K,[1]
Data Unit Transferred Across I/O Channel	Byte	Block	Byte, block	Byte, file, block
Data Support, Memory and Comm. Lines	Both	DMA	DMA	Both
Mass Storage	Both	Vendor did not specify	None	Both
Other Peripherals	Both	Vendor did not specify	DMA	Both
I/O, Backup, and Diagnostic Peripherals Supported	FEP console, diskette, patch panel	FEP console	FEP console, diskette	FEP console, diskette, disk, magnetic tape, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	No	No	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Software, firmware	Firmware	Software, firmware	Software
IPL method	Download from host, IPL diskette	Internal self-load	Internal self-load, IPL diskette	Download from host, IPL diskette, hard disk
Additional Software Supported	Development, communications	Vendor did not specify	Vendor did not specify	Vendor did not specify
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via console	Yes, via user-selected parameters, user-created programs, and via console
Software Separately Priced	Some	Some	None	Some
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics, port/line status	Local/remote loopback, internal diagnostics, problem determination, port/line status	Internal diagnostics	Local/remote loopback, internal diagnostics, problem determination, port/line status
Data Collected	Node/link/software status, line outages, port statistics, trace, line hits, error rates	Traffic loading, node/link/software status, line outages, port statistics, trace, line hits, error rates, events, link loading	Traffic loading, line outages, trace, line hits, error rates, data display/rt monitor	Traffic loading, node/link/software status, accounting, line outages, port statistics, trace, line hits, error rates, events, link loading
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	35,000.00	38,000.00	73,000.00	Vendor did not specify
Monthly Maintenance ($)	300.00	Vendor did not specify	613.00	Vendor did not specify
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	No	Yes	No	Yes
Date of Announcement	Vendor did not specify	March 1987	Vendor did not specify	1979
Date of First Commercial Delivery	1985	January 1987	December 1982	1979
Number of Systems Installed to Date	Vendor did not specify	100	380	1,000
Serviced by	Chi Corporation	Computer Network Tech	Computerm, IBM	DCA
VENDOR PHONE NUMBER	(216) 831-2622	(612) 420-4466	(412) 391-7804	(404) 442-4000
COMMENTS	Preconfigured, dynamic routing, 2 async screen editors, auto term. prot. detect., redund., multi. loc./rem. hosts, VTS emul., VTS on X.25 ntwk	Network support for remote peripherals	Channel extension support for printers, CRTs, check sorters, mag tape, & front ends w/ satellite efficient protocols	[1]512K per processor, maximum 24 processors; TCP/IP support, OSI network management, DCA/DNMS compatible

Communications Processors Comparison Columns

MANUFACTURER	Infotron Systems Corp.	Infotron Systems Corp.	International Business Machines Corp. (IBM)	International Business Machines Corp. (IBM)
MODEL	**892NP**	**990NP 990NP/992NP**	**IBM 3270**	**IBM 3725**
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	Not applicable	Not applicable	IBM 43XX, 303X, 308X, 309X	IBM S/370 (except models 115 & 125), 303X
Direct Attachment to Host	No	No	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	No	Yes	Yes
Max. Hosts attachable to FEP	None	None	4	8
Max. Hosts Supported Simultaneously	None	Over 10	4	8
IBM Emulation	None	3270 BSC	Yes	270X/370X
PU Type within Network	None	None	Vendor did not specify	Vendor did not specify
Remote Line Concentrator	Yes	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	2	Over 10	4	8
Host-independent Network Processor	Yes	Yes	No	No
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching	No	No	No	No
Distributed Processing Node	Yes	Yes	No	No
Network Architecture Compliance	Proprietary	Proprietary	SNA	SNA
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	104 channels	640	28	256 with expansion
Highest Line Speed Supported (bps)	64K	64K	64K	256K (LIC Type 4B)
Effect on Line Capacity, All Lines Full Duplex	None	None	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	No	No
Dynamic Line Reconfiguration	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	No	No	Yes	Yes
Code Conversion	None	None	Yes	Yes
Error Control	ARQ-CRC	Vendor did not specify	LRC & CRC detection/correction	LRC & CRC detection/correction
Automatic Transmission Speed Detection	110 to 9600	To 9600	Yes, via optional software	Yes, via optional software
Auto. Disconnect of Inactive Terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor Type	6502, 80186	6502, 8086, 80186	Proprietary	Proprietary
Main Memory Word Size (bits)	Not applicable	Vendor did not specify	18	18
Main Memory Storage Capacity (bytes)	Not applicable	Vendor did not specify	1M, expandable to 2M	3M
Data Unit Transferred Across I/O Channel	Not applicable	Vendor did not specify	Block	Block
Data Support, Memory and Comm. Lines	DMA, interrupt	DMA, interrupt	DMA	DMA
Mass Storage	Not applicable	Vendor did not specify	DMA	DMA
Other Peripherals	Not applicable	Vendor did not specify	DMA	DMA
I/O, Backup, and Diagnostic Peripherals Supported	FEP console, network manager	FEP console, diskette	FEP console	FEP console
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	No	Yes	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Firmware	Software, firmware	Software	Software
IPL method	Internal self-load	EEPROM	Internal self-load	Internal self-load
Additional Software Supported	Vendor did not specify	Not applicable	ACF/NCP, NTO, NPSI, NRF, NPDA, ACF/TCAM	NCCF, NPDA, ACF/NCP-PEP, EP/3725
User Programmability	Yes, via console	Yes, via console	Yes	Yes
Software Separately Priced	Some	Some	All	All
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, problem determination	Yes	Yes	Vendor did not specify
Data Collected	Traffic loading, line outages, trace, error rates, events	Yes	Yes	Vendor did not specify
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	11,000.00	20,000.00	Vendor did not specify	Vendor did not specify
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	No	No	No	No
Date of Announcement	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Commercial Delivery	October 1984	1984	1986	1983
Number of Systems Installed to Date	30	6,000	Vendor did not specify	Vendor did not specify
Serviced by	Infotron	Infotron	IBM	IBM
VENDOR PHONE NUMBER	(609) 424-9400	(609) 424-9400	(914) 765-1900	(914) 765-1900
COMMENTS	8 nodes per network; ANM-800 network manager optional; multiple links up to 64K, auto alternate routing	Provides adaptive routing; comprehensive network management features; bisync emulation and async/BSC/SDLC support	Contact local IBM rep.	Contact local IBM rep.

Communications Processors Comparison Columns

MANUFACTURER	**International Business Machines Corp. (IBM)**	**International Business Machines Corp. (IBM)**	**Lemcom Systems, Inc.**	**Lemcom Systems, Inc.**
MODEL	**IBM 3745 130/150/170**	**IBM 3745 210/410**	**Communications Micro Controller 32**	**Communications Micro Controller 4**
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	IBM 43XX, 937X, 308X, 3090	IBM S/370, 43XX, 937X, 3033, 308X, 3080	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. Hosts attachable to FEP	4	16	1	1
Max. Hosts Supported Simultaneously	Vendor did not specify	8	1	1
IBM Emulation	Yes	Yes	270X/370X, EP	270X/370X, EP, 370X/37X5, custom
PU Type within Network	Vendor did not specify	Vendor did not specify	Not applicable	Not applicable
Remote Line Concentrator	Yes	Yes	No	No
Max. Hosts Served by One Concentrator	Vendor did not specify	Unlimited	Not applicable	Not applicable
Host-independent Network Processor	No	No	No	No
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching	No	No	No	No
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	SNA	SNA, X.25	Not applicable	Not applicable
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	Vendor did not specify	512	8	4
Highest Line Speed Supported (bps)	Vendor did not specify	1.544M	57.6K	57.6K
Effect on Line Capacity, All Lines Full Duplex	None	None	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	No	No
Terminal-Initiated Applications Switching	No	No	No	No
Dynamic Line Reconfiguration	Yes	Yes	No	No
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	Yes	Yes	Custom	No
Code Conversion	Yes	Yes	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	LRC & CRC detection/correction	LRC & CRC detection/correction	Parity check w/retransmit on error	Parity check w/retransmit on error
Automatic Transmission Speed Detection	Yes	Vendor did not specify	Yes	Yes
Auto. Disconnect of Inactive Terminals	No	Vendor did not specify	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Proprietary	Proprietary	Motorola 6800	Motorola 6800
Main Memory Word Size (bits)	18	Vendor did not specify	8	8
Main Memory Storage Capacity (bytes)	Vendor did not specify	8M (per CCU)	80K	40K
Data Unit Transferred Across I/O Channel	Block	Block	Byte, block	Byte, block
Data Support, Memory and Comm. Lines	DMA	DMA	Interrupt	Interrupt
Mass Storage	DMA	DMA	None	None
Other Peripherals	DMA	DMA	None	None
I/O, Backup, and Diagnostic Peripherals Supported	FEP console	Vendor did not specify	FEP console	FEP console
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	Yes	No	No
OPERATING SOFTWARE				
Operating System Implemented in	Software	Software	Firmware	Firmware
IPL method	Internal self-load	Internal self-load	Internal self-load	Internal self-load
Additional Software Supported	Vendor did not specify	ACF/NCP V%, EP, NTO, ACF/VTAM, Netview	Problem determination aids	Problem determination aids
User Programmability	Yes	Yes	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	All	All	Utilities only	Utilities only
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Yes	Yes	Local/remote loopback, internal diagnostics, problem determination	Local/remote loopback, internal diagnostics, problem determination
Data Collected	Yes	Yes	Trace	Trace
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	Vendor did not specify	Vendor did not specify	10,000.00	9,000.00
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	No	No	No	No
Date of Announcement	1989	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Commercial Delivery	1989	March 1988	November 1980	March 1977
Number of Systems Installed to Date	Vendor did not specify	Vendor did not specify	75	400
Serviced by	IBM	IBM	National Advanced Sys.	National Advanced Sys.
VENDOR PHONE NUMBER	(914) 765-1900	(914) 765-1900	(602) 944-1543	(602) 944-1543
COMMENTS	Contact local IBM rep.	Contact local IBM rep.	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts

Communications Processors Comparison Columns

MANUFACTURER	Lemcom Systems, Inc.	Lemcom Systems, Inc.	NCR Comten	NCR Comten
MODEL	Communications Micro Controller 8	Distributed Network Processor Series	Model 5620	Model 5655
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	IBM S/360, S/370, 30XX, 43XX, & compat.	Vendor did not specify	IBM 360/370, 303X, NCR 8500/8600, 308X, 43XX	IBM 360/370, 303X, 308X, 43XX, & compat.
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. Hosts attachable to FEP	1	32	2	8
Max. Hosts Supported Simultaneously	1	32	2	8
IBM Emulation	270X/370X, EP, custom	270X/370X, EP, 370X/37X5, SNA/SDLC, 370X BSC	270X/370X, EP, 370X/37X5, NCP, 3270 BSC, SNA/SDLC	270X/370X, EP, 370X/37X5, NCP, 3270 BSC, SNA/SDLC
PU Type within Network	Not applicable	PU Type 2	PU Type 4	PU Type 4
Remote Line Concentrator	No	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	Not applicable	32	Vendor did not specify	Vendor did not specify
Host-independent Network Processor	No	Yes	No	No
Host Channel Extender	No	Yes	Yes	Yes
Terminal Controller	No	Yes	Yes	Yes
Store-and-Forward Message Switching	No	Yes	No	No
Distributed Processing Node	No	No	Yes	Yes
Network Architecture Compliance	Not applicable	SNA, OSI, internal	SNA, BSC, OSI, X.25	SNA, BSC, OSI, X.25
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	8	3,000	64	512
Highest Line Speed Supported (bps)	57.6K	64K	T1 or token ring	T1 or token ring
Effect on Line Capacity, All Lines Full Duplex	None	Load dependent	Load dependent	Load dependent
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	No	Yes	Yes	Yes
Terminal-Initiated Applications Switching	No	Yes	Yes	Yes
Dynamic Line Reconfiguration	No	Yes	Yes	Yes
Interface to Ethernet LAN	No	Vendor did not specify	No	No
Protocol Conversion	Custom	Async to 3270 BSC, BSC/SDLC, SDLC/BSC	Async to 3270 BSC, SDLC to X.25, async to X.25	Async to 3270 BSC, SDLC to X.25, async to X.25
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	Parity check w/retransmit on error	LRC & CRC detection/correction, parity	LRC & CRC detection/correction	LRC & CRC detection/correction
Automatic Transmission Speed Detection	Yes	110 to 19.2K	300 to 19.2K	300 to 19.2K
Auto. Disconnect of Inactive Terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor Type	Motorola 6800	Motorola 6809E	Proprietary	Proprietary
Main Memory Word Size (bits)	8	8	32	32
Main Memory Storage Capacity (bytes)	80K	15M	4M	8M
Data Unit Transferred Across I/O Channel	Byte, block	Byte, block	Block	Block
Data Support, Memory and Comm. Lines	Interrupt	Both	DMA, interrupt	DMA, interrupt
Mass Storage	None	Both, bubble	DMA	DMA
Other Peripherals	None	Vendor did not specify	DMA	DMA
I/O, Backup, and Diagnostic Peripherals Supported	FEP console	FEP console, patch panel, bubble memory	FEP console, diskette, disk, printer	FEP console, diskette, disk, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	No	Yes	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Firmware	Software, firmware	Software	Software
IPL method	Internal self-load	Manual load, internal self-load, bubble	Download from host, disk	Download from host,disk
Additional Software Supported	Problem determination aids	Vendor did not specify	Vendor did not specify	Vendor did not specify
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters and via console	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	Utilities only	All	Some	Some
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics, problem determination	Local/remote loopback, internal diagnostics	Local/remote loopback, internal diagnostics, problem determination, port/line status	Local/remote loopback, internal diagnostics, problem determination, port/line status
Data Collected	Trace	Traffic loading, line outages, line hits, error rates, events, link loading	Traffic loading, node/link/software status, line outages, port statistics, trace, line hits, error rates, events, link loading, none	Traffic loading, node/link/software status, line outages, port statistics, trace, line hits, error rates, events, link loading, none
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	10,000.00	15,000.00	Vendor did not specify	Vendor did not specify
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	No	No	Vendor did not specify	Vendor did not specify
Date of Announcement	Vendor did not specify	Vendor did not specify	February 1989	March 1989
Date of First Commercial Delivery	November 1980	March 1981	March 1989	March 1989
Number of Systems Installed to Date	75	725	Vendor did not specify	Vendor did not specify
Serviced by	National Advanced Sys.	National Advanced Sys.	NCR Comten	NCR Comten
VENDOR PHONE NUMBER	(602) 944-1543	(602) 944-1543	(612) 638-7944	(612) 638-7944
COMMENTS	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts	Dist. MPU FEP; up to 256 MPUs prog. to do various comm. proc. functions, front-end polling	Field upgradeable processor performance; T1, token ring and host connectivity can be expanded in field; prices range from $122,100 to $254,000	Field upgradeable processor performance; T1, token ring and host connectivity can be expanded in field; prices range from $122,100 to $254,000

Communications Processors Comparison Columns

MANUFACTURER	NCR Comten	NCR Comten	Netlink, Incorporated	NTX Communications Corp.
MODEL	Model 5665	Model 5675	Network SNA-Hub	NTX 3800 Model 2 Series
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	IBM 360/370, 303X, 308X, 43XX, and compatibles	IBM 360/370, 303X, 308X, 43XX, and compatibles	Most vendors	IBM 3090, 308X, PCM
Direct Attachment to Host	Yes	Yes	No	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	No	Yes
Max. Hosts attachable to FEP	8	16	Not applicable	4
Max. Hosts Supported Simultaneously	8	16	Not applicable	2
IBM Emulation	270X/370X, EP, 370X/37X5, NCP, 3270 BSC, SNA/SDLC	270X/370X, EP, 370X/37X5, NCP, 3270 BSC, SNA/SDLC	Not applicable	CTCA
PU Type within Network	PU Type 4	PU Type 4	PU Type 5	Vendor did not specify
Remote Line Concentrator	Yes	Yes	Yes	No
Max. Hosts Served by One Concentrator	Vendor did not specify	Vendor did not specify	18	Vendor did not specify
Host-independent Network Processor	No	No	Yes	No
Host Channel Extender	Yes	Yes	No	No
Terminal Controller	Yes	Yes	Yes	No
Store-and-Forward Message Switching	No	No	No	No
Distributed Processing Node	Yes	Yes	Yes	No
Network Architecture Compliance	SNA, BSC, OSI, X.25	SNA, BSC, OSI, X.25	SNA	Vendor did not specify
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	1024	1024	16	8
Highest Line Speed Supported (bps)	T1 or token ring	T1 or token ring	64K	Vendor did not specify
Effect on Line Capacity, All Lines Full Duplex	Load dependent	Load dependent	None	Capacity halved
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	No
Dynamic Line Reconfiguration	Yes	Yes	Yes	No
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	Async to 3270 BSC, SDLC to X.25, async to X.25	Async to 3270 BSC, SDLC to X.25, async to X.25	No	No
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	None	None
Error Control	LRC & CRC detection/correction	LRC & CRC detection/correction	Vendor did not specify	ARQ-CRC
Automatic Transmission Speed Detection	300 to 19.2K	300 to 19.2K	No	No
Auto. Disconnect of Inactive Terminals	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor Type	Proprietary	Proprietary	Intel	Proprietary
Main Memory Word Size (bits)	32	32	16	72
Main Memory Storage Capacity (bytes)	16M	16M	1M to 3M	Vendor did not specify
Data Unit Transferred Across I/O Channel	Block	Block	Not applicable	Block
Data Support, Memory and Comm. Lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	Both
Mass Storage	DMA	DMA	Not applicable	Vendor did not specify
Other Peripherals	DMA	DMA	Not applicable	Vendor did not specify
I/O, Backup, and Diagnostic Peripherals Supported	FEP console, diskette, disk, printer	FEP console, diskette, disk, printer	Not applicable	FEP console
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	Yes	No	No
OPERATING SOFTWARE				
Operating System Implemented in	Software	Software	Software	Hardware, firmware
IPL method	Download from host, disk	Download from host, disk	Download from host	Internal self-load
Additional Software Supported	Vendor did not specify	Vendor did not specify	Netlink Subnetwork, CNM NetView extensions	Vendor did not specify
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Configuration parameters	No
Software Separately Priced	Some	Some	Some	Some
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics, problem determination, port/line status	Local/remote loopback, internal diagnostics, problem determination, port/line status	ROM/RAM-based, NPDA[1]	Local/remote loopback, internal diagnostics, problem determination, port/line status
Data Collected	Traffic loading, node/link/software status, line outages, port statistics, trace, line hits, error rates, events, link loading, none	Traffic loading, node/link/software status, line outages, port statistics, trace, line hits, error rates, events, link loading, none	Node/link/software status, line outages, error rates, events	Traffic loading, line outages, line hits, error rates, link loading
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	Vendor did not specify	Vendor did not specify	14,000.00	65,000.00
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	440.00
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Maintenance Bundled with Lease/rental	Vendor did not specify	Vendor did not specify	No	Vendor did not specify
Date of Announcement	March 1989	March 1989	Vendor did not specify	1986
Date of First Commercial Delivery	March 1989	March 1989	1987	1986
Number of Systems Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Serviced by	NCR Comten	NCR Comten	Netlink	NTX
VENDOR PHONE NUMBER	(612) 638-7944	(612) 638-7944	(919) 878-8612	(408) 747-1444
COMMENTS	Field upgradeable processor performance; T1, token ring and host connectivity can be expanded in field; prices range from $122,100 to $254,000	Field upgradeable processor performance; T1, token ring and host connectivity can be expanded in field; prices range from $122,100 to $254,000	[1]NetView, Netmaster; SNA concent./router to IBM hosts or hosts supp. SNA; routing by user; interface IBM token ring; supports SNA over async links	—

Communications Processors Comparison Columns

MANUFACTURER	Periphonics Corporation	Periphonics Corporation	Unisys Corp.	Unisys Corp.
MODEL	VPS 3000/5000	VPS 7000/9000	Unisys CP2000	Unisys DCP/15
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	Most major vendors	Most major vendors	A Series	Unisys Series 110, Series 2200
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	No	Yes	Yes
Max. Hosts attachable to FEP	2	4	25	1 enc./2 cabinet
Max. Hosts Supported Simultaneously	2	4	25	1 enc./2 cabinet
IBM Emulation	270X/370X, 370X/37X5, 3270 BSC, SNA/SDLC	270X/370X, 370X/37X5, 3270 BSC, SNA/SDLC	Yes	3270 BSC, SNA/SDLC, 3270 SNA, 3780 BSC
PU Type within Network	PU Type 2	PU Type 2	PU Type 2, PU Type 5	PU Type 2, PU Type 4, T.5
Remote Line Concentrator	Yes	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	2	4	Unlimited	Any host in network
Host-independent Network Processor	Yes	Yes	No	Yes
Host Channel Extender	Yes	Yes	Vendor did not specify	No
Terminal Controller	Yes	Yes	Yes	No
Store-and-Forward Message Switching	No	No	No	Yes
Distributed Processing Node	Yes	Yes	Yes	No
Network Architecture Compliance	SNA, BSC, async TTY	SNA, BSC, async	SNA, X.25, BNA	SNA, BSC, OSI, X.25, DDN, X.21, PDN
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	32	64 (7000), 48 (9000)	24	48 as FEP
Highest Line Speed Supported (bps)	9600	9600	64K	10M/LAN, 64K/V.35
Effect on Line Capacity, All Lines Full Duplex	Minor	Minor	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Dynamic Line Reconfiguration	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	Yes	Yes
Protocol Conversion	Async to 3270 BSC	Async to 3270 BSC	Yes	Async to uniscope, 3270/uni, uni/3270
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	Yes	ASCII to EBCDIC
Error Control	Vendor did not specify	Vendor did not specify	Vendor did not specify	LRC & CRC detection/correction, parity, ARQ-CRC
Automatic Transmission Speed Detection	Yes	Yes	Yes	110 to 1800
Auto. Disconnect of Inactive Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Intel 286	Motorola 6800	Multiprocessor	Unisys DCP/40
Main Memory Word Size (bits)	16	32	16	16
Main Memory Storage Capacity (bytes)	16M	8M sys., 32M vc.	2M	6M
Data Unit Transferred Across I/O Channel	Byte	Byte	Byte	Block
Data Support, Memory and Comm. Lines	Interrupt	Interrupt	DMA	DMA
Mass Storage	Interrupt	Interrupt	Vendor did not specify	DMA
Other Peripherals	Interrupt	Interrupt	Vendor did not specify	DMA
I/O, Backup, and Diagnostic Peripherals Supported	Diskette, magnetic tape	Diskette	Disk	FEP console, diskette, patch panel, disk, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Proprietary software	Proprietary software	Firmware	Software, firmware
IPL method	Internal self-load	Download from host, internal self-load	IPL diskette	Download from host, IPL diskette
Additional Software Supported	Peritalk, Dave, Param	VRAM	Vendor did not specify	Vendor did not specify
User Programmability	Yes, via user-selected parameters, via console, voice dlg., basic edit	Yes, via user-selected parameters, user-created programs, and via console	No	Yes, via user-created programs
Software Separately Priced	All	All	All	All
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Internal diagnostics	Local/remote loopback, internal diagnostics, problem determination, port/line status	Vendor did not specify	Local/remote loopback, internal diagnostics, problem determination, port/line status
Data Collected	Traffic loading, node/link/software status, line outages, port statistics, error rates, events	Traffic loading, node/link/software status, line outages, port statistics, error rates, events	Vendor did not specify	Traffic loading, line outages, line hits, error rates, events
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	28,585.00
Monthly Maintenance ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	76.00
Monthly Lease/rental ($)	Vendor did not specify	Vendor did not specify	Vendor did not specify	720.00
Maintenance Bundled with Lease/rental	No	No	Vendor did not specify	No
Date of Announcement	1988	1987	Vendor did not specify	April 1987
Date of First Commercial Delivery	1988	1987	1986	Vendor did not specify
Number of Systems Installed to Date	25	25	Vendor did not specify	800
Serviced by	Periphonics	Periphonics	Unisys	Unisys
VENDOR PHONE NUMBER	(516) 467-0500	(516) 467-0500	(215) 542-4011	(215) 542-4011
COMMENTS	VPS3000 des. for Audiotex applications for "voice bulletin boards"; VPS5000 incl. interf. for inter. vce. resp./Audiotex appl.; priced $20K-$70K	Screen emulation, appl. gen. w/COBOL-like commands; VPS 9000 supports T1 lines; priced $47K-$125K; maint. is pctg. of purch. prc.	—	—

Communications Processors Comparison Columns

MANUFACTURER	Unisys Corp.	Unisys Corp.	Unisys Corp.	Unisys Corp.
MODEL	Unisys DCP/30	Unisys DCP/40	Unisys DCP/5	Unisys DCP/50
COMPUTER SYSTEMS INTERFACED				
Manufacturer/Models	Unisys 1100 Series, 2200 Series, Series 80	Unisys Series 1100, Series 2200	Unisys 1100 Series, 2200 Series, System 80	Unisys Series 1100, Series 2200, System 80
Direct Attachment to Host	Yes	Yes	No	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	No	Yes
Max. Hosts attachable to FEP	6	16	Not applicable	32
Max. Hosts Supported Simultaneously	6	16	Not applicable	16
IBM Emulation	3270 BSC, SNA/SDLC, 3270 SNA, 3780 BSC	3270 BSC, SNA/SDLC,3270 SNA, 3780 BSC	3270 BSC, SNA/SDLC, 3270 SNA, 3780 BSC	3270 BSC, SNA/SDLC, 3270 SNA, 3780 BSC
PU Type within Network	PU Type 2, PU Type 4, PU Type 5	PU Type 2, T.4, T.5	PU Type 2, PU Type 4, PU Type 5	PU Type 2, T.4, T.5
Remote Line Concentrator	Yes	Yes	Yes	Yes
Max. Hosts Served by One Concentrator	Any host in network	Any host in network	Any host in network	Any host in network
Host-independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching	Yes	Yes	Yes	Yes
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	SNA, BSC, OSI, X.25, DDN, X.21, PDN	SNA, BSC, OSI, X.25, DDN, X.21, PDN	X.25	SNA, BSC, OSI, X.25, DDN, X.21, PDN
COMMUNICATIONS LINE CAPACITY				
No. Half-Duplex Lines Attachable	160	1,000	7	876
Highest Line Speed Supported (bps)	64K/V.35, 250K/coax	10M/LAN, 64K/V.35	19.2K (async, sync)	64K/V.35, 250K/coax
Effect on Line Capacity, All Lines Full Duplex	None	None	None	None
COMMUNICATIONS FEATURES				
Multiplexing/Demultiplexing	No	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Dynamic Line Reconfiguration	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Yes	No	Yes
Protocol Conversion	Async to uniscope, UTS/3270, 3270/UTS	Async to uniscope, 3270/uni, uni/3270	Async to uniscope, 3270 to UTS	Async to uniscope, uni/3270, 3270/uni
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	LRC & CRC detection/correction, parity, ARQ-CRC	LRC & CRC detection/correction, parity, ARQ-CRC	LRC & CRC detection/correction, ARQ-CRC	LRC & CRC detection/correction, parity, ARQ-CRC
Automatic Transmission Speed Detection	110 to 1800	110 to 1800	110 to 1800	110 to 1800
Auto. Disconnect of Inactive Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor Type	Unisys DCP/30	Unisys DCP/40	Unisys DCP/15	Unisys DCP/50
Main Memory Word Size (bits)	16	16	16	16
Main Memory Storage Capacity (bytes)	4M	6M	2M	8M
Data Unit Transferred Across I/O Channel	Block	Block	Not applicable	Block
Data Support, Memory and Comm. Lines	DMA	DMA	DMA	DMA
Mass Storage	DMA	DMA	DMA	DMA
Other Peripherals	DMA	DMA	DMA	DMA
I/O, Backup, and Diagnostic Peripherals Supported	FEP console, diskette, patch panel, disk, printer	FEP console, diskette, disk, printer	Diskette, disk, site console	FEP console, diskette, patch panel, disk, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support for X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
OPERATING SOFTWARE				
Operating System Implemented in	Software, firmware	Software, firmware	Software	Software, firmware
IPL method	Download from host, IPL diskette	Download from host, IPL diskette	Download from host, IPL diskette	Download from host, IPL diskette
Additional Software Supported	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
User Programmability	Yes, via user-created programs	Yes, via user-created programs	Yes, via user-created programs	Yes, via user-created programs
Software Separately Priced	All	All	All	All
NETWORK MANAGEMENT/CONTROL				
Diagnostic Tests Supported	Local/remote loopback, internal diagnostics, problem determination	Local/remote loopback, internal diagnostics, problem determination	Local/remote loopback, internal diagnostics, problem determination	Local/remote loopback, internal diagnostics, problem determination
Data Collected	Traffic loading, port statistics, trace, line hits, error rates, events	Traffic loading, line outages, port statistics, trace, error rates	Traffic loading, line outages, port statistics, trace, line hits, error rates, events	Traffic loading, trace, line hits, events
PRICING AND AVAILABILITY				
Minimum Configuration	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Purchase Price ($)	99,000.00	10,815.00	11,800.00	255,395.00
Monthly Maintenance ($)	235.00	585.00	72.00	634.00
Monthly Lease/rental ($)	2,300.00	2,319.00	Vendor did not specify	5,629.00
Maintenance Bundled with Lease/rental	No	No	No	No
Date of Announcement	October 1988	January 1980	March 1989	December 1987
Date of First Commercial Delivery	October 1988	Vendor did not specify	Vendor did not specify	Vendor did not specify
Number of Systems Installed to Date	90	3,500	Vendor did not specify	200
Serviced by	Unisys	Unisys	Unisys	Unisys
VENDOR PHONE NUMBER	(215) 542-4011	(215) 542-4011	(215) 542-4011	(215) 542-4011
COMMENTS	—	—	—	—

Communications Processors

The term "communications processor" not only describes a specific category of equipment, but also includes a broad array of systems that perform communications processing functions in addition to providing other services. Our definition of communications processors includes multifunctional, intelligent systems that are dedicated to communications and able to serve as nodes in the network. This generally includes three basic types of products: front-end processors, intelligent switches, and remote concentrators.

In addition to defining communications processing, this report discusses communications processor design, its place in modern network architectures, the evolution of the communications processor, general advantages and restrictions of today's systems, and the state of the communications processor marketplace.

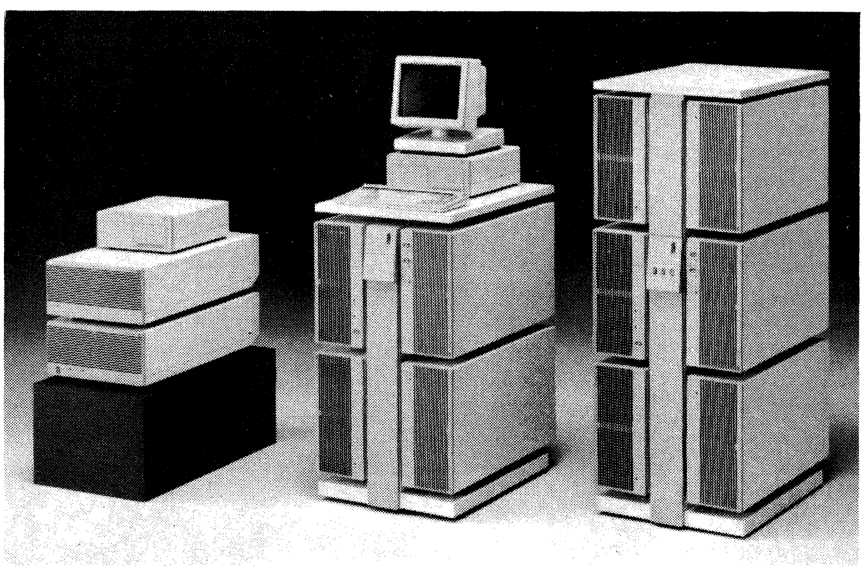
This report also includes comparison columns outlining the major characteristics of 68 communications processors from 26 vendors.

REPORT HIGHLIGHTS **PAGE**

Until recently, it was fairly easy to group data communications equipment into specific categories according to their basic functions. Devices that convert digital signals into analog ones are modems, units that combine data from many channels onto one channel are multiplexers, and so forth. Integration is the byword of the communications industry, and manufacturers have begun to combine many functionalities in one system. Modems incorporate multiplexing and/or protocol conversion, terminals contain modem chips, and larger systems integrate switching and multiplexing, as well as providing gateways to other networks. It is becoming more difficult to pigeonhole these new integrated devices into the basic communications equipment categories.

The definition of a communications processor varies greatly, depending upon who is giving it. They perform many functions, but different processors have different capabilities. While network designers have one view of what a communications processor does, equipment manufacturers have another. Everything from an IBM 3725 to a four-port packet assembler/disassembler (PAD) has been called a "communications processor."

From a network designer's point of view, a communications processor should be able to set up connections to transmit and receive data, multiplex and demultiplex data, frame and unframe messages, perform error correction and protocol conversion, choose transmission routes, and collect performance and traffic statistics. This definition has led many manufacturers to classify their protocol converters, PADs, terminal controllers, and stat muxes as



The modular Comten 5620XP can be configured in a variety of ways: from the left, a typical 16-line remote configuration, a 32-line channel-connected configuration, and a 64-line channel-connected configuration.

Communications Processors

TABLE 1. COMMUNICATIONS PROCESSORS FUNCTIONS

Physical transmission and reception of data
Data buffering and queueing
Multiplexing
Message framing and unframing
Control of transmission errors
Message sequencing
Protocol conversion
Message pacing and flow control
Message or packet assembly and disassembly
Route selection
Session establishment and disconnection
Formatting of data for use by specific host or terminal applications
Reporting and logging of device or transmission errors or failures
Fallback switching in case of host, device, or transmission line failure
Gather and record network performance and traffic statistics

**Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.*

communications processors. They consider devices that connect terminals to communications networks and maintain control through changing network conditions are communications processors. While marketing departments can develop good ads with this designation, it is problematic in terms of defining equipment. It is simply ridiculous to put an IBM 3725 and a protocol converter in the same equipment category.

Several years ago, in an attempt to narrow the field of devices that would be included in this survey, we placed PADs and terminal controllers in a Protocol Conversion Systems tab, which also included black-box protocol converters, terminal emulators, and code and speed converters. This was in keeping with our premise that true communications processors, concentrators included, are involved in a *dynamic* process involving feedback from other intelligent devices in the network. Protocol converters, PADs, and statistical multiplexers perform basically *static* processes that remain constant as network conditions change.

Datapro defines a communications processor as a multifunctional, intelligent device dedicated to communications and able to serve as a control point, or node, in a data communications network. It can serve as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. As a *front-end processor (FEP)*, the communications processor serves as a peripheral device locally attached to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management, either under the control of a master (usually front-end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches. (Table 1 lists the major functions of a communications processor in the typical network.)

The network designer's definition would qualify two devices as communications processors: the front-end processor and the network processor. While the front-end processor connects directly to the host processor's block/byte multiplexer or selector channels, the network processor is a standalone unit that is not host dependent and has a large degree of operating autonomy. Its primary function is to provide a link between user terminal devices and the front-end processor and/or other network processors. Communications with the FEP is on the data link level. While it does not carry on a dialog with the FEP, it does respond to FEP-initiated network signals.

While the above definitions are sound, we are finding that describing certain devices as communications processors is still problematic. Packet switches, for example, often fit quite nicely into our definition, but we cannot classify them only as comm processors. We have concluded that one must actually classify comm processing in terms of application and/or functionality. If a system performs many of the functions normally considered part of the communications processing function, it can be classified as a comm processor.

We also recognize, however, that there is a small but important class of equipment that belongs to the traditional communications processing realm. This includes IBM 372X and NCR Comten front-end processors. IBM controls a majority of this market, and there are only a handful of vendors that manufacture competing systems. Unisys also manufactures communications processors for its mainframes. Full product reports on these systems are included within this tab. Front-end processing is the most complex task a communications processor can perform. In a large, complex network governed by one or more mainframe hosts, a front end must do all but the last three functions listed in Table 1 in the normal course of its operations.

Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialog with a host computer and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions in the table. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators. It must also change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch establishes an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor can perform, and communications processors acting as concentrators can easily be confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, PADs, and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change on the network.

An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly: accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached devices. Some sophisticated terminal controllers, notably IBM's 3274s, can perform some or all of these functions. A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy: a concentrator can concentrate data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3705 acting as a remote node (concentrator) and an IBM 3274 within that concentrator's domain. A user can build an entire network from intelligent concentrators communicating with one another as peers, but cannot do the same with cluster controllers.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices.

Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, and Unisys' BNA and DCA. Open architectures include CCITT's X.25 packet-switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standardization (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most often as a front end and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies, depending on the architecture. In Unisys' DCA, the DCP-Series front end controls many Presentation layer functions, while in IBM's SNA, the host's access method (along with software residing in the 327X terminal controllers) handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all the mainframe architectures, the same communications processor models that serve as front ends can also function as intelligent switches and as remote concentrators. In these functions, the communications processor usually appear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture can perform another important function in addition to the other three: that of an intelligent gateway. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet switched data networks using the X.25 protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers via a uniform set of complementary protocols. Designed specifically for public data networks, X.25 protocols ultimately establish virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices—computers or terminals—at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols.

In a public network, the network provider is responsible for network management. The X.25 communications processors in such a network therefore carry a heavy load of

Communications Processors

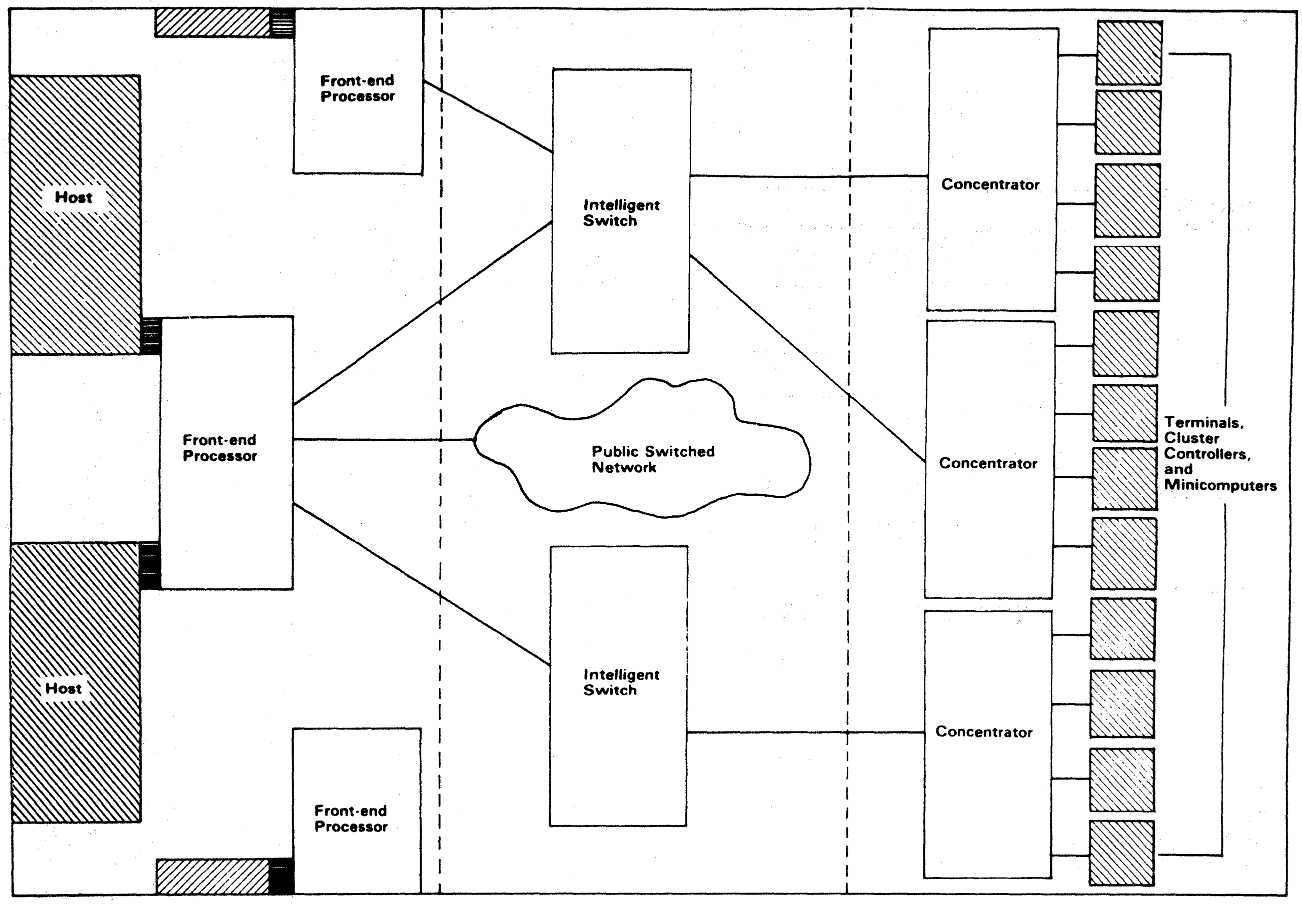


Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

access, error, and class-of-service control, along with provisions for statistically recording traffic and usage data to be sorted by individual users. Communications processors designed to function as switches in public networks are the likeliest to support high-capacity, attached storage devices such as disk and tape drives.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture. Table 2 shows the protocols supported by various vendors' communications processors.

Transparent architectures are offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some of these products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system for these functions.

COMMUNICATIONS PROCESSOR DESIGN

The basic design of almost all communications processors follows the same three-tiered, hierarchical plan—a plan that they share in common with their close cousins, the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy, along with its associated main memory; it controls the communications processor's operation according to the rules and parameters of its operating software and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU

Communications Processors

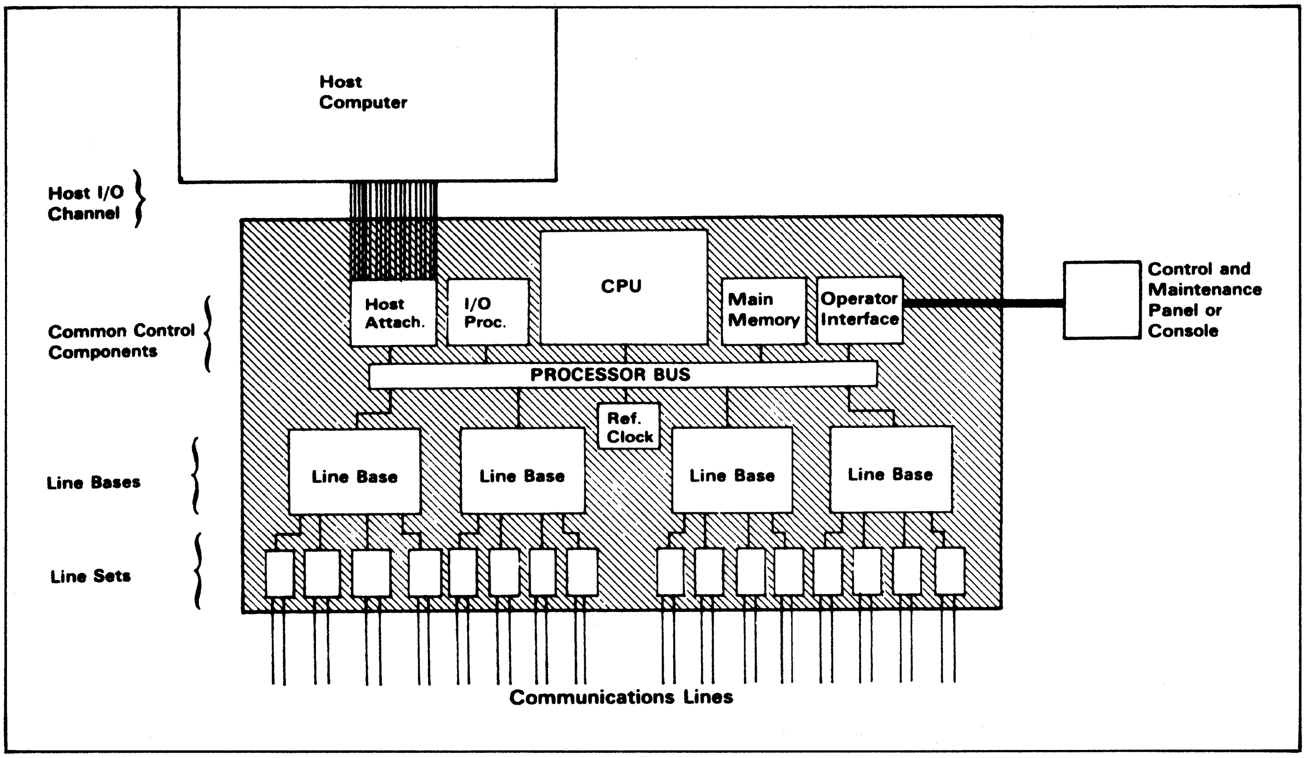


Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor can contain more than one host interface, several I/O processors, and many more line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session establishment, application-level formatting, and error logging. It also delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the reference clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to the attached host channel, and transmits it up the channel to the host; for data coming from the host, it performs the same process in reverse. The host interface's principal function is the conversion of data from the communications processor's internal word size to that of the host computer.

Some communications processors contain one or more input/output processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generated by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for timing signals at different data rates.

The operator interface allows a human operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the above-mentioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor and a group of attached communications lines that share a common synchronization pattern, line speed, and (sometimes) protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommodate from 8 to 32 line bases, each of which handles from two to eight line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the backplane or a side plane of the processor's cabinet. The physical bus architecture, popularized by minicomputer design, provides easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, it also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might only need to replace one line base and eight line sets, rather than swapping out an entire front-end processor. The hierarchical design extends the communications processors' functionality over time and helps to protect the user's investment in the face of changing technology. Figure 2 shows the hierarchical configuration of a generalized communications processor.

THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it came into being in the middle 1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hard-wired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and performing simple error notification.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform a number of functions more efficiently than a mainframe; incidentally also supplied the bus architecture that gives communications processors their modularity and flexibility. The ARPAnet, the first large-scale packet switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the intelligent virtual circuit switch, the first functional communications processor.

A later development in minicomputer applications created the distributed processor, a small computer dedicated to part of a larger application that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications handling under software control. Indeed, network architectures from such minicomputer vendors as Digital Equipment Corporation and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the higher cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures and to a large extent made such architectures possible.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing; they defined the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

One further development produced the communications processor as we know it today: the microprocessor. The advent of cheap silicon intelligence allows designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger, more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization each is to use. Some newer systems are composed entirely of redundant, microprocessor-controlled modules, which can perform the functions of other modules with the proper software load; such a processor is actually a distributed communications network in a box.

The advent of the microprocessor has blurred the distinction between traditional communications processors and less broadly functional devices, such as multiplexers and terminal controllers, creating a new class of intelligent protocol converters dedicated to tasks that were once economically performed by multifunctional communications controllers. Now, even modems can detect, report, and in some cases correct transmission errors and sense the conditions of transmission lines. The old definition of a communications processor as a computer that has been programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3725.

In answer to this shifting definition, Datapro offers Tab C23, Protocol Conversion Systems, in Volume 2 of *Datapro Reports on Data Communications.* There, the reader will find information on many product categories formerly covered in this report, including protocol converters, intelligent terminal controllers (with conversion capabilities), and PADs.

ADVANTAGES AND RESTRICTIONS

The principal advantage of a communications processor as a networking tool is the physical and logical separation of the networking function from the application of its end users. Whatever its architecture, such a network can function for any application, can grow in size without qualitative change to accommodate new applications, and can accommodate new applications through the installation of relatively standard, intelligent components. In simpler terms, the user does not have to redesign and rebuild a modular network to change the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they can accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design can survive several breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

In operation, a network controlled by communications processors can survive the total failure of one or more of its host processors. In a multihost network, front-end processors can switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows for a graceful degradation of service in the event of a host failure, sometimes allowing users to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

Also in operation, the communications processor still fulfills its original purpose: relieving the host of the overhead generated by keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid-1970s when the first communications processors appeared, and thanks to the declining cost of memory and processing power, some of today's communications processors are bigger, faster, and more powerful than that era's mainframes. They need to be.

Complexity and incompatibility are among the restrictions of today's communications processors. In an era of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer should meddle. Most require programs written in an arcane, Assembler-level language, sometimes (but not always) with the benefit of pregenerated macros in the host access method.

Even with recent advances in simplicity and modularity, configuring a communications processor to suit a specific network or application can be difficult. With today's microprocessor technology, the better communications processors are simpler; as an example, IBM's 3725 Communication Controller sports a parts list only half as long as that of the older 3705. The trend is toward fewer, more powerful components, but most communications processors are still lagging a bit behind that trend.

THE CURRENT MARKETPLACE

The market for full-scale communications processors can be broken down into four segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; packet-switching processors marketed as components of large, vendor-independent private networks; and intelligent concentrators designed to serve in transparent network architectures.

IBM remains the leader in the communications processor market in terms of market share, with about 85 percent. NCR Comten retains the number two position; other vendors fighting for a share of the market include Amdahl, Computer Communications, Inc. (CCI), and NTX. The other mainframe vendors, such as Unisys, Control Data, and Honeywell, do not really compete with one another in

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes	Yes; host PAD connector, terminal PAD connection; DDN, GET, AT&T, Globenet terminal protocol detection for NTR, 2780, 3780, HASP, REM1	TELNET (TCP/IP), automatic
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Computerm Corporation	Yes (1052/2741 emulation)	Yes	Yes	No	No	No
Control Data						
CDCNET	Yes	Yes	No	Yes	Tymnet, Telenet	None
DCA						
355	Yes	Yes	Yes	Yes	GTE Telenet, ITT, RCA	DEC DDCMP—trunk only
335	Yes	Yes	No	No	GTE Telenet Tymnet, Datapac, Uninet, Autonet, PSS	—
375	Yes	Yes, IBM 3270 BSC	No	No	Yes, Telenet, Tymnet, Uninet, Transpac, Datapac	Accunet, Cylix, PSS, Autonet
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	GTE Telenet	—
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
Icot						
254	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
257	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
Infotron						
990NP Network Processor	Yes	Yes	Yes	Yes	Yes	Virtually all are supported
892NP Network Processor	Yes	Yes	Yes	Yes	Passthru only	Not applicable
KMW Systems						
Auscom 8911A	Yes	No	No	Yes	Yes	User defined
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	RPQ	Request price quotation
Distributed Network Processor Series	Yes	Yes	Yes	RPQ	RPQ	Request price quotation
M/A-Com						
9708 MPX	No	No	No	Yes	Yes	X.75
9724 RPX	No	No	No	Yes	Yes	X.75
9000 NDX	Yes	Yes	Yes	Yes	Yes	X.75
Micom						
Micro800	Yes	No	No	No	Yes, Telenet, Tymnet, Datapac, Transpac, Datex-P, Telepac	No
MB2-XAP-STD	Yes	No	No	No	Yes	No
MB3-CSW	Yes	No	No	No	Yes	—
MB3-XAP-STD/MB3-XAP-HS	Yes	No	No	No	Yes	Telex
MB3-BSC-STD	Yes	Yes	No	No	Yes	No

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
MB3-PSW-STD/MB3-PSW-HS	Yes	No	No	No	Yes	No
MB5-XAP-STD	Yes	No	No	No	Yes	Telex
NCR Comten						
5620	Yes	Yes	Yes	Yes	Yes, HPADs & TPADS—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS Telenet, Transpac, Tymnet	
3690	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	Telenet, Transpac, Tyment
3695	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	Telenet, Transpac, Tyment
5660	Yes	Yes	Yes	Yes	Yes, HPADS &TPADs—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS	Telenet, Transpac, Tymnet
Netlink Inc.						
Network SNA-Hub	No	No	Yes	No	No	Token Ring
NTX						
3800 Model 2.1	—	No	No	No	No	NDLC (extended HDLC)
3800 Model 2.2	—	No	No	No	No	NDLC (extended HDLC)
3800 Model 2.3	—	No	No	No	No	NDLC (extended HDLC)
Paradyne						
Pix/Pixnet	Yes	No	No	Paradyne SDLC	No	—
Pixnet-XL	No	No	No	HDLC, LAPD	—	—
Periphonics						
VoicePac	Yes	Yes	Yes	Special order	Special order	PARS
VoiceBox	Yes	Yes	Yes	Special order	No	—
VoiceStar 40XX	Yes	Yes	Yes	Special order	No	—
VoiceStar 42XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
VoiceStar 46XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
VoiceStar 47XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
Telematics						
Net 25	Yes	No	No	Yes	Yes	—
Series 500, 1000, 2000	Yes	No	No	Yes	Yes	—
Tri-Data						
Netway 1500	Yes	Yes	Yes	Yes—Telenet, Tymnet	IPARS	
Tymnet						
Micro-Engine	Yes	Yes	Yes	Yes	Yes	Telex, 2741, Univac DDCMP, Honeywell, others
Mini-Engine	Yes	Yes	Yes	Yes	Yes	Telex, 2741, Univac, DDCMP, Honeywell, others
Engine	Yes	Yes	Yes	Yes	Yes DDCMP,	Telex, 2741, Univac, Honeywell, others
Tymnet ATC	Yes	No	No	No	No	None
Unisys						
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
CP9585	Yes	Yes	Yes	Yes	Yes	—
B974	Yes	Yes	No	No	No	—
CP2000	Yes	Yes	Yes	Yes	DTE, Tymnet, Telenet, various PTT	—
Unisys						
DCP/15, DCP/40, & DCP/50	Yes	Yes	Yes	Yes	Yes, X.29 PAD	PARS, DDN TELNET
Vitalink Communications						
TransLAN	Yes	Yes	Yes	Yes	Yes	—
TransSDLC	Yes	No	Yes	No	Yes	—
TransLINK	Yes	No	Yes	Yes	Yes	—

the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Honeywell's Datanet 8 Series features a broad array of compatibility software. The Unisys DPC Series goes further than most in providing host-independent networking. Among vendors of private networks, the two U.S. public network leaders, Tymnet and Telenet, have solid offerings. A number of vendors offer intelligent concentrators, often at the high ends of lines of statistical multiplexers. Among these are Infotron, Micom, and DCA.

According to a 1987 survey done by Focus Research Group, Inc. (Hartford, Connecticut), IBM has 85.2 percent of the communications processor market, while NCR Comten has 5.1 percent. Amdahl has 2.3 percent and Memorex, which is no longer in the processor market, had 3.8 percent. No other communications processor vendor has even a 1 percent stake. Focus Research feels that IBM's growth and strength in the market will continue; it predicts that "89 percent of users with plans to buy front-end communications processors over the next year will go with Big Blue." According to Framingham, Massachusetts-based International Data Corporation (IDC), a market research firm, the communications processor market is expected to grow at an annual rate of only 10 percent through 1990. Thus, vendors must find ways of attracting new customers and keeping established ones.

One method is to offer new products. Over the last year, Amdahl Corporation introduced the 4725 (an IBM-compatible version of the 3725), and Control Data introduced the XN10 network processor and enhanced versions of the 8/20 and the 8/30 with T1 data-handling capability. In an attempt to attract and keep customers, vendors are offering multifunction products, connectivity, and increased transmission speeds.

NCR Comten's new announcements included the 5620XP, which is aimed at the 3725, NCP Version 4.0, and an IBM-compatible SNA Network Interconnect (SNI) feature. At this point, in spite of IBM's recent 3745 announcement, the Comten 5660 is as powerful as, it not more powerful than, the 3745, according to an NCR Comten representative. The spokesperson stated that the only areas in which Comten is currently lagging are in peer-to-peer connectivity, direct token-ring connection, and complete NetView compatibility.

While NCR Comten is still very much involved in competing in the IBM arena, the company is also looking ahead and making plans to support evolving industry standards and multivendor communications. Eric Birkeland, an NCR Comten director of product marketing, sees the company moving ahead to support non-IBM equipment. He stated, "Our point of emphasis in the future is our role as a general communications processor vendor, supporting a variety of hosts. You can expect to see products from us that allow you to interconnect to ISDN and OSI. We are now actively participating with other companies on both developments. Both are important parts of our future direction." One example is NCR Comten's plans for new, enhanced software support for X.25.

Channel extenders, while they have been around for a number of years, have just recently gained market acceptance. IBM may have legitimized the product last June when it introduced its own channel extension unit. Channel extenders attach to mainframe channels, supporting disk drives, front-end processors, printers, and other mainframe equipment. One vendor describes the market as being in the first generation of channel extension products.

While these products may be only first generation, there is a question of whether they will pose a threat to front-end processors. Channel extenders increase interactive performance by letting users bypass the communications processor. While channel extenders compete in high-speed, point-to-point applications, they cannot handle gateway functions or switching among processors. However, channel extenders can be configured with individually targeted channels to accommodate more than one host. Some of the products listed in the comparison columns are channel extenders or offer channel extension capabilities. However, most channel extender vendors do not categorize their products as communications processors; therefore, a separate report is planned to deal exclusively with these devices.

THE COMPARISON COLUMNS

At the end of this report are comparison columns listing the device specifications of many communications processing systems. While compiling this report in January 1988, Datapro sent requests to over 25 firms known or believed to manufacture communications processors. *The absence of any company from the columns means that the company either failed to respond to our request by the deadline or chose not to be listed.*

The Key to Communications Processors Comparison Columns provides a complete description of the comparison column entries.

VENDORS

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose products are shown in the comparison columns that follow this report.

Amdahl Corporation
1250 East Arques Avenue, P.O. Box 470
Sunnyvale, CA 94088-3470 (408) 746-6000

Communications Processors

Century Analysis
114 Center Avenue
Pacheco, CA 94553 (415) 680-7800

Chi Corporation
26055 Emery Road
Cleveland, OH 44128 (216) 831-2622

Computer Communications Inc.
2610 Columbia Street
Torrance, CA 90277 (213) 320-9101

Computerm Corporation 100 Wood Street
Pittsburgh, PA 15222 (412) 391-7804

Control Data Corporation
8100 34th Avenue South
Minneapolis, MN 55420 (612) 853-8100

Digital Communications Associates, Inc. (DCA)
1000 Alderman Drive
Alpharetta, GA 30201 (404) 442-4000

Honeywell Information Systems, Inc.
200 Smith Street
Waltham, MA 02154 (617) 895-6000

Hughes Network Systems, Inc. 11717 Exploration Lane
Germantown, MD 20874 (301) 428-5500

Icot Corporation
3801 Zanker Road, P.O. Box 5143
San Jose, CA 95150-5143 (408) 433-3300

Infotron Systems Corporation
9 North Olney Avenue
Cherry Hill, NJ 08003 (609) 424-9400

International Business Machines Corporation
Old Orchard Road
Armonk, NY 10504
Contact your local IBM representative

KMW Systems Corporation
100 Shepherd Mountain Plaza
Austin, TX 78730-5014 (512) 338-3100

Lemcom Systems, Inc.
2104 West Peoria Avenue
Phoenix, AZ 85029 (602) 944-1543

Micom Systems, Inc.
4100 Los Angeles Avenue, P.O. Box 8100
Simi Valley, CA 93062-8100 (805) 583-8600

NCR Comten
2700 Snelling Avenue North
St. Paul, MN 55113 (612) 638-7777

Netlink Inc.
3214 Spring Forest Road
Raleigh, NC 27604 (919) 878-8612

NTX Communications Corporation
508 Tasman Drive
Sunnyvale, CA 94089 (408) 747-1444

Paradyne Corporation
8550 Ulmerton Road
Largo, FL 33540 (813) 530-2000

Periphonics Corporation
4000 Veterans Memorial Highway
Bohemia, NY 11716 (516) 467-0500

Telematics International, Inc.
Crown Center, 1415 NW 62nd Street
Fort Lauderdale, FL 33309 (305) 772-3070

Tri-Data
1450 Kifer Road
Sunnyvale, CA 94086-5306 (415) 746-2900

Tymnet—McDonnell Douglas Network Systems Company
2560 North First Street, P.O. Box 49019
San Jose, CA 95161-9019 (408) 922-0250

Unisys Corporation
One Unisys Place
Detroit, MI 48232 (313) 972-7000

Unisys Corporation
P.O. Box 500
Blue Bell, PA 19424 (215) 542-4011

Vitalink Communications Corporation
6607 Kaiser Drive
Fremont, CA 94555 (415) 755-6130.

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON COLUMNS

The comparison columns that follow this report list the major characteristics of 68 commercially available communications processors. The text below explains the column entries, in order of their appearance.

Computer Systems Interfaced. For processors that serve IBM and plug-compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug compatibles. For processors operating in open network architectures, we list "Most major vendors."

Direct Attachment to Host. This is one indication of whether the device is a true front-end processor. Network processors do not connect directly to the host.

FUNCTIONAL CHARACTERISTICS

Front-End Processors. This entry indicates whether the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously.

IBM Emulation. This entry lists the degree of IBM emulation the processor can perform.

PU Type within Network. This entry indicates the PU (physical unit) type found within the network.

Remote Line Concentrator. A "yes" for this entry indicates whether the processor in question can serve as a line concentrator remote from any host processor in its network. The next entry lists the number of hosts the concentrator can serve at one time.

Host-Independent Network Processor. This entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Host Channel Extender. This entry indicates that the processor can function as a host channel extender within its architecture.

Terminal Controller. This entry indicates that the processor in question can function as a terminal controller within its architecture.

Store-and-Forward Message-Switching Processor. This entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Distributed Processing Node. Most true communications processors are not able to perform applications processing; however, some (including a few intelligent concentrators) can support distributed applications in addition to their principal networking function. This class of communications processor is becoming rarer.

Network Architecture Compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device, or it may support the prearchitectural protocols of the vendor(s) whose hosts it supports.

Communications Line Capacity. The first section of this entry deals with the number of lines a communications processor can support. The next entry lists the highest data rate the processor can support. The last entry lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

COMMUNICATIONS FEATURES/FUNCTIONS

Entries under this heading list the major functions a communications processor perform; but that not all communications processors **do** perform.

Multiplexing/Demultiplexing. This entry indicates that the processor in question can function as a multiplexer.

Terminal-Initiated Application Switching. This entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications Processor Initiated Dynamic Line Reconfiguration. Dynamic line configuration is another name for fallback switching. This entry indicates that the processor in question can switch without operator intervention a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure.

Interface to Ethernet LAN. This entry indicates that the processor offers an interface to an Ethernet LAN.

Protocol Conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code Conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error Control. This entry specifies which of the available schemes for error detection (e.g., parity, LRC, or CRC) the processor in question uses.

Automatic Transmission Speed Detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic Disconnect of Inactive Dial-Up Terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

SYSTEM CHARACTERISTICS

Processor Type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON COLUMNS (Continued)

Main Memory Word Size, bits. In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main Memory Storage Capacity, bytes. This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a time-shared or interrupt basis.

Level of Data Unit Transferred Across I/O Channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte or block).

Type of Data Transfer Supported between Memory and a) Communications Lines, b) Mass Storage, and c) Other Peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors, must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components share control of main memory with the CPU and can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, Backup, and Diagnostic Peripherals Supported. Most communications processors interact only with their attached hosts and terminals and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information and feature diagnostic consoles for direct operator intervention.

Support for Remote Console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Support X.25 Level 3 Capabilities. This entry indicates that the processor supports X.25 capabilities.

COMMUNICATIONS OPERATING SOFTWARE

Operating System Implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) on-board the processor, or in some combination of these.

IPL Method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from on-board read-only memory.

Additional Software Supported. This entry lists any network control or applications software that the processor in question can support.

User Programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an Assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native Assembler language.

Software Separately Priced. This entry indicates whether the communications processor's operating software is included in the cost of the hardware.

Approximate Proportion of Currently Installed Systems Supplied as Turnkey Systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

NETWORK MANAGEMENT/CONTROL CAPABILITIES

Diagnostic Tests Supported. Some processors now offer management functions, such as running diagnostic tests. Examples include remote and local loopback, port/link status, and internal diagnostics.

Data Collected. In gathering performance data, the processor can collect traffic statistics, line failures, error records, etc.

PRICING AND AVAILABILITY

Entries under this header list purchase, lease (or rental) and maintenance pricing, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product.

Vendor Phone Number. The vendor's phone number is supplied at the bottom of each comparison column as a courtesy to the reader.

Comments. Comments at the end of the columns describe significant or unusual features, capabilities, or applications that are not reflected in the standard entries.☐

Communications Processors

VENDOR AND MODEL	Amdahl 4705E*	Amdahl 4705T*	Amdahl 4725	Century Analysis OSI (Office Systems Interface)
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All IBM- and Amdahl-compatible mainframes	All IBM- and Amdahl-compatible mainframes	All IBM- and Amdahl-compatible mainframes	NCR Criterion, 9800
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	6	6	Up to 8	Not applicable
Max. No. of Active Hosts Supported Simultaneously	4	4	Vendor did not specify	Vendor did not specify
IBM Emulation	270X/370X, EP, NCP, ACF	270X/370X, EP, NCP, PEP	ACF/NCP, PEP, EP, 3725	Not applicable
PU Type within Network	PU Type 4	PU Type 4	PU Type 4	Vendor did not specify
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	Unlimited	Unlimited	Unlimited	1
Host-Independent Network Processor	No	No	No	No
Host Channel Extender	Yes	Yes	No	No
Terminal Controller	No	No	No	Yes
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	No	No	No	Yes
Network Architecture Compliance	SNA	SNA	SNA	Proprietary
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	352	FEP 352, high speed 384	256	24
Highest Line Speed Supported (bps)	64K	2.048M	256K	19.2K
Effect on Line Capacity, If All Lines Are Full-Duplex	Capacity halved	High speed section-none FEP section-halved	Vendor did not specify	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	No	No	No	Yes
Terminal-Initiated Applications Switching	Yes	Yes, via Commpro	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	No	No	Vendor did not specify	Yes
Interface to Ethernet LAN	No	No	Vendor did not specify	No
Protocol Conversion	S/S, BSC, SDLC to X.25	No	Vendor did not specify	No
Code Conversion	ASCII/EBCDIC via soft.	ASCII to EBCDIC	ASCII to EBCDIC	No
Error Control	LRC and CRC	LRC and CRC	LRC and CRC	Yes
Automatic Transmission Speed Detection	50-9600 bps via soft.	50-9600 bps	Yes	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	68010
Main Memory Word Size, bits	18	18	Vendor did not specify	16 bit
Main Memory Storage Capacity, bytes	1,024K	To 1,024K	Up to 3M	756K
Level of Data Unit Transferred across I/O Channel	Byte or block	Byte or block	Byte or block	Byte, block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	DMA/ Interrupt	Interrupt
Mass Storage	None	Vendor did not specify	Vendor did not specify	Not applicable
Other Peripherals	None	Vendor did not specify	Vendor did not specify	Not applicable
I/O, Back-Up, and Diagnostic Peripherals Supported	Diskette (diagnostic)	Diskette (diagnostic), console-via Commpro	Vendor did not specify	Not applicable
Support for Remote Console	No	Yes, via Commpro	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	No
Communications Operating Software:				
Operating System Implemented in	Software	Software	Software	Proprietary
IPL Method	Download from host	Downline load from host	Download from host	Download from host
Additional Software Supported	Commpro, UTS/F (UNIX)	Commpro	Yes	Spreadsheet, print format
User Programmability	Yes	Yes	Yes	No
Software Separately Priced	Yes	Yes	Yes	Not applicable
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	All	100%	Vendor did not specify	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes	Yes	Yes	Yes, point status
Data Collected	Yes	Yes	Yes	Traffic statistics
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	52,600	67,000+	From 71,500 to 545,160	6,995
Monthly Maintenance, $	375	475+	Contact vendor	600/yr.
Monthly Lease/Rental, $	2,385 (2-yr. lease)	3,000+ (2-yr. lease)	Contact vendor	Vendor did not specify
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	April 1983	1986	4725-40 (1987)*	1981
Number of Systems Installed to Date	800	6	New	1,200
Serviced by	Amdahl	Amdahl	Amdahl	CAI
VENDOR PHONE NUMBER	(408) 746-6000	(408) 746-6000	(408) 746-6000	(415) 680-7800
COMMENTS	Remote load via comm. line; operates with IBM 3705 and 3705/Commpro software. *1987 info.	Remte load via comm lne basic. same as 4705E; supports up to 4 high-speed links.*1987 info.	*4725-30 model will be available 3rd quarter 1988. Runs standard IBM 3725 ACF/NCP software.	Load leveling, raw line selection, terminal key ahead, mainframe intel. rout., port contention.

Communications Processors

VENDOR AND MODEL	Chi Communications Processor CCP/3205	Chi Communications Processor CCP/3205P	Chi Communications Processor CCP/3212	Computer Communications CC-6F
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Unisys Series 1100	Unisys Series 1100	Unisys Series 1100	IBM S/370, 30XX, 43XX, and compatibles
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	8	2	8	2
Max. No. of Active Hosts Supported Simultaneously	8	2	8	2
IBM Emulation	No	No	No	370X/37X5 EP
PU Type within Network	PU Type 2	PU Type 2	PU Type 2	PU Type 4
Remote Line Concentrator:	Yes	Yes	Yes	No
Maximum No. of Hosts Served by One Concentrator	Unlimited	Unlimited	Unlimited	Not applicable
Host-Independent Network Processor	Yes	Yes	Yes	No
Host Channel Extender	No	No	No	No
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	X.25, OSI	X.25, OSI	X.25, OSI	No
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	Over 1,000	24	Over 1,000	32
Highest Line Speed Supported (bps)	64K	64K	64K	56K
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Yes	Yes	No
Protocol Conversion	Async to uniscope, 3270 to uni., async to X.25	Async to uniscope	Async/unisc.; 3270 to async, async to X.25	No
Code Conversion	ASCII/EBCDIC/XS3	ASCII/EBCDIC/XS3	ASCII/EBCDIC/XS3	Yes
Error Control	LRC-CRC detect/correct.	LRC-CRC detect/correct.	LRC-CRC detect/correct.	Parity LRC, and CRC
Automatic Transmission Speed Detection	Yes, 110-19.2K bps	Yes, 110-19.2K bps	Yes, 110-19.2K	Yes; 110-1200 bps
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Concurrent 3205	Concurrent 3205	Concurrent 3212	CCI 601
Main Memory Word Size, bits	32	32	32	16
Main Memory Storage Capacity, bytes	1M (std.), up to 8M	1M (std.), up to 8M	4M (std.), up to 16M	64K
Level of Data Unit Transferred across I/O Channel	Byte	Byte	Byte	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Other Peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, diskette, patch panel	FEP console, diskette, patch panel	FEP console, diskette, patch panel	FEP CRT console, diskette, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Software and firmware combination	Firmware/software combination	Firmware/software combination	Software
IPL Method	Host download, diskette	Host download, diskette	Host download, diskette	From host/diskette
Additional Software Supported	Development, communications	Development, communications	Development, communications	Value added options, assembler, utilities, diagnostics
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters & programs
Software Separately Priced	Some	Some	Some	Value added options
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	All	All	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Loc/rem. lpbk, internal diag., prob. determ.	Loc/rem. lpbk, internal diag., prob. determ.	Loc/rem. lpbk, internal diag., prob. determ.	Not applicable
Data Collected	Line outage/hits, port stat., error, trace	Line outage/hits, port stat., error, trace	Line outage/hits, port stat., errors, trace	Statistics
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	50,000	35,000	90,000	17,900
Monthly Maintenance, $	600	300	Depends upon config.	150
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Contact vendor	630
Is Maintenance Bundled with Lease/Rental?	No	No	No	Yes
Date of First Delivery	1977	1985	1987	November 1981
Number of Systems Installed to Date	100	Info. not available	Info. not available	30
Serviced by	Chi	Chi	Chi	Computer Communications
VENDOR PHONE NUMBER	(216) 831-2622	(216) 831-2622	(216) 831-2622	(213) 320-9101
COMMENTS	Dynamic rout., 2 async screen ed., auto. term. protocol detect, redund mult. loc/rem. hosts.	Preconfig., dynamic routing, 2 async screen ed., auto term. protocol detect. redundancy.	Replaces 3210; High-speed vers.; TCP/IP; dynamic rout.; 2 async screen ed.; redundancy.	Auto-poll, autobaud rate detect, autodial, single IOP support, off line util., flow contrl

Communications Processors

VENDOR AND MODEL	Computer Communications CC-8	Computer Communications CC-80/85	Computer Communications CCI Superband 8400	Computerm Model 3800/3890
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 43XX, 30XX, and compatibles
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	4	7	4	2 to 4
Max. No. of Active Hosts Supported Simultaneously	4	7	4	2 to 4
IBM Emulation	370X/37X5 EP	370X/37X5 EP	CTCA	Not applicable
PU Type within Network	PU Type 4	PU Type 4	CTCA	Not applicable
Remote Line Concentrator:	No	No	No	Yes
Maximum No. of Hosts Served by One Concentrator	Not applicable	Not applicable	Not applicable	2 to 4
Host-Independent Network Processor	No	Yes	No	Yes
Host Channel Extender	No	No	Yes	Yes
Terminal Controller	Yes	Yes	No	No
Store-and-Forward Message Switching Processor	No	Yes	No	No
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	No	No	SNA	Transparent
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	Vendor did not specify	Vendor did not specify	4	8 full duplex (to an aggregate of 1M bps)
Highest Line Speed Supported (bps)	230.4K	230.4K	1.544M	448K per line (Model 4)
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	No	No
Terminal-Initiated Applications Switching	Yes	Yes	No	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	No
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	No	No	No	No
Code Conversion	Yes	Yes	No	No
Error Control	Parity LRC and CRC	Parity LRC and CRC	Native HDLC	LRC-CRC detect/correct.
Automatic Transmission Speed Detection	Yes; 110-1200 bps	Yes; 110-1200 bps	No	No
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	CCI 801	CCI 8001/8501	Mult. 8809, 8089, 68000	IBM Series/1*
Main Memory Word Size, bits	16	16	8	16
Main Memory Storage Capacity, bytes	64K	256K	512K-1M	512K
Level of Data Unit Transferred across I/O Channel	Byte	Byte	Byte, block, selector	Byte, block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	DMA	DMA
Mass Storage	DMA/Interrupt	DMA/Interrupt	DMA	None
Other Peripherals	DMA/Interrupt	DMA/Interrupt	Not applicable	DMA
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP CRT console, diskette, printer	Disk (40-200MB), mag tape, FEP CRT, printer	Diskette, supervisory console, display unit	FEP console, diskette
Support for Remote Console	Yes	Yes	Yes	No
Support X.25 Level 3 Capabilities	Yes	Yes	No	No
Communications Operating Software:				
Operating System Implemented in	Software	Software	Software	Firmware and software combination
IPL Method	From host/diskette	From host/disk	Host, manual diskette	Inter. slf-load/disk.
Additional Software Supported	Value added options assembler loader, utilities, diagnostics	Value added options, custom software, assembler, loader,	Not applicable	Vendor did not specify
User Programmability	Yes, via user-selected parameters & programs	Yes, via user-selected parameters & programs	Yes	Yes, user configurable
Software Separately Priced	Value added options	Options and custom sys.	None	None
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	90%	95%	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Vendor did not specify	Vendor did not specify	Through NetView	Internal
Data Collected	Statistics	Statistics	Through NetView	Traffic load., line outages, errrors, trace
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	39,840	68,000/115,640	55,965	93,000
Monthly Maintenance, $	296	246/426	369	834
Monthly Lease/Rental, $	1,224 (3-yr.); 1,600 (rental)	1,932 (3-yr. lease)	1,552 (3-yr. lease)	2,854 (3-yr. lease)
Is Maintenance Bundled with Lease/Rental?	Yes	Yes	Yes	Yes
Date of First Delivery	1976	1975	January 1986	June 1983
Number of Systems Installed to Date	270	432	24	100+
Serviced by	Computer Communications	Computer Communications	Computer Communications	Computerm
VENDOR PHONE NUMBER	(213) 320-9101	(216) 320-9101	(216) 320-9101	(412) 391-7804
COMMENTS	Auto poll, autobaud rate detect, speed & code conver., autodump, autoload, multihost spt	Used mainly for custom store-and-forward message switches, electronic mail, etc.	T1 processor for bulk file data transfer; simult. attached to pre-SNA/SNA hosts.	*Series/1 w/proprietary processors; ch. extension includes printers, CRTs, & magnetic tape.

Communications Processors

VENDOR AND MODEL	Computerm Model 4080	Control Data CDCNET	Digital Communications Associates (DCA) System 335	Digital Communications Associates (DCA) System 355
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 43XX, 30XX, and compatibles	CDC Cyber 170/180	Most vendors	Most vendors
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	4	2	4	44
Max. No. of Active Hosts Supported Simultaneously	4	2	42	124
IBM Emulation	Not applicable	None	SNA/SDLC, 3270 BSC	SNA/SDLC, 3270 BSC
PU Type within Network	Not applicable	PU Type 5	Vendor did not specify	Vendor did not specify
Remote Line Concentrator:	Yes	Yes, RTI	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	4	Unlimited	42	124
Host-Independent Network Processor	Yes	No	Yes	Yes
Host Channel Extender	Yes	No	No	No
Terminal Controller	No	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	No	Yes	Yes	Yes
Network Architecture Compliance	Transparent	CDCNET (OSI model)	SNA, X.25, BSC	SNA, BSC, X.25
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	8 full duplex (to an aggregate of 1M bps)	MTI 64, LAN 5,000	4	44
Highest Line Speed Supported (bps)	448K (per line)	64K	72K	72K
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	No	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	No	Yes	Yes	Yes
Interface to Ethernet LAN	No	Yes	Yes	Yes
Protocol Conversion	No	No	Async - 3270 BSC, async -X.25, TCP/IP to X.25	Async-3270, async-X.25, TCP/IP - X.25
Code Conversion	No	ASCII to EBCDIC	No	No
Error Control	LRC-CRC detect/correct.	Parity check, LRC-CRC,	ARQ-CRC	ARQ-CRC
Automatic Transmission Speed Detection	No	Yes, 100 bps—38.4K bps	Yes	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	IBM Series 1*	Multiple MC 68000	Z80B, 68000	Z80B, 68000
Main Memory Word Size, bits	16	16 bits	8 bits	8 bits
Main Memory Storage Capacity, bytes	512K	1M-4M	64K-512K	64K-512K
Level of Data Unit Transferred across I/O Channel	Byte, block	Block	Byte, block	Byte, block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	None	None	DMA/Interrupt	DMA/Interrupt
Other Peripherals	DMA	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, diskette	FEP console	FEP console, disk, diskette	Dual call console, disk, diskette
Support for Remote Console	No	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	No	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Firmware/software combination	Firmware/software combination	Software	Software
IPL Method	Inter. slf-load, disk.	Download from host	Downline/int. self-load	Intern. self-load/man.
Additional Software Supported	Vendor did not specify	None	Not applicable	Not applicable
User Programmability	Yes, user configurable	Yes, via user-created programs	Yes, via user-selected parameters, console	Yes, via user-selected parameters, console
Software Separately Priced	None	Some	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	All	All	25%	25%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Internal	Loc/rem. lpbk, internal diag., prob. determ.	Loc/rem loop., port/ line status, internal	Loc/rem loop., port/ line stat. mod/lead.
Data Collected	Traffic load/line out./ error rates/trace	Traffic load/line out./ line hits/events/acct.	Traffic load/line out./ port stat./errors/hits	Traff. load., line hits stream., net soft. fail
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	97,000	12,565	Vendor did not specify	Vendor did not specify
Monthly Maintenance, $	690	70	Contact vendor	Contact vendor
Monthly Lease/Rental, $	2,610 (3-yr. lease)	600 (3-yr. lease)	Contact vendor	Contact vendor
Is Maintenance Bundled with Lease/Rental?	Yes	No	No	No
Date of First Delivery	December 1982	December 1985	1980	1980
Number of Systems Installed to Date	188	2,000+	Info. not available	Info. not available
Serviced by	Computerm	Control Data	DCA, third party	DCA, third party
VENDOR PHONE NUMBER	(412) 391-7804	(612) 853-5641	(404) 442-4000	(404) 442-4000
COMMENTS	*Series/1 w/proprietary microprocessors. Includes PRT, CRT, satellite comm. support.	CDCNET—dist. netwrk. of mainframe, term., & net work device interfaces conn. by Ethernet/X.25.	Supports direct 802.3 LAN interface running TCP/IP software.	Supports direct 802.3 LAN interface running TCP/IP software.

Communications Processors

VENDOR AND MODEL	Digital Communications Associates (DCA) System 375	Honeywell Bull Datanet 8/10	Honeywell Bull Datanet 8/20	Honeywell Bull Datanet 8/30
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	DPS 7/DPS 88/DPS 8000/ DPS 8/DPS 90/DPS 7000	DPS 7/DPS 8/DPS 8000/ DPS 88/DPS 90/DPS 7000	DPS 7/DPS 8/DPS 8000/ DPS 88/DPS 90/DPS 7000
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	144	1 or 2	4	4
Max. No. of Active Hosts Supported Simultaneously	124	1 or 2	4	4
IBM Emulation	SNA/SDLC, 3270 BSC	Yes	Yes	Yes
PU Type within Network	Vendor did not specify	Vendor did not specify	Vendor did not specfiy	Vendor did not specify
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	124	Vendor did not specify	Vendor did not specify	Vendor did not specify
Host-Independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	No	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	Yes	Yes	Yes	Yes
Network Architecture Compliance	SNA, BSC, X.25	Honeywell Bull DSA, ISO	Honeywell Bull DSA, ISO	Honeywell Bull DSA, OSI
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	144	31	127	255 (max.)
Highest Line Speed Supported (bps)	72K	2.5M (T1)	2.5M (T1)	2.5M (T1)
Effect on Line Capacity, if All Lines are Full-Duplex	None	Load dependent	Load dependent	Load dependent
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes (by host program)	Yes (by host program)	Yes (by host program)
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Via X.25	Via X.25	Via X.25
Protocol Conversion	Async/X.25/3270 BSC, TCP/IP to X.25	No	No	No
Code Conversion	No	No	No	No
Error Control	ARQ-CRC	Yes	Yes	Yes
Automatic Transmission Speed Detection	Yes	Yes; 110, 300, 1200 bps	Yes, 110, 300, 1200 bps	Yes; 110, 300, 1200 bps
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes; optional, variable	Yes; optional, variable	Yes; optional, variable
SYSTEM CHARACTERISTICS				
Processor	Z80A/B, 68000	Datanet 8/10	Datanet 8/20	Datanet 8/30
Main Memory Word Size, bits	8	16	16	16
Main Memory Storage Capacity, bytes	64 to 512K	1M to 2M (w/option)	1M to 2M (w/option)	2M to 4M (w/option)
Level of Data Unit Transferred across I/O Channel	Byte, block	Byte	Byte	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	Async bus	Async bus	Async bus
Mass Storage	DMA/Interrupt	Async bus	Async bus	Async bus
Other Peripherals	DMA/Interrupt	Async bus	Async bus	Async bus
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, diskette, disk	Console, diskette	Console, diskette	Console, diskette
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
Communications Operating Software:				
Operating System Implemented in	Software	Firmware and software combination	Firmware and software combination	Firmware and software combination
IPL Method	Intern. self-load/man.	Host, local, or VIP	Host, local, or VIP	Host, local, or VIP
Additional Software Supported	Not applicable	Additional on host for administrative and control	On host for administra- tive and control	On host for control and administrative
User Programmability	Yes, via user-selected parameters, console	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	All	All	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	25%	Software is customer installable	Software is customer installable	Software is customer installable
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Loc/rem. loop., port/ line stat. modem lead	Yes	Yes	Yes
Data Collected	Traff. load., line hits net soft. failures	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	Vendor did not specify	23,900	38,000	80,000
Monthly Maintenance, $	Contact vendor	130	215	350
Monthly Lease/Rental, $	Contact vendor	795 (4-yr. lease)	1,275 (4-yr. lease)	2,675 (4-yr. lease)
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	December 1984	1985	1985	1985
Number of Systems Installed to Date	Info. not available	Info. not available	Info. not available	Info. not available
Serviced by	DCA, third party	Honeywell Bull	Honeywell Bull	Honeywell Bull
VENDOR PHONE NUMBER	(404) 442-4000	(617) 895-6000	(617) 895-6000	(617) 895-6000
COMMENTS	Supports direct 802.3 LAN interface running TCP/IP software.	Low-end model in the Datanet 8 Series.		

Communications Processors

VENDOR AND MODEL	Hughes Network Systems Network Controlled 9708 MPX	Hughes Network Systems Standalone MPX	Hughes Network Systems 9000 NPX	Hughes Network Systems 9724 RPX
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via X.25/ X.75	Most vendors via X.25/ X.75	Most vendors via communications	Most vendors via X.25/ X.75
Direct Attachment to Host	No (X.25)	No (X.25)	No (X.25)	No (X.25)
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	No	No	No
Max. No. of Hosts Channel-Attachable to Front-End	Not applicable	Not applicable	Not applicable	Not applicable
Max. No. of Active Hosts Supported Simultaneously	Not applicable	Not applicable	Not applicable	Not applicable
IBM Emulation	Not applicable	Not applicable	SNA/SDLC	SNA/SDLC
PU Type within Network	Not applicable	Not applicable	PU Type 2	PU Type 2
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	7	8	600+	23
Host-Independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	Yes	Yes	Yes	Yes
Network Architecture Compliance	OSI, X.25	X.25, OSI	X.25, OSI	X.25, OSI
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	8	8	640	24
Highest Line Speed Supported (bps)	19.2K	19.2K	64K	64K
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	No	No	SDLC to X.25	SDLC to X.25
Code Conversion	No	No	No	No
Error Control	ARQ-CRC/LRC-CRC detect.	ARQ-CRC, LRC-CRC detect	LRC-CRC detect/ARQ-CRC	LCR-CRC detect/ ARQ-CRC
Automatic Transmission Speed Detection	No	No	No	No
Automatic Disconnect of Inactive Dial-Up Terminals	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Intel 186	Intel 186	Intel 186 & 286	Intel 286 and 186
Main Memory Word Size, bits	16	16	16	16
Main Memory Storage Capacity, bytes	704K	512K	Over 50M	2M
Level of Data Unit Transferred across I/O Channel	Byte, block	Byte, block	Byte, block	Byte, block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	Not applicable	Not applicable	DMA	Not applicable
Other Peripherals	Not applicable	Not applicable	Not applicable	Not applicable
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, disk, magnetic tape	Not applicable	Disk, tape, console	Disk, tape, console
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Firmware	Firmware	Firmware	Firmware
IPL Method	Download from host	Internal self-load	Downln. load/loc reload	Downline load, local
Additional Software Supported	Remote diagnostics	Vendor did not specify	Remote diagnostics	Remote diagnostics
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	All	None	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	All	Not applicable (new)	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Loc/rem lpbk/internal diag/prob. determ.	Loc/rem lpbk, internal diag., prob. determ.	Loc/rem lpbk, internal diag, prob. determ.	Loc/rem lpbk/internal diag./prob. determ.
Data Collected	Traff. load/stat/trace/ account/errors/events	Events/stat/traff load/ line out/error/trace	Events/stat./account./ trace/errors/traf. load	Events/stat/accounting/ trace/errors/line hits
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	8,900	7,400	30,000	Under 20,000
Monthly Maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1986	January 1988	1982	1986
Number of Systems Installed to Date	170	New product	700	100
Serviced by	Hughes Network	Hughes Network	Hughes Network	Hughes Network
VENDOR PHONE NUMBER	(301) 428-5895	(301) 428-5895	(301) 428-5895	(301) 428-5895
COMMENTS	Part of HNS Integrated Packet Network; network mgmt. capability; X.21 logical addressing.	Field upgrade. to network controlled 9708 MPX. mon. & controlled from async terminal.	Part of HNS' Integrated Packet Network; full netwrk. mgmt. capabil., Virtual Circuit Recon.	Part of HNS Integrated Packet Network; full network mgmt. capabilities, dynamic routing.

Communications Processors

VENDOR AND MODEL	ICOT Corporation 254*	ICOT Corporation 257*	Infotron 990NP Network Processor	Infotron 892NP Network Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	ICOT 254	ICOT 257	Vendor did not specify	Not applicable
Direct Attachment to Host	Vendor did not specify	Vendor did not specify	No	No
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	No	No
Max. No. of Hosts Channel-Attachable to Front-End	No	No	None	None
Max. No. of Active Hosts Supported Simultaneously	8	28	Over 10 hosts	None
IBM Emulation	3270 BSC, SNA/SDLC	3270 BSC, SNA/SDLC	3270 BSC	None
PU Type within Network	Vendor did not specify	Vendor did not specify	No	None
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	8	28	Over 10 hosts	2 hosts
Host-Independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	Vendor did not specify	Vendor did not specify	No	No
Terminal Controller	Yes	Yes	No	No
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	Yes	Yes	Yes	Yes
Network Architecture Compliance	SNA, BSC, NCR	SNA, BSC, NCR	Proprietary	Proprietary
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	8	28 (all sync)	640	104 channels
Highest Line Speed Supported (bps)	Vendor did not specify	19.2K	64K	64K
Effect on Line Capacity, if All Lines are Full-Duplex	28	Vendor did not specify	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	No	No	Yes (async)	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Vendor did not specify	Vendor did not specify	No	No
Protocol Conversion	Yes	Yes	No	No
Code Conversion	Yes	Yes	No	No
Error Control	Yes	Yes	Yes	ARQ-CRC
Automatic Transmission Speed Detection	No	No	Yes, to 9600 bps	Yes, 110 to 9600 bps
Automatic Disconnect of Inactive Dial-Up Terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Multi-Intel 8088	Intel 8088	6502/8086/80186	80186, 6502
Main Memory Word Size, bits	16K	16K	Vendor did not specify	Not applicable
Main Memory Storage Capacity, bytes	128K	128K	Vendor did not specify	Not applicable
Level of Data Unit Transferred across I/O Channel	Byte	Byte	Not applicable	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	Interrupt	Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	Mail box	Mail box	Not applicable	Not applicable
Other Peripherals	Vendor did not specify	Vendor did not specify	Not applicable	Not applicable
I/O, Back-Up, and Diagnostic Peripherals Supported	Host console	Host console	Console/diskette	Console, network manager
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Vendor did not specify	Vendor did not specify	Yes	No
Communications Operating Software:				
Operating System Implemented in	Firmware	Firmware	Firmware and software combination	Firmware
IPL Method	Download from host	Download from host	EEPROM	Internal self-load
Additional Software Supported	No	No	Not applicable	Vendor did not specify
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via console	Yes, via console
Software Separately Priced	No	No	Some	Some
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	100%	100%	25%	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Vendor did not specify	Vendor did not specify	Yes	Loc/rem lpbk, internal, prob. determination
Data Collected	Vendor did not specify	Vendor did not specify	Yes	Traffic load/line out./ error rates/event/trace
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	5,200 and up	7,200 and up	20,000	11,000 (16 ch./2 links)
Monthly Maintenance, $	Contact vendor	Contact vendor	Contact vendor	Vendor did not specify
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Contact vendor	Vendor did not specify
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1981	1981	1984	October 1987
Number of Systems Installed to Date	Vendor did not specify	Vendor did not specify	6,000	30
Serviced by	ICOT, third party w/NCR	ICOT, third party w/NCR	Infotron	Infotron
VENDOR PHONE NUMBER	(408) 433-3300	(408) 433-3300	(609) 424-9400	(609) 424-9400
COMMENTS	IBM 2780/3780 BSC emulation. *1987 information.	2780/3780 BSC emulation *1987 information.	Provides adapt. routing comp. netwrk. mgmt. features; bisync emula. & async/BSC/SDLC suprt.	8 nodes/network; ANM-800 Netwrk Mgr. (opt.), mult. links up to 64K, auto. alt. routing.

Communications Processors

VENDOR AND MODEL	IBM 3705-80 Models M81 through M83*	IBM 3720	IBM 3725	IBM 3745
COMPUTER SYSTEMS INTERFACED		IBM 43XX, 303X, 308X,		
Manufacturers and Models	IBM S/370, 30XX, and 43XX; S/370 in 270X	309X Yes (Models 1 & 11;	IBM S/370 (except models 115 and 125), 303X,	IBM S/370, 43XX, 937X, 3033, 308X, 3080
Direct Attachment to Host	Yes	Models 2, 12 via phone)	Yes	Yes
FUNCTIONAL CHARACTERISTICS		Yes		
Front-end Processor	Yes	4	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	2	4	8	16
Max. No. of Active Hosts Supported Simultaneously	2	Yes	8	8
IBM Emulation	270X/370X		270X and 3705 with EP	Yes
		—		
PU Type within Network	—	Yes	—	—
Remote Line Concentrator:	No	4	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	Not applicable	No	8	Unlimited
Host-Independent Network Processor	No	No	No	No
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	No	SNA	No	No
Network Architecture Compliance	SNA		SNA	SNA, X.25
Communications Line Capacity:		28 Std.-1,2; 60 w/ex-		
No. of Half-Duplex Lines Physically Attachable to Processor	16	pan. unit; 16 std-11, 12 64K	256 w/ 3726 expansion	512
Highest Line Speed Supported (bps)	57.6K	None	256K (LIC Type 4B)	1.544M
Effect on Line Capacity, if All Lines are Full-Duplex	Capacity halved		None	None
COMMUNICATIONS FEATURES/FUNCTIONS		Yes		
Multiplexing/Demultiplexing	No	No	Yes	Yes
Terminal-Initiated Applications Switching	No	Yes	No	No
Comm. Processor-Initiated Dynamic Line Reconfig.	No	No	Yes	Yes
Interface to Ethernet LAN	No	Yes	No	No
Protocol Conversion	Yes		Yes	Yes
		Yes		
Code Conversion	Yes	LRC, CRC	Yes	Yes
Error Control	LRC and CRC	Yes, via optional soft.	LRC and CRC	Yes
Automatic Transmission Speed Detection	Yes, via optional soft.	No	Yes, via optional soft.	—
Automatic Disconnect of Inactive Dial-Up Terminals	No		No	—
SYSTEM CHARACTERISTICS		Proprietary		
Processor	Proprietary	18	Proprietary	Proprietary
Main Memory Word Size, bits	18	1M (expand. up to 2M)	18	—
Main Memory Storage Capacity, bytes	256K	Block	256K-3M	4 to 8M (per CCU)
Level of Data Unit Transferred across I/O Channel	Block		Block	Block
Type of Data Transfer Supported between Memory &:		DMA		
Communications Lines	DMA	DMA	DMA	DMA
Mass Storage	DMA	DMA	DMA	DMA
Other Peripherals	DMA	FEP console	DMA	DMA
I/O, Back-Up, and Diagnostic Peripherals Supported	None	Yes	FEP console	—
Support for Remote Console	No	Yes	Yes, up to 150 meters	Yes
Support X.25 Level 3 Capabilities	—		Yes	Yes
Communications Operating Software:		Software		
Operating System Implemented in	Software		Software	Software
		Internal self-load		
IPL Method	Download from host	ACF/NCP, NTO, NPSI, NRF	Internal self-load	Internal self-load
Additional Software Supported	NCCF, NPDA	NPDA, ACF/TCAM, EP R3 EP R4, NetView	NCCF, NPDA, ACF/NCP-PEP, EP/3725	ACF/NCP V5, EP, NTO, ACF/VTAM, NetView, ACF/SSP, X.25 NSF R2
		Yes		
User Programmability	Yes		Yes	Yes
		Yes		
Software Separately Priced	Yes		Yes	Yes
		None		
Approx. Proportion of Currently Installed	—		None	None
Systems Supplied As Turnkey Systems	None			
NETWORK MANAGEMENT/CONTROL CAPABILITIES		Yes		
Diagnostic Tests Supported	—		—	Yes
		Yes		
Data Collected	—		—	Yes
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:		36,500/26,00 (Mod. 1/2)		
Purchase Price, $	36,600 (M81)	175 (1); 142 (2)	From 60,500 to 75,000	From 125,000 to 188,000
Monthly Maintenance, $	219	2,605 (1); 1,855 (2)	Contact vendor	Contact vendor
Monthly Lease/Rental, $	1,465 (2-yr. lease); 1,721 (rental)		From 3,030 to 4,020	From 12,500 to 18,800
Is Maintenance Bundled with Lease/Rental?	Yes	No	No	No
Date of First Delivery	August 1981	1986—1, 2; 1987—11,12	1983	March 1988 (3745-210)
Number of Systems Installed to Date	Vendor did not specify	Vendor did not specify	Vendor did not specify	New
Serviced by	IBM	IBM	IBM	IBM
VENDOR PHONE NUMBER	Contact local IBM rep.	Contact local IBM rep.,	Contact local IBM rep.	Contact local IBM rep.
COMMENTS	*IBM no longer markets these models.	3721 expansion unit expands capabilities of 3720; Models 1, 2, 11, and 12.	HONE Configurator CF-3725 should be consulted for actual no. of operable lines.	3745-410 is scheduled for September 1988.

Communications Processors

VENDOR AND MODEL	KMW Systems, Auscom 8911A Channel Interface	Lemcom Systems Communications Micro Controller 4	Lemcom Systems Communications Micro Controller 8	Lemcom Systems Communications Micro Controller 32
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM mainframes, plug-compatible hosts	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.
Direct Attachment to Host	Yes (thru channel)	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	1	1	1	1
Max. No. of Active Hosts Supported Simultaneously	1	1	1	1
IBM Emulation	3274(1A/1D), 3803, 3272	270X, 370X, EP, custom	270X/370X, EP, custom.	270X/370X, EP
PU Type within Network	Vendor did not specify	Not applicable	Not applicable	Not applicable
Remote Line Concentrator:	No	No	No	No
Maximum No. of Hosts Served by One Concentrator	Not applicable	Not applicable	Not applicable	Not applicable
Host-Independent Network Processor	Yes	No	No	No
Host Channel Extender	No	No	No	No
Terminal Controller	No	No	No	No
Store-and-Forward Message Switching Processor	Yes	No	No	No
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	Various	Not applicable	Not applicable	Not applicable
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	112	4	8	8
Highest Line Speed Supported (bps)	1.544M	57.6K	57.6K	57.6K
Effect on Line Capacity, if All Lines are Full-Duplex	Vendor did not specify	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	No	No	No	No
Terminal-Initiated Applications Switching	No	No	No	No
Comm. Processor-Initiated Dynamic Line Reconfig.	No	No	No	No
Interface to Ethernet LAN	Yes	No	No	No
Protocol Conversion	No	No, custom	Custom	Custom
Code Conversion	Yes, ASCII to EBCDIC	Yes, ASCII to EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	Yes	Parity ck. w/retran.	Parity ck. w/retran.	Parity ck. w/retran.
Automatic Transmission Speed Detection	No	Yes	Yes	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	DEC LSI 11/73	Motorola 6800	Motorola 6800	Motorola 6800
Main Memory Word Size, bits	16	8	8	8
Main Memory Storage Capacity, bytes	1M	40K	80K	80K
Level of Data Unit Transferred across I/O Channel	Block	Byte/block	Byte/block	Byte/block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	Interrupt	Interrupt	Interrupt
Mass Storage	DMA/Interrupt	None	None	None
Other Peripherals	DMA/Interrupt	None	None	None
I/O, Back-Up, and Diagnostic Peripherals Supported	Tape cartridge, disk, diskette	FEP console	FEP console	FEP console
Support for Remote Console	No	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	No	No	No
Communications Operating Software:				
Operating System Implemented in	Software	Firmware	Firmware	Firmware
IPL Method	Manual load from tape	Internal self-load	Internal self-load	Internal self-load
Additional Software Supported	Vendor did not specify	Problem determination aids	Problem determination aids	Problem determination aids
User Programmability	Yes	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	Yes	Utilities only	Utilities only	Utilities only
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	50%	None	None	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes	Loc/rem loopback, inter diag., prob. determ.	Loc/rem. lpbk, internal diag., prob. determ.	Rem/loc lpbk., internal diag., prob. determ.
Data Collected	No	Trace	Trace	Trace
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	20,000	9,000	10,000	10,000
Monthly Maintenance, $	300/mo.	Contact vendor	Contact vendor	Contact vendor
Monthly Lease/Rental, $	No	Contact vendor	Contact vendor	Contact vendor
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1980	March 1977	November 1980	November 1980
Number of Systems Installed to Date	2,000	400	75	75
Serviced by	KMW	National Advanced Sys.	National Advanced Sys.	National Advanced Sys.
VENDOR PHONE NUMBER	(512) 338-3000	(602) 944-1543	(602) 944-1543	(602) 944-1543
COMMENTS	Full programmable IBM channel interface.	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.

Communications Processors

VENDOR AND MODEL	Lemcom Systems Distributed Network Processor Series	Micom MB3-BSC	Micom MB3-XAP	NCR Comten Comten 3695
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX, & compat.	Most vendors via X.25	Most vendors via X.25	NCR 8500/8600, IBM 360/370, 303X, 308X, 43XX
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	No	No	Yes
Max. No. of Hosts Channel-Attachable to Front-End	32	Not applicable	Not applicable	8
Max. No. of Active Hosts Supported Simultaneously	32	Not applicable	Not applicable	8
IBM Emulation	270X/370X, EP, 370X BSC SNA/SDLC, 370X/37X5	3270 BSC, DSP	Not applicable	270X, 370X, NCP, SNA/SDLC, 3270 BSC
PU Type within Network	PU Type 2	Not applicable	Not applicable	PU Type 4, PU Type 5
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	32	16	22	8 concurrently
Host-Independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	Yes	No	No	No
Terminal Controller	Yes	Yes	No	No
Store-and-Forward Message Switching Processor	Yes	No	No	Yes
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	SNA, OSI, internal	X.25, BSC	X.25	SNA, BSC, X.25
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	3,000	4	24	512
Highest Line Speed Supported (bps)	64K	9600	9600	256K
Effect on Line Capacity, if All Lines are Full-Duplex	Load dependent	None	None	More than 9.6K-halved, less than 9.6K-none
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Planned	No	No	No
Protocol Conversion	BSC-SDLC, Async-3270, SDLC-BSC	3270 BSC to X.25	Async to X.25	Async to 3270 BSC
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	Baudot to ASCII	ASCII to EBCDIC
Error Control	Parity, LRC-CRC	Parity ck. w/retransmit	Parity ck. w/retransmit	Parity, LRC-CRC detect.
Automatic Transmission Speed Detection	Yes, 110 to 19.2K bps	No	Yes	Yes, 110 to 9600 bps
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Motorola 6809E	Z80B	Z80B	Proprietary
Main Memory Word Size, bits	8	512K	512K	32
Main Memory Storage Capacity, bytes	15M	8K	8K	4MB
Level of Data Unit Transferred across I/O Channel	Byte, block	Byte	Byte	Byte or block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	Interrupt	Interrupt	Interrupt
Mass Storage	DMA/Interrupt/bubble	Interrupt	Interrupt	DMA
Other Peripherals	Vendor did not specify	Interrupt	Interrupt	DMA
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, bubble memory, patch panel	Yes	Yes	Hard disk, diskette, FEP console, printer
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Firmware and software combination	Firmware	Firmware	Software
IPL Method	Internal/manual/bubble	Internal self-load	Internal self-load	Manual load from disk.
Additional Software Supported	Vendor did not specify	No	No	NCR Comten networking & connectivity software
User Programmability	Yes, via user-selected parameters, console	No	No	Yes, via user-created programs
Software Separately Priced	All	All	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	25%	All	All	Info. not available
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Rem/loc. lpbk, prob. determ., internal diag.	Yes	Yes	Intern. diag., prob. determ., port/line stat
Data Collected	Traff. load/line out./link hit/error/events	Yes	Yes	Traffic/line out./link load/stat/trace/events
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	15,00	3,740	2,290	124,000
Monthly Maintenance, $	Contact vendor	Contact vendor	Contact vendor	473
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Contact vendor	6,176
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	March 1981	1987	1987	1986
Number of Systems Installed to Date	725	50	1,000	Info. not available
Serviced by	National Advanced Sys.	Independent distributors	Independent distributors	NCR Comten
VENDOR PHONE NUMBER	(602) 944-1543	(805) 583-8600	(805) 583-8600	(612) 638-7944
COMMENTS	Dist. MPU FEP; up to 256 MPUs prog. to do var. comm. proc. func., front-end polling.			Users can connect to IBM, X.25 and/or mixed vendor networks.

Communications Processors

VENDOR AND MODEL	NCR Comten Comten 5620XP	NCR Comten Comten 5660	Netlink Inc. Network SNA-Hub	NTX Communications NTX 3800 Model 2 Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM 360/370, 303X, NCR 8500/8600, 308X, 43XX	IBM 360/370, 303X, 308X, 43XX, & compat.	Most vendors	IBM and plug-compatible mainframes
Direct Attachment to Host	Yes	Yes	No	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	No	Yes
Max. No. of Hosts Channel-Attachable to Front-End	2	8	Not applicable	4
Max. No. of Active Hosts Supported Simultaneously	2	8	Not applicable	2
IBM Emulation	270X/370X, SNA/SDLC, 3270 BSC, NCP, EP	270X, 370X/37XP, NCP, EP 3270 BSC	Not applicable	CTCA
PU Type within Network	PU Type 4, PU Type 5	PU Type 4, PU Type 5	PU Type 5	Not applicable
Remote Line Concentrator:	Yes	Yes	Yes	No
Maximum No. of Hosts Served by One Concentrator	2 concurrently	8 concurrently	16	Not applicable
Host-Independent Network Processor	Yes	Yes	Yes	No
Host Channel Extender	No	No	No	Yes
Terminal Controller	No	No	PC controller	No
Store-and-Forward Message Switching Processor	Yes	Yes	No	No
Distributed Processing Node	No	No	Yes	No
Network Architecture Compliance	SNA, X.25, BSC	SNA, X.25, BSC	SNA	SNA
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	64	1,024	16	8
Highest Line Speed Supported (bps)	64K	256K; mult. T1s via mux	64K	6M (T2)
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	No
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	No
Interface to Ethernet LAN	No	No	No*	No
Protocol Conversion	Yes, async to 3270 BSC	Yes, async to 3270 BSC	No	No
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	No	No
Error Control	parity, LRC-CRC detect.	Parity, LRC-CRC detect.	Yes	ARQ-CRC
Automatic Transmission Speed Detection	Yes	Yes	No	No
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	No	Not applicable
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Intel	Proprietary
Main Memory Word Size, bits	32	32	16	Proprietary
Main Memory Storage Capacity, bytes	4M	16M	1M to 3M	Vendor did not specify
Level of Data Unit Transferred across I/O Channel	Byte or block	Byte or block	Not applicable	Block
Type of Data Transfer Supported between Memory &:				
Communications Lines	Interrupt	Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	DMA	DMA	Not applicable	Not applicable
Other Peripherals	DMA	DMA	Not applicable	Not applicable
I/O, Back-Up, and Diagnostic Peripherals Supported	FEP console, disk, printer	FEP console, diskette, disk, printer	Not applicable	FEP console, PC
Support for Remote Console	No	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes (future plans)	No
Communications Operating Software:				
Operating System Implemented in	Software	Software	Software	Firmware and software combination
IPL Method	Manual load	Manual load	Download from host	Internal self-load
Additional Software Supported	NCR Comten networking & connectivity software	NCR Comten networking & connectivity software	None	None
User Programmability	Yes, via user-created programs	Yes, via user-created programs	Configuration macros	Yes, via user-selected parameters
Software Separately Priced	All	All	Some	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	Info. not available	Info. not available	25%	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Intern. diag., prob. determ., port/line stat	Intern. diag., prob. determ., port/line stat	ROM/RAM-based, NPDA, NetView, Netmaster	Loc/rem lpbk, internal, prob. determ., NetView
Data Collected	Traf load/line out/link load/stat/events/trace	Events/stat/trace/link load/traf load/line out	Yes	Traff. load/line out/ errors/events/ln. hits
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	22,600	310,000	15,000	76,000
Monthly Maintenance, $	140	711	Vendor did not specify	400
Monthly Lease/Rental, $	1,324	15,075	Vendor did not specify	Not applicable
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1987	1986	1987	1986
Number of Systems Installed to Date	Info. not available	Info. not available	Vendor did not specify	Proprietary
Serviced by	NCR Comten	NCR Comten	Netlink	NTX
VENDOR PHONE NUMBER	(612) 638-7944	(612) 638-7944	(919) 878-8612	(408) 747-1444
COMMENTS	Allows users to connect to IBM, X.25 and/or mixed vendor networks.	Allows users to connect to IBM, X.25 and/or mixed vendor networks.	SNA concen./router to IBM hosts or hosts sup. SNA; routing by user; *interf IBM Token Ring.	Supports multiple T1 links in pt-to-pt or multipoint config.

Communications Processors

VENDOR AND MODEL	Paradyne Pix/Pixnet	Paradyne Pixnet-XL	Periphonics Voicepac	Periphonics VoiceBox
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 43XX, 30XX, and compatibles	Most major vendors	Most major vendors
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	1	2	7	3
Max. No. of Active Hosts Supported Simultaneously	Multiple	Multiple	7	3
IBM Emulation	Not applicable	Not applicable	370X/37X5, SNA/SDLC, 3270 BSC	370X/37X5, 3270 BSC
PU Type within Network	Not applicable	Not applicable	PU Type 2	PU Type 2
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	Multiple	Multiple	7	3
Host-Independent Network Processor	Yes	Yes	Optional	Optional
Host Channel Extender	Yes	Yes	Yes	Yes
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	No	No	No	No
Distributed Processing Node	Yes	No	Yes	Yes
Network Architecture Compliance	None	OSI-modeled	SNA	SNA
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	13	16	104	32
Highest Line Speed Supported (bps)	56K (per line)	2.048M	9600	9600
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	Minor	Minor
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	No
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
Protocol Conversion	Async/3270, PC/3270	Async/3270, PC/3270	Async to 3270 BSC	Async to 3270 BSC
Code Conversion	ASCII to EBCDIC	ASCII, EBCDIC	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	Yes	CRC	All industry standards	All industry standards
Automatic Transmission Speed Detection	Yes	Yes	Yes	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	LSI 11/23; LSI 11/73	LSI 11/23
Main Memory Word Size, bits	16	16	16	16
Main Memory Storage Capacity, bytes	128K	4M	320K	128K
Level of Data Unit Transferred across I/O Channel	Byte	Block, byte	Byte	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	Interrupt	Interrupt
Mass Storage	None	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Other Peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	Mag. tape; console	Diskette, console	CRT, printer, diskette	CRT, printer, diskette
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	No	No	Yes	No
Communications Operating Software:				
Operating System Implemented in	Firmware and software combination, hardware	Firmware and software combination	Proprietary software	Proprietary software
IPL Method	Intern. self-load, man.	Internal	Download or disk load	EPROM based
Additional Software Supported	Utilities	Utilities	I/O Gen, Pave, Param, Utalk	None
User Programmability	Self-configuring	No, vendor supported	Yes, voice dialog and basic edit functions	No
Software Separately Priced	None	None	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	All	All	75%	40%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes, internal testing	Yes, internal testing	Yes, local and remote loopback	Yes, local and remote loopback
Data Collected	Yes	Yes	Traffic loading	Traffic loading
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	From 30,000	From 30,000	28,000	20,000
Monthly Maintenance, $	Contact vendor	Contact vendor	250 min., variable	Approx. 200
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Variable	Variable
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	April 1976	March 1985	1981	1983
Number of Systems Installed to Date	Over 6,000	Over 500	400	40
Serviced by	Paradyne	Paradyne	Periphonics	Periphonics
VENDOR PHONE NUMBER	(813) 530-2000	(813) 530-2000	(516) 467-0500	(516) 467-0500
COMMENTS	Permits remote peripherals & CRTs to access mult. IBM hosts/applic. as loc. attac. devices.	Allows rem. peripherals CRTs, etc. to access IBM hosts as locally attached devices.	Handles data & voice interchang. via single I/O port; can convert, concentrate Prot./code.	Solid state unit can concentrate, convert protocol & code; serve as remote network node.

Communications Processors

VENDOR AND MODEL	Periphonics VoiceStar 46XX	Periphonics VoiceStar 47XX	Telematics NET 25 Series 200	Telematics NET 25 Series 5000
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most major vendors	Most major vendors
Direct Attachment to Host	Yes	Yes	No	No
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	No	No
Max. No. of Hosts Channel-Attachable to Front-End	3	7	Not applicable	Not applicable
Max. No. of Active Hosts Supported Simultaneously	4	7	Not applicable	Not applicable
IBM Emulation	370X/37X5, SNA/SDLC, 3270 BSC	370X/37X5, SNA/SDLC, 3270 BSC	No	No
PU Type within Network	PU Type 1, PU Type 2	PU Type 1, PU Type 2	No	Not applicable
Remote Line Concentrator:	Yes	Yes	Yes (packet switch)	Yes
Maximum No. of Hosts Served by One Concentrator	4	7	400	400
Host-Independent Network Processor	Yes	Yes	No	No
Host Channel Extender	Yes	Yes	No	No
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	Yes	Yes	No	No
Distributed Processing Node	Yes	Yes	No	No
Network Architecture Compliance	SNA	SNA	SNA, BSC, OSI, X.25, DECnet	SNA, BSC, OSI, X.25, DECnet
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	50	96	34	448
Highest Line Speed Supported (bps)	9600	9600	64K	230K
Effect on Line Capacity, if All Lines are Full-Duplex	Minor	Minor	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Yes	No	No
Protocol Conversion	Async to 3270 BSC	Async to 3270 BSC	Async to X.25, SDLC to X.25	Async to X.25, SDLC to X.25
Code Conversion	ASCII to EBCDIC	ASCII to EBCDIC	No	No
Error Control	All industry standards	All industry standards	LRC-CRC detect, Parity	LRC-CRC detect., parity
Automatic Transmission Speed Detection	Yes	Yes	Yes, 50 bps-19.2K bps	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Multi 68000, LSI 11	Multi 68000, LSI 11/73	MC 68010	MC 68020
Main Memory Word Size, bits	32 ECC; 16 ECC	32 ECC; 16 ECC	16	32
Main Memory Storage Capacity, bytes	Up to 3M	Up to 6M	4M	16M
Level of Data Unit Transferred across I/O Channel	2M or 4MB	2M or 4 bytes	Byte or block	Byte or block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	DMA/Interrupt	Interrupt	Interrupt
Mass Storage	DMA/Interrupt	DMA/Interrupt	DMA	DMA
Other Peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	CRT, printer, disk, diskette, tape	CRT, printer, disk, diskette, tape	Removable disk, printer and diskette	Diskette, disk, printer and magnetic tape
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Realtime, UNIX based	Realtime, UNIX based	Software	Software
IPL Method	Hard disk	Hard disk	Downld. from host, disk	Disk, downld. from host
Additional Software Supported	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang.	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang.	Pascal, C, Assembler	Pascal, C, Assembler
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters; user-prog.	Yes, via user-selected parameters, programs
Software Separately Priced	All	All	Some	Some
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	100%	100%	75%	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes, local and remote loopback	Yes, local and remote loopback	Intern. diag., prob. determ., port/line stat	Intern. diag, port/line status, prob. determ.
Data Collected	Traffic loading	Traffic loading	Traf load/line out/link load/stat/errors/events	Link load/stat/errors/events/account
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	65,000	136,000	15,000	Vendor did not specify
Monthly Maintenance, $	Approx. 650	Contact vendor	By quote	By quote
Monthly Lease/Rental, $	Variable	Variable	None	None
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1983	1985	March 1987	June 1988
Number of Systems Installed to Date	95	Info. not available	280+	New product
Serviced by	Periphonics	Periphonics	Telematics	Telematics
VENDOR PHONE NUMBER	(516) 467-0500	(516) 467-0500	(305) 772-3070	(305) 772-3070
COMMENTS	Transaction processing sys. w/ voice response, hand-held term., PC, & POS device support.	High capacity & thruput transact. process. sys. w/voice resp., hand-hld term., PC/POS support.	Other data collecterd includes node/link/soft ware status and accounting.	

Communications Processors

VENDOR AND MODEL	Tri-Data Netway 1500	Tymnet Micro-Engine	Tymnet Mini-Engine	Tymnet Engine
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most major vendors	Most major vendors
Direct Attachment to Host	No	No	No	No
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	No	No	No
Max. No. of Hosts Channel-Attachable to Front-End	Not applicable	Not applicable	Not applicable	Not applicable
Max. No. of Active Hosts Supported Simultaneously	Not applicable	Not applicable	Not applicable	Not applicable
IBM Emulation	SNA/SDLC, 3270 BSC, Uniscope, VIP7800	Not applicable	Not applicable	Not applicable
PU Type within Network	PU Type 2	Not applicable	Not applicable	Not applicable
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	4	Configuration dependent	Configuration dependent	Configuration dependent
Host-Independent Network Processor	Yes	Yes	Yes	Yes
Host Channel Extender	No	No	No	No
Terminal Controller	Yes	Yes	Yes	Yes
Store-and-Forward Message Switching Processor	No	No	No	Yes
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	SNA, X.25, BSC	Tymnet proprietary — X.25 based	Tymnet proprietary — X.25 based	Tymnet proprietary — X.25 based
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	4	Configuration dependent	Configuration dependent	Configuration dependent
Highest Line Speed Supported (bps)	56K	19.2K	74K	74K
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	No	Yes	Yes
Interface to Ethernet LAN	Yes	No	Yes (internodal)	No
Protocol Conversion	Async-3270 BSC, async-X.25, async-uniscope	Yes, contact vendor	Yes, contact vendor	Yes, contact vendor
Code Conversion	ASCII to EBCDIC	ASCII, Baudot, EBCDIC	ASCII, Baudot, EBCDIC	ASCII, Baudot, EBCDIC
Error Control	Parity check w/retrans	Check sum w/ retrans.	Check sum w/ retrans.	Check sum w/ retrans.
Automatic Transmission Speed Detection	No	Yes	Yes	Yes
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	64180	Tymnet proprietary	Tymnet proprietary	Tymnet proprietary
Main Memory Word Size, bits	8	32	32	32
Main Memory Storage Capacity, bytes	512K	1M	1M	4M
Level of Data Unit Transferred across I/O Channel	Byte	Byte	Byte	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA/Interrupt	Interrupt	DMA/Interrupt	DMA/Interrupt
Mass Storage	DMA/Interrupt	Not applicable	DMA/Interrupt	DMA/Interrupt
Other Peripherals	DMA/Interrupt	Not applicable	DMA/Intertupt	DMA/Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	Disk	None	Disk, tape	Disk and tape
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Software	Software with firmware assist	Software with firmware assist	Software with firmware assist
IPL Method	Internal self-load	Auto download-node/host	Auto. download-Eng/host	Auto down-disk/Eng/host
Additional Software Supported	Vendor did not specify	Various interface software products	Various interface software products	Various interface software products
User Programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	All	All	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	90%	100%	100%	100%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Internal, prob. determ. port/line status.	Remotely accessible software oper. monitors	Yes, remotely accessible soft. op. monitors	Remotely accessible software oper. monitors
Data Collected	Port stat., traffic ld, line outages, events	Node/link/soft.-status, loading, statistics	Node/link/software—status, load., statist.	Node/link/software—status, load., statis.
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	7,500	Vendor did not specify	Vendor did not specify	Vendor did not specify
Monthly Maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly Lease/Rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is Maintenance Bundled with Lease/Rental?	Yes	No	No	No
Date of First Delivery	April 1986	1983	1981	1978
Number of Systems Installed to Date	75	2,000+	1,000+	1,000+
Serviced by	Tri-Data	Tymnet	Tymnet	Tymnet
VENDOR PHONE NUMBER	(408) 746-2900	(408) 922-0250	(408) 922-0250	(408) 922-0250
COMMENTS	Supports Coax A, SSI, ASCII term. to IBM/HP/Unisys/Honeywell/DEC w/ univer. printer sharing	Sold as a node in a complete network, compatible with Tymnet's public netwrk.	Sold as a node in comp. netwrk, compatible w/ Tymnet's pub. netwrk., avail. in dual config.	Sold as a node in comp. network; compat. w/ Tymnet's pub. network; avail. in dual config.

Communications Processors

VENDOR AND MODEL	Tymnet ATC (Asynchronous Terminal Concentrator)	Tymnet Pico-Engine	Unisys DCP/15	Unisys DCP/40
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Vendor did not specify	Most major vendors	Unisys Series 1100, Series 2200	Unisys Series 1100, Series 2200
Direct Attachment to Host	No	No	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	No	No	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	Not applicable	Not applicable	1/enclosure, 2/cabinet	16
Max. No. of Active Hosts Supported Simultaneously	Not applicable	Not applicable	1/enclosure, 2/cabinet	16
IBM Emulation	Not applicable	3270 BSC	SNA/SDLC, 3270 BSC, 3270 SNA, 2780/3780	3270 BSC, 3270 SNA, SNA SDLC, 2780/3780 BSC
PU Type within Network	Not applicable	PU Type 1, Type 2, Type 4	PU Type 2, PU Type 4	PU Type 2
Remote Line Concentrator:	Yes, terminal only	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	Configuration dependent	Configuration dependent	Any host in network	Any host in network
Host-Independent Network Processor	Yes	Yes	Yes, (init. host load)	Yes (init. host load)
Host Channel Extender	No	No	No	No
Terminal Controller	Yes	Yes	No	No
Store-and-Forward Message Switching Processor	No	No	Yes, custom. by users	Yes, custom. by users
Distributed Processing Node	No	No	No	No
Network Architecture Compliance	Tymnet proprietary, X.25 based	Tymnet proprietary, X.25 based	SNA, BSC, OSI, X.25, DDN, X.21 CKT-swit. PDN	SNA,BSC,OSI,X.25,DDN, X.21 CKT-switched PDN
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	10	8	48 as FEP	1,000
Highest Line Speed Supported (bps)	9600	64K	64K (V.35), 250K (coax)	64K (V.35), 250K (coax)
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	No	No
Terminal-Initiated Applications Switching	Yes	Yes	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	No	No	Yes	Yes
Interface to Ethernet LAN	No	No	Yes (future plans)	Yes (future plans)
Protocol Conversion	Async to network	Async to 3270 BSC/to X.25/to Uni.; SDLC-X.25	Async to uniscope, 3270 to uniscope, uni.- 3270	Async to uniscope, 3270 to uni., uni. to 3270
Code Conversion	No	ASCII-EBCDIC, Baudot	ASCII to EBCDIC	ASCII to EBCDIC
Error Control	Check sum w/ retrans.	LRC-CRC detect/correct	Parity/ARQ-CRC/LRC-CRC	Parity/ARQ-CRC/LRC-CRC
Automatic Transmission Speed Detection	110 to 9600 bps	No	Yes, 110 to 1800 bps	Yes, 110 to 1800 bps
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Tymnet-utilizing LSI-11	Tymnet (proprietary)	Unisys DCP/15	Unisys DCP/40
Main Memory Word Size, bits	16	32	16	16
Main Memory Storage Capacity, bytes	60K	1M	4M	6M
Level of Data Unit Transferred across I/O Channel	Byte	Byte, file, block	Block	Block
Type of Data Transfer Supported between Memory &:				
Communications Lines	Interrupt	DMA/Interrupt	DMA	DMA
Mass Storage	None	Not applicable	DMA	DMA
Other Peripherals	None	Not applicable	DMA	DMA
I/O, Back-Up, and Diagnostic Peripherals Supported	None	Diagnostic console	Disk/diskette/FEP console/printer/patch pan.	Console, disk, printer, diskette
Support for Remote Console	Yes, diagnostic report	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	No	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Firmware	Hardware with firmware assist	Firmware and software combination	Firmware and software combination
IPL Method	Internal self-load	Downld from host/manual	Downld. from host, disk	Host download, disk
Additional Software Supported	None	Various interface software products	Vendor did not specify	Vendor did not specify
User Programmability	No	Yes, via user-selected parameters	Yes, via user-created programs	Yes, via user-created programs
Software Separately Priced	No	All	All	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	100%	All	None	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes, remotely accessible software op. mon.	Intern. diag., prog. determ. port/line stat.	Loc/rem lpbk, internal, port/line, prob. deter.	Loc/remt lpbk, internal diag., prob. deter.
Data Collected	Node/link/software—status, load, statistic	Traffic/line/stat/trace account/errors/events	Traffic load, line out. line hit, events, err.	Traffic/line hits/port stat./err. rates/trace
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	Vendor did not specify	8,000	28,585 (includes soft.)	108,815 (includes soft.)
Monthly Maintenance, $	Contact vendor	67	76	595
Monthly Lease/Rental, $	Contact vendor	Contact vendor	720 (5-yr lease, includes software)	2,319 (5-yr. lease, includes software)
Is Maintenance Bundled with Lease/Rental?	No	No	No	No
Date of First Delivery	1984	June 1988	April 1987	January 1980
Number of Systems Installed to Date	400+	New product	600	3,500
Serviced by	Tymnet	McDonnell Douglas Field Service Co.	Unisys	Unisys
VENDOR PHONE NUMBER	(408) 922-0250	(408) 922-0250	(215) 542-4011	(215) 542-4011
COMMENTS	Sold as a node in a complete network; compatible with Tymnet's public network.	Product acts as a PAD, concentrator, and switch in office environment; batt. backup.	Supports 52 lines in remote concentrator con fig.; packaging support for 2 DCP/15s per cab.	Up to 3.6 times more powerful than DCP/15. Telcon offers functions such as auto switch.

Communications Processors

VENDOR AND MODEL	Unisys DCP/50	Unisys CP3680/ CP3680-01	Unisys CP9585	Unisys B974
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Unisys Series 1100, Series 2200	Unisys B2000, B3000, B4000, V300/V500 Series	All Unisys; IBM S/370, 30XX, 43XX, & compat.	B2000, B3000, B4000, V300 Series
Direct Attachment to Host	Yes	Yes	Yes	Yes
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	Yes	Yes	Yes
Max. No. of Hosts Channel-Attachable to Front-End	16	6	127	2
Max. No. of Active Hosts Supported Simultaneously	16	6	127	1
IBM Emulation	3270 SNA, 3270 BSC, SNA SDLC, 2780-3780 BSC	No	BSC, SNA	No
PU Type within Network	PU Type 2	Vendor did not specify	PU Type 2, PU Type 5	Vendor did not specify
Remote Line Concentrator:	Yes	Yes	Yes	No
Maximum No. of Hosts Served by One Concentrator	Any host in network	6	127	Vendor did not specify
Host-Independent Network Processor	Yes (init. host load)	No	Yes	No
Host Channel Extender	No	Vendor did not specify	Vendor did not specify	Vendor did not specify
Terminal Controller	No	Yes	Yes	No
Store-and-Forward Message Switching Processor	Yes, custom. by users	Yes	Yes	Yes
Distributed Processing Node	No	Yes	Yes	No
Network Architecture Compliance	SNA/BSC/OSI/X.25/DDN/ X.21 CKT-switched PDN	No	BNA, SNA, X.25	X.25
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	976	265	Vendor did not specify	96
Highest Line Speed Supported (bps)	64K (V.35), 250K (coax)	56K	56K	56K
Effect on Line Capacity, if All Lines are Full-Duplex	None	Not applicable	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	No	Yes	No	No
Terminal-Initiated Applications Switching	Yes	No	Yes	Yes
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	No	Yes	No
Interface to Ethernet LAN	Yes (future plans)	Vendor did not specify	Vendor did not specify	No
Protocol Conversion	Async to uniscope, uni. to 3270, 3270 to uni.	Yes	Yes	Yes
Code Conversion	ASCII to EBCDIC	Yes	Yes	Yes
Error Control	parity/LRC-CRC/ARQ-CRC	Yes	Yes	Yes
Automatic Transmission Speed Detection	Yes, 110 to 1800 bps	No	No	No
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Unisys DCP/50	21mx	CP 9585 multiprocessor	Multiprocessor
Main Memory Word Size, bits	16	16	Vendor did not specify	8 bits
Main Memory Storage Capacity, bytes	8M	1.5M	3.5M	3.5M
Level of Data Unit Transferred across I/O Channel	Block	Word	Byte	Byte
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA	DMA/Interrupt	DMA	DMA
Mass Storage	DMA	DMA	DMA	Vendor did not specify
Other Peripherals	DMA	Vendor did not specify	Vendor did not specify	Vendor did not specify
I/O, Back-Up, and Diagnostic Peripherals Supported	Console/diskette/patch panel/disk/printer	Console, disk, remote diagnostics	Mag. tape, fixed/remote disk, printers, card	Disk
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Vendor did not specify	Yes	No
Communications Operating Software:				
Operating System Implemented in	Firmware and software combination	Firmware and software combination	Firmware and software	Firmware and software combination
IPL Method	Host download, diskette	Host download, disk	Internal self load	Downline load from host
Additional Software Supported	Vendor did not specify	NDL/DCS/switch/remote SPO/switch-plus/ASPEN	NDL, GEMCOS, BNA, SNA, BSC	Vendor did not specify
User Programmability	Yes, via user-created programs	Yes, via user-selected parameters	Yes	No
Software Separately Priced	All	All	Yes	All
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	None	Not applicable	Not applicable	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Loc/rem. lpbk, internal diag, prob. determ.	Yes, local	Vendor did not specify	Vendor did not specify
Data Collected	Traffic load/line hits/ errors/event/trace/inv.	Supplied utility	Vendor did not specify	Vendor did not specify
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	255,395 (include soft.)	64,050 (3680)	40,739	Vendor did not specify
Monthly Maintenance, $	634	535	217	Vendor did not specify
Monthly Lease/Rental, $	5,629 (5-yr. lease, includes software)	2,415 (3-yr. lease)	1,560 (3-yr. lease)	Vendor did not specify
Is Maintenance Bundled with Lease/Rental?	No	Yes	Yes	Vendor did not specify
Date of First Delivery	December 1987	January 1978	1985	1984
Number of Systems Installed to Date	50	300	400	Info. not available
Serviced by	Unisys	Unisys	Unisys	Unisys
VENDOR PHONE NUMBER	(215) 542-4011	(313) 972-7000	(313) 972-7000	(313) 972-7000
COMMENTS	Up to 9.6 times more powerful than DCP/15; Telcon offers functions such as auto switch.	Redundant system, back-up host.		

Communications Processors

VENDOR AND MODEL	Unisys CP2000	Vitalink Communications TransLAN	Vitalink Communications TransLINK	Vitalink Communications TransSDLC
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	A Series	Vendor did not specify	Vendor did not specify	Vendor did not specify
Direct Attachment to Host	Yes	No	No	No
FUNCTIONAL CHARACTERISTICS				
Front-end Processor	Yes	No	No	Yes
Max. No. of Hosts Channel-Attachable to Front-End	25	Not applicable	Not applicable	Not applicable
Max. No. of Active Hosts Supported Simultaneously	25	Unlimited	Unlimited	Unlimited
IBM Emulation	Yes	Vendor did not specify	Vendor did not specify	Vendor did not specify
PU Type within Network	PU Type 2, PU Type 5	Not applicable	Not applicable	PU Type 2
Remote Line Concentrator:	Yes	Yes	Yes	Yes
Maximum No. of Hosts Served by One Concentrator	Unlimited	Unlimited	Unlimited	Unlimited
Host-Independent Network Processor	No	Yes	Yes	Yes
Host Channel Extender	Vendor did not specify	No	No	No
Terminal Controller	Yes	No	No	Yes
Store-and-Forward Message Switching Processor	No	Yes	Yes	Yes
Distributed Processing Node	Yes	Yes	Yes	Yes
Network Architecture Compliance	BNA, SNA, X.25	ISO 3309, Ethernet, 802.3	SNA, DECnet	SNA
Communications Line Capacity:				
No. of Half-Duplex Lines Physically Attachable to Processor	24	Up to 8	Up to 8	Up to 8
Highest Line Speed Supported (bps)	64K	2.048M	64K	64K
Effect on Line Capacity, if All Lines are Full-Duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/Demultiplexing	Yes	Yes	Yes	Yes
Terminal-Initiated Applications Switching	Yes	Yes	No	No
Comm. Processor-Initiated Dynamic Line Reconfig.	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Yes	Yes	Yes
Protocol Conversion	Yes	No	No	No
Code Conversion	Yes	No	No	No
Error Control	Yes	CRC-16	CRC-16	CRC-16
Automatic Transmission Speed Detection	Yes	Not applicable	Not applicable	Not applicable
Automatic Disconnect of Inactive Dial-Up Terminals	Yes	Not applicable	Not applicable	Not applicable
SYSTEM CHARACTERISTICS				
Processor	Multiprocessor	MC 68010	MC 68010	MC 68010
Main Memory Word Size, bits	16	32	32	32
Main Memory Storage Capacity, bytes	2M	1.5M	1.5M	1.5M
Level of Data Unit Transferred across I/O Channel	Byte	Block	Block	Block
Type of Data Transfer Supported between Memory &:				
Communications Lines	DMA	DMA	DMA	DMA
Mass Storage	Vendor did not specify	DMA	DMA	DMA
Other Peripherals	Vendor did not specify	Interrupt	Interrupt	Interrupt
I/O, Back-Up, and Diagnostic Peripherals Supported	Disk	Console	Console	Console
Support for Remote Console	Yes	Yes	Yes	Yes
Support X.25 Level 3 Capabilities	Yes	Yes	Yes	Yes
Communications Operating Software:				
Operating System Implemented in	Firmware	Software and hardware combination	Hardware and software combination	Hardware and software combination
IPL Method	Load from syst. or disk	Internal self-load	Internal self-load	Internal self-load
Additional Software Supported	Vendor did not specify	Not applicable	Not applicable	Not applicable
User Programmability	No	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software Separately Priced	All	Not applicable	Not applicable	Not applicable
Approx. Proportion of Currently Installed Systems Supplied As Turnkey Systems	None	5%	5%	5%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic Tests Supported	Yes	Yes	Yes	Yes
Data Collected	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Minimum Configuration, Including All Hardware Components Required for Basic Operation:				
Purchase Price, $	Vendor did not specify	10,000 to 15,000	9,000 to 12,500	9,000 to 12,500
Monthly Maintenance, $	Vendor did not specify	Not applicable	Not applicable	Not applicable
Monthly Lease/Rental, $	Vendor did not specify	Not applicable	Not applicable	Not applicable
Is Maintenance Bundled with Lease/Rental?	Vendor did not specify	Vendor did not specify	Vendor did not specify	Vendor did not specify
Date of First Delivery	1986	November 1984	September 1986	September 1986
Number of Systems Installed to Date	Info. not available	1,600+	Vendor did not specify	Vendor did not specify
Serviced by	Unisys	Vitalink	Vitalink	Vitalink
VENDOR PHONE NUMBER	(313) 972-7000	(408) 755-6130	(408) 755-6130	(408) 755-6130
COMMENTS				

All About Communications Processors

The term "communications processor" describes not only a specific category of equipment, but also includes a broad array of systems that perform one or many communications processing functions in addition to providing other services. We have narrowed our definition of communications processors to include multifunctional, intelligent systems that are dedicated to communications and able to serve as nodes in the network. This generally includes three basic types of products: front-end processors, intelligent switches, and remote concentrators.

In addition to defining communications processing, this report discusses comm processor design, its place in modern network architectures, the evolution of the communications processor, general advantages and restrictions of today's systems, and the state of the communications processor marketplace.

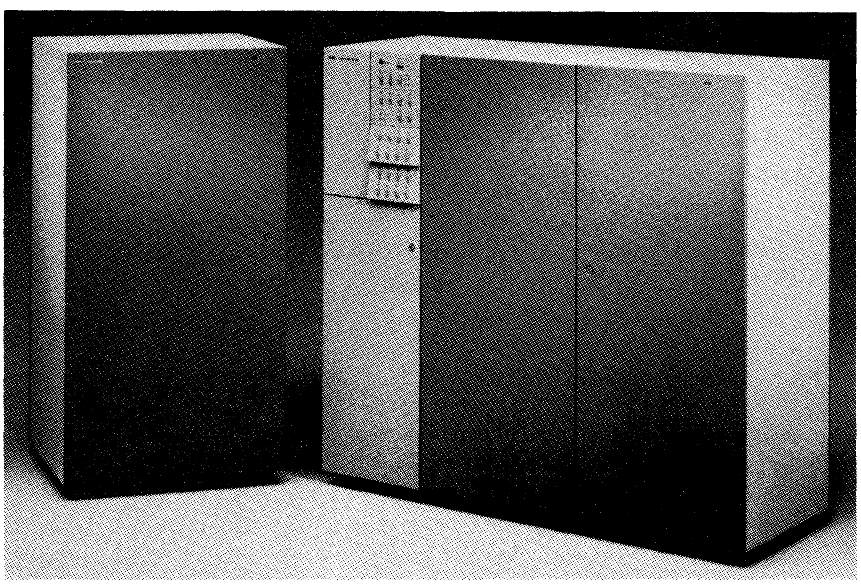
This report also includes comparison charts outlining the major characteristics of 84 communications processors from over 25 vendors.

Until recently, it has been fairly easy to group various types of data communications equipment into specific categories according to their basic functionality. Devices that convert digital signals into analog ones are modems, units that combine data from many channels onto one channel are multiplexers, and so forth. Integration is the byword of the communications industry, and manufacturers have begun to combine many functionalities in one system. Modems incorporate multiplexing and/or protocol conversion, terminals contain modem chips, and larger systems integrate switching and multiplexing, as well as provide gateways to other networks. While the basic communications equipment categories remain, it is becoming increasingly more difficult to pigeonhole new devices into them.

It has always been difficult to categorize communications processors, because like newer integrated systems, they perform many functions, but not always the same ones. Therefore, the definition of a communications processor varies greatly, depending upon who is giving it. While network designers have one view of what a communications processor does, equipment manufacturers have another. Everything from an IBM 3725 to a four-port packet assembler/disassembler (PAD) has been called a "communications processor."

From a network designer's point of view, a communications processor should be able to set up connections to transmit and receive data, multiplex and demultiplex data, frame and unframe messages, perform error correction and protocol conversion, choose transmission routes, and collect performance and traffic statistics. This definition has led many manufacturers to classify their protocol converters, PADs, terminal controllers, and stat muxes as communications processors. They claim that anything that can connect terminal devices to communications networks and maintain control over these devices through changing network conditions are comm processors. While this may be a designation on which marketing departments can develop good ads, it is problematic in terms of defining equipment. It is simply ridiculous to put an IBM 3725 and a protocol converter in the same equipment category.

Several years ago, in an attempt to narrow the field of devices that would be included in our comm processor survey, we placed PADs and terminal controllers in a protocol conversion systems tab that also included black-box protocol converters, terminal emulators, and code and speed converters. This was in keeping with our premise that true communications processors, concentrators in-



The Comten 5660 Communications Processor is three times faster and offers more power and line connectivity than any SNA-compatible communications processor available in the market.

All About Communications Processors

TABLE 1. COMMUNICATIONS PROCESSORS FUNCTIONS.

Physical transmission and reception of data
Data buffering and queueing
Multiplexing
Message framing and unframing
Control of transmission errors
Message sequencing
Protocol conversion
Message pacing and flow control
Message or packet assembly and disassembly
Route selection
Session establishment and disconnection
Formatting of data for use by specific host or terminal applications
Reporting and logging of device or transmission errors or failures
Fallback switching in case of host, device, or transmission line failure
Gather and record network performance and traffic statistics.

cluded, are involved in a *dynamic* process involving feedback from other intelligent devices in the network. Protocol converters, PADS, and statistical multiplexers perform basically *static* processes that do not change as conditions change in the network.

Datapro defines a communications processor as a multifunctional, intelligent device dedicated to communications and able to serve as control points, or nodes, in a data communications network. It may serve as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. As a *front-end processor*, the communications processor serves as a locally attached peripheral device to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management either under the control of a master (usually front-end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches. (Table 1 lists the major functions of a communications processor in the typical network.)

Using the network designer's definition would qualify two devices as communications processors: the front-end processor and the network processor. While the front-end processor connects directly to the host processor's block/byte multiplexer or selector channels, the network processor is a standalone unit that is not host-dependent and has a large degree of operating autonomy. Its primary function is to provide a link between user terminal devices and the front-end processor and/or other network processors. Communications with the FEP is on the data link level. While it does not carry on a dialogue with the FEP, it does respond to FEP-initiated network signals.

While the above definitions are sound, we are finding that pegging particular devices as communications processors is still problematic. Packet switches, for example, often fit quite nicely into our definition, but we cannot classify them only as comm processors. We have concluded that one must actually classify comm processing in terms of application and/or functionality. If a system performs many of the functions normally considered part of the communications processing function, it can be classified as a comm processor. We also recognize, however, that there is a small but important class of equipment that belongs to the traditional communications processing realm. This includes IBM 372X and NCR Comten front-end processors. IBM controls a majority of this market, and there are only a handful of vendors that manufacture competing systems. Sperry and Burroughs (Unisys) also manufacture communications processors for their respective mainframes. Full product reports on these systems are included within this tab. Front-end processing is the most complex task a communications processor can perform. In a large, complex network governed by one or more mainframe hosts, a front-end must do all but the last three functions (listed in Table 1) in the normal course of its operations. Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialogue with a host computer, and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators, and change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch simply establishes an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor can perform, and communications processors acting as concentrators can easily be confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, packet assembler/disassemblers (PADs), and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change on the network. An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly: accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached

All About Communications Processors

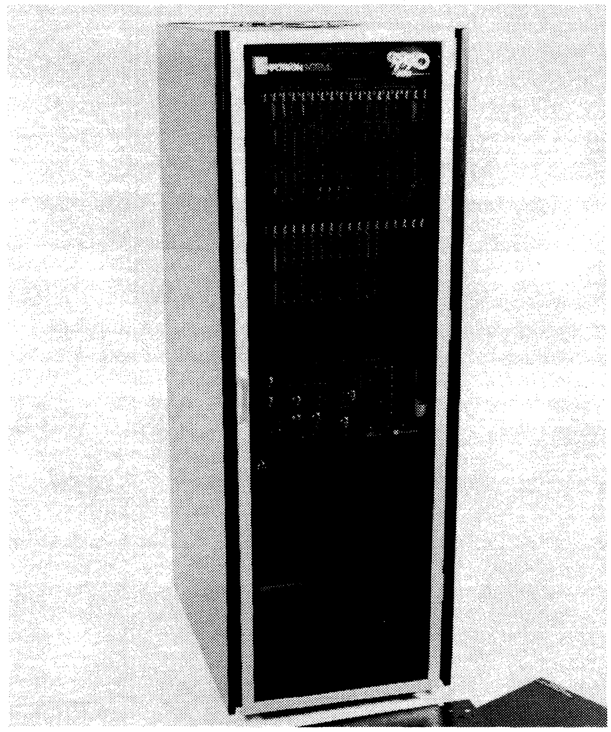
devices. Some sophisticated terminal controllers, notably IBM's 3274s, can perform some or all of these functions. A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy: a concentrator can concentrate data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3705 acting as a remote node (concentrator) and an IBM 3274 within that concentrator's domain. A user can build an entire network from intelligent concentrators communicating with one another as peers, but cannot do the same with cluster controllers.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices. Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, and Unisys' BNA and DCA. Open architectures include the CCITT's X.25 packet switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standard (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most often as a front end, and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies from architecture to architecture. In Unisys' DCA the DCP-Series front end has control over many Presentation-layer functions, while in IBM's SNA, the host's access method, along with software residing in the 327X terminal controllers, handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all the mainframe architectures, the same communications processor models that serve as front ends can also function as intelligent switches and as remote concentrators. In these functions, the communications usually appear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture can also perform another important function in conjunction with any of the other three, that of an intelligent gateway. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet switched data networks using the X.25 protocols.



Infotron's 990 Network Processor supports tandem switching and link load balancing. It provides an X.25 interface, as well as a variety of protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers through a uniform set of complementary protocols. Designed specifically for public data networks, the X.25 protocols provide ultimately for the establishment of virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices, computers or terminals, at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols. Since, in a public network, the network provider is responsible for network management, the X.25 communications processors in such a network carry a heavy load of access, error, and class-of-service control, along with many provisions for statistical recording of traffic and usage data that can be sorted by individual user account. Communications processors designed to function as switches in public networks are the likeliest to support high-capacity attached storage devices such as disk and tape drives.

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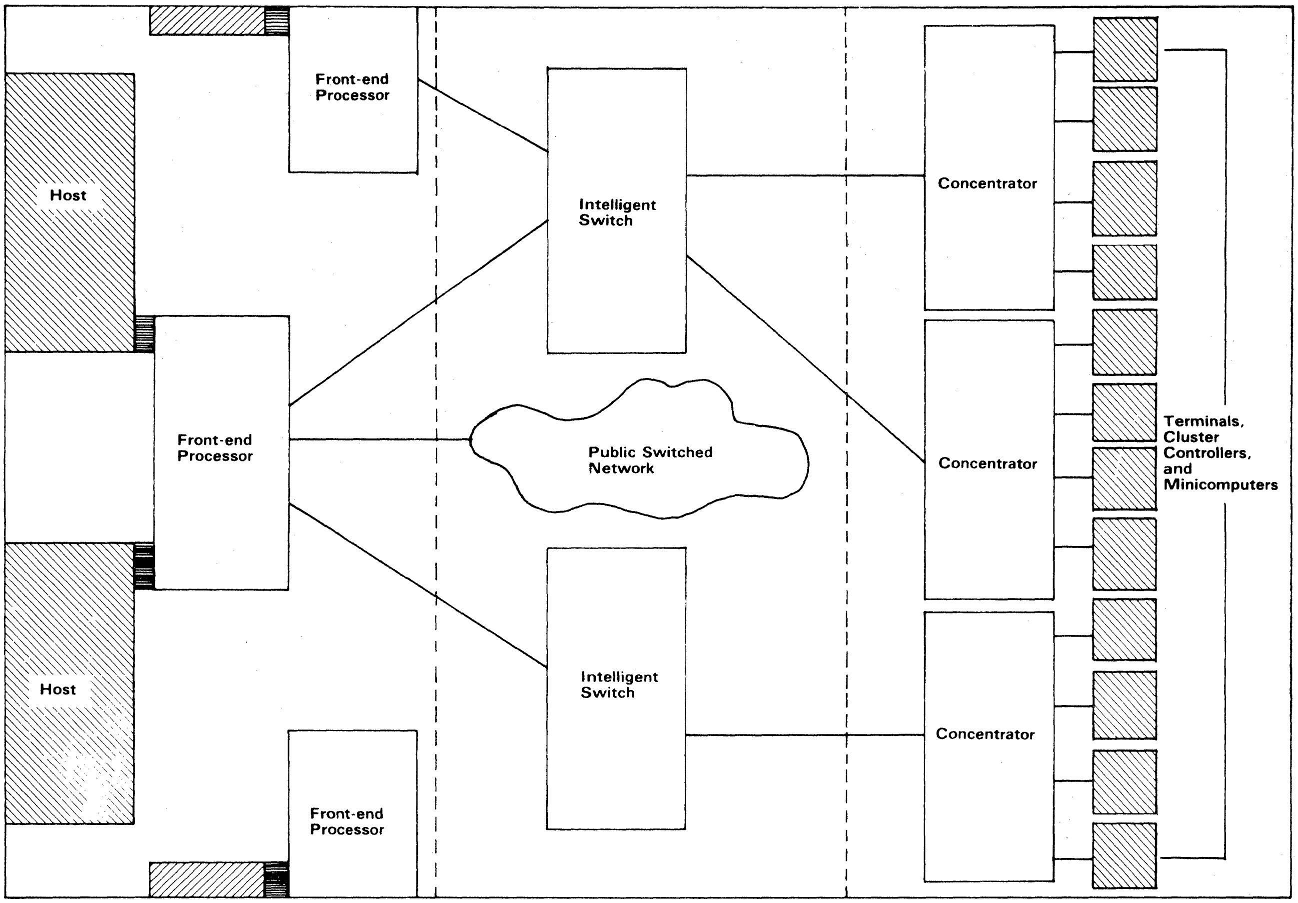

Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture. Table 2 shows the protocols supported by various vendors' communications processors.

Transparent architectures are offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without much of the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some such products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system to provide these functions.

COMMUNICATIONS PROCESSOR DESIGN

The basic design of almost all communications processors follows the same, three-tiered, hierarchical plan—a plan that they share in general with their close cousins the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy along with its associated main memory; it controls the communications processor's operation according to the rules and parameters of its operating software, and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session establishment, application-level formatting, and error logging, and delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the refer-

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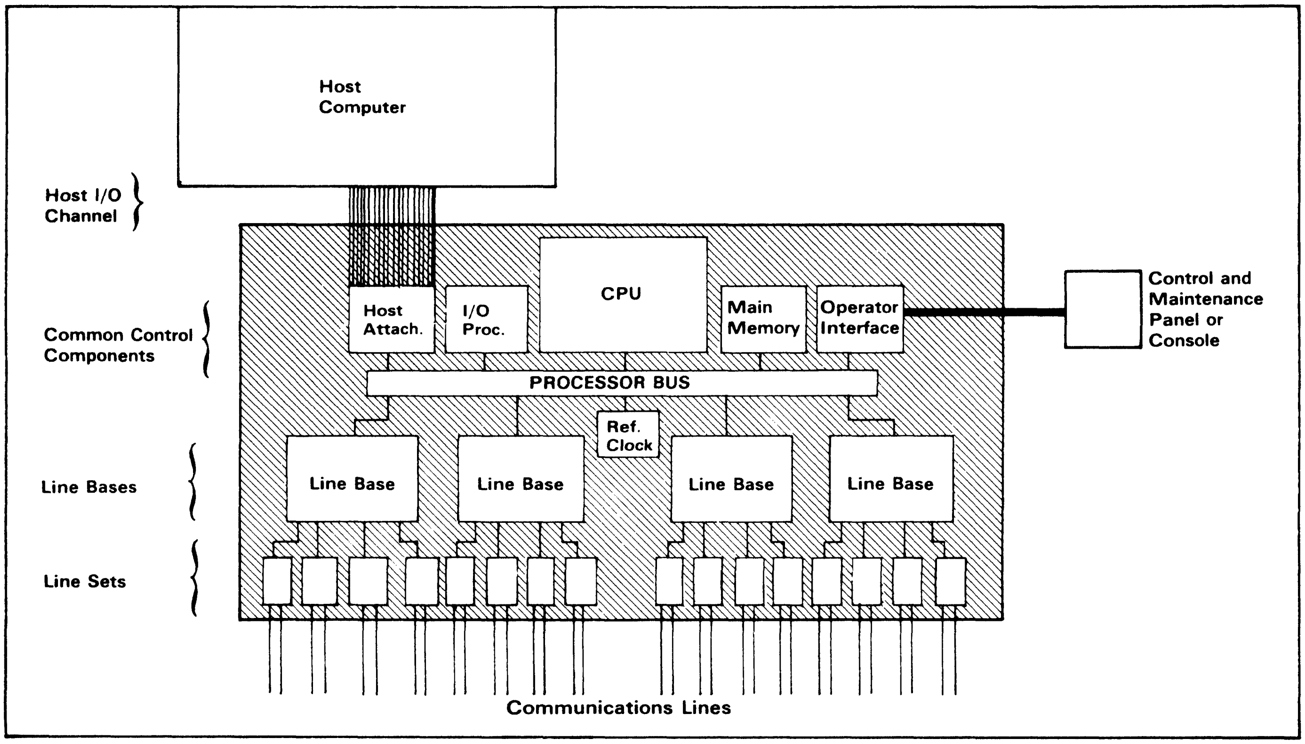

Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor may contain more than one host interface, several I/O processors, and many more line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

ence clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to the attached host channel, and transmits it up the channel to the host; for data coming from the host, it performs the same process in reverse. The host interface's principal function is conversion of data from the communications processor's internal word size to that of the host computer. Some communications processors contain one or more input/output (I/O) processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generated by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for the timing of signals at different data rates.

The operator interface allows a human operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the above-mentioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor and a group of attached communications lines that share a common synchronization pattern, line speed, and sometimes, protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommo-

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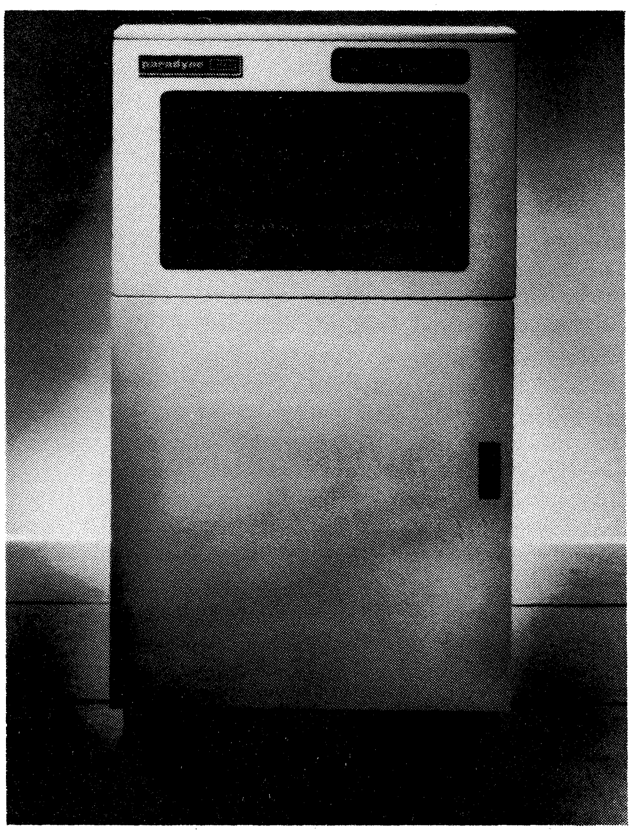
date from 8 to 32 line bases, each of which handles from two to eight line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the back plane or a side plane of the processor's cabinet. The physical bus architecture, made popular in the design of minicomputers, allows for easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, it also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might need to replace only one line base and eight line sets, rather than having to swap out an entire front-end processor. The hierarchical design extends the communications processors' functionality over time and helps to protect the user's investment in the face of changing technology. Figure 2 shows the hierarchical configuration of a generalized communications processor.



Paradyne's Pixnet-XL system extends the block or byte multiplexer channel of IBM mainframes to connect remote high speed devices.

THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it came into being in the mid to late 1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hardwired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and performing simple error notification for the host.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform any of a number of functions more efficiently than a mainframe, and incidentally also provided the bus architecture that gives communications processors their modularity and flexibility. The ARPAnet, the first large-scale packet switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the intelligent virtual circuit switch, the first functional communications processor.

A later development in minicomputer applications created the distributed processor, a small computer, dedicated to part of a larger application, that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications handling under software control. Indeed, network architectures from such minicomputer vendors as Digital Equipment Corporation and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the increasing cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures, and to a large extent, made such architectures possible.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing, and of the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

All About Communications Processors

One further development produced the communications processor as we know it today: the microprocessor. The advent of cheap silicon intelligence allows designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger and more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization each is to use. Some newer systems are composed entirely of redundant, microprocessor-controlled modules, each of which can perform any of the functions of any other with the proper software load; such a processor is actually a distributed communications network in a box.

The advent of the microprocessor has also begun to blur the distinction between traditional communications processors and less broadly functional devices, such as multiplexers and terminal controllers, and has created a new class of intelligent protocol converters dedicated to a task that was once economical only as a function within a multifunctional communications controller. Now, even modems can detect, report, and in some cases correct transmission errors, and sense the conditions of transmission lines. The old definition of a communications processor as a computer that has been programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3725.

In answer to this shifting definition, Datapro offers a section in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS, Tab C23, entitled Protocol Conversion Systems. In this section, the reader will find information on many product categories formerly covered in this report: protocol converters, intelligent terminal controllers (with conversion capabilities), and PADs, to name three.

ADVANTAGES AND RESTRICTIONS

The principal advantage of a communications processor as a networking tool is the physical and logical separation of the networking function from the application of its end users. Whatever its architecture, such a network can function for any application, can grow in size without qualitative change to accommodate new applications, and can accommodate new applications through the installation of relatively standard, intelligent components. In simpler terms, the user does not have to redesign and rebuild a modular network to accommodate a change in the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they can accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design can survive several breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

The DCP/15 from Unisys is the newest member of the DCP communications processor family. It is a front-end processor for smaller Series 1100 host computer networks.

In operation, a network controlled by communications processors can survive the total failure of one or more of its host processors. In a multihost network, front-end processors can switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows for a graceful degradation of service in the event of a host failure, perhaps allowing users time to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

Also in operation, the communications processor still fulfills its original purpose; relieving the host of the overhead generated in keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid 1970s when the first communications processors appeared, and thanks to the ever lower cost of memory and processing power, some of today's communications processors are bigger, faster, and more powerful than that era's mainframes. They need to be.

Among the restrictions of today's communications processors are complexity and incompatibility. In an era of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Amnet						
N6050	No, PAD ext'l	No, PAD ext'l	No, PAD ext'l	No	Yes	—
N6070	No, PAD ext'l	No, PAD ext'l	No, PAD ext'l	No	Yes	—
N7400	No, PAD ext'l	No, PAD ext'l	No, PAD ext'l	No	Yes	—
Cableshare						
CSI Data Concentrator	Yes	No	Yes	Yes	Yes	
LSI-X.25 Front-End	Yes	No	No	No	GTE Telenet, Tymnet, Euronet	Uninet, Datapac PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	Yes	No	No	Yes	Yes	Same as above, and Telex and Teletex
LSI-X.25 Host Port Concentrator	Yes	No	No	No	Yes	Same as above, and Telex and Teletex
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200, UTS
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data						
2551-3 & 2551-4	Yes	Yes	No	Yes	Tymnet, Telenet,	None
CDCNET	Yes	Yes	No	Yes	Tymnet, Telenet	None
DCA						
355	Yes	Yes	Yes	Yes	GTE Telenet, ITT, RCA	DEC DDCMP—trunk only
335	Yes	Yes	No	No	GTE Telenet Tymnet, Datapac, Uninet, Autonet, PSS	—
375	Yes	Yes, IBM 3270 BSC	No	No	Yes, Telenet, Tymnet, Uninet, Transpac, Datapac	Accunet, Cylix, PSS, Autonet
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
Icot						
254	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
257	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
Infotron						
990NP Network Processor	Yes	Yes	Yes	Yes	Yes	Virtually all are supported
KMW Systems						
Auscom 8911A	Yes	No	No	Yes	Yes	User defined
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	RPQ	Request price quotation
Distributed Network Processor Series	Yes	Yes	Yes	RPQ	RPQ	Request price quotation
M/A-Com						
9708 MPX	No	No	No	Yes	Yes	X.75
9724 RPX	No	No	No	Yes	Yes	X.75
9000 NDX	Yes	Yes	Yes	Yes	Yes	X.75

**Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.*

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Micom						
Micro800	Yes	No	No	No	Yes, Telenet, Tymnet, Datapac, Transpac, Datex-P, Telepac	No
MB2-XAP-STD	Yes	No	No	No	Yes	No
MB3-CSW	Yes	No	No	No	Yes	—
MB3-XAP-STD/MB3-XAP-HS	Yes	No	No	No	Yes	Telex
MB3-BSC-STD	Yes	Yes	No	No	Yes	No
MB3-PSW-STD/MB3-PSW-HS	Yes	No	No	No	Yes	No
MB5-XAP-STD	Yes	No	No	No	Yes	Telex
NCR Comten						
5620	Yes	Yes	Yes	Yes	Yes, HPADs & TPADS—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS Telenet, Transpac,Tymnet	—
3690	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	Telenet, Transpac, Tyment
3695	Yes	Yes	Yes	Yes	Yes, HPADs & TPADs include Accunet, Datapac, etc.	— Telenet, Transpac, Tyment
5660	Yes	Yes	Yes	Yes	Yes, HPADS &TPADs—VANs include Accunet, Datapac, Datex-P, DDX, DN1, Itapac, Infonet, Luxpac, PSS	Telenet, Transpac, Tymnet
Netlink Inc.						
Network SNA-Hub	No	No	Yes	No	Future	No
NTX						
3800 Model 2.1	—	No	No	No	No	NDLC (extended HDLC)
3800 Model 2.2	—	No	No	No	No	NDLC (extended HDLC)
3800 Model 2.3	—	No	No	No	No	NDLC (extended HDLC)
Paradyne						
Pix/Pixnet	Yes	No	No	Paradyne SDLC	No	—
Pixnet-XL	No	No	No	HDLC, LAPD	—	—
Periphonics						
VoicePac	Yes	Yes	Yes	Special order	Special order	PARS
VoiceBox	Yes	Yes	Yes	Special order	No	—
VoiceStar 40XX	Yes	Yes	Yes	Special order	No	—
VoiceStar 42XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
VoiceStar 46XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
VoiceStar 47XX	Yes Telenet, Infonet	Yes	Yes	Special order	Yes, host or terminal PAD—	PARS
Telefile						
Tele-Switch	Yes	Yes	Yes	Yes	Yes—Telenet, PSS, Euronet	—
Telematics						
Net 25	Yes	No	No	Yes	Yes	—
Series 500, 1000, 2000	Yes	No	No	Yes	Yes	—
Tri-Data						
Netway 200	Yes	Yes	Yes	No	Yes—X.25, terminal PAD, X.3, X.28, x.29, Telenet cert.	PARS, SNA, Uniscope, ICC
Tymnet						
Micro-Engine	Yes	Yes	Yes	Yes	Yes	Telex, 2741, Univac DDCMP, Honeywell, others
Mini-Engine	Yes	Yes	Yes	Yes	Yes	Telex, 2741, Univac, DDCMP, Honeywell, others

**Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.*

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Engine	Yes	Yes	Yes	Yes	Yes DDCMP,	Telex, 2741, Univac, Honeywell, others
Tymnet ATC	Yes	No	No	No	No	None
Unisys						
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
CP9585	Yes	Yes	Yes	Yes	Yes	—
B974	Yes	Yes	No	No	No	—
CP2000	Yes	Yes	Yes	Yes	DTE, Tymnet, Telenet, various PTT	—
Unisys						
DCP/10A, DCP/15, DCP/20, & DCP/40	Yes	Yes	Yes	Yes	Yes	Videotex, SITA gateway
Vitalink Communications						
TransLAN	Yes	Yes	Yes	Yes	Yes	—
TransSDLC	Yes	No	Yes	No	Yes	—
TransLINK	Yes	No	Yes	Yes	Yes	—

Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

should meddle. Most require that their programs be written in an arcane, assembler-level language, sometimes with the benefit of pregenerated macros in the host access method, often without.

Even with recent advances in simplicity and modularity, configuring a communications processor to suit a specific network or application can be difficult. With today's microprocessor technology, the better communications processors are the simpler; as an example, IBM's 3725 Communication Controller sports a parts list only half as long as that of the older 3705. The trend is toward fewer components each of which can do more, but most communications processors are still lagging a bit behind that trend.

THE CURRENT MARKETPLACE

The growth rate of the communications processor market remained steady over the past year, but competition in that market is speeding up. In a recent report, IDC states that prices for communications processors are expected to decline by an average of two percent over the next five years, resulting from slower growth rates, competition, and improved manufacturing methods. In the IDC report, communications processors were divided into two areas: devices that were used with IBM hosts and those that were designed for use with non-IBM systems. Front-end processor unit sales for IBM hosts grew 14 percent from 5,935 to 6,760. Revenue also grew by 14 percent from 5,935 to 6,760. IDC predicts that revenue for this market will grow to $1,104 million by 1990. Using these figures, IBM has an 82 percent share of the market, which is down slightly from its previous 90 percent share of the market.

Despite the slowing growth rate, the competition has gotten more intense and 1986 saw introductions on a number of new products. One of the most significant introductions was from NCR Comten and its Comten 5660. This processor offers three times the processing power of anything currently on the market. IBM countered this announcement with some of its own, including enhancements to the 3725, new software releases (i.e.; VTAM 3.1.1), a remote front-end processor (3720), and enhancements of its network management offerings (NetView).

However, NCR Comten does not give up easily, and in June 1986, introduced the Comten 3690 Model L8 and the Comten 3695 communications processors. The 3690 L8 is designed for medium-sized networks, while the Comten 3695 can be used in medium- to large-sized networks. NCR Comten also met the software issue with an introduction, in February 1987, of a CNG release that supports extended network addressing (ENA), supports full SNA trunking capabilities, and provides access to IBM ACF/VTAM Version 3 Release 1.1 environments.

The IDC report also claims that revenues in the non-IBM market grew by only 6 percent and will reach $260 million by 1990. Shipments of these processors grew by only three percent in 1985. In this market area, IDC places Unisys (formerly Burroughs) as the market leader with a 22 percent share. The integration of its processors with those from Sperry will keep the company busy over the next several years. Unisys (formerly Sperry) also introduced a new model in its DCP line, the DCP/15, aimed at the small- to medium-sized network.

The market for full-scale communications processors can be broken down into four segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; packet-switching processors marketed as components of large, vendor-independent private networks; and intelligent concentrators designed to serve in transparent network architectures.

IBM remains the leader in the communications processor market, as seen by its market share. NCR Comten retains the number two position, while other vendors fighting for a

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KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS

The comparison charts that follow this report list the major characteristics of 70 commercially available communications processors. The text below explains the chart entries, in order of their appearance on the charts.

Computer systems interfaced. For processors that serve IBM and plug-compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug compatibles. For processors operating in open network architectures, we list "Most major vendors."

Direct attachment to host. This is one indication of whether the device is a true front-end processor or not. Network processors do not connect directly to the host.

Functional Configurations

Front-end Processors. A "yes" for this entry indicates that the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously. A third entry lists the degree of IBM emulation the processor can perform, and the last entry indicates the PU (physical unit) type found within the network.

Remote line concentrator. A "yes" for this entry indicates that the processor in question can serve as a line concentrator remote from any host processor in its network. The entry below lists the number of hosts that concentrator can serve at one time.

Host-independent network processor. A "yes" for this entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Store-and-forward message switching processor. A "yes" for this entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Distributed processing node. Most true communications processors are not able to perform applications processing; however, some, including a few intelligent concentrators, can support some distributed applications in addition to their principal networking function. This class of communications processor is becoming rarer.

Terminal controller. A "yes" for this entry indicates that the processor in question can function as a terminal controller within its architecture.

Network architecture compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device, or it may support the pre-architectural protocols of the vendor(s) whose hosts it supports.

Communications line capacity. The first section of this entry deals with the number of lines a communications processor can support. The next entry lists the highest data rate the processor can support. The last entry lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

Host Channel Extender. A "yes" for this entry indicates that the processor can function as a host channel extender within its architecture.

Communications Features/Functions

Entries under this heading list a number of major functions a communications processor can perform, but that not all communications processors **do** perform.

Multiplexing/demultiplexing. A "yes" for this entry indicates that the processor in question can function as a multiplexer.

Terminal-initiated application switching. A "yes" for this entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications processor initiated dynamic line reconfiguration. Dynamic line configuration is another name for fallback switching. A "yes" for this entry indicates that the processor in question can switch a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure, without operator intervention.

Protocol conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error control. This entry specifies which of the available schemes for error detection (e.g., Parity, LRC, or CRC) the processor in question uses.

Automatic transmission speed detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic disconnect of inactive dial-up terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

Interface to Ethernet LAN. A "Yes" indicates that the processor offers an interface to an Ethernet LAN.

System Characteristics

Processor type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Main memory word size, bits. In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main memory storage capacity, bytes. This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a time-shared or interrupt basis.

All About Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS (Continued)

Level of data unit transferred across I/O channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte, or block).

Type of data transfer supported between memory and a) communications lines, b) mass storage, and c) other peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components have share control of main memory with the CPU, and can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, backup, and diagnostic peripherals supported. Most communications processors interact only with their attached hosts and terminals, and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information, and feature diagnostic consoles for direct operator intervention.

Support for remote console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Support X.25 Level 3 capabilities. A "Yes" indicates that the processor can support X.25 capabilities.

Communications Operating Software

Operating system implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) onboard the processor, or in some combination of these.

IPL method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from onboard read-only memory.

Additional software supported. This entry lists any network control or applications software that the processor in question can support.

User programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native assembler language.

Software separately priced. This entry shows to what extent the communications processor's operating software is bundled with the cost of the hardware.

Approximate proportion of currently installed systems supplied as turnkey systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

Network Management/Control Capabilities

Diagnostic tests supported. Some processors now offer management functions, such as running diagnostic tests. Examples include remote and local loopback, port/link status, and internal diagnostics.

Data collected. In gathering performance data, the processor can collect traffic statistics, line failures, error records, etc.

Pricing and Availability.

Entries under this header list purchase, lease (or rental) and maintenance pricing, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product.

share of the market include Amdahl, Computer Communications, Inc. (CCI), and NTX. The other mainframe vendors, such as Unisys (including both Burroughs and Sperry), Control Data, and Honeywell, do not really compete with one another in the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Honeywell's Datanet 8 Series features a broad array of compatibility software. The Unisys DPC Series goes farther than most in providing host-independent networking.

Among vendors of private networks, the two U.S. public network leaders, Tymnet and GTE Telenet have solid offerings. Amnet also offers a line of packet-switching processors. A number of vendors offer intelligent concentrators, often at the high ends of lines of statistical multiplexers. Among these are Infotron, Micom, and DCA.

THE COMPARISON COLUMNS

At the end of this report are comparison columns listing the device specifications of many communications processing systems. While compiling this report in January 1987, Datapro sent requests to over 25 firms known or believed to manufacture communications processors. *The absence of any company from the charts means that the company either failed to respond to our request by the deadline, was unknown to us, or chose not to be listed.*

The Key to Communications Processors Comparison Charts provides a complete description of the comparison chart entries.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone

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numbers of the vendors whose communications products are shown in the comparison charts that follow.

Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

Amnet, Inc., 1881 Worcester Road, Framingham, MA 01701. Telephone (617) 879-6306.

Cableshare, 20 Enterprise Drive, P.O. Box 5880, London, Ontario, Canada N6A 4L6. Telephone (519) 686-2900.

Century Analysis, 114 Center Avenue, Pacheco, CA 94553. Telephone (415) 680-7800.

Chi Corporation, 26055 Emery Road, Cleveland, OH 44128. Telephone (216) 831-2622.

Computer Communications Inc., 2610 Columbia Street, Torrance, CA 90277. Telephone (213) 320-9101.

Control Data Corporation, 8100 34th Avenue South, Minneapolis, MN 55420. Telephone (612) 853-8100.

Digital Communications Associates, Inc. (DCA), 1000 Alderman Drive, Alpharetta, GA 30201. Telephone (404) 442-4000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, MA 02154. Telephone (617) 895-6000.

Icot Corporation, 3801 Zanker Road, P.O. Box 5143, San Jose, CA 95150-5143. Telephone (408) 433-3300.

Infotron Systems Corporation, 9 North Olney Avenue, Cherry Hill, NJ 08003. Telephone (609) 424-9400.

International Business Machines Corporation, Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

KMW Systems Corporation, 100 Shepherd Mountain Plaza, Austin, TX 78730-5014. Telephone (512) 338-3100.

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, AZ 85029. Telephone (602) 944-1543.

M/A-COM Telecommunications Div., Comm. Network Group, 11717 Exploration Lane, Germantown, MD 20874. Telephone (301) 428-5500.

Micom Systems, Inc., 4100 Los Angeles Avenue, P.O. Box 8100, Simi Valley, CA 93062-8100. Telephone (805) 583-8600.

NCR Comten, 2700 Snelling Avenue North, St. Paul, MN 55113. Telephone (612) 638-7777.

Netlink Inc., 3214 Spring Forest Road, Raleigh, NC 27604. Telephone (919) 878-8612.

NTX Communications Corporation, 508 Tasman Drive, Sunnyvale, CA 94089. Telephone (408) 747-1444.

Paradyne Corporation, 8550 Ulmerton Road, Largo, FL 33540. Telephone (813) 530-2000.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, NY 11716. Telephone (516) 467-0500.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, CA 92714. Telephone (714) 250-1830.

Telematics International, Inc., Crown Center, 1415 NW 62nd Street, Fort Lauderdale, FL 33309. Telephone (305) 772-3070.

Tri-Data, 505 East Middlefield Road, Mountain View, CA 94039-7505. Telephone (415) 969-3700.

Tymnet—McDonnell Douglas Network Systems Company, 2710 Orchard Parkway, San Jose, CA 95134. Telephone (408) 946-4900.

Unisys Corporation, 6071 2nd Avenue, Detroit, MI 48232. Telephone (313) 972-7000.

Unisys Corporation, P.O. Box 500, Blue Bell, PA 19424. Telephone (215) 542-4011.

Vitalink Communications Corporation, 1350 Charleston Road, Mountain View, CA 94043. Telephone (415) 968-5465. □

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SUPPLIER AND MODEL	Amdahl 4705E	Amdahl 4705T	Amnet N6050	Amnet N6070
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All IBM- and Amdahl-compatible mainframes	All IBM- and Amdahl-compatible mainframes	Most vendors	Most vendors
Direct attachment to host	Yes	Yes	No	No
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	6	6	Not applicable	Not applicable
Max. no. of active hosts supported simultaneously	4	4	Not applicable	Not applicable
IBM emulation	270X/370X, EP, NCP, ACF	270X/370X, EP, NCP, PEP	Not applicable	Not applicable
PU type within network	PU Type 4	PU Type 4	Not applicable	Not applicable
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Unlimited
Host-independent network processor:	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network architecture compliance	SNA	SNA	OSI X.25	OSI X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	352	FEP 352, high speed-384	112	1,024
Highest line speed supported (bps)	64K bps	2.048M bps	64K bps	64K
Effect on line capacity, if all lines are full-duplex	Capacity halved	High speed section-none FEP section-halved	None	None
Host Channel Extender:	Yes	Yes	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes-via Commpro	Yes, PAD	Yes, PAD
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	S/S, BSC, SDLC to X.25	No	Yes, PAD	Yes, PAD
Code conversion	ASCII/EBCDIC via soft.	ASCII to EBCDIC	No	No
Error control	LRC and CRC	LRC and CRC	Yes	Yes
Automatic transmission speed detection	50-9600 bps via soft.	50 to 9600 bps	—	—
Automatic disconnect of inactive dial-up terminals	Yes	Yes	—	—
Interface to Ethernet LAN	No	No	—	—
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Multiprocessor	Multiprocessor
Main memory word size, bits	18	18	16	16
Main memory storage capacity, bytes	1024K	To 1024K	512K	1MB
Level of data unit transferred across I/O channel	Byte or Block	Byte or block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	DMA	DMA
Mass storage	None	—	Not applicable	Not applicable
Other peripherals	None	—	Not applicable	Not applicable
I/O, backup, and diagnostic peripherals supported	Diskette (diagnostic)	Diskette (diagnostic), console-via Commpro	Yes	Yes
Support for remote console	No	Yes, via Commpro	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	'C' — MP/OS	'C' — MP/OS
IPL method	Download from host	Downline load from host	Local & remote IPL	Local & remote IPL
Additional software supported	Commpro, UTS/F (Unix)	Commpro	Net Mgmt. Sys.	Net. Mgmt. System
User programmability	Yes	Yes	Yes, 'C' language	Yes, 'C' language
Software separately priced	Yes	Yes	Some	Some
Approx. proportion of currently installed systems supplied as turnkey systems	All	100%	Not applicable	Not applicable
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	Yes	Yes	Yes
Data collected	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	52,600	67,000+	35,000	50,000
Monthly maintenance, $	375	475+	Contact vendor	Contact vendor
Monthly lease/rental, $	2,385 (2-yr. lease)	3,000+ (2-yr. lease)	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	April 1983	1986	May 1985	March 1983
Number of systems installed to date	800	6	20	15
Serviced by	Amdahl	Amdahl	Amnet	Amnet
COMMENTS	Remote load via comm. line; operates with IBM 3705 and 3705/Commpro software.	Remte load via comm lne basic. same as 4705E; can support up to 4 high-speed links.	Auto. table generation.	Auto. table generation.

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SUPPLIER AND MODEL	Amnet N7400	Cableshare CSI Data Concentrator*	Cableshare LSI-X.25 Front-End Processor*	Cableshare LSI-X.25 Host Port Concentrator*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	All computers using ASCII serial communi-	DEC PDP-11 and VAX	All hosts supporting async communications
Direct attachment to host	No	—	—	—
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	No	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not applicable	16	1	32 async channels
Max. no. of active hosts supported simultaneously	Not applicable	16	1	32
IBM emulation	Not applicable	No	No	No
PU type within network	Not applicable	—	—	—
Remote line concentrator:	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	Unlimited	16	1	32
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	Yes	Yes	No	Yes
Network architecture compliance	OSI X.25	X.25	X.25, OSI	X.25, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	64	16	127	32
Highest line speed supported (bps)	256K bps	56K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	Halved	Halved
Host Channel Extender:	No	—	—	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes, PAD	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	No
Protocol conversion	Yes, PAD	Async to X.25	Async/X.25	Async/X.25
Code conversion	No	None	1	Baudot/ASCII
Error control	Yes	X.25 procedures	Infor. not available	Infor. not available
Automatic transmission speed detection	—	Yes	No	Yes, 110-9600 bps
Automatic disconnect of inactive dial-up terminals	—	Yes	No	Yes
Interface to Ethernet LAN	—	—	—	—
SYSTEM CHARACTERISTICS				
Processor	PC/AT (80286)	Intel 8088	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	640K	192K	64K	64K
Level of data unit transferred across I/O channel	Block	Block	Block	Infor. not available
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Infor. not available
Mass storage	Not applicable	None	None	Infor. not available
Other peripherals	Not applicable	None	None	Infor. not available
I/O, backup, and diagnostic peripherals supported	Yes	Console	FEP console	Console
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	—	—	—
Communications operating software:				
Operating system implemented in	'C'—MP/OS under MS/DOS	Firmware/software combination	Software	Software
IPL method	Local and remote IPL	Internal self load	Download from host	Internal self load
Additional software supported	Net. Mgmt. Sys.	None	None	None
User programmability	Yes—PC/AT	Yes, via user-selected parameters	No	No
Software separately priced	Some	None	Infor. not available	Infor. not available
Approx. proportion of currently installed systems supplied as turnkey systems	Not applicable	All	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	—	—	—
Data collected	Yes	—	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	7,000	3,000	13,450	Contact vendor
Monthly maintenance, $	One percent	None	100	70
Monthly lease/rental, $	Contact vendor	Not available	None	None
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	April 1987	June 1983	November 1978	March 1980
Number of systems installed to date	—	No	75	25
Serviced by	Amnet	Cableshare	Digital Equipment Corp.	Digital Equipment Corp.
COMMENTS	Auto. table generation.	*1986 information.	DTE or DCE support; supports up to 5 X.25 netwrk links w/ DTE or DCE config.*1986 infor.	DTE or DCE support; supports up to 5 X.25 network links with DTE/ DCE config.*1986 infor.

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SUPPLIER AND MODEL	Cableshare LSI-X.25 Intelligent Concentrator*	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor CCP/3205	Chi Communications Processor CCP/3205P
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All async terminals	NCR Criterion, 9800	Unisys 1100 Series	Unisys 1100 Series
Direct attachment to host	—	No	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	32 async channels	Not applicable	8	2
Max. no. of active hosts supported simultaneously	32	—	8	2
IBM emulation	No	Not applicable	No	No
PU type within network	—	—	PU Type 2	PU Type 2
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	32	One	Unlimited	Unlimited
Host-independent network processor:	Yes	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	X.25, OSI	Proprietary	X.25	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	32	24	Over 1,000	24
Highest line speed supported (bps)	19.2K	19.2K bps	64K	64K
Effect on line capacity, if all lines are full-duplex	Halved	None	None	None
Host Channel Extender:	—	No	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	No	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Async/X.25	No	Async/unis., 3270/async	Async to uniscope
Code conversion	Baudot/ASCII	No	ASCII/EBCDIC/XS3	ASCII/EBCDIC/XS3
Error control	—	Yes	LRC, BCC, CRC	LRC, BCC, CRC
Automatic transmission speed detection	Yes, 110-9600 bps	No	Yes, 110-19.2K bps	Yes, 110-19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Site option	Site option
Interface to Ethernet LAN	—	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	LSI-11/2 or PDP-11/23	68010	Perkin Elmer 3205	Perkin Elmer 3205
Main memory word size, bits	16	16 bit	32	32
Main memory storage capacity, bytes	64K	756K bytes	1M (stnd.), up to 4M	1M (stand.), up to 4M
Level of data unit transferred across I/O channel	Infor. not available	Byte, block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Infor. not available	Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	Infor. not available	Not applicable	DMA/Interrupt	DMA/Interrupt
Other peripherals	Infor. not available	Not applicable	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	Console	Not applicable	FEP console, diskette, patch panel	FEP console, diskette, patch panel
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	—	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Proprietary	Software and firmware	Firmware/software combination
IPL method	Internal self load	Download from host	Host/diskette/self-load	Host/diskette/self-load
Additional software supported	None	Spreadsheet, print format	Development, communications	Dev., communications
User programmability	No	No	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	Infor. not available	Not applicable	X.25, X780, uniscope terminal	X.25, X780, uniscope terminal emulation
Approx. proportion of currently installed systems supplied as turnkey systems	— All	All	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	Yes, point status	Yes	Yes
Data collected	—	Traffic statistics	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	6,995	50,000	35,000
Monthly maintenance, $	70	600/yr.	600	300
Monthly lease/rental, $	None	—	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	—	No	No	No
Date of first delivery	March 1980	1981	1977	1985
Number of systems installed to date	125	1,200	85	3
Serviced by	Digital Equipment Corp.	CAI	Chi Corporation	Chi Corporation
COMMENTS	DTE or DCE support; supports up to 5 X.25 network links with DTE/DCE config.*1986 infor.	Load leveling, raw line selection, terminal key ahead, mainframe intel. rout., port contention.	Dynamic rout., 2 async screen ed., auto. term. protocol detect, redund mult. loc/rem. hosts.	Preconfig., dynamic routing, 2 async screen ed., auto term. protocol detect. redundancy.

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SUPPLIER AND MODEL	Chi Communications Processor CCP/3210	Computer Communications CC-6F	Computer Communications CC-8	Computer Communications CC-80/85
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Unisys 1100 Series	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	8	2	4	7
Max. no. of active hosts supported simultaneously	8	2	4	7
IBM emulation	No	370X/37X5 EP	370X/37X5 EP	370X/37X5 EP
PU type within network	PU Type 2	PU Type 4	PU Type 4	PU Type 4
Remote line concentrator:	Yes	No	No	No
Maximum no. of hosts served by one concentrator	Unlimited	Not applicable	Not applicable	Not applicable
Host-independent network processor:	Yes	No	No	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	X.25	No	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	Over 1,000	32	—	—
Highest line speed supported (bps)	64K	56K	230.4K bps	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	No	No	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async/unisc.; 3270/asyn	No	No	No
Code conversion	—	Yes	Yes	Yes
Error control	ASCII/EBCDIC/XS3	Parity, LRC, and CRC	Parity, LRC and CRC	Parity, LRC and CRC
Automatic transmission speed detection	LRC, BCC, CRC	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes, 110-19.2K bps	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Perkin Elmer 3210	CCI 601	CCI 801	CCI 8001/8501
Main memory word size, bits	32	16	16	16
Main memory storage capacity, bytes	0.5M stand. (up to 4M)	64K	64K	256K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Other peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	FEP console, diskette, patch panel	FEP CRT console, diskette, printer	FEP CRT console, diskette, printer	Disk (40-200MB), mag tape, FEP CRT, printer
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Hardware/software combination	Software	Software	Software
IPL method	Host/diskette/self-load	From host/diskette	From host/diskette	From host/disk
Additional software supported	Dev., communications	Value added options, assembler, utilities, diagnostics	Value added options assembler loader, utilities, diagnostics	Value added options, custom software, assembler, loader, utilities
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters & programs	Yes, via user-selected parameters & programs	Yes, via user-selected parameters & programs
Software separately priced	X.25, X780, uniscope terminal emulation	Value added options	Value added options	Options and custom sys.
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	90%	95%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	—	—	—
Data collected	Yes	—	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	85,000	17,900	39,840	68,000/115,640
Monthly maintenance, $	750	150	296	246/426
Monthly lease/rental, $	Contact vendor	630	1,224 (3-yr.); 1,600 (rental)	1,932 (3-yr. lease)
Is maintenance bundled with lease/rental?	No	Yes	Yes	Yes
Date of first delivery	1983	November 1981	1976	1975
Number of systems installed to date	4	30	270	432
Serviced by	Chi Corporatation	Computer Communications	Computer Communications	Computer Communications
COMMENTS	High-speed vers., fully expand.; dynamic rout., 2 async screen ed., redundancy, UTS simulat.	Auto-poll, autobaud rate detect, autodial, single IOP support, off line util., flow contrl	Auto poll, autobaud rate detect, speed & code conver., autodump, autoload, multihost spt	Used mainly for custom store-and-forward message switches, electronic mail, etc.

All About Communications Processors

SUPPLIER AND MODEL	Computer Communications CCI-8400	Control Data 2551-3	Control Data 2551-4	Control Data CDCNET
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	CDC Cyber 170, 180, Cyber 70, 6000 Series	CDC Cyber 170, 180, Cyber 70, 6000 Series	CDC Cyber 170 CDCNET
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	2	2	2
Max. no. of active hosts supported simultaneously	4	1	1	2
IBM emulation	CTCA	No	No	No
PU type within network	CTCA	PU Type 5	PU Type 5	PU Type 5
Remote line concentrator:	No	Yes	Yes	Yes, TRI
Maximum no. of hosts served by one concentrator	Not applicable	8	8	Unlimited
Host-independent network processor:	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Yes
Network architecture compliance	—	Yes	Yes	CDCNET (OSI model)
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	—	32	254	MTI—64, Network—5000
Highest line speed supported (bps)	—	56K bps	56K	128K bps
Effect on line capacity, if all lines are full-duplex	—	None	None	None
Host Channel Extender:	Yes	No	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	Yes
Terminal-initiated applications switching	No	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	No	No
Code conversion	No	Yes	Yes	ASCII to EBCDIC
Error control	Native HDLC	Yes	Yes	Yes, extensive
Automatic transmission speed detection	No	Yes; 100 to 1200 bps	Yes; 100 to 1200 bps	Yes, 100 bps—38.4K bps
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Mult. 8809, 8089, 68000	CDC 1551-3	CDC 2551-4	Multiple MC 68000
Main memory word size, bits	8	16	16	16 bits
Main memory storage capacity, bytes	512K-1MB	256K	256K	1-4MB
Level of data unit transferred across I/O channel	Byte, block, selector	Byte and control	Byte and control	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	DMA	None	None	None
Other peripherals	—	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	Diskette, supervisory console, display unit	Console, cassette	Console, cassette	Console
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	No	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Firmware/software combination	Firmware/software combination	Firmware/software combination
IPL method	Host, manual diskette	Download from host	Download from host	Download from host
Additional software supported	—	None	None	None
User programmability	Yes	Yes, via user-selected programs	Yes	Yes, via user-selected programs
Software separately priced	None	All	All	Some
Approx. proportion of currently installed systems supplied as turnkey systems	All	98%	98%	100%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	Local and remote loop-back	Local and remote loop-back	Local and remote loop-back
Data collected	—	Extensive statistics	Extensive diagnostics	Extensive diagnostics
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	55,965	36,955	48,648	15,595
Monthly maintenance, $	369	433	483	65
Monthly lease/rental, $	1,552 (3-yr. lease)	1,067 (3-yr. lease)	1,403 (3-yr. lease)	624 (3-yr. lease)
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	January 1986	January 1983	January 1983	December 1985
Number of systems installed to date	24	Infor. not available	Infor. not available	1,000+
Serviced by	Computer Communications	Control Data Corp.	Control Data Corp.	Control Data Corp.
COMMENTS	T1 processor for bulk file data transfer; simult. attached to pre-SNA/SNA hosts.	Predecessor was 2550 products, first shipped in 1976.	Predecessor was 2550 product, first shipped in 1976.	CDCNET—dist. netwrk. of mainframe, term., & net work device interfaces conn. by Ethernet/X.25.

All About Communications Processors

SUPPLIER AND MODEL	Digital Communications Associates System 355	Digital Communications Associates System 335	Digital Communications Associates System 375	Digital Communications Associates System 330
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Most vendors	Most vendors	Most vendors
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	44	4	114	Not applicable
Max. no. of active hosts supported simultaneously	124	42	124	26
IBM emulation	Yes	Yes	Yes	No
PU type within network	—	—	—	—
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	124	42	124	26
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	INA/X.25/SNA	INA/X.25./SNA	INA/X.25/SNA	INA, X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	44	4	114 trunks, 120 lines	28
Highest line speed supported (bps)	72K bps	72K bps	72K bps	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	—	—	—	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async to 3270, X.25/SNA	Async to 3270, BSC/X.25	Async/X.25/3270 BSC	Async to X.25
Code conversion	ASCII to EBCDIC	Yes, ASCII to EBCDIC	ASCII to EBCDIC	No
Error control	Yes-CRC	Yes—CRC	Yes-CRC	CRC
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	110 - 9600 bps	110-9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Yes	Yes	—	—
SYSTEM CHARACTERISTICS				
Processor	Z80B, 68000	Z80B, 68000	Z80A/B, 68000	Z80B
Main memory word size, bits	8 bits	8 bits	8	8
Main memory storage capacity, bytes	64K - 512K	64K - 512K	11MB	19.2K bps
Level of data unit transferred across I/O channel	Byte/block	Byte/block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	Interrupt
Other peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	Interrupt
I/O, backup, and diagnostic peripherals supported	Dual call console, diagnostics built-in	Dual call console, diagnostics built-in	Dual call console, diagnostics built-in	Diagnostics built-in, console, diskette
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	—
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	Internal self-load	Downline/int. self-load	Internal self-load	Internal self-load
Additional software supported	Not applicable	Not applicable	Not applicable	Not applicable
User programmability	Yes; via user-selected parameters/programs	Yes, via user-selected parameters; programs	Yes, via user-selected parameters, programs	Yes, via user-selected parameters
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	25%	25%	25%	Not applicable
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Loc/rem loop., port/ line stat. mod/lead.	Loc/rem loop., port/ line status, mod. lead	Loc/rem. loop., port/ line stat. modem lead	Yes
Data collected	Traff. load., line hits stream., net soft. fail	Trunk down, hardware failures	Traff. load., line hits net soft. failures	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	Contact vendor	Contact vendor	See comments
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1980	1980	December 1984	—
Number of systems installed to date	Infor. not available	Infor. not available	Infor. not available	—
Serviced by	DCA, third party	DCA, third party	DCA, third party	DCA
COMMENTS	Supports host selection port contention, full line and modem control facilities; X.25 gate.	Supports host selection, port contention, full line and modem control facilities.	Diagnostics plus error checking; X.25 gateway interface; advanced features software.	$6,495—10 ports; $8,495—26 ports; D/I; host select.; port conten.; alternate routing.

All About Communications Processors

SUPPLIER AND MODEL	Digital Communications Associates System 332	Digital Communications Associates System 334 Bisync	Honeywell Information Systems Datanet 8/10	Honeywell DATANET 8/20
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	IBM and compatibles	Honeywell DPS 7, DPS 88 DPS 8, DPS 90, DPS 7E	Honeywell DPS 7, DPS 8, DPS 88, DPS 90, DPS 7E
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	1 or 2	4
Max. no. of active hosts supported simultaneously	24	500	1 or 2	4
IBM emulation	No	3274, 37X5 FEP	Yes	Yes
PU type within network	—	—	—	—
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	24	12	—	—
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Not applicable	Yes	Yes
Network architecture compliance	INA, X.25	INA, 3270 BSC, X.25	Honeywell DSA (ISO)	Honeywell DSA (ISO)
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	26	14	31	127
Highest line speed supported (bps)	72K bps	72K bps	19.2K bps	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	None	Load-dependent	Load-dependent
Host Channel Extender:	—	—	—	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes (by host program)	Yes (by host program)
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async to X.25	3270 to X.25	No	No
Code conversion	No	No	No	No
Error control	CRC	CRC	Yes	Yes
Automatic transmission speed detection	110-9600 bps	Not applicable	Yes; 110, 300, 1200 bps	Yes
Automatic disconnect of inactive dial-up terminals	Yes	No	Yes; optional, variable	Yes
Interface to Ethernet LAN	—	—	—	—
SYSTEM CHARACTERISTICS				
Processor	Z80B/M68K	Z80B/M68K	DATANET 8/10	DATANET 8/20
Main memory word size, bits	8	8	16	—
Main memory storage capacity, bytes	640K	1024K	1MB	1MB
Level of data unit transferred across I/O channel	Byte	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	Async bus	Async bus
Mass storage	Interrupt	Interrupt	Async bus	Async bus
Other peripherals	Interrupt	Interrupt	Async bus	Async bus
I/O, backup, and diagnostic peripherals supported	Diagnostics built-in, console, diskette	Diagnostics built-in, console, diskette	Console, diskette	Console, diskette
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	—	—	—	—
Communications operating software:				
Operating system implemented in	Software	Software	Firmware/software combination	Firmware/software combination
IPL method	Internal self-load	Internal self-load	Host, local, or VIP	Host, local, or VIP
Additional software supported	Not applicable	Not applicable	Additional on host for administrative and control	On host for administrative and control
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	Not applicable	Not applicable	Software is customer installable	Software is customer installable
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	Yes	—	—
Data collected	Yes	Yes	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	See comments	See comments	23,900	38,000
Monthly maintenance, $	Contact vendor	Contact vendor	130	215
Monthly lease/rental, $	Contact vendor	Contact vendor	795 (5-yr. lease)	1,275 (5-yr. lease)
Is maintenance bundled with lease/rental?	No	No	Yes	Yes
Date of first delivery	—	—	1985	1985
Number of systems installed to date	—	—	Infor. not available	Infor. not available
Serviced by	DCA	DCA	Honeywell	Honeywell
COMMENTS	$9,995—12 ports; 24—$10,995; D/I; host selection; port contention alt. routing.	$14,995—4 ports; 8 port—$17,495; $19,995—12 ports; user-initiated terminal sess. switch.	Low-end model in the DATANET 8 Series.	—

All About Communications Processors

SUPPLIER AND MODEL	Honeywell DATANET 8/30	ICOT Corporation 254	ICOT Corporation 257	Infotron 990NP Network Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Honeywell DPS 7, DPS 8, DPS 88, DPS 90, DPS 7E	ICOT 254	ICOT 257	—
Direct attachment to host	Yes	—	—	No
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	4	No	No	None
Max. no. of active hosts supported simultaneously	4	8	28	Over 10 hosts
IBM emulation	Yes	3270 BSC, SNA/SDLC	3270 BSC, SNA/SDLC	3270 BSC
PU type within network	—	—	—	No
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	8	28	Over 10 hosts
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	Honeywell DSA (OSI)	SNA, BSC, NCR	SNA, BSC, NCR	Proprietary
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	255 (max.)	8	28 (all sync)	640
Highest line speed supported (bps)	19.2K bps	—	19.2K bps	64K bps
Effect on line capacity, if all lines are full-duplex	Load dependent	28	—	None
Host Channel Extender:	—	—	—	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes (by host program)	No	No	Yes (async)
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Yes	Yes	No
Code conversion	No	Yes	Yes	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Yes	No	No	Yes (Up to 9600 bps)
Automatic disconnect of inactive dial-up terminals	Yes	No	No	Yes
Interface to Ethernet LAN	—	—	—	No
SYSTEM CHARACTERISTICS				
Processor	DATANET 8/30	Multi-Intel 8088	Intel 8088	6502/8086/80186
Main memory word size, bits	—	128K bytes	128K bytes	—
Main memory storage capacity, bytes	2MB	128K bytes	128K bytes	—
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Does not apply
Type of data transfer supported between memory and:				D
Communications lines	Async bus	Interrupt	Interrupt	DMA and Interrupt
Mass storage	Async bus	Mail box	Mail box	Does not apply
Other peripherals	Async bus	—	—	Does not apply
I/O, backup, and diagnostic peripherals supported	Console, diskette	Host console	Host console	Console/diskette
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	—	—	—	Yes
Communications operating software:				
Operating system implemented in	Firmware/software combination	Firmware	Firmware	Combination firmware & software
IPL method	Host, local, or VIP	Download from host	Download from host	EEPROM
Additional software supported	On host for control and administrative	No	No	Does not apply
User programmability	Yes, via user-selectedq parameters	Yes, via user selected parameters	Yes, via user selected parameters	Yes, via console
Software separately priced	All	No	No	Some
Approx. proportion of currently installed systems supplied as turnkey systems	Software is customer installable	100%	100%	25%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	—	—	Yes
Data collected	—	—	—	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	80,000	5,200 and up	7,200 and up	20,000
Monthly maintenance, $	350	—	—	Contact vendor
Monthly lease/rental, $	2,675	—	—	Contact vendor
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	1985	1981	1981	1984
Number of systems installed to date	Infor. not available	—	—	4,000
Serviced by	Honeywell	ICOT, third party w/NCR	ICOT, third party w/ NCR	Infotron
COMMENTS	—	IBM 2780/3780 BSC emulation.	2780/3780 BSC emulation	Provides adapt. routing comp. netwrk. mgmt. features; bisync emula. & async/BSC/SDLC suprt.

All About Communications Processors

SUPPLIER AND MODEL	IBM 3705-80 Models M81 through M83*	IBM 3720	IBM 3725	KMW Systems, Auscom 8911A Channel Interface
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, and 43XX; S/370 in 270X	IBM 43XX, 303X, 308X, 309X	IBM S/370 (except models 115 and 125), 303X,	IBM mainframes, plug-compatible hosts
Direct attachment to host	Yes	Yes (Models 1 & 11; Models 2, 12 via phone)	Yes	Yes (thru channel)
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	2	4	8	1
Max. no. of active hosts supported simultaneously	2	4	8	1
IBM emulation	270X/370X	Yes	270X and 3705 with EP	3274(1A/1D), 3803, 3272
PU type within network	—	—	—	—
Remote line concentrator:	No	Yes	Yes	No
Maximum no. of hosts served by one concentrator	Not applicable	4	8	—
Host-independent network processor:	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA	SNA	SNA	Various
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	16	28 Std.-1,2; 60 w/ expan. unit; 16 std-11,12	256 w/ 3726 expansion	112
Highest line speed supported (bps)	57.6K	64k bps	230.4K bps	1.544M bps
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	None	—
Host Channel Extender:	—	No	—	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	No
Terminal-initiated applications switching	No	No	No	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	No
Protocol conversion	Yes	Yes	Yes	No
Code conversion	Yes	Yes	Yes	Yes, ASCII to EBCDIC
Error control	LRC and CRC	LRC, CRC	LRC and CRC	Yes
Automatic transmission speed detection	Yes; via optional soft.	Yes, via opt. software	Yes, via opt. software	No
Automatic disconnect of inactive dial-up terminals	No	No	No	No
Interface to Ethernet LAN	No	No	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	DEC LSI 11/73
Main memory word size, bits	18		18	16
Main memory storage capacity, bytes	256K	1MB (expand. up to 2MB)	256K—3MB	1MB
Level of data unit transferred across I/O channel	Block	Block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	DMA/Interrupt
Mass storage	DMA	DMA	DMA	DMA/Interrupt
Other peripherals	DMA	DMA	DMA	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	None	FEP console	FEP console	Tape cartridge, disk, diskette
Support for remote console	No	Yes	Yes, up to 150 meters (492 feet)	No
Support X.25 Level 3 capabilities	—	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	Download from host	Internal self load	Internal self load	Manual load from tape
Additional software supported	NCCF, NPDA	ACF/NCP, NTO, NPSI, NRF NPDA, ACF/TCAM, EP R3 EP R4, NetView	NCCF, NPDA, ACF/NCP-PEP, EP/3725	—
User programmability	Yes	Yes	Yes	Yes
Software separately priced	Yes	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	— None	None	None	50%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	Yes	—	Yes
Data collected	—	Yes	—	No
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	36,600 (M81)	36,500/26,00 (Mod. 1/2)	32,000	20,000
Monthly maintenance, $	219	175 (1); 142 (2)	—	300/mo.
Monthly lease/rental, $	1,465 (2-yr. lease); 1,721 (rental)	2,605 (1); 1,855 (2)	1,485 (rental)	No
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	August 1981	1986—1/2; 1987—11/12	1983	1980
Number of systems installed to date	Infor. not available	—	Infor. not available	2,000
Serviced by	IBM	IBM	IBM	KMW
COMMENTS	*IBM no longer markets these models.	3721 expansion unit expands capabilities of 3720; Models 1, 2, 11, and 12.	HONE Configurator CF-3725 should be consulted for actual no. of operable lines.	Full programmable IBM channel interface.

All About Communications Processors

SUPPLIER AND MODEL	Lemcom Systems CMC-4	Lemcom Systems CMC-8	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.	IBM S/360, S/370, 30XX, 43XX, & compat.
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	1	1	64
Max. no. of active hosts supported simultaneously	1	1	1	64
IBM emulation	270X, 370X, EP	270X, 370X, EP	270X, 370X, EP	270X, 370X, EP
PU type within network	Not applicable	Not applicable	Not applicable	—
Remote line concentrator:	No	No	No	Yes
Maximum no. of hosts served by one concentrator	Not applicable	Not applicable	Not applicable	64
Host-independent network processor:	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	Optional
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Optional
Network architecture compliance	Not applicable	Not applicable	Not applicable	DMMA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	4	8	—	—
Highest line speed supported (bps)	56K	56K	56K	57.6K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
Host Channel Extender:	No	No	No	Yes
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	No	Yes
Terminal-initiated applications switching	No	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	RPQ
Protocol conversion	No	No	No	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Optional—300, 1200	Optional—300,1200	Optional-300,1200	110 to 19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	Planned
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6800	Motorola 6800	Motorola 6809
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	40K	80K	320K	15M
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	DMA/Interrupt
Mass storage	None	None	None	DMA/Interrupt
Other peripherals	None	None	None	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	FEP console	FEP console	FEP console	FEP console and bubble memory
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	No	No	No	Planned
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Software
IPL method	Internal self-load	Internal self-load	Internal self-load	Self-/manual-/down-load
Additional software supported	Problem determination aids	Problem determination aids	Problem determination aids	Channel prog. simulator & prob. determin. aids
User programmability	User-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	Utilities only	Utilities only	Utilities only	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	None	25%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes; loopback, internal diagnostics	Yes; loopback, internal diagnostics	Yes, loopback, internal diagnostics	Yes; rem. prob. deter., loopback, intern. diag.
Data collected	Trace	Trace	Trace	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,000	16,000	20,000	25,00
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	March 1977	November 1980	March 1979	1981
Number of systems installed to date	400	65	135	560
Serviced by	Various	Various	Various	Various
COMMENTS	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.	Microprocessor-directed FEP; front-end polling and console support avail.; OEM discounts.	Dist. MPU FEP; up to 256 MPUs prog. to do var. comm. proc. func., Front-end polling.

All About Communications Processors

SUPPLIER AND MODEL	M/A-COM 9708 MPX	M/A-COM 9724 RPX	M/A-COM 9000 NPX	Micom Micro800/X.25
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via X.25	Most vendors via X.25	Most vendors via communications	Most
Direct attachment to host	No (X.25)	No (X.25)	No (X.25)	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	No	No	No	No
— Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	Not applicable	Not applicable
— Max. no. of active hosts supported simultaneously	Not applicable	Not applicable	Not applicable	Not applicable
— IBM emulation	Not applicable	Not applicable	Not applicable	Not applicable
— PU type within network	Not applicable	Not applicable	Not applicable	Not applicable
Remote line concentrator:	Yes	Yes	Yes	Yes
— Maximum no. of hosts served by one concentrator	7	23	600+	24
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	No
Terminal controller	No	No	No	No
Network architecture compliance	X.25	X.25	X.25	X.25
Communications line capacity:				
— No. of half-duplex lines physically attachable to processor	8	24	640	24
— Highest line speed supported (bps)	19.2K	64K bps	64K bps	19.2K bps
— Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	Not applicable	Not applicable	Not applicable	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	No	No
Code conversion	No	No	No	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	No	No	No	Yes
Automatic disconnect of inactive dial-up terminals	No	No	No	Yes
Interface to Ethernet LAN	No	No	No	—
SYSTEM CHARACTERISTICS				
Processor	Intel 186	Intel 286 and 186	Intel 186 & 286	Z80A; Z80B
Main memory word size, bits	16	16	16	8
Main memory storage capacity, bytes	640K	2MB	Over 50MB	64K
Level of data unit transferred across I/O channel	Byte/block	Byte/block	Byte, block	Byte
Type of data transfer supported between memory and:				
— Communications lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	Interrupt
— Mass storage	Not applicable	—	DMA	None
— Other peripherals	Not applicable	—	—	None
I/O, backup, and diagnostic peripherals supported	Disk, tape, console	Disk, tape, console	Disk, tape, console	Yes Async terminals
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	Yes
Communications operating software:				
— Operating system implemented in	Firmware	Firmware	Firmware	Firmware
— IPL method	Downline load	Downline load	Downln. load/loc reload	Int. self/downline load
— Additional software supported	Remote diagnostics	Remote diagnostics	Remote diagnostics	None
— User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters & programs	Yes, via user-selected parameters
— Software separately priced	Part of full network	Part of full network	Part of full network	Options only
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Memory probe & patch, rem. loop from NMC	Mem. probe & patch, rem loop from NMC, loc diag	Mem. probe & patch, rem loop from NMC, loc diag	Yes
Data collected	Events, statistics, accounting	Events, statistics, accounting	Events, statistics, accounting	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
— Purchase price, $	Under 10,000	Under 20,000	30,000	2,050
— Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
— Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	—	—	—	No
Date of first delivery	1986	1986	1984	1982
Number of systems installed to date	—	—	—	2,000
Serviced by	M/A-COM	M/A-COM	M/A-COM	Independent distributors.
COMMENTS	Part of M/A-COM's Integ. Packet Network; full net. mgmt. cap.; VC reconnect, loc. reld	Part of M/A-COM's Integrated Packet Network; full network management capability.	Part of M/A-COM's Integrated Packet Network; full management capability.	—

All About Communications Processors

SUPPLIER AND MODEL	Micom MB2-XAP-STD	Micom MB3-CSW	Micom MB3-XAP-STD/ MB3-XAP-HS	Micom MB3-BSC-STD
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via X.25	Most vendors	Most vendors via X.25	DSP compatible
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	Not applicable	Not applicable
Max. no. of active hosts supported simultaneously	Not applicable	Not applicable	Not applicable	Not applicable
IBM emulation	Not applicable	No	Not applicable	327X
PU type within network	Not applicable	Not applicable	Not applicable	Not applicable
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	254 channels	Unlimited	Unlimited
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	No	Yes	Yes
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	X.25	Micro 800/proprietary	X.25	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	16	10	16	4
Highest line speed supported (bps)	9600 bps	19.2K bps	9600 bps	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	—	—	—	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	No	No
Code conversion	No	No	No	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	110-9600 bps	110 to 9600 bps	110-9600 bps	110-9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	280A	Z80B	Z80B	Z80B
Main memory word size, bits	256K	8	512K	512K
Main memory storage capacity, bytes	8K	256K bytes	8K	8K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt (STD)	DMA/Interrupt
Mass storage	Interrupt	Interrupt	Interrupt	Interrupt
Other peripherals	Interrupt	None	DMA/Interrupt	Interrupt
I/O, backup, and diagnostic peripherals supported	Yes	Diagnostics built in	Yes	Yes
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	—	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Firmware
IPL method	Inter. self/downline ld	Internal self-load	Intern. self/down load	Internal self-load
Additional software supported	No	Not applicable	No	No
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	All	None	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	Yes	Yes	Yes
Data collected	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	1,790	600, plus MB3-4/MB3-10	2,250	3,740
Monthly maintenance, $	Contact vendor	Not applicable	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Not applicable	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	—	Not applicable	—	—
Date of first delivery	1986	1986	1986	1987
Number of systems installed to date	—	—	—	—
Serviced by	Independent distributors	Independent distributors	Independent distributors	Independent distributors
COMMENTS	Expand. from 4 ch. to 16 channel async PAD; compat. w/ Micom's X.25 control system.	Interconnects 4 or 10 Micro 800/2, 800/2M, or MB2-ESM composite; supports ch. speed conver.	Expand. from 4 ch. to 16 ch. PAD; compatible with Micom's X.25 control system.	Supports up to 64 3270 BSC devices; compatible with Micom's X.25 control system.

All About Communications Processors

SUPPLIER AND MODEL	Micom MB3-PSW-STD/ MB3-PSW-HS	Micom MB5-XAP-STD	NCR Comten— Comten 5620	NCR Comten— Comten 3690
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via X.25	Most vendors via X.25	IBM 360/370, 303X, NCR 8500, 8600, 308X, 43XX	IBM 360/370, 303X, NCR 8500/8600, 308X, 43XX
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	2	8
Max. no. of active hosts supported simultaneously	Not applicable	Not applicable	2	4
IBM emulation	Not applicable	Not applicable	270X, 37XX w/ NCP	270X, 37XX w/ NCP
PU type within network	Not applicable	Not applicable	PU Type 5, PU Type 4	PU Type 5, PU Type 4
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	2	4
Host-independent network processor:	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	Yes	Yes	No	No
Terminal controller	Yes	Yes	No	No
Network architecture compliance	X.25	X.25	SNA, OSI	SNA, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	12	24	32	80
Highest line speed supported (bps)	—	19.2K bps	64K bps	256K bps
Effect on line capacity, if all lines are full-duplex	None	None	More than 9.6K—halved; less than 9.6K—none	More than 9.6K-halved; less than 9.6K-none
Host Channel Extender:	—	—	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	Yes; Async to 3270 BSC	Yes; Async to 3270 BSC
Code conversion	No	No	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	110-9600 bps	110-9600 bps	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	—	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Z80B	Z80B	Proprietary	Proprietary
Main memory word size, bits	512K	512K	32	32
Main memory storage capacity, bytes	8K	8K	4MB	4MB
Level of data unit transferred across I/O channel	Frame	Byte	Byte or block	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt (STD)	Interrupt	Interrupt	Interrupt
Mass storage	Interrupt	Interrupt	DMA	DMA
Other peripherals	Interrupt	Interrupt	DMA	DMA
I/O, backup, and diagnostic peripherals supported	Yes	Yes	Hard disk, diskette, console	Hard disk, diskette, console
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Software	Software
IPL method	Internal self	Intern. self/down load	RCP load via hard disk	Manual load from disk.
Additional software supported	No	No	NCR Comten networking & connectivity software	NCR Comten networking & connectivity software
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes	Yes
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	Infor. not available	Infor. not available
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes	Yes	—	—
Data collected	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	3,740	4,350	22,575	69,420
Monthly maintenance, $	Contact vendor	Contact vendor	162	332
Monthly lease/rental, $	Contact vendor	Contact vendor	985 (3-yr. lease)	2,844 (3-yr. lease)
Is maintenance bundled with lease/rental?	—	—	No	No
Date of first delivery	1986	1986	1985	1978
Number of systems installed to date	—	—	Infor. not available	Infor. not available
Serviced by	Independent distributors	Independent distributors	NCR Comten	NCR Comten
COMMENTS	DMA/Interrupt (HS); expand. from 6 to 12 link packet switch; compat. w/ Micom X.25 Control.	Expandable from 8 ch. to 24 ch. async PAD; compat. w/ Micom X.25 Control System.	RCP load also via trunk reload via disk; does not need computer centr envir., oper. in office	Downloads from host; RCP load via hard disk or comm. line; reload via hard disk.

All About Communications Processors

SUPPLIER AND MODEL	NCR Comten—Comten 3695	NCR Comten—Comten 5660	Netlink Inc. Network SNA-Hub	NTX Communications Corporation NTX 3800—Model 2.1
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	NCR 8500/8600, IBM 360/370, 303X, 308X, 43XX	IBM 360/370, 303X, 308X, 43XX, & compat.	Most vendors	IBM and plug-compatible mainframes
Direct attachment to host	Yes	Yes	No	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	8	8	Not applicable	4
Max. no. of active hosts supported simultaneously	8	8	Not applicable	2 local, mult. remote
IBM emulation	270X, 37XX w/ NCP	270X, 37XX w/ NCP	Not applicable	CTCA
PU type within network	PU Type 5, PU Type 4	PU Type 5, PU Type 4	PU Type 2, PU Type 5	Not applicable
Remote line concentrator:	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	8	8	16	Not applicable
Host-independent network processor:	Yes	Yes	Yes	No
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	No	No	Yes	No
Terminal controller	No	No	PC controller	No
Network architecture compliance	SNA, OSI	SNA, ISO	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	512	1,024	16	8
Highest line speed supported (bps)	256K bps	256K bps	64K bps	512K bps
Effect on line capacity, if all lines are full-duplex	More than 9.6K-halved, less than 9.6K-none	None	None	Halved
Host Channel Extender:	No	No	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	No
Protocol conversion	Yes, Async to 3270 BSC	Yes	No	No
Code conversion	Yes	Yes	No	No
Error control	Yes	Yes	Yes	ARQ-CRC
Automatic transmission speed detection	110 to 9600 bps	Yes	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	No
Interface to Ethernet LAN	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	8086, 80188	Proprietary
Main memory word size, bits	32	32 bits	16 bits	8 bits
Main memory storage capacity, bytes	4MB	16MB	1MB	96K
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Not applicable	Block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	DMA	DMA	Not applicable	Not applicable
Other peripherals	DMA	DMA	Not applicable	Not applicable
I/O, backup, and diagnostic peripherals supported	Hard disk, diskette, console	Hard disk, diskette, console	Not applicable	PC
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Future	No
Communications operating software:				
Operating system implemented in	Software	Software	Firmware/software combination	Proprietary host-based software
IPL method	Manual load from disk.	Manual load from disk.	Download from host	Internal
Additional software supported	NCR Comten networking & connectivity software	NCR Comten network. connect. software	None	Not applicable
User programmability	Yes	Yes	No	Configuration macros
Software separately priced	All	All	None	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	Infor. not available	Infor. not available	None	—
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	Yes; local loopback when offline	ROM/RAM-based, NPDA	Yes; local/remote loopback, remote reconfig.
Data collected	Yes	Yes	Yes	Link loading, error rates, etc.
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	124,420	310,000	9,975 (port cards sep.)	76,370
Monthly maintenance, $	473	694	—	400
Monthly lease/rental, $	5,136 (3-yr. lease)	10,485 (3-yr. lease)	—	2,854 (1-year lease)
Is maintenance bundled with lease/rental?	No	No	—	No
Date of first delivery	1986	1986	1987 (second quarter)	1985
Number of systems installed to date	Infor. not available	Infor. not available	—	Infor. not available
Serviced by	NCR Comten	NCR Comten	Netlink	NTX
COMMENTS	Download from host; RCP load via hard disk or communications line; reload via hard disk.	Download from host; RCP load via hard disk or comm. line; reload via hard disk.	SNA concentrator and router to IBM hosts or host supp. SNA; routing determ. by user.	Supports multiple links up to 512K bps each; full hardware redundancy.

All About Communications Processors

SUPPLIER AND MODEL	NTX Communications Corporation NTX 3800—Model 2.2	NTX Communications Corporation NTX 3800—Model 2.3	Paradyne Pix/Pixnet	Paradyne Pixnet-XL
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM and plug-compatible mainframes	IBM and plug-compatible mainframes	IBM S/370, 30XX, 43XX, and compatibles	IBM/370, 43XX, 30XX, and compatibles
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	4	1	2
Max. no. of active hosts supported simultaneously	2 local, mult. remote	2 local, mult. remote	Multiple	Multiple
IBM emulation	CTCA	CTCA	Not applicable	Not applicable
PU type within network	Not applicable	Not applicable	Not applicable	Not applicable
Remote line concentrator:	No	No	Yes	Yes
Maximum no. of hosts served by one concentrator	Not applicable	—	Multiple	Multiple
Host-independent network processor:	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	No
Terminal controller	No	No	Yes	Yes
Network architecture compliance	SNA	SNA	None	OSI-modeled
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	8	8	13	16
Highest line speed supported (bps)	1024K bps	1.544M bps	56K bps (per line)	2.048M bps
Effect on line capacity, if all lines are full-duplex	Halved	Halved	None	None
Host Channel Extender:	No	No	Yes	Yes
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	No	No	Async/3270; PC/3270	Async/3270, PC/3270
Code conversion	No	No	ASCII/EBCDIC	ASCII, EBCDIC
Error control	ARC-CRC	ARQ-CRC	Yes	CRC
Automatic transmission speed detection	No	No	Yes	Yes
Automatic disconnect of inactive dial-up terminals	No	No	No	No
Interface to Ethernet LAN	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Proprietary
Main memory word size, bits	8	8	16	16 bit
Main memory storage capacity, bytes	96K	96K	128K	4MB
Level of data unit transferred across I/O channel	Block	Block	Byte	Block, byte
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	Not applicable	Not applicable	None	DMA/Interrupt
Other peripherals	Not applicable	Not applicable	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	PC	PC	Mag. tape; console	Diskette, console
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	No	No	No	No
Communications operating software:				
Operating system implemented in	Proprietary	Proprietary	Firmware/software combination, hardware	Firmware/software combination
IPL method	Internal	Internal	Intern. self-load, man.	Internal
Additional software supported	Not applicable	Not applicable	Utilities	Utilities
User programmability	Configuration macros	Configuration macros	Self-configuring	No, vendor supported
Software separately priced	Yes	Yes	None	None
Approx. proportion of currently installed systems supplied as turnkey systems	—	—	All	All
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes; local/remote loop-back, remote reconfig.	Yes; local/remote loop-back, remote reconfig.	Yes, internal testing	Yes, internal testing
Data collected	Link loading, error rates, etc.	Link loading, error rates, etc.	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	97,370	118,370	Contact vendor	Contact vendor
Monthly maintenance, $	400	400	Contact vendor	Contact vendor
Monthly lease/rental, $	3,560 (1-year lease)	5,944 (1-yr. lease)	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1985	1985	April 1976	March 1985
Number of systems installed to date	Infor. not available	Infor. not available	Over 6,000	Over 500
Serviced by	NTX	NTX	Paradyne	Paradyne
COMMENTS	Supports multiple links up to 1024K bps each, full hardware redundancy.	Supports mult. links up to 1.544M bps each; full hardware redundancy.	Permits remote peripherals & CRTs to access mult. IBM hosts/applic. as loc. attac. devices.	Allows rem. peripherals CRTs, etc. to access IBM hosts as locally attach. devices.

All About Communications Processors

SUPPLIER AND MODEL	Periphonics Voicepac	Periphonics VoiceBox	Periphonics VoiceStar 40XX	Periphonics VoiceStar 42XX
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most major vendors	Most major vendors
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	7	3	Not available	Not available
Max. no. of active hosts supported simultaneously	7	3	1	2
IBM emulation	370X, 3803, 327X, 5250	327X, 370X	370X, 3803, 327X, 5250	370X, 3803, 327X, 5250
PU type within network	PU Type 2	PU Type 2	PU Type 1, 2	PU Type 1, 2
Remote line concentrator:	Yes	Yes	No	No
Maximum no. of hosts served by one concentrator	7	3	Does not apply	Does not apply
Host-independent network processor:	Optional	Optional	Yes	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	No	Yes
Network architecture compliance	SNA	SNA	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	104	32	8	16
Highest line speed supported (bps)	9600 bps	9600 bps	9600 bps	9600 bps
Effect on line capacity, if all lines are full-duplex	Minor	Minor	Minor	Minor
Host Channel Extender:	Yes	Yes	Yes	Yes
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	All industry standards	Industry standard	Industry standards	Industry standards
Automatic transmission speed detection	Yes	Yes	Yes	Yes
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	LSI 11/23; LSI 11/73	LSI 11/23	80286 and LSI 11	68000 and LSI 11
Main memory word size, bits	16	16	16 bit ECC	16 bit ECC
Main memory storage capacity, bytes	320K	128K	1M	Up to 2M
Level of data unit transferred across I/O channel	Byte	Byte	2 bytes	2 bytes
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Other peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	CRT, printer, floppy	CRT, printer, floppy	CRT, printer, disk, floppy	CRT, printer, disk, floppy, tape
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	No	No	Yes
Communications operating software:				
Operating system implemented in	Proprietary software	Proprietary software	Unix based	Unix based
IPL method	Download or disk load	EPROM based	Hard disk	Hard disk
Additional software supported	I/O Gen, Pave, Param, Utalk	None	Voice dialog utility, rel. dbms, Pave, Param. Utalk, high-level lang.	Voice dialog utility, rel. dbms, Pave, Utalk, Param, High level lang.
User programmability	Yes, voice dialog and basic edit functions	No	Yes	Yes
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	75%	40%	100%	100%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes, local and remote loopback	Yes, local and remote loopback	Yes, local and remote loopback	Yes, local and remote loopback
Data collected	Traffic loading	Traffic loading	Traffic loading	Traffic loading
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	25,00	20,000	35,000	50,000
Monthly maintenance, $	250 min., variable	Approx. 200	Approx. 350	Approx. 500
Monthly lease/rental, $	Variable	Variable	Variable	Variable
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1981	1983	1985	1985
Number of systems installed to date	350	25	Infor. not available	Infor. not available
Serviced by	Periphonics	Periphonics	Periphonics	Periphonics
COMMENTS	Handles data & voice interchang. via single I/O port; can convert, concentrate Prot./code.	Solid state unit can concentrate, convert protocol & code; serve as remote network node.	Low end transaction processing sys. with voice respse., handheld terminal, & PC support.	Transaction processing system with voice response, hand-held terminal, & PC support.

All About Communications Processors

SUPPLIER AND MODEL	Periphonics VoiceStar 46XX	Periphonics VoiceStar 47XX	Telefile Computer Products Tele-Switch	Telematics NET 25*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most	Most
Direct attachment to host	Yes	Yes	Yes	—
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	3	7	Not applicable	Not applicable
Max. no. of active hosts supported simultaneously	4	7	Not applicable	Not applicable
IBM emulation	370X, 3803, 2848, 327X	370X, 3803, 327X, 5250	No	No
PU type within network	PU Type 1, 2	PU Type 1, 2	—	—
Remote line concentrator:	Yes	Yes	Yes	Yes (packet switch)
Maximum no. of hosts served by one concentrator	4	7	Not applicable	4
Host-independent network processor:	Yes	Yes	Yes	No
Store-and-forward message switching processor	Yes	Yes	Yes	No
Distributed processing node	Yes	Yes	Yes	No
Terminal controller	Yes	Yes	No	Yes
Network architecture compliance	SNA	SNA	X.25	None
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	50	96	450	480
Highest line speed supported (bps)	9600 bps	9600 bps	153K bps	64K
Effect on line capacity, if all lines are full-duplex	Minor	Minor	None	Halved
Host Channel Extender:	Yes	Yes	No	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	No	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Yes	Yes	No	No
Code conversion	Yes	Yes	No	No
Error control	Industry standards	Industry standards	Parity, LRC and CRC	Yes
Automatic transmission speed detection	Yes	Yes	Yes	50 bps—19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	
Interface to Ethernet LAN	Yes	Yes	Yes	—
SYSTEM CHARACTERISTICS				
Processor	Multi 68000, LSI 11	Multi 68000 and LSI 11	M68000	MC68000/Telematics S1
Main memory word size, bits	32 bit ECC; 16 bit ECC	32 bit ECC; 16 bit ECC	16	32
Main memory storage capacity, bytes	Up to 3M	Up to 6M	64K to 4MB	16M
Level of data unit transferred across I/O channel	2 or 4MB	2 or 4 bytes	Byte or block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
Mass storage	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA
Other peripherals	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt	DMA/Interrupt
I/O, backup, and diagnostic peripherals supported	CRT, printer, disk, floppy, tape	CRT, printer, disk, floppy, tape	Diskette	Removable disk (5M bytes)
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	Yes	Yes	Yes	—
Communications operating software:				
Operating system implemented in	Real time, Unix based	Real time, Unix based	Firmware/software combination	Software
IPL method	Hard disk	Hard disk	Internal selfload	Disk or remote port
Additional software supported	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang. & netwrk. defin. util.	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang. & netwrk. defin. util.	—	Pascal; C
User programmability	Yes	Yes	Yes, via user-selected parameters	Yes
Software separately priced	All	All	Special applications only	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	100%	100%	75%	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes, local and remote loopback	Yes, local and remote loopback	Yes; local loopback	—
Data collected	Traffic loading	Traffic loading	Traffic loading, outages	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	65,000	115,000	12,512	45,900
Monthly maintenance, $	Approx. 650	Approx. 1,150	84	275
Monthly lease/rental, $	Variable	Variable	417 (3 yrs.)	None
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	—	1985	October 1980	February 1984
Number of systems installed to date	70	Infor. not available	200	500+
Serviced by	Periphonics	Periphonics	Telefile	Telematics
COMMENTS	Transaction processing sys. w/ voice response, hand-held term., PC, & POS device support.	High capacity & thruput transact. process. sys. w/ voice resp., hand-held term., PC/POS supp	CCITT X.25 switching & management capabilities; also contains multiplexing protocol.	CCITT X.25 software support; public or private networks. 3270 support; *1986 infor.

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SUPPLIER AND MODEL	Telematics Series 500, 1000, 2000*	Tri-Data Netway 200	Tymnet Micro-Engine	Tymnet Mini-Engine
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most	Most major vendors	Most major vendors	Most major vendors
Direct attachment to host	—	No	No	No
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	No	No	No	No
Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	Not applicable	Not applicable
Max. no. of active hosts supported simultaneously	Not applicable	Not applicable	Not applicable	Not applicable
IBM emulation	No	Not applicable	Not applicable	Not applicable
PU type within network	—	PU Type 2	Not applicable	Not applicable
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	4	4	Configuration dependent	Configuration dependent
Host-independent network processor:	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	None	SNA; X.25	Tymnet proprietary — X.25 based	Tymnet proprietary — X.25 based
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	480	6	Configuration dependent	Configuration dependent
Highest line speed supported (bps)	64K	19.2K bps	19.2K bps	74K bps
Effect on line capacity, if all lines are full-duplex	Halved	None	None	None
Host Channel Extender:	—	No	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	No	Yes	Yes, contact vendor	Yes, contact vendor
Code conversion	No	ASCII to EBCDIC	ASCII, Baudot, EBCDIC	ASCII, Baudot, EBCDIC
Error control	Yes	Parity; LRC; CRC	Check sum w/ retrans.	Check sum w/ retrans.
Automatic transmission speed detection	50 bps—19.2K bps	No	Yes	Yes
Automatic disconnect of inactive dial-up terminals	—	Yes, some protocols	Yes	Yes
Interface to Ethernet LAN	—	No	No	Yes (internodal)
SYSTEM CHARACTERISTICS				
Processor	MC68000/Telematics S1	Zilog Z80	Tymnet/proprietary	Tymnet/proprietary
Main memory word size, bits	32	8 bits	32	32
Main memory storage capacity, bytes	16M	256K	1M	1MB
Level of data unit transferred across I/O channel	Block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	DMA/Interrupt	Interrupt	DMA/Interrupt
Mass storage	DMA	DMA/Interrupt	Not applicable	Not applicable
Other peripherals	DMA/Interrupt	DMA/Interrupt	Not applicable	Not applicable
I/O, backup, and diagnostic peripherals supported	Removable disk (5M bytes)	Diskette	None	Not applicable
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	—	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software with firmware assist	Software with firmware assist
IPL method	Disk or remote port	Internal self-load	Auto download-node/host	Auto. download-Eng/host
Additional software supported	Pascal; C	CP/M, Macro 80, Word-star, Plink II	Various interface software products	Various interface software products
User programmability	Yes	Yes, via user-defined parameters	Yes, via user selected parameters	Yes, via user selected parameters
Software separately priced	Yes	All but O.S.	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	90%	100%	100%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	Yes, power-on diagnostics	Remotely accessable software oper. monitors	Yes, remotely access-ible soft. op. monitors
Data collected	—	Port statistics	Node/link/soft.-status, loading, statistics	Node/link/software—status, load., statist.
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	26,000	7,920	Contact vendor	Contact vendor
Monthly maintenance, $	150	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	None	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	Infor. not available	No	No
Date of first delivery	December 1983	April 1983	1983	1981
Number of systems installed to date	500+	—	2,000+	1,000+
Serviced by	Telematics	Tri-Data	Tymnet	Tymnet
COMMENTS	CCITT X.25 software support; public or private networks. 3270 support; *1986 infor.	Supports networks up to 50 nodes @ 32 devices per node.	Sold as a node in a complete network, compatible with Tymnet's public network	Sold as a node in comp. netwrk, compatible w/ Tymnet's pub. netwrk., avail. in dual config.

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SUPPLIER AND MODEL	Tymnet Engine	Tymnet ATC (Asynchronous Terminal Concentrator)	Unisys DCP/10A	Unisys Corp. DCP/15
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	—	Unisys Series 1100, Series 2200	Unisys Series 1100, Series 2200
Direct attachment to host	No	No	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	No	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not applicable	Not applicable	1	1/enclosure, 2 max.
Max. no. of active hosts supported simultaneously	Not applicable	Not applicable	1	1/enclosure, 2 max.
IBM emulation	Not applicable	Not applicable	See comments	See comments
PU type within network	Not applicable	Not applicable	See comments	See comments
Remote line concentrator:	Yes	Yes, terminal only	Yes	Yes
Maximum no. of hosts served by one concentrator	Configuration dependent	Configuration dependent	Any host in network	Any host in network
Host-independent network processor:	Yes	Yes	Yes	Yes, (init. host load)
Store-and-forward message switching processor	Yes	No	Custom	Custom
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	No	No
Network architecture compliance	Tymnet proprietary — X.25 based	Tymnet proprietary, X.25 based	DCA	DCA (see comments)
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	Configuration dependent	10	24	48
Highest line speed supported (bps)	74K	9600 bps	64K	64K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	No	No	RPQ	RPQ
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	Yes	Yes
Protocol conversion	Yes, contact vendor	Async to network	Yes, several	Yes, several
Code conversion	ASCII, Baudot, EBCDIC	No	Yes, several	Yes, several
Error control	Check sum w/ retrans.	Check sum w/ retrans.	Industry standards	Industry standard
Automatic transmission speed detection	Yes	110 to 9600 bps	Yes, 110 - 19.2K bps	—
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	—
Interface to Ethernet LAN	No	No	Planned 1987	Planned 1987
SYSTEM CHARACTERISTICS				
Processor	Tymnet/proprietary	Tymnet-utilizing LSI-11	Unisys DCP/10	Unisys DCP/15
Main memory word size, bits	32	16	16	16
Main memory storage capacity, bytes	4MB	60K	2MB	4MB
Level of data unit transferred across I/O channel	Byte	Byte	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA/Interrupt	Interrupt	DMA	DMA
Mass storage	DMA/Interrupt	None	DMA	DMA
Other peripherals	DMA/Interrupt	None	DMA	DMA
I/O, backup, and diagnostic peripherals supported	Disk and tape	None	Disk	Disks
Support for remote console	Yes	Yes, diagnostic report	Yes	—
Support X.25 Level 3 capabilities	Yes	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software with firmware assist	Firmware	Firmware/software combination	Firmware/software combination
IPL method	Auto down-disk/Eng/host	Internal self load	Downld. from host, disk	Downld. from host, disk
Additional software supported	Various interface software products	None	File transfer	File transfer
User programmability	Yes, via user selected parameters	No	Yes, via user-selected programs	Yes, via user-created programs
Software separately priced	All	No	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	100%	100%	None	None
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Remotely accessible software oper. monitors	Yes, remotely accessible software op. mon.	Yes, local and remote	Yes, local and remote
Data collected	Node/link/software—status, load., statis.	Node/link/software—status, load, statistic	Several statistics	Several statistics
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	Contact vendor	20,000	28,585 (includes soft.)
Monthly maintenance, $	Contact vendor	Contact vendor	100	76
Monthly lease/rental, $	Contact vendor	Contact vendor	450 (5-yr. lease)	720 (includes software)
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1978	1984	1985	April 1987
Number of systems installed to date	1,000+	400+	400	—
Serviced by	Tymnet	Tymnet	Unisys	Unisys
COMMENTS	Sold as a node in comp. network; compat. w/ Tymnet's pub. network; avail. in dual config.	Sold as a node in a complete network; compatible with Tymnet's Public network.	Full range of SNA co-exist. software prod./gateways; also, DDN gateway.	Full range of SNA co-existence software products/gateways; also DDN gateway.

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SUPPLIER AND MODEL	Unisys DCP/20	Unisys DCP/40	Unisys CP3680/ CP3680-01	Unisys CP9585
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Unisys Series 1100, Series 2200	Unisys Series 1100, Series 2200	Unisys B2000, B3000, B4000, V300 Series,	All Unisys; IBM S/370, 30XX, 43XX, & compat.
Direct attachment to host	Yes	Yes	Yes	Yes
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	16	4	127
Max. no. of active hosts supported simultaneously	3	16	4	127
IBM emulation	See comments	See comments	No	No
PU type within network	See comments	See comments	—	—
Remote line concentrator:	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Any host in network	Any host in network	4	127
Host-independent network processor:	Yes (init. host load)	Yes (init. host load)	No	Yes
Store-and-forward message switching processor	Custom	Custom	Yes	Yes
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network architecture compliance	DCA, see comments	DCA, see comments	No	BNA, SNA, X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	24	1,023		
Highest line speed supported (bps)	64K	64K	56K bps	56K
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	None
Host Channel Extender:	RPQ	RPQ	—	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	No	No
Terminal-initiated applications switching	Yes	Yes	No	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Yes, several	Yes, several	Yes	Yes
Code conversion	Yes, several	Yes, several	Yes	Yes
Error control	Industry standards	Industry standard	Yes	Yes
Automatic transmission speed detection	Yes, 110 to 19.2K bps	Yes, 110 to 19.2K bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
Interface to Ethernet LAN	Planned 1987	Planned 1987	—	—
SYSTEM CHARACTERISTICS				
Processor	Unisys DCP/20	Unisys DCP/40	—	CP 9585 multiprocessor
Main memory word size, bits	16	16	—	—
Main memory storage capacity, bytes	2MB	6MB	1.5MB	3.5MB
Level of data unit transferred across I/O channel	Block	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA/Interrupt	DMA
Mass storage	DMA	DMA	DMA	DMA
Other peripherals	DMA	DMA	—	—
I/O, backup, and diagnostic peripherals supported	Disk	Console, disk, mag. tape	Console, disk, remote diagnostics	Mag. tape, fixed/remote disk, printers, card
Support for remote console	Yes	Yes	No	Yes
Support X.25 Level 3 capabilities	Yes	Yes	—	—
Communications operating software:				
Operating system implemented in	Firmware/software combination	Firmware/software combination	Firmware and software combination	Software and firmware
IPL method	Download host, disk	Host download & disk	Download from host	Internal self load
Additional software supported	File transfer	File transfer	NDL, DCS, switch, switch-plus	NDL, GEMCOS, BNA, SNA
User programmability	Yes, via user-created programs	Yes, via user created programs	Yes, via user selected parameters	Yes
Software separately priced	All	All	All	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	None	10%	Not applicable	Not applicable
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes, local and remote	Yes, local and remote	—	—
Data collected	Several statistics	Several statistics	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	47,350	103,600	64,050 (3680)	40,739
Monthly maintenance, $	245	590	535	217
Monthly lease/rental, $	1,080 (5-yr. lease)	2,340 (5-yr. lease)	2,415 (3-yr. lease)	1,560 (3-yr. lease)
Is maintenance bundled with lease/rental?	No	No	Yes	Yes
Date of first delivery	January 1982	September 1979	January 1978	1985
Number of systems installed to date	600	2,500	300	400
Serviced by	Unisys	Unisys	Unisys	Unisys
COMMENTS	Full range of SNA co-existence software products/gateways; also DDN gateway.	Full range of SNA co-existence software products/gateways; also DDN gateway.	Redundant system.	—

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SUPPLIER AND MODEL	Unisys B974	Unisys CP2000	Vitalink Communications TransLAN	Vitalink Communications TransLINK
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	B2000, B3000, B4000, V300 Series	A Series	—	—
Direct attachment to host	Yes	Yes	No	No
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	2	25	Not applicable	Not applicable
Max. no. of active hosts supported simultaneously	1	25	Unlimited	Unlimited
IBM emulation	No	PU Type 2	—	—
PU type within network	—	PU Type 2	PU Type 2	SDLC
Remote line concentrator:	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	Unlimited	Unlimited	Unlimited
Host-independent network processor:	No	No	Yes	Yes
Store-and-forward message switching processor	Yes	No	Yes	Yes
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Yes	No	No
Network architecture compliance	X.25	BNA, SNA, X.25	SNA/DECnet	SNA, DECnet
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	96	24	1, 4, 8, 12, or 16	1, 4, 8, 12, or 16
Highest line speed supported (bps)	56K bps	64K bps	2.048M bps	64K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
Host Channel Extender:	—	—	No	No
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Yes	Yes	No	No
Code conversion	Yes	Yes	No	No
Error control	Yes	Yes	CRC-16	CRC-16
Automatic transmission speed detection	No	Yes	Not applicable	Not applicable
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Not applicable	Not applicable
Interface to Ethernet LAN	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Multi-processor	Multi-processor	MC 68010	MC 68010
Main memory word size, bits	8 bits	16 bits	32 bits	32 Bit
Main memory storage capacity, bytes	3.5MB	1.5MB	1.5MB	1.5MB
Level of data unit transferred across I/O channel	Byte	Byte	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	DMA
Mass storage	—	—	DMA	DMA
Other peripherals	—	—	Interrupt	Interrupt
I/O, backup, and diagnostic peripherals supported	Disk, tape, console	Disk	Console	Console
Support for remote console	Yes	Yes	Yes	Yes
Support X.25 Level 3 capabilities	No	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware/software combination	Firmware	Software/hardware combination	Hardware/software combination
IPL method	Downline load from host	Load from syst. or disk	Internal self-load	Internal self-load
Additional software supported	—	—	Not applicable	Not applicable
User programmability	No	No	User selected parameters	User-selected parameters
Software separately priced	All	All	Not applicable	Not applicable
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	5%	5%
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	—	—	Yes	Yes
Data collected	—	—	Yes	Yes
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	Contact vendor	10-15,000	9,000-12,500
Monthly maintenance, $	Contact vendor	Contact vendor	—	—
Monthly lease/rental, $	Contact vendor	Contact vendor	—	—
Is maintenance bundled with lease/rental?	—	—	—	—
Date of first delivery	1984	1986	November 1984	December 1985
Number of systems installed to date	Infor. not available	Infor. not available	1,600+	—
Serviced by	Unisys	Unisys	—	—
COMMENTS	—	—	The NP III acts as hardware host to all Vitalink network products.	The NP III acts as hardware host to all Vitalink network products.

All About Communications Processors

SUPPLIER AND MODEL	Vitalink Communications TransSDLC			
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	—			
Direct attachment to host	No			
FUNCTIONAL CONFIGURATIONS				
Front-end processor:	Yes			
Max. no. of hosts channel-attachable to front-end	Not applicable			
Max. no. of active hosts supported simultaneously	Unlimited			
IBM emulation	—			
PU type within network	PU Type 2			
Remote line concentrator:	Yes			
Maximum no. of hosts served by one concentrator	Unlimited			
Host-independent network processor:	Yes			
Store-and-forward message switching processor	Yes			
Distributed processing node	Yes			
Terminal controller	Yes			
Network architecture compliance	SNA/DECnet			
Communications line capacity:				
No. of half-duplex lines physically attachable to processor	1, 4, 8, 12, or 16			
Highest line speed supported (bps)	64K bps			
Effect on line capacity, if all lines are full-duplex	None			
Host Channel Extender:	No			
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes			
Terminal-initiated applications switching	No			
Comm. processor-initiated dynamic line reconfig.	Yes			
Protocol conversion	No			
Code conversion	No			
Error control	CRC-16			
Automatic transmission speed detection	Not applicable			
Automatic disconnect of inactive dial-up terminals	Not applicable			
Interface to Ethernet LAN	Yes			
SYSTEM CHARACTERISTICS				
Processor	MC 68010			
Main memory word size, bits	32 Bit			
Main memory storage capacity, bytes	1.5MB			
Level of data unit transferred across I/O channel	Block			
Type of data transfer supported between memory and:				
Communications lines	DMA			
Mass storage	DMA			
Other peripherals	Interrupt			
I/O, backup, and diagnostic peripherals supported	Console			
Support for remote console	Yes			
Support X.25 Level 3 capabilities	Yes			
Communications operating software:				
Operating system implemented in	Hardware/software combination			
IPL method	Internal self-load			
Additional software supported	Not applicable			
User programmability	User selected parameters			
Software separately priced	Not applicable			
Approx. proportion of currently installed systems supplied as turnkey systems	5%			
NETWORK MANAGEMENT/CONTROL CAPABILITIES				
Diagnostic tests supported	Yes			
Data collected	Yes			
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	9,000-12,500			
Monthly maintenance, $	—			
Monthly lease/rental, $	—			
Is maintenance bundled with lease/rental?	—			
Date of first delivery	September 1986			
Number of systems installed to date	100+			
Serviced by	—			
COMMENTS	The NP III acts as hardware host to all Vitalink network products.			

All About Communications Processors

A communications processor can be defined as a multifunctional device that may serve as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. The report covers the communications processor design, its place in modern network architectures, the evolution of the communications processor, the general advantages and restrictions of today's communications processors, and the state of the communications processor marketplace.

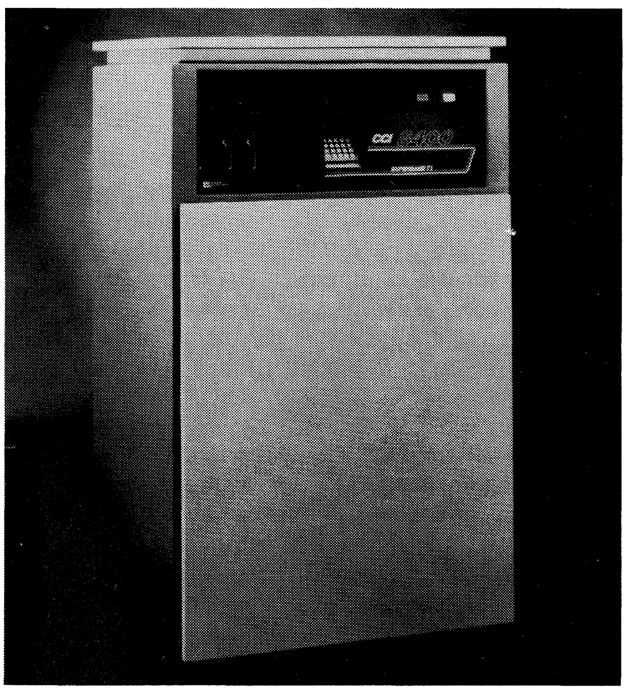
In 1984, Datapro sharpened its definition of a communications processor to include only truly multifunctional, intelligent devices dedicated to networking. Single-function devices such as protocol converters, terminal controllers, and X.25 PADs were given their own tab. Look for information on Protocol Conversion Systems behind Tab C23 in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS.

This report also includes comparison charts outlining the major characteristics of 70 communications processors from over 25 vendors.

Communications processors can be defined as multifunctional, program-controlled, digital computers dedicated to communications and able to serve as control points, or nodes, in a data communications network. In general, such a processor performs one or more of three major functions: front-end processing, intelligent switching, and concentration. A *front-end processor* serves as a locally attached peripheral device to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management either under the control of a master (usually front-end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches.

Each of the three major functions is a combination of some or all of the following subfunctions:

- physical transmission and reception of data
- data buffering and queueing
- multiplexing
- message framing and unframing
- control of transmission errors
- message sequencing
- protocol conversion
- message pacing and flow control
- message or packet assembly and disassembly
- route selection
- session establishment and disconnection
- formatting of data for use by specific host or terminal applications
- reporting and logging of device or transmission errors or failures
- fallback switching in case of host, device, or transmission line failure
- gather and recording of network performance and traffic statistics.



The CCI 8400—Superband—is a specialized T1 Processor designed to transfer large volumes of data between two host sites at a rapid rate of speed (1.544M bps). Superband's software-driven architecture provides a large degree of system visibility and control. Through the status panel and connected display station, operators gain instantaneous access to important network functions and error detection conditions. Superband attaches to as many as four existing IBM multiplexor or selector channels and to any two of four possible T1 carrier facilities.

All About Communications Processors

The most sophisticated communications processors, especially those marketed primarily as front ends by mainframe computer vendors, can perform all of these tasks. Indeed, in a large, complex network governed by one or more mainframe hosts, a front end must perform all but the last three in the normal course of its operations. Front-end processing is the most complex task a communications processor can perform.

Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialogue with a host computer, and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators, and change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch simply establishes an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor can perform, and communications processors acting as concentrators can easily be confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, packet assembler/disassemblers (PADs), and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change on the network. An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly: accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached devices. Some sophisticated terminal controllers, notably IBM's 3274s, can perform some or all of these functions. A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy: a concentrator can concentrate data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3705 acting as a remote node (concentrator) and an IBM 3274 within that concentrator's domain. A user can build an entire network from intelligent concentrators communicating with one another as peers, but cannot do the same with cluster controllers.

COMMUNICATIONS PROCESSOR DESIGN

The basic design of almost all communications processors follows the same, three-tiered, hierarchical plan—a plan that they share in general with their close cousins the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy along with its associated main memory; it controls the communications processor's operation according to the rules and parameters of its operating software, and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session establishment, application-level formatting, and error logging, and delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the reference clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to the attached host channel, and transmits it up the channel to the host; for data coming from the host, it performs the same process in reverse. The host interface's principal function is conversion of data from the communications processor's internal word size to that of the host computer. Some communications processors contain one or more input/output (I/O) processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generated by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for the timing of signals at different data rates.

The operator interface allows a human operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a

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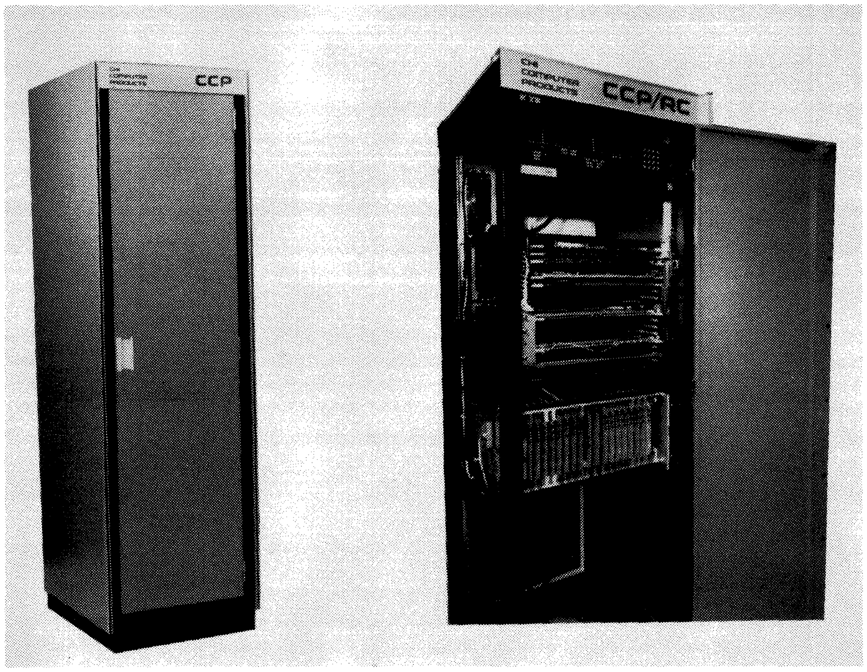

The Chi Communications Processor functions as a front-end processor, a remote line concentrator, a host-independent network processor, and a terminal controller. The processor is designed to work with the Sperry 1100 Series systems.

dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the above-mentioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor and a group of attached communications lines that share a common synchronization pattern, line speed, and sometimes, protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommodate from 8 to 32 line bases, each of which handles from two to eight line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the back plane or a side plane of the processor's cabinet. The physical bus architecture, made popular in the design of minicomputers, allows for easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, it also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might need to replace only one line base and eight line sets, rather than having to swap out an entire front-end processor. The hierarchical design extends the communications processors' functionality over time and helps to protect the user's investment in the face of changing technology. Figure 2 shows the hierarchical configuration of a generalized communications processor.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices. Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, Burroughs' BNA, and Sperry's DCA. Open architectures include the CCITT's X.25 packet switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standard (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most

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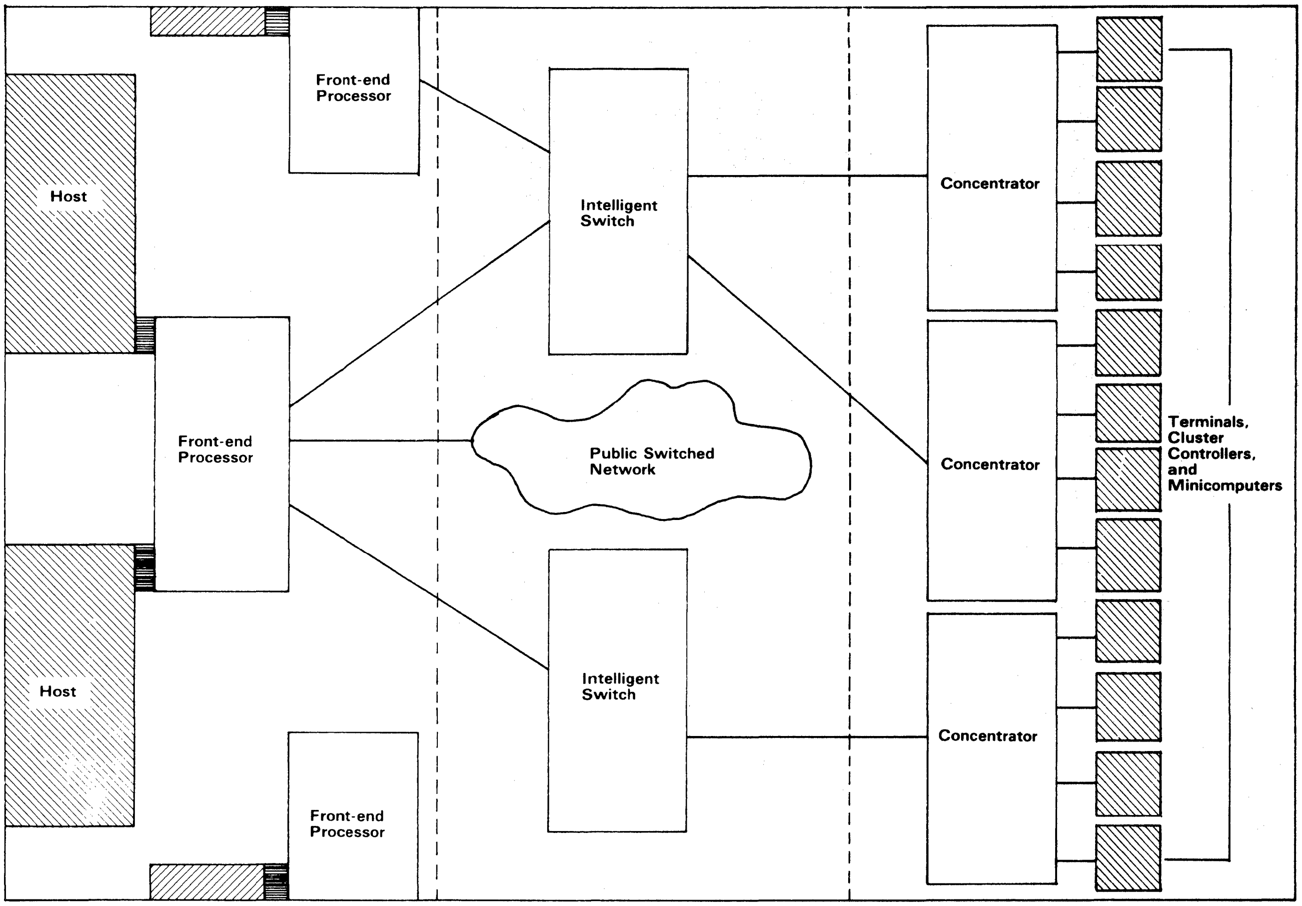

Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

often as a front end, and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies from architecture to architecture. In Sperry's DCA the DCP-Series front end has control over many Presentation-layer functions, while in IBM's SNA, the host's access method, along with software residing in the 327X terminal controllers, handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all the mainframe architectures, the same communications processor models that serve as front ends can also function as intelligent switches and as remote concentrators. In these functions, the communications usually appear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture can also perform another important function in conjunction with any of the other three, that of an intelligent gateway. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet switched data networks using the X.25 protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers through a uniform set of complementary protocols. Designed specifically for public data networks, the X.25 protocols provide ultimately for the establishment of virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices, computers or terminals, at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols. Since, in a public network, the network provider is responsible for network management, the X.25 communications processors in such a network carry a heavy load of access, error, and class-of-service control, along with many provisions for statistical recording of traffic and usage data that can be sorted by individual user account. Communications processors designed to function as switches in public networks are the likeliest to support high-capacity attached storage devices such as disk and tape drives.

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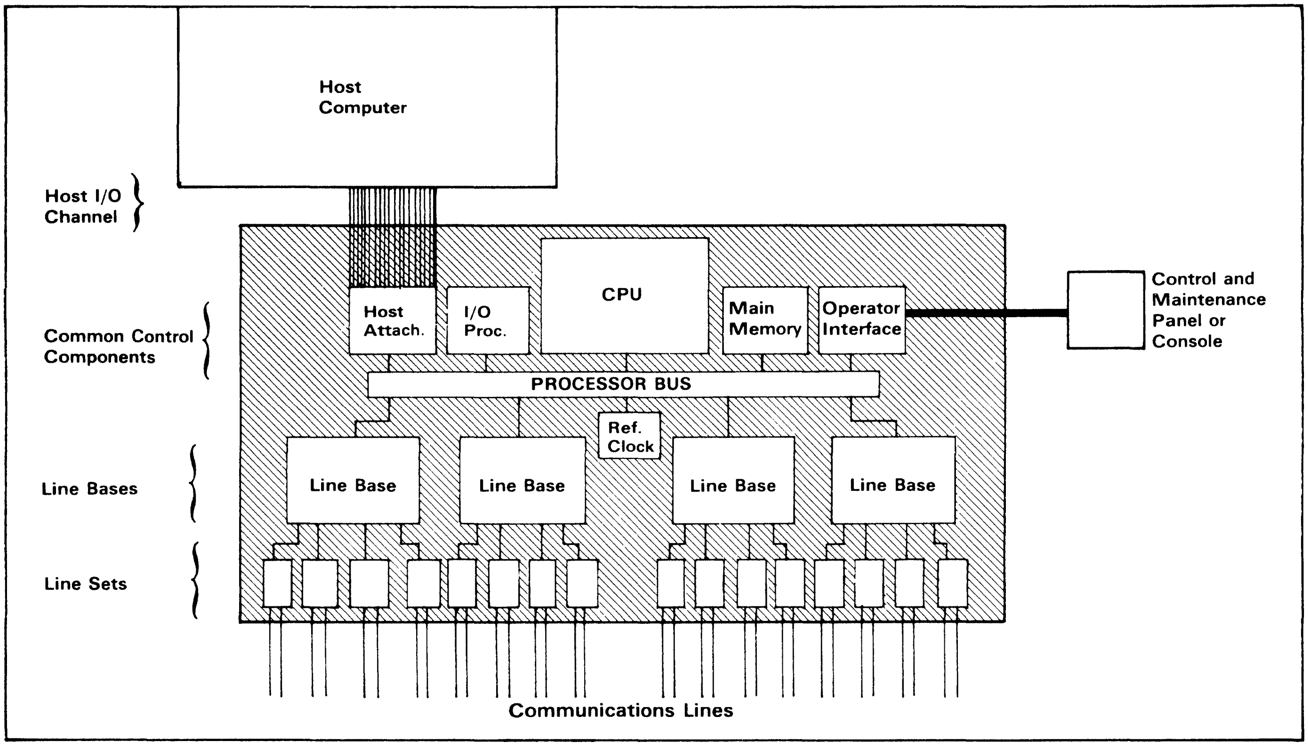

Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor may contain more than one host interface, several I/O processors, and many more line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture. Table 1 shows the protocols supported by various vendors' communications processors.

Transparent architectures are offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without much of the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some such products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system to provide these functions.

THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it came into being in the mid to late 1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hardwired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and performing simple error notification for the host.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform any of a number of functions more efficiently than a mainframe, and incidentally also provided the bus architecture that gives communications processors their modularity and flexibility. The ARPAnet, the first large-scale packet switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the

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TABLE 1. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Amnet						
N6000/XAS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	NCR, Burroughs
N6000/XPS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	Tinet, Visa
N6000/XTS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	PARS, Burroughs
Burroughs Corp.						
CP9558-1	Yes	Yes	Yes	Yes	Yes	Most Burroughs protocols
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
CP9585	Yes	Yes	Yes	Yes	Yes	—
Cableshare						
CSI Data Concentrator	Yes	No	Yes	Yes	Yes	
LSI-X.25 Front-End	Yes	No	No	No	GTE Telenet, Tymnet, Euronet	Uninet, Datapac PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	Yes	No	No	Yes	Yes	Same as above, and Telex and Teletex
LSI-X.25 Host Port Concentrator	Yes	No	No	No	Yes	Same as above, and Telex and Teletex
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200, UTS
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data						
2551-3 & 2551-4	Yes	Yes	No	No	GTE Telenet, Tymnet, Datapac, Transpac, BPO, ITT	—
DCA						
355	Yes	Yes	Yes	Yes	GTE Telenet, ITT, RCA	DEC DDCMP—trunk only
335	Yes	Yes	No	No	GTE Telenet Tymnet, Datapac, Uninet, Autonet, PSS	—
375	Yes	Yes, IBM 3270 BSC	No	No	Yes, Telenet, Tymnet, Uninet, Transpac, Datapac	Accunet, Cylix, PSS, Autonet
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	GTE Telenet	—
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
Icot						
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	NCR, AIRINC
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400
254	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
257	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S

Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

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TABLE 1. TERMINAL PROTOCOLS SUPPORTED (Continued)

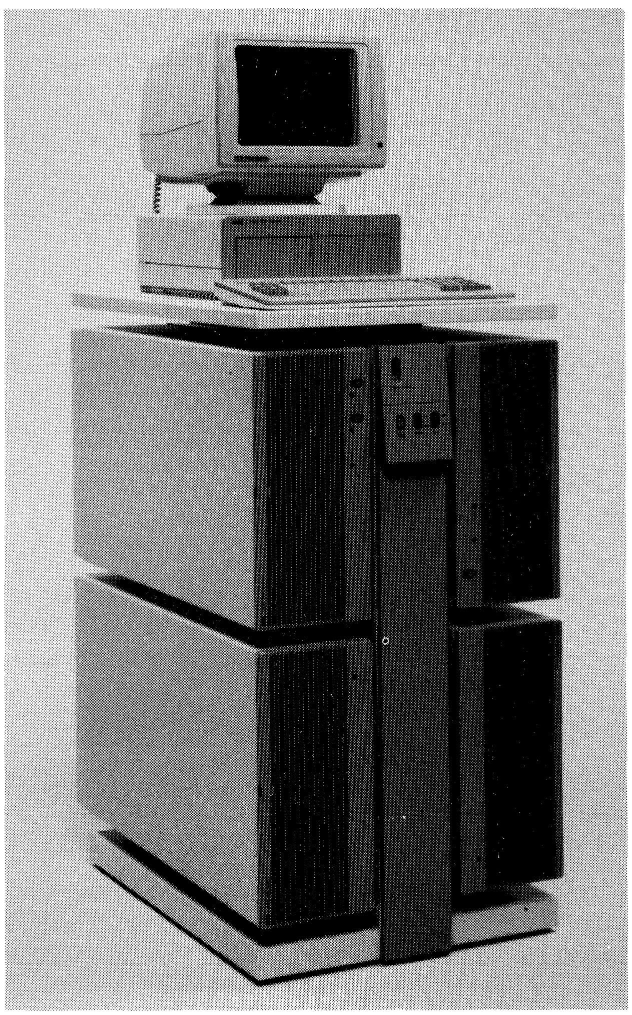
Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Infotron						
990NP Network Processor	Yes	Yes	Yes	Yes	Yes	Virtually all are supported
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	RPQ	Request price quotation
Distributed Network Processor Series	Yes	Yes	Yes	RPQ	RPQ	Request price quotation
M/A-Com DCC						
CP 9000 Series I	No	No	No	Yes	Yes	—
CP 9000 Series II	Yes	Yes	Yes	HDLC (LAPB)	Yes, Uninet	X.75
Micom						
Micro800	Yes	No	No	No	Yes, Telenet, Tymnet, Datapac, Transpac, Datex-P, Telepac	No
Micro860	Async	No	No	No	No	—
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Transpac, Uninet, Datapac, others	83B3
3670 Model 85	Yes	Yes	Yes	Yes	GTE Telenet, Tymnet, Uninet, Transpac, Datapac, Datex-P, UKPSS	—
3690 (A5-E5, T1-U1)	Yes	Yes	Yes	Yes	Yes	83B3
721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
5620	Yes	Yes	Yes	Yes	Yes	—
NTX						
3800 Model 1	No	Yes	No	No	No	NDLC (extended HDLC)
3800 Model 2	No	No	No	No	No	NDLC (extended HDLC)
Paradyne						
Pix/Pixnet	Yes	No	No	Paradyne SDLC	No	—
Pixnet—XL	No	No	No	HDLC, LAPD	—	—
Periphonics						
VoiceBox	Yes	Yes	Yes	No	No	—
Sperry						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Yes	REM1, NTR
Telefile						
Telepac	Yes	Yes	Yes	No	All major U.S. and European networks	—
Telematics						
Net 25	Yes	No	No	Yes	Yes	—
Series 500, 1000, 2000	Yes	No	No	Yes	Yes	—
Tymnet						
Micro-Engine	Yes	Yes	Yes	Yes	Yes	VIP-7700, Telex, TI-Net, X.PC, Wang, DDCMP, UTS-400
Mini-Engine	Yes	Yes	Yes	Yes	Yes	VIP-7700, Telex, TI-Net, X.PC, Wang, DDCMP, UTS-400
Engine	Yes	Yes	Yes	Yes	Yes	VIP-7700, Telex, TI-Net, X.PC, Wang, DDCMP
Tymnet ATC	Yes	No	No	No	No	None

**Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.*

intelligent virtual circuit switch, the first functional communications processor.

A later development in minicomputer applications created the distributed processor, a small computer, dedicated to part of a larger application, that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications handling under software control. Indeed, network architectures from such minicomputer vendors as Digital Equipment Corporation and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the increasing cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures, and to a large extent, made such architectures possible.



NCR Comten's 5620 can handle up to 32 communications lines and channel attaches to one or two IBM or NCR host computers. A fully configured Comten 5620 consists of a CPU, two communications subsystems, a channel interface unit for host connection, and a fixed disk drive.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing, and of the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

One further development produced the communications processor as we know it today: the microprocessor. The advent of cheap silicon intelligence allows designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger and more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization each is to use. Some newer systems are composed entirely of redundant, microprocessor-controlled modules, each of which can perform any of the functions of any other with the proper software load; such a processor is actually a distributed communications network in a box.

The advent of the microprocessor has also begun to blur the distinction between traditional communications processors and less broadly functional devices such as multiplexers and terminal controllers, and has created a new class of intelligent protocol converters dedicated to a task that was once economical only as a function within a multifunctional communications controller. Now, even modems can detect, report, and in some cases correct transmission errors, and sense the conditions of transmission lines. The old definition of a communications processor as a computer that has been programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3725.

In answer to this shifting definition, Datapro offers a section in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS, Tab C23, entitled Protocol Conversion Systems. In this section, the reader will find information on many product categories formerly covered in this report: protocol converters, intelligent terminal controllers (with conversion capabilities), and PADs, to name three. To complement the C23 section, we have sharpened the focus of this C13 report to include only true, multifunctional communications processors.

ADVANTAGES AND RESTRICTIONS

The principal advantage of a communications processor as a networking tool is the physical and logical separation of the networking function from the application of its end users. Whatever its architecture, such a network can function for any application, can grow in size without qualitative change to accommodate new applications, and can

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accommodate new applications through the installation of relatively standard, intelligent components. In simpler terms, the user does not have to redesign and rebuild a modular network to accommodate a change in the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they can accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design can survive several breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

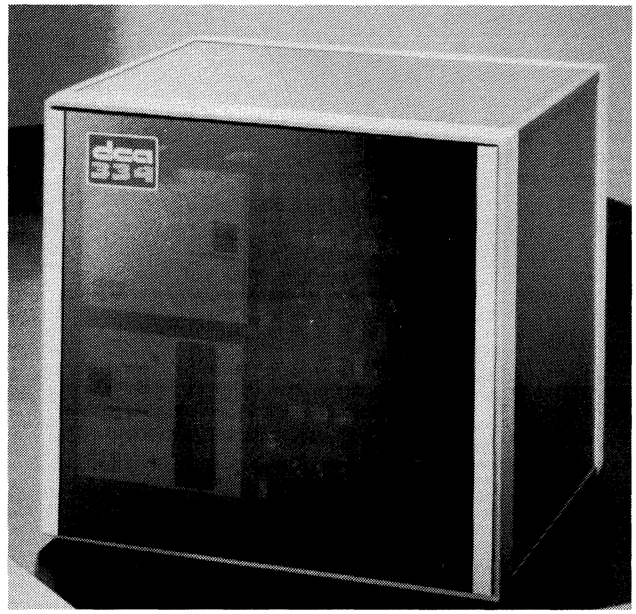
In operation, a network controlled by communications processors can survive the total failure of one or more of its host processors. In a multihost network, front-end processors can switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows for a graceful degradation of service in the event of a host failure, perhaps allowing users time to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

Also in operation, the communications processor still fulfills its original purpose; relieving the host of the overhead generated in keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid 1970s when the first communications processors appeared, and thanks to the ever lower cost of memory and processing power, some of today's communications processors are bigger, faster, and more powerful than that era's mainframes. They need to be.

Among the restrictions of today's communications processors are complexity and incompatibility. In an era of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer should meddle. Most require that their programs be written in an arcane, assembler-level language, sometimes with the benefit of pregenerated macros in the host access method, often without.

Even with recent advances in simplicity and modularity, configuring a communications processor to suit a specific network or application can be difficult. With today's microprocessor technology, the better communications processors are the simpler; as an example, IBM's 3725 Communication Controller sports a parts list only half as long as that of the older 3705. The trend is toward fewer components each of which can do more, but most communications processors are still lagging a bit behind that trend.

Despite the advent of open architectures and the impending arrival of truly standard protocols, the integration of terminals, computers, and protocols foreign to a given vendor's architecture remains difficult. The gateway function is a plus, but it is cumbersome and often expensive.



DCA's System 334 Bisync Network Processor lets users at a remote IBM 3270 Information Display System terminal, or equivalent, communicate with an IBM host computer. The System 334 supports alternate routing, network switching, and port contention.

Most vendors are beginning to offer some level of IBM compatibility through their communications processors, but balk at anything beyond concession to the obvious market leader.

THE CURRENT MARKETPLACE

The market for full-scale communications processors can be broken down into four segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; packet-switching processors marketed as components of large, vendor-independent private networks; and intelligent concentrators designed to serve in transparent network architectures.

In the IBM world, IBM sells 90 percent of the communications processors. The remaining 10 percent accounts for some of the most intense competition in data communications. Within that market, NCR Comten is the clear leader, followed by Amdahl, Computer Communications Inc., and NTX.

The other mainframe vendors, Burroughs, Control Data, Honeywell, NCR, and Sperry do not really compete with one another in the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Honeywell's Datanet 8 line features a broad array of compatibility software. Sperry's DPC Series goes farther than most in providing host-independent networking.

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KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS

The comparison charts that follow this report list the major characteristics of 70 commercially available communications processors. The text below explains the chart entries, in order of their appearance on the charts.

Computer systems interfaced. For processors that serve IBM and plug-compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug compatibles. For processors operating in open network architectures, we list "Most major vendors."

Functional Configurations

Front-end Processors. A "yes" for this entry indicates that the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously. A third entry lists the degree of IBM emulation the processor can perform.

Remote line concentrator. A "yes" for this entry indicates that the processor in question can serve as a line concentrator remote from any host processor in its network. The entry below lists the number of hosts that concentrator can serve at one time.

Host-independent network processor. A "yes" for this entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Store-and-forward message switching processor. A "yes" for this entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Distributed processing node. Most true communications processors are not able to perform applications processing; however, some, including a few intelligent concentrators, can support some distributed applications in addition to their principal networking function. This class of communications processor is becoming rarer.

Terminal controller. A "yes" for this entry indicates that the processor in question can function as a terminal controller within its architecture.

Network architecture compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device, or it may support the prearchitectural protocols of the vendor(s) whose hosts it supports.

Communications line capacity. The five sections of this entry all deal with the number of lines a communications processor can support within specific ranges of data rates. The first three list the maximum number of **half-duplex** communications lines the processor can support within the three specified speed ranges. The fourth lists the highest data rate the processor can support. The fifth lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

Communications Features/Functions

Entries under this heading list a number of major functions a communications processor can perform, but that not all communications processors **do** perform.

Multiplexing/demultiplexing. A "yes" for this entry indicates that the processor in question can function as a multiplexer.

Terminal-initiated application switching. A "yes" for this entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications processor initiated dynamic line reconfiguration. Dynamic line configuration is another name for fallback switching. A "yes" for this entry indicates that the processor in question can switch a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure, without operator intervention.

Protocol conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error control. This entry specifies which of the available schemes for error detection (e.g., Parity, LRC, or CRC) the processor in question uses.

Automatic transmission speed detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic disconnect of inactive dial-up terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

System Characteristics

Processor type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Main memory word size, bits. In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main memory storage capacity, bytes. This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a time-shared or interrupt basis.

Level of data unit transferred across I/O channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte, or block).

Type of data transfer supported between memory and a) communications lines, b) mass storage, and c) other peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components have share control of main memory with the CPU, and

All About Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS (Continued)

can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, backup, and diagnostic peripherals supported. Most communications processors interact only with their attached hosts and terminals, and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information, and feature diagnostic consoles for direct operator intervention.

Support for remote console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Communications Operating Software

Operating system implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) onboard the processor, or in some combination of these.

IPL method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from onboard read-only memory.

Additional software supported. This entry lists any network control or applications software that the processor in question can support.

User programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native assembler language.

Software separately priced. This entry shows to what extent the communications processor's operating software is bundled with the cost of the hardware.

Approximate proportion of currently installed systems supplied as turnkey systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

Pricing and Availability. Entries under this header list purchase, lease (or rental) and maintenance pricing for minimum and maximum configurations, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product.

Among vendors of private networks, the two U.S. public network leaders, Tymnet and GTE Telenet have solid offerings. Amnet also offers a line of packet-switching processors.

A number of vendors offer intelligent concentrators, often at the high ends of lines of statistical multiplexers. Among these are Infotron, Micom, and DCA.

Datapro sent requests to over 30 firms known or believed to manufacture communications processors. *The absence of any company from the charts means that the company either failed to respond to our request by the deadline, was unknown to us, or chose not to be listed.* The Key to Communications Processors Comparison Charts provides a complete description of the comparison chart entries.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose communications products are shown in the comparison charts that follow.

Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

Amnet, Inc., 1885 Worcester Road, Framingham, MA 01701. Telephone (617) 879-6306.

Burroughs Corporation, Burroughs Place, Detroit, MI 48232. Telephone (313) 972-7000.

Cableshare, 20 Enterprise Drive, P.O. Box 5880, London, Ontario, Canada N6A 4L6. Telephone (519) 686-2900.

Century Analysis, 80 Berry Drive, Pacheco, CA 94553. Telephone (415) 680-7800.

CHI Corporation, 26055 Emery Road, Cleveland, OH 44128. Telephone (216) 831-2622.

Computer Communications Inc., 2610 Columbia Street, Torrance, CA 90277. Telephone (213) 320-9101.

Control Data Corporation, 8100 34th Avenue South, Minneapolis, MN 55420. Telephone (612) 853-8100.

Digital Communications Associates, Inc. (DCA), 1000 Alderman Drive, Alpharetta, GA 30201. Telephone (404) 442-4000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, MA 02154. Telephone (617) 895-6000.

Icot Corporation, P.O. Box 5143, San Jose, CA 95150-5143. Telephone (408) 433-3300.

Infotron Systems Corporation, 9 North Olney Avenue, Cherry Hill, NJ 08003. Telephone (609) 424-9400.

International Business Machines Corporation, Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, AZ 85029. Telephone (602) 944-1543.

M/A-COM Telecommunications Div., Comm. Network Group, 11717 Exploration Lane, Germantown, MD 20874. Telephone (301) 428-5500.

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Micom Systems, Inc., P.O. Box 8100, Simi Valley, CA 93062-8100. Telephone (805) 583-8600.

NCR Comten, 2700 Snelling Avenue North, St. Paul, MN 55113. Telephone (612) 638-7777.

NTX Communications Corporation, 508 Tasman Drive, Sunnyvale, CA 94089. Telephone (408) 747-1444.

Paradyne Corporation, 8550 Ulmerton Road, Largo, FL 33540. Telephone (813) 530-2000.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, NY 11716. Telephone (516) 467-0500.

Sperry Corporation, Computer Systems Division, P.O. Box 500, Blue Bell, PA 19424. Telephone (215) 542-4011.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, CA 92714. Telephone (714) 557-6660.

Telematics International, Inc., Crown Center, 1415 NW 62nd Street, Fort Lauderdale, FL 33309. Telephone (305) 772-3070.

Tri-Data, 505 East Middlefield Road, Mountain View, CA 94039-7505. Telephone (415) 969-3700.

Tymnet—McDonnell Douglas Network Systems Company, 2710 Orchard Parkway, San Jose, CA 95134. Telephone (408) 946-4900. □

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SUPPLIER AND MODEL	Amdahl 4705E	Amdahl 4705T	Amnet N6000/XAS	Amnet N6000/XPS
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All IBM- and Amdahl-compatible mainframes	All IBM- and Amdahl-compatible mainframes	Most vendors	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	6	6	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	4	4	Does not apply	Does not apply
IBM emulation	270X/370X, EP, NCP, ACF	270X/370X, EP, NCP, PEP	Does not apply	Does not apply
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	112	1,024
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA	SNA	OSI X.25	OSI X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	352	FEP-352, High speed-384	112	1,024
2000 to 9600 bps	352	FEP-352, High speed-384	112	1,024
Over 9600 bps	Application-dependent	Application dependent	28	256
Highest line speed supported (bps)	64K	2.048M bps	64K	64K
Effect on line capacity, if all lines are full-duplex	Capacity halved	High speed section-none FEP section-halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes-via Commpro	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	S/S, BSC, SDLC to X.25	No	Yes	Yes
Code conversion	ASCII/EBCDIC via soft.	ASCII to EBCDIC	Yes	Yes
Error control	LRC and CRC	LRC and CRC	Yes	Yes
Automatic transmission speed detection	50-9600 bps via soft.	50 to 9600 bps	PAD	PAD
Automatic disconnect of inactive dial-up terminals	Yes	Yes	PAD	PAD
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Multi-microprocessor	Multi-microprocessor
Main memory word size, bits	18	18	16	16
Main memory storage capacity, bytes	1024K	To 1024K	Up to 1M	Up to 4M
Level of data unit transferred across I/O channel	Byte or Block	Byte or block	Byte & block	Byte & block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	None	—	DMA and Interrupt	DMA and Interrupt
Other peripherals	None	—	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette (diagnostic)	Diskette (diagnostic), console-via Commpro	Yes	Yes
Support for remote console	No	Yes, via Commpro	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	Download from host	Downline load from host	Local & remote IPL	Local & remote IPL
Additional software supported	Comm-pro, UTS/F (Unix)	Commpro	Utilities	Utilities
User programmability	Yes	Yes	Yes/restricted	Yes/restricted
Software separately priced	Yes	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	All	100 percent	Does not apply	Does not apply
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	52,600	67,000+	25,000	75,000
Monthly maintenance, $	375	475+	Contact vendor	Contact vendor
Monthly lease/rental, $	2,385 (2-yr. lease)	3,000+ (2-yr. lease)	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	350,000+	375,000+	100,000+	1,000,000
Monthly maintenance, $	800+	900+	Contact vendor	Contact vendor
Monthly lease/rental, $	16,000+ (2-yr. lease)	17,600+ (2-yr. lease)	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	Inform. not available	Inform. not available
Date of first delivery	April 1983	1986	1985	1985
Number of systems installed to date	800	6	20	10+
Serviced by	Amdahl	Amdahl	Amnet	Amnet
COMMENTS	Remote load via comm. line; operates with IBM 3705 and 3705/Commpro software, with up to 2.4 times the 3705 throughput capacity.	Remte load via comm lne basic. same as 4705E; can support up to 4 high-speed links at up to 2.048M bps ea., high speed links can multiplex data from IBM host w/ ext. data/dig. voice opt. satellite buffing.	Dynamic packet routing Dist. Net. Mgmt. Autocall.	Redundant hardware, Dist. Net. Mgmt. Autocall, Dynamic routing.

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SUPPLIER AND MODEL	Amnet N6000/XTS	Burroughs CP3680/ CP3680-01	Burroughs CP9558-1	Burroughs CP9585
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Burroughs B2000, B3000, B4000 Series	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	4	—	15
Max. no. of active hosts supported simultaneously	Does not apply	4	—	15
IBM emulation	Does not apply	No	—	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	512	4	12	—
Host-independent network processor	Yes	No	Yes	Yes
Store-and-forward message switching processor	No	Yes	Yes	Yes
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	OSI X.25	—	BNA, SNA	BNA, SNA, X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	512	288 async, 72 sync	47	—
2000 to 9600 bps	512	40	—	—
Over 9600 bps	128	40	12	—
Highest line speed supported (bps)	64K	19.2K	19.2K	56K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	—	—	—
Terminal-initiated applications switching	Yes	—	—	—
Comm. processor-initiated dynamic line reconfig.	Yes	—	—	—
Protocol conversion	Yes	Yes	—	—
Code conversion	Yes	Yes	ASCII to EBCDIC	ASCII to EBCIC
Error control	Yes	—	—	Yes
Automatic transmission speed detection	PAD	—	No	No
Automatic disconnect of inactive dial-up terminals	PAD	—	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Multi-microprocessor	—	CP9558P	CP 9585
Main memory word size, bits	16	—	16; multiprocessors	16
Main memory storage capacity, bytes	Up to 2M	—	1.2M	—
Level of data unit transferred across I/O channel	Byte and block	—	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA	DMA
Mass storage	DMA and Interrupt	DMA	DMA	DMA
Other peripherals	DMA and Interrupt	—	—	—
I/O, back-up, and diagnostic peripherals supported	Console, printer, disk	—	Mag. tape, floppy and hard disk	Mag. tape, floppy and hard disk
Support for remote console	Yes	—	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination software and firmware	Combination software and firmware	Software and firmware
IPL method	Local and remote IPL	Download from host	—	Internal self load
Additional software supported	Utilities	NDL, DCS	Internal selfload	—
User programmability	Yes, on restricted basis	Yes, via user selected parameters	Yes	Yes
Software separately priced	Yes	All	Yes	—
Approx. proportion of currently installed systems supplied as turnkey systems	Does not apply	75 percent	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	64,050 (3680)	15,000	40,739
Monthly maintenance, $	Contact vendor	535	210	217
Monthly lease/rental, $	Contact vendor	2,415 (3-yr. lease)	1,051	1,560 (3-yr. lease)
Maximum practical configuration:				
Purchase price, $		124,950 (3680 + -01)	29,401	81,635
Monthly maintenance, $	500,000	1,010	200	632
Monthly lease/rental, $	Contact vendor	2,310 (3-yr. lease)	1,033 (3-yr. lease)	3,494 (3-yr. lease)
Is maintenance bundled with lease/rental?	Inform. not available	—	Yes	Yes
Date of first delivery	January 1983	January 1978	October 1980	1985
Number of systems installed to date	12	300	1,000	200
Serviced by	Amnet	Burroughs	Burroughs	Burroughs
COMMENTS	Dynamic routing Distributed Net Management Autocall.	Redundant system.		—

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SUPPLIER AND MODEL	Cableshare CSI Data Concentrator	Cableshare LSI-X.25 Front-End Processor	Cableshare LSI-X.25 Host Port Concentrator	Cableshare LSI-X.25 Intelligent Concentrator
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All computers using ASCII serial communication ports	DEC PDP-11 and VAX	All hosts supporting async communications	All async terminals
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	16	1	32 async channels	32 async channels
Max. no. of active hosts supported simultaneously	16	1	32	32
IBM emulation	No	No	No	No
Remote line concentrator	Yes	No	Yes	Yes
Maximum no. of hosts served by one concentrator	16	1	32	32
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	X.25	X.25, OSI	X.25, OSI	X.25, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	16	127	32	32
2000 to 9600 bps	16	127	32	32
Over 9600 bps	16	127	32	32
Highest line speed supported (bps)	56K	19.2K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	Halved	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	No	No	No
Comm. processor-initiated dynamic line reconfig.	No	No	No	No
Protocol conversion	Async to X.25	Async/X.25	Async/X.25	Async/X.25
Code conversion	None	1	Baudot/ASCII	Baudot/ASCII
Error control	X.25 procedures	Inform. not available	Inform. not available	—
Automatic transmission speed detection	Yes	No	Yes, 110-9600 bps	Yes, 110-9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 8088	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	192K	64K	64K	64K
Level of data unit transferred across I/O channel	Block	Block	Infor. not available	Inform. not available
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	Inform. not available	Inform. not available
Mass storage	None	None	Inform. not available	Inform. not available
Other peripherals	None	None	Inform. not available	Inform. not available
I/O, back-up, and diagnostic peripherals supported	Console	FEP console	Console	Console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software and firmware	Software	Software	Software
IPL method	Internal self load	Download from host	Internal self load	Internal self load
Additional software supported	None	None	None	None
User programmability	Yes, via user selected parameters	No	No	No
Software separately priced	None	Inform. not available	Inform. not available	Inform. not available
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	3,000	13,450	Contact vendor	Contact vendor
Monthly maintenance, $	None	100	70	70
Monthly lease/rental, $	Not available	None	None	None
Maximum practical configuration:				
Purchase price, $	5,600	16,450	Contact vendor	Contact vendor
Monthly maintenance, $	None	125	100	100
Monthly lease/rental, $	Not available	—	—	—
Is maintenance bundled with lease/rental?	No	—	—	—
Date of first delivery	June 1983	November 1978	March 1980	March 1980
Number of systems installed to date	No	75	25	125
Serviced by	Cableshare	Digital Equipment Corp.	Digital Equipment Corp.	Digital Equipment Corp.
COMMENTS	—	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration.	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration.	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration.

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SUPPLIER AND MODEL	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor CCP/3205	Chi Communications Processor CCP/3205P	Chi Communications Processor CCP/3210
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	DEC PDP Series, NCR Century & Criterion	Sperry 1100 Series	Sperry 1100 Series	Sperry 1100 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	None	8	2	8
Max. no. of active hosts supported simultaneously	Multiple	8	2	8
IBM emulation	No	No	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Multiple	Unlimited	Unlimited	Unlimited
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	Yes	X.25	X.25	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	24	Over 1000	24	Over 1,000
2000 to 9600 bps	24	300	24	500
Over 9600 bps	24	150	24	230
Highest line speed supported (bps)	19.2K	64K	64K	64K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Planned	Async/uniscope, 3270/as	Async to uniscope	Async/unisc.; 3270/asyn
Code conversion	Planned	ASCII/EBCDIC/XS3	ASCII/EBCDIC/XS3	
Error control	Yes	LRC, BCC, CRC	LRC, BCC, CRC	ASCII/EBCDIC/XS3
Automatic transmission speed detection	No	Yes, 110-19.2K bps	Yes, 110-19.2K bps	LRC, BCC, CRC
Automatic disconnect of inactive dial-up terminals	No	Site option	Site option	Yes, 110-19.2K bps
SYSTEM CHARACTERISTICS				
Processor	CA-108/116/124	Perkin Elmer 3205	Perkin Elmer 3205	Perkin Elmer 3210
Main memory word size, bits	16	32	32	32
Main memory storage capacity, bytes	1M	1M (stnd.), up to 4M	1M stand., up to 4M	0.5M stand. (up to 4M)
Level of data unit transferred across I/O channel	Block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Other peripherals	Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	FEP Console	FEP console, diskette, patch panel	FEP console, diskette, patch panel	FEP console, diskette, patch panel
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software and firmware	Combination of software and firmware	Combination of hardware and software
IPL method	Download from host	Host/diskette/self-load	Host/diskette/self-load	Host/diskette/self-load
Additional software supported	—	Development, communications	Dev., communications	Dev., communications
User programmability	Via user-selected parameters	Yes, user-selected parameters	Yes, user selected parameters	Yes, user selected parameters
Software separately priced	No	X.25, X780, uniscope terminal	X.25, X780, uniscope terminal emulation	X.25, X780, uniscope terminal emulation
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	6,500	50,000	35,000	85,000
Monthly maintenance, $	Software 25; h/w 150	600	300	750
Monthly lease/rental, $	—	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	10,950	250,000—500,000	50,000	500,000+
Monthly maintenance, $	Software 25; h/w 150	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	—	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	December 1985	1977	1985	1983
Number of systems installed to date	798	85	3	4
Serviced by	CAI	Chi Corporation	Chi Corporation	Chi Corporatation
COMMENTS	CAI implementation uses Motorola 68000, flow control, load leveling, raw line class selection, error correction, terminal key-ahead buffering.	Standard version communications processor; dynamic routing two async screen editors; automatic terminal protocol detection; redundancy; multiple loc/rem. hosts; UTS sim.; UTS on X.25 netwk	Preconfigured, entry-level comm. processor; dynamic routing; two async screen editors; auto. term. protocol detection; redundancy; mult. local/remote hosts; UTS simulation; UTS siml. on X.25 netwk	High-speed version, fully expandable; dynamic routing; 2 async screen editors; auto. terminal protocol detection; redundancy; mult. loc/remote hosts; UTS simulation; UTS on X.25 networks.

All About Communications Processors

SUPPLIER AND MODEL	Computer Communications CC-6F	Computer Communications CC-8	Computer Communications CC-80/85	Computer Communications CCI-8400 V 2.0
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and comptatibles	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	4	7	4
Max. no. of active hosts supported simultaneously	2	4	7	4
IBM emulation	370X/37X5 EP	370X/37X5 EP	370X/37X5 EP	CTCA
Remote line concentrator	No	No	No	No
Maximum no. of hosts served by one concentrator	Does not apply	Does not apply	Does not apply	Does not apply
Host-independent network processor	No	No	Yes	No
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	No	No	No	—
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	240	1232	—
2000 to 9600 bps	32	120	120	—
Over 9600 bps	4	32	120	—
Highest line speed supported (bps)	56K	230.4K	230.4K	—
Effect on line capacity, if all lines are full-duplex	None	None	None	—
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	No
Terminal-initiated applications switching	Yes	Yes	Yes	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	No	No
Code conversion	Yes	Yes	Yes	No
Error control	Parity, LRC, and CRC	Parity, LRC and CRC	Parity, LRC and CRC	Native HDLC
Automatic transmission speed detection	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	NO
SYSTEM CHARACTERISTICS				
Processor	CCI 601	CCI 801	CCI 8001/8501	Mult. 8809, 8089, 68000
Main memory word size, bits	16	16	16	8
Main memory storage capacity, bytes	64K	64K	256K	512K-1M
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte, block, selector
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Mass storage	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	—
I/O, back-up, and diagnostic peripherals supported	FEP CRT console, diskette, printer	FEP CRT console, diskette, printer	Disk (40-200MB), mag tape, FEP CRT, printer	Diskette, supervisory console, display unit
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	From host/diskette	From host/diskette	From host/disk	Host, manual diskette
Additional software supported	Value added options, assembler, utilities, diagnostics	Value added options assembler loader, utilities, diagnostics	Value added options, custom software, assembler, loader, utilities	—
User programmability	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes
Software separately priced	Value added options	Value added options	Options and custom sys.	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	90 percent	95 percent	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	17,900	39,840	68,000/115,640	55,965
Monthly maintenance, $	150	296	246/426	369
Monthly lease/rental, $	630	1,224 (3-yr.); 1,600 (rental)	1,932 (3-yr. lease)	1,552 (3-yr. lease)
Maximum practical configuration:				
Purchase price, $	Contact vendor	181,200	674,050	99,908
Monthly maintenance, $	Contact vendor	1,593	3,344	699
Monthly lease/rental, $	Contact vendor	5,858 (3-yr.); 7,635 (rental)	17,523 (3-yr. lease)	2,990 (3-yr. lease)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	Yes
Date of first delivery	November 1981	1976	1975	January 1986
Number of systems installed to date	30	270	432	8
Serviced by	Computer Communications	Computer Communications	Computer Communications	Computer Communications
COMMENTS	Auto-poll, autobaud rate detect, autodial, single IOP support, off line utility, flow control, async line interface support; host load diskless system.	Auto poll, autobaud rate detect, speed and code conversion, auto dump, autoload, multi host support, terminal initiated line sel., etc.	Used mainly for custom store-and-forward message switches, electronic mail, and high-speed transaction processing systems (e.g., airline reservations).	T1 processor for bulk file data transfer; simultaneously attached to pre-SNA/SNA hosts; transparent passthrough no host softwr. changes to OS; local/remote console for system mon. diag., config.

All About Communications Processors

SUPPLIER AND MODEL	Control Data 2551-3	Control Data 2551-4	Digital Communications Associates System 355	Digital Communications Associates System 335
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	CDC Cyber 170, CDC Cyber 180, Cyber 70, Cyber 6000 Series	CDC Cyber 170, CDC Cyber 180, Cyber 6000 Series, Cyber 70	Most vendors	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	DEC-10	No
Max. no. of hosts channel-attachable to front-end	2	2	66	Does not apply
Max. no. of active hosts supported simultaneously	1	1	2855+	276
IBM emulation	No	No	Yes	Yes
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	8	8	124	20
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network architecture compliance	Yes	Yes	INA/X.25/SNA	INA/X.25./SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	254	44 trunks, 120 lines	4 trunks, 40 lines
2000 to 9600 bps	32	254	44 trunks, 120 lines	4 trunks, 40 lines
Over 9600 bps	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	22 trunks, 110 lines	2 trunks, 76 lines
Highest line speed supported (bps)	56K	56K	72K	72K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	Async/X.25	Async to X.25
Code conversion	Yes	Yes	No	No
Error control	Yes	Yes	Yes-CRC	Yes—CRC
Automatic transmission speed detection	Yes; 100 to 1200 bps	Yes; 100 to 1200 bps	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CDC 2551-3	CDC 2551-4	Z80A/B, M68K	Z80A/B, M68K
Main memory word size, bits	16	16	8	8
Main memory storage capacity, bytes	256K	256K	2136K	1280K
Level of data unit transferred across I/O channel	Byte and control	Byte and control	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	None	None	Interrupt	Interrupt
Other peripherals	DMA and Interrupt	DMA and Interrupt	Interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	Console, cassette	Console, cassette	Dual floppy disk; disk; diagnostics built-in	Dual floppy disk; disk; diagnos. built-in
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of firmware and software	Combination of software and firmware	Software	Software
IPL method	Download from host	Download from host	Internal self-load	Downline/int. self-load
Additional software supported	None	None	Configuration generator	Configuration generator
User programmability	Yes	Yes	Yes; via user selected parameters/programs	User-selected parameters; programs
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	98 percent	98 percent	5 percent	5 percent
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	36,955	48,648	12,000 and up	6,795
Monthly maintenance, $	433	483	Contact vendor	Contact vendor
Monthly lease/rental, $	1,067 (3-yr. lease)	1,403 (3-yr. lease)	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	68,570	157,478	144,145	27,925
Monthly maintenance, $	751	483	Contact vendor	Contact vendor
Monthly lease/rental, $	2,048 (3-yr. lease)	5,093 (3-yr. lease)	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	No	Contact vendor	Contact vendor
Date of first delivery	January 1983	January 1983	October 1980	1983
Number of systems installed to date	Inform. not available	Inform. not available	Inform. not available	Inform. not available
Serviced by	Control Data Corp.	Control Data Corp.	DCA, third party	DCA, third party
COMMENTS	Predecessor was 2550 products, first shipped in 1976.	Predecessor was 2550 product, first shipped in 1976.	Supports host selection port contention, full line and modem control facilities; handles up to 44 high-speed trunk lines; symmetric multiproc.	Supports host selection, port contention, full line and modem control facilities. Functions with 1 to 4 trunks.

All About Communications Processors

SUPPLIER AND MODEL	Digital Communications Associates System 375	Digital Communications Associates System 330	Digital Communications Associates System 332	Digital Communications Associates System 334 Bisync
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Most vendors	Most vendors	IBM and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	DEC-10	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	87	Does not apply	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	7301	141	268	500
IBM emulation	Yes	No	No	3274, 37X5 FEP
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	124	27	25	12
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	Does not apply
Network architecture compliance	INA/X.25/SNA	INA, X.25	INA, X.25	INA, 3270 BSC, X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	114 trunks, 120 lines	28	26	14
2000 to 9600 bps	114 trunks, 120 lines	28	26	14
Over 9600 bps	57 trunks, 110 lines	Does not apply	Does not apply	8
Highest line speed supported (bps)	72K bps	19.2K	72K	72K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async/X.25	Async to X.25	Async to X.25	3270 to X.25
Code conversion	No	No	No	No
Error control	Yes-CRC	CRC	CRC	CRC
Automatic transmission speed detection	110 - 9600 bps	110-9600 bps	110-9600 bps	Does not apply
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Z80A/B, M68K	Z80B	Z80B/M68K	Z80B/M68K
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	11M	192K	640K	1024K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	Interrupt	Interrupt	Interrupt	Interrupt
Other peripherals	Interrupt	Interrupt	Interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	Dual call. tape unit; disk diag. built-in	Diagnostics built-in, console, diskette	Diagnostics built-in, console, diskette	Diagnostics built-in, console, diskette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	Internal self-load	Internal self-load	Internal self-load	Internal self-load
Additional software supported	Configuration generator	Does not apply	Does not apply	Does not apply
User programmability	Yes, via user-selected parameter programs	Yes, via user selected parameters	Yes, via user selected parameters	Yes, via user selected parameters
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	25 percent	Does not apply-new product	Does not apply-new product	Does not apply-new product
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	16,995	See comments	See comments	See comments
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	234,165	—	—	—
Monthly maintenance, $	Contact vendor	—	—	—
Monthly lease/rental, $	Contact vendor	—	—	—
Is maintenance bundled with lease/rental?	Contact vendor	No	No	No
Date of first delivery	December 1984	—	—	—
Number of systems installed to date	Inform. not available	—	—	—
Serviced by	DCA, third party	DCA	DCA	DCA
COMMENTS	Diagnostics plus error checking; X.25 gateway interface; advanced features software; full transparency, data concentration; host select ion, and camp-on network management.	$6,495—10 ports; $8,495—26 ports; Drop-and-insert; host selection, port contention; full line and modem control facilities; alternate routing.	$9,995—12 ports; $10,995—24 ports; Drop-and-insert; host selection, port contention; full line and modem control facilities; alternate routing.	$14,995—4 ports; $17,495—8 ports; $19,995—12 ports; User-initiated terminal session switching; port contention; alternate routing; drop-and-insert.

All About Communications Processors

SUPPLIER AND MODEL	Honeywell Information Systems Datanet 8*	ICOT Corporation 254	ICOT Corporation 257	Infotron 990NP Network Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Honeywell DPS 88, DPS 8, and DPS7	ICOT 254	ICOT 257	—
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	4	No	No	None
Max. no. of active hosts supported simultaneously	4	8	28	Over 10 hosts
IBM emulation	Yes	3270 BSC, SNA/SDLC	3270 BSC, SNA/SDLC	3270 BSC
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	4	8	28	Over 10 hosts
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	Honeywell DSA (ISO)	SNA, BSC, NCR	SNA, BSC, NCR	Proprietary
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128		—	640
2000 to 9600 bps	Load-dependent		—	From 320 to 124
Over 9600 bps	Load-dependent	8 (all sync)	28 (all sync)	Does not apply
Highest line speed supported (bps)	56K	—	19.2K bps	56K bps
Effect on line capacity, if all lines are full-duplex	Load-dependent	28	28	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes (by host program)	No	No	Yes (async)
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Yes	Yes	No
Code conversion	No	Yes	Yes	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Yes; 110, 300, 1200 bps	No	No	Yes (Up to 9600 bps)
Automatic disconnect of inactive dial-up terminals	Yes; optional, variable	No	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Datanet 8 (Honeywell)	Multi-Intel 8088	Intel 8088	6502/8086/80186
Main memory word size, bits	16	128K bytes	128K bytes	—
Main memory storage capacity, bytes	1536K	128K bytes	128K bytes	—
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Does not apply
Type of data transfer supported between memory and:				D
Communications lines	Async bus	Interrupt	Interrupt	DMA and Interrupt
Mass storage	Async bus	Mail box	Mail box	Does not apply
Other peripherals	Async bus	—	—	Does not apply
I/O, back-up, and diagnostic peripherals supported	Console, diskette	Host console	Host console	Console/diskette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Firmware	Firmware	Combination firmware & software
IPL method	Host, local, or VIP	Download from host	Download from host	EEPROM
Additional software supported	Additional on host for administrative and control	No	No	Does not apply
User programmability	Yes, via user selected parameters	Yes, via user selected parameters	Yes, via user selected parameters	Yes, via console
Software separately priced	All	No	No	Some
Approx. proportion of currently installed systems supplied as turnkey systems	Software is customer installable	100 percent	100 parameters	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	42,565	5200 and up	7,200 and up	20,000
Monthly maintenance, $	259	—	—	Contact vendor
Monthly lease/rental, $	1,432 (5-yr. lease)	—	—	Contact vendor
Maximum practical configuration:				
Purchase price, $	210,465	15,000	30,000	100,000
Monthly maintenance, $	1,138	—	—	Contact vendor
Monthly lease/rental, $	7,615 (5-yr. lease)	—	—	Contact vendor
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	1981	1981	1981	1984
Number of systems installed to date	Over 1000	—	—	2,000
Serviced by	Honeywell	ICOT, third party w/NCR	ICOT, third party w/ NCR	Infotron
COMMENTS	*1985 information.	IBM 2780/3780 BSC emulation.	2780/3780 BSC emulation	The 990NP provides adaptive routing; comprehensive network management features; bisync emulation (remote polling); X.25 gateway support; Async/BSC/BOP/SDLC support.

All About Communications Processors

SUPPLIER AND MODEL	IBM 3705-II Models E1 through L4*	IBM 3705-80 Models M81 through M83	IBM 3725	Lemcom Systems CMC-4
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, and 43XX; S/360 in 270X emulation mode only	IBM S/370, 30XX, and 43XX; S/370 in 270X emulation mode only	IBM S/370 (except models 115 and 125), 303X, 308X, 43XX	IBM S/360, S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	2	8	1
Max. no. of active hosts supported simultaneously	4	2	8	1
IBM emulation	270X/370X	270X/370X	270X and 3705 with EP	270X, 370X, EP
Remote line concentrator	Yes	No	Yes	No
Maximum no. of hosts served by one concentrator	1	Does not apply	8	Does not apply
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA	SNA	SNA	Does not apply
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	352	16	256 with 3726 expansion	4
2000 to 9600 bps	352	16	256 with 3726 expansion	4
Over 9600 bps	32	Inform. not available	128 with 3726 expansion	3
Highest line speed supported (bps)	230.4K	57.6K	230.4K bps	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	Yes	No
Terminal-initiated applications switching	No	No	No	No
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	No
Protocol conversion	Yes	Yes	Yes	No
Code conversion	Yes	Yes	Yes	Yes
Error control	LRC and CRC	LRC and CRC	LRC and CRC	Yes
Automatic transmission speed detection	Yes, via optional soft.	Yes; via optional soft.	Yes, via opt. software	Optional—300, 1200
Automatic disconnect of inactive dial-up terminals	No	No	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Motorola 6800
Main memory word size, bits	18	18	18	8
Main memory storage capacity, bytes	512K	256K	512K—2M	40K
Level of data unit transferred across I/O channel	Block	Block	Block	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Interrupt
Mass storage	DMA	DMA	DMA	None
Other peripherals	DMA	DMA	DMA	None
I/O, back-up, and diagnostic peripherals supported	None	None	FEP console	FEP console
Support for remote console	No	No	Yes, up to 150 meters (492 feet)	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Firmware
IPL method	Download from host	Download from host	Internal self load	Internal self-load
Additional software supported	NCCF, NPDA	NCCF, NPDA	NCCF, NPDA, ACF/NCP-PEP, EP/3725	Problem determination aids
User programmability	Yes	Yes	Yes	User-selected parameters
Software separately priced	Yes	Yes	Yes	Utilities only
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	38,230 (E1)	36,600 (M81)	32,000	14,000
Monthly maintenance, $	147	219	—	Contact vendor
Monthly lease/rental, $	1,635 (2-yr. lease)	1,465 (2-yr. lease); 1,721 (rental)	1,485 (rental)	Contact vendor
Maximum practical configuration:				
Purchase price, $	107,040 (L4)	52,600 (M83)	75,000	20,000
Monthly maintenance, $	447	239	213	Contact vendor
Monthly lease/rental, $	6,290 (2-yr. lease)	2,265 (2-yr. lease); 2,661 (rental	3,485 (rental)	Contact vendor
Is maintenance bundled with lease/rental?	Yes	Yes	No	Contact vendor
Date of first delivery	August 1975	August 1981	1983	March 1977
Number of systems installed to date	50,000	Inform. not available	Inform. not available	335
Serviced by	IBM	IBM	IBM	Various
COMMENTS	*As of 3/3/86, IBM is withdrawing from marketing all models of the 3705-II. Model conversions, upgrades, special features, existing RPQs, etc. will continue to be accepted until 7/23/86.	—	HONE Configurator CF-3725 should be consulted for actual number of operable lines, depending on line speeds, protocols, 3 other variable factors.	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee.

All About Communications Processors

SUPPLIER AND MODEL	Lemcom Systems CMC-8	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series	M/A-COM 9708
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	Most vendors via X.25
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	1	1	64	—
Max. no. of active hosts supported simultaneously	1	1	64	—
IBM emulation	270X, 370X, EP	270X, 370X, EP	270X, 370X, EP	—
Remote line concentrator	No	No	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	Does not apply	64	7
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	Optional	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Optional	No
Network architecture compliance	Does not apply	Does not apply	DMMA	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	8	32	6500	8
2000 to 9600 bps	8	32	1500	8
Over 9600 bps	6	24	250	8
Highest line speed supported (bps)	56K	56K	57.6K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	RPQ	Yes
Protocol conversion	No	No	Yes	No
Code conversion	Yes	Yes	Yes	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Optional—300,1200	Optional-300,1200	110 to 19.2K bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6800	Motorola 6809	Intel 186
Main memory word size, bits	8	8	8	16
Main memory storage capacity, bytes	80K	320K	15M	640K
Level of data unit transferred across I/O channel	Byte	Byte	Byte and block	—
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	None	None	DMA and Interrupt	—
Other peripherals	None	None	DMA and Interrupt	—
I/O, back-up, and diagnostic peripherals supported	FEP console	FEP console	FEP console and bubble memory	Disk, tape, console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Software	Firmware
IPL method	Internal self-load	Internal self-load	Self-/manual-/down-load	Downline load
Additional software supported	Problem determination aids	Problem determination aids	Channel prog. simulator & prob. determin. aids	Remote diagnostics
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	No
Software separately priced	Utilities only	Utilities only	All	Part of full network
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	25 percent	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	16,000	20,000	25,00	Under 10,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	—
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	—
Maximum practical configuration:				
Purchase price, $	30,000	60,000	500,000	Contact vendor
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	—
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	—
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	Contact vendor	—
Date of first delivery	November 1980	March 1979	1981	1986
Number of systems installed to date	65	135	415	—
Serviced by	Various	Various	Various	M/A-COM
COMMENTS	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee.	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts.	Distributed MPU FEP; up to 256 MPUs can be programmed to perform various comm. processing functions; front-end polling, dynamic application selection; and multi-console support available.	Part of M/A-COM's Integrated Packet Network; full network management capability.

All About Communications Processors

SUPPLIER AND MODEL	M/A-COM 9724	M/A-COM DCC CP9000 Series II	Micom Micro800/X.25	Micom Micro 860
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via X.25	Most vendors via communications interface	Most	Most vendors
FUNCTIONAL CONFIGURATIONS		N		
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	—	Does not apply	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	—	Does not apply	Does not apply	Does not apply
IBM emulation	—	Does not apply	Does not apply	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	73	No limit	24	80 channels
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	Yes	No	No
Terminal controller	No	Yes	No	No
Network architecture compliance	X.25	X.25	X.25	Micro 800/proprietary
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	24	640	24	8
2000 to 9600 bps	24	640	24	8
Over 9600 bps	24	640	Inform. not available	8
Highest line speed supported (bps)	64K	64K bps	19.2K bps	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Yes	No	No
Code conversion	No	No	No	No
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	No	No	Yes	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 286 and 186	Intel 186 & 286	Z80A; Z80B	Z80B
Main memory word size, bits	16	16	8	8
Main memory storage capacity, bytes	2M	Over 50MB	64K	64K bytes
Level of data unit transferred across I/O channel	—	Byte, block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	Interrupt	Interrupt
Mass storage	—	DMA	None	Interrupt
Other peripherals	—	—	None	None
I/O, back-up, and diagnostic peripherals supported	Disk, tape, console	Disk, tape, console	Async terminals	Diagnostics built in
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Firmware
IPL method	Downline load	Downline load	Int. self/downline load	Internal self-load
Additional software supported	Remote diagnostics	Remote diagnostics	None	Does not apply
User programmability	Yes	Yes, via user selected parameters & programs	User-selected parameters	Yes, user selected parameters
Software separately priced	Part of full network	All	Options only	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Under 20,000	Under 30,000	2,050	2,550
Monthly maintenance, $	—	—	Contact vendor	Does not apply
Monthly lease/rental, $	—	—	Contact vendor	Does not apply
Maximum practical configuration:				
Purchase price, $	Contact vendor	Contact vendor	6,250	3,250
Monthly maintenance, $	—	—	Contact vendor	Does not apply
Monthly lease/rental, $	—	—	Contact vendor	Does not apply
Is maintenance bundled with lease/rental?	—	—	No	Does not apply
Date of first delivery	1986	1984	1982	1983
Number of systems installed to date	—	—	2,000	—
Serviced by	M/A-COM	M/A-COM	Independent distributors.	Independent, distributors
COMMENTS	Part of M/A-COM's Integrated Packet Network; full network management capability.	Part of M/A-COM's Integrated Packet Network; full management capability.		Interconnects 4 or 8 Micro 800/2 composites; supports channel speed conversion.

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SUPPLIER AND MODEL	NCR Comten 3650	NCR Comten 5620	NCR Comten 3690 Models A8-E8	NCR Comten 3690 Model T8
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 308X, 43XX, & compatibles; NCR 8500, 8600	IBM 360/370, 303X, 308X, 43XX, and compatibles, NCR 8500, 8600	IBM S/370, 30XX, 308X, 43XX, and compatibles; NCR 8500, 8600	IBM S/370, 30XX, 308X, 43XX, and compatibles; NCR 8500, 8600
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	2	8	2
Max. no. of active hosts supported simultaneously	2	2	8	2
IBM emulation	270X, 370X, ACF/NCP	270X, 370X, ACF/NCP	270X/370X, ACF/NCP	270X, 370X, ACF/NCP
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Unlimited
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA/CNA, OSI	SNA/CNA, OSI	SNA/CNA, OSI	SNA/CNA, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	32	512	128
2000 to 9600 bps	128	32	512	128
Over 9600 bps	Up to 64	Up to 16	Up to 256	Up to 64
Highest line speed supported (bps)	230.4K	64K	256K	256K
Effect on line capacity, if all lines are full-duplex	More than 9.6K—halved; less than 9.6K—none	More than 9.6K—halved; less than 9.6K—none	More than 9.6K—halved, less than 9.6K—none	More than 9.6K—halved; less than 9.6K—none
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Proprietary
Main memory word size, bits	32	32	32	32
Main memory storage capacity, bytes	1M	4M	4M	1M
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Byte, block, or file	Byte, block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	DMA	DMA	DMA	DMA
Other peripherals	DMA	DMA	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Diskette, hard disk, console	Hard disk, diskette, console	Diskette, hard disk, console	Diskette, hard disk, console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Combination of software and firmware
IPL method	See comments	See comments	See comments	See comments
Additional software supported	NDP, DLSS1, Code 59, Comten Networking software	NDP, CLSS1, Codel 59, Comten Networking software	NDP, CLSS1, Codel 59, Comten networking software	NDP, CLSS1, Codel, Comten networking software
User programmability	Yes, via user selected parameters & user prog.	Yes	Yes, via user selected parameters & user prog.	Yes, via user created programs
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	Inform. not available	Inform. not available	Inform. not available	Inform. not available
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	41,000	22,000	105,000	66,000
Monthly maintenance, $	261	Contact vendor	415	366
Monthly lease/rental, $	1,250 (2-yr. lease)	Contact vendor	3,600 (2-yr. lease)	2,257 (2-yr. lease)
Maximum practical configuration:				
Purchase price, $	125,000	95,000	300,000	108,500
Monthly maintenance, $	Contact vendor	Contact vendor	1,700	518
Monthly lease/rental, $	Contact vendor	Contact vendor	8,500 (2-yr. lease)	2,935 (2-yr. lease)
Is maintenance bundled with lease/rental?	No	Contact vendor	No	No
Date of first delivery	March 1975	1985	June 1978	January 1980
Number of systems installed to date	1,800	Inform. not available	Inform. not available	Inform. not available
Serviced by	NCR Comten	NCR Comten	NCR Comten	NCR Comten
COMMENTS	Manual load from diskette and download from host; reload from hard disk, RCP load via trunk or hard disk.	Handles applications switching, routing, polling, auto. dialing, error recov., & multiplexing for up to 32 lines; runs all Comtens netwrk. prod.; reload from hard disk, RCP load via trunk/hrd disk	Manual load from diskette and download from host; RCP load via hard disk or comm line; reload via hard disk.	Manual load from diskette and downline load from host; RCP load via hard disk or comm. line reload via hard disk.

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SUPPLIER AND MODEL	NCR Comten 721-300	NTX Communications Corporation NTX 3800—Model 2	NTX Communications Corporation NTX 3800—Model 1	Paradyne Pix/Pixnet
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	NCR JRX, VRX Systems	IBM and plug-compatible mainframes	IBM and plug-compatible mainframes	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	4	4	1
Max. no. of active hosts supported simultaneously	2	2	2	Multiple
IBM emulation	No	CTCA	270X, 37X5 EP	Does not apply
Remote line concentrator	Yes	No	No	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Does not apply	Does not apply	Multiple
Host-independent network processor	Yes	No	No	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Yes
Network architecture compliance	CNA	SNA	BSC	None
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	99	8	8	None
2000 to 9600 bps	52-99	8	8	Application-dependent
Over 9600 bps	10 at 56K	8	8	3 full-duplex
Highest line speed supported (bps)	56K	6.312M	6.312M	56K bps
Effect on line capacity, if all lines are full-duplex	None	Halved	Halved	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	No	Yes
Terminal-initiated applications switching	No	Does not apply	Does not apply	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	No	No	No	Async/3270; PC/3270
Code conversion	No	No	No	ASCII/EBCDIC
Error control	Yes	CRC	CRC	Yes
Automatic transmission speed detection	No	No	No	Yes
Automatic disconnect of inactive dial-up terminals	Yes	No	No	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Proprietary
Main memory word size, bits	16	Proprietary	Proprietary	16
Main memory storage capacity, bytes	1M	9.6K	9.6K	128K
Level of data unit transferred across I/O channel	Byte and block	Block	Block; byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	Interrupt	Interrupt	DMA and Interrupt
Mass storage	—	None	None	None
Other peripherals	DMA	None	None	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Cassette	Internal diag. processor	Internal diag. processor	Mag. tape; console
Support for remote console	No	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Proprietary host-based software	Host-based software	Combination software, firmware, hardware
IPL method	Load from cassette	Inform. not available	Inform. not available	Intern. self-load, man.
Additional software supported	No	None	None	Utilities
User programmability	No	Configuration macros	Access method macros	Self-configuring
Software separately priced	All	All	None	None
Approx. proportion of currently installed systems supplied as turnkey systems	Inform. not available	Inform. not available	Inform. not available	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	46,000	163,340	145,730	Contact vendor
Monthly maintenance, $	370	400	474	Contact vendor
Monthly lease/rental, $	1,637/yr.	5,709 (1-year lease)	5,754 (1-year lease)	Contact vendor
Maximum practical configuration:				
Purchase price, $	95,000	240,805		Contact vendor
Monthly maintenance, $	577	628	233,005	Contact vendor
Monthly lease/rental, $	3,500	8,902	730	Contact vendor
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	1976	1985	1985	April 1976
Number of systems installed to date	Approx. 1,200	Inform. not available	Inform. not available	Over 5,500
Serviced by	NCR Comten	NTX	NTX	Paradyne
COMMENTS	—	Supports multiple 1.544M bps cross-domain links over terrestrial or satellite facilit. Supported by ACF/VTAM with NTX Cross Domain Control Program; full circuit redundancy.	Supports multiple 1.544M bps links using IBM BSC; full circuit redundancy.	Pix/Pixnet permits remote peripherals and CRTs to access multiple IBM hosts and applications as locally attac. devices without remote TP software and with no software maintenance.

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SUPPLIER AND MODEL	Paradyne Pixnet-XL	Periphonics Voicepac	Periphonics VoiceBox	Periphonics VoiceStar 40XX
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM/370, 43XX, 30XX, and compatibles	Most major vendors	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	7	3	Not available
Max. no. of active hosts supported simultaneously	Multiple	7	3	1
IBM emulation	Does not apply	370X, 3803, 327X, 5250	327X, 370X	370X, 3803, 327X, 5250
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	Multiple	7	3	Does not apply
Host-independent network processor	Yes	Optional	Optional	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	OSI-modeled	SNA	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	None	104	32	8
2000 to 9600 bps	Application dependent	104	32	8
Over 9600 bps	16 full-duplex	Does not apply	Does not apply	Does not apply
Highest line speed supported (bps)	2.048M bps	9.6K	9.6K	9600 bps
Effect on line capacity, if all lines are full-duplex	None	Minor	Minor	Minor
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async/3270, PC/3270	Yes	Yes	Yes
Code conversion	ASCII, EBCDIC	Yes	Yes	Yes
Error control	CRC	All industry standards	Industry standard	Industry standards
Automatic transmission speed detection	Yes	Yes	Yes	Yes
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	LSI 11/23; LSI 11/73	LSI 11/23	80286 and LSI 11
Main memory word size, bits	16 bit	16	16	16 bit ECC
Main memory storage capacity, bytes	4M	320K	128K	1M
Level of data unit transferred across I/O channel	Block, byte	Byte	Byte	2 bytes
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette, console	CRT, printer, floppy	CRT, printer, floppy	CRT, printer, disk, floppy
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination firmware/ software	Proprietary software	Proprietary software	Unix based
IPL method	Internal	Download or disk load	EPROM based	Hard disk
Additional software supported	Utilities	I/O Gen, Pave, Param, Utalk	None	Voice dialog utility, rel. dbms, Pave, Param. Utalk, high-level lang.
User programmability	No, vendor supported	Yes, voice dialog and basic edit functions	No	Yes
Software separately priced	None	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	75 percent	40 percent	100 percent
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	25,00	20,000	35,000
Monthly maintenance, $	Contact vendor	250 min., variable	Approx. 200	Approx. 350
Monthly lease/rental, $	Contact vendor	Variable	Variable	Variable
Maximum practical configuration:				
Purchase price, $	Contact vendor	300,000	50,000	60,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Variable	Variable	Variable
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	March 1985	1981	1983	1985
Number of systems installed to date	Over 250	350	25	Inform. not available
Serviced by	Paradyne	Periphonics	Periphonics	Periphonics
COMMENTS	Pixnet-XL allows remote peripherals, CRTs, IBM 3800 & Xerox 9700 laser printers, and other per -ipherals to access IBM hosts as locally attached devices. No host or TP software is required.	Handles data and voice interchangeably via a single I/O port; can concentrate, convert protocol & code, and serve as a network node.	A solid state unit that can concentrate, convert protocol and code, serve as a remote, unattended network node, and provide voice response.	Low end transaction processing system with voice response, hand-held terminal, and PC support.

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SUPPLIER AND MODEL	Periphonics VoiceStar 42XX	Periphonics VoiceStar 46XX	Periphonics VoiceStar 47XX	Sperry DCP/10A*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most major vendors	Sperry Series 1100, Series 90
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Not available	3	7	1
Max. no. of active hosts supported simultaneously	2	4	7	1
IBM emulation	370X, 3803, 327X, 5250	370X, 3803, 2848, 327X	370X, 3803, 327X, 5250	No
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	4	7	Inform. not available
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	Yes	Yes	Yes	Custom
Distributed processing node	Yes	Yes	Yes	No
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	SNA	SNA	SNA	DCA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	16	50	96	6 sync, 24 async
2000 to 9600 bps	16	50	96	6 sync, 24 async
Over 9600 bps	Does not apply	Does not apply	Does not apply	6 sync, 24 async
Highest line speed supported (bps)	9600 bps	9600 bps	9600 bps	64K
Effect on line capacity, if all lines are full-duplex	Minor	Minor	Minor	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Inform. not available
Code conversion	Yes	Yes	Yes	Inform. not available
Error control	Industry standards	Industry standards	Industry standards	Inform. not available
Automatic transmission speed detection	Yes	Yes	Yes	Yes
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Inform. not available
SYSTEM CHARACTERISTICS				
Processor	68000 and LSI 11	Multi 68000, LSI 11	Multi 68000 and LSI 11	Sperry DCP/10
Main memory word size, bits	16 bit ECC	32 bit ECC; 16 bit ECC	32 bit ECC; 16 bit ECC	16
Main memory storage capacity, bytes	Up to 2M	Up to 3M	Up to 6M	512K
Level of data unit transferred across I/O channel	2 bytes	2 or 4MB	2 or 4 bytes	Inform. not available
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Mass storage	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
I/O, back-up, and diagnostic peripherals supported	CRT, printer, disk, floppy, tape	CRT, printer, disk, floppy, tape	CRT, printer, disk, floppy, tape	Inform. not available
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Unix based	Real time, Unix based	Real time, Unix based	Combination software and firmware
IPL method	Hard disk	Hard disk	Hard disk	Inform. not available
Additional software supported	Voice dialog utility, rel. dbms, Pave, Utalk, Param, High level lang.	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang. & netwrk. defin. util.	Voice dialog utility, rel. dbms, Pave, Utalk, Param, high level lang. & netwrk. defin. util.	Inform. not available
User programmability	Yes	Yes	Yes	Inform. not available
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	100 percent	100 percent	100 percent	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	50,000	65,000	115,000	20,000
Monthly maintenance, $	Approx. 500	Approx. 650	Approx. 1,150	100
Monthly lease/rental, $	Variable	Variable	Variable	450 (5-yr. lease)
Maximum practical configuration:				
Purchase price, $	80,000	200,000	400,000	40,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	220
Monthly lease/rental, $	Variable	Variable	Variable	990 (5-yr. lease)
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1985	—	1985	1985
Number of systems installed to date	Inform. not available	70	Inform. not available	—
Serviced by	Periphonics	Periphonics	Periphonics	Sperry
COMMENTS	Transaction processing system with voice response, hand-held terminal, and PC support.	Transaction processing system with voice response, hand-held terminal, PC, and POS device support.	High capacity and thruput transaction processing system with voice response, hand-held terminal, PC, and POS device support.	*1985 information. DCP/10A replaces the DCP/10.

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SUPPLIER AND MODEL	Sperry DCP/20*	Sperry DCP/40*	Telefile Computer Products Telepac	Telematics NET 25
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Sperry Series 1100, Series 90	Sperry Series 1100, Series 90	Standalone or Telefile T80 Series	Most
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	4	16	8	Does not apply
Max. no. of active hosts supported simultaneously	3	16	8	Does not apply
IBM emulation	No	No	None	No
Remote line concentrator	Yes	Yes	Yes	Yes (packet switch)
Maximum no. of hosts served by one concentrator	No specific limit	No specific limit	12	4
Host-independent network processor	Yes (init. host load)	Yes (init. host load)	Yes	No
Store-and-forward message switching processor	Custom	Custom	Yes	No
Distributed processing node	No	No	Yes	No
Terminal controller	No	No	No	Yes
Network architecture compliance	DCA	DCA	X.25	None
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	47 sync; 192 async	255 sync; 1023 async	280	480
2000 to 9600 bps	47	255	280	480
Over 9600 bps	47	140	280	160
Highest line speed supported (bps)	64K	64K	19.2K bps	64K
Effect on line capacity, if all lines are full-duplex	None	None	None	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Async to 3270 BSC/SDLC	No
Code conversion	Yes	Yes	ASCII to EBCDIC	No
Error control	Yes	Yes	Parity, LRC and CRC	Yes
Automatic transmission speed detection	Yes, 110 to 19.2K bps	Yes, 110 to 19.2K bps	50 to 9600 bps	50 bps—19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	
SYSTEM CHARACTERISTICS				
Processor	Sperry DCP/20	Sperry DCP/40	M68000	MC68000/Telematics S1
Main memory word size, bits	16	16	16	32
Main memory storage capacity, bytes	512K	3.5M	64K Bytes MOS RAM	16M
Level of data unit transferred across I/O channel	Block	Block	Byte or block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA and Interrupt	DMA and Interrupt
Mass storage	DMA	DMA	DMA and Interrupt	DMA
Other peripherals	DMA	DMA	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Console, disk, mag. tape, diskette	Console, disk, mag. tape	FEP console, disk, diskette, mag tape	Removable disk (5M bytes)
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination software and firmware	Combination software and firmware	Combination of software & firmware	Software
IPL method	Host download & disk	Host download & disk	Int. selfload, dskt.	Disk or remote port
Additional software supported	File transfer	File transfer	Program dev. software, utilities	Pascal; C
User programmability	Yes, via user created programs	Yes, via user created programs	Yes, via user-selected parameters	Yes
Software separately priced	All	All	Special applications only	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	None	10 percent	80 percent	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	47,350	103,600	17,100	45,900
Monthly maintenance, $	245	590	114	275
Monthly lease/rental, $	1,080 (5-yr. lease)	2,340 (5-yr. lease)	570 (3 yrs.)	None
Maximum practical configuration:				
Purchase price, $	135,000	480,000	18,810	220,000
Monthly maintenance, $	700	2,500	126	1,320
Monthly lease/rental, $	2,800 (5-yr. lease)	10,000 (5-yr. lease)	627 (3 yrs.)	None
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	January 1982	September 1979	October 1980	February 1984
Number of systems installed to date	—	—	40	500+
Serviced by	Sperry	Sperry	Telefile	Telematics
COMMENTS	*1985 information.	*1985 information.	Prov. mode for mult. CCITT X.25 pub. or priv. packet netwk.; Sup. all ASCII based hosts and terminals; interface to SNA/SDLC networks.	CCITT X.25 software support; public or private networks. 3270 support; multi-processors (up to 5 CPUs).

All About Communications Processors

SUPPLIER AND MODEL	Telematics Series 500, 1000, 2000	Tri-Data Netway 200	Tymnet Micro-Engine	Tymnet Mini-Engine
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most	Most major vendors	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	Does not apply	Does not apply	Does not apply	Does not apply
IBM emulation	No	Does not apply	Does not apply	Does not apply
Remote line concentrator	Yes	Yes	Pack. switch-prot.conv.	Pack. switch-prot.conv.
Maximum no. of hosts served by one concentrator	4	4	Configuration dependent	Configuration dependent
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	None	SNA; X.25	Tymnet proprietary — X.25 based	Tymnet proprietary — X.25 based
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	480	6	Configuration dependent	Configuration dependent
2000 to 9600 bps	480	6	Configuration dependent	Configuration dependent
Over 9600 bps	160	6	Configuration dependent	Configuration dependent
Highest line speed supported (bps)	64K	56K	19.2K	74K
Effect on line capacity, if all lines are full-duplex	Halved	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	No
Protocol conversion	No	Yes	Yes	Yes
Code conversion	No	ASCII to EBCDIC	ASCII, Baudot, EBCDIC	ASCII, Baudot, EBCDIC
Error control	Yes	Parity; LRC; CRC	Check sum w/ retrans.	Check sum w/ retrans.
Automatic transmission speed detection	50 bps—19.2K bps	No	Yes	Yes
Automatic disconnect of inactive dial-up terminals	—	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	MC68000/Telematics S1	Zilog Z80	Tymnet/proprietary	Tymnet/proprietary
Main memory word size, bits	32	8 bits	32	32
Main memory storage capacity, bytes	16M	256K	1M	1M
Level of data unit transferred across I/O channel	Block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	Interrupt	DMA and Interrupt
Mass storage	DMA	DMA and Interrupt	Does not apply	Does not apply
Other peripherals	DMA and Interrupt	DMA and Interrupt	Does not apply	Does not apply
I/O, back-up, and diagnostic peripherals supported	Removable disk (5M bytes)	Diskette	None	None
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software with firmware assist	Software with firmware assist
IPL method	Disk or remote port	Rem. download or manual	Auto. download-Eng/host	Auto. download-Eng/host
Additional software supported	Pascal; C	CP/M, Macro 80, Word-star, Plink II	Various interface software	Various interface software
User programmability	Yes	Yes	Yes, via user selected parameters	Yes, via user selected parameters
Software separately priced	Yes	All but O.S.	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	90 percent	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	26,000	7,920	10,000 (approx.)	30,000 (approx.)
Monthly maintenance, $	150	Contact vendor	Coverage dependent	Coverage dependent
Monthly lease/rental, $	None	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	185,000	15,000	20,000 (approx.)	60,000
Monthly maintenance, $	1,110	Contact vendor	Coverage dependent	Coverage dependent
Monthly lease/rental, $	None	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	Inform. not available	No	No
Date of first delivery	December 1983	April 1983	1983	1981
Number of systems installed to date	500+	—	1,800	1,050
Serviced by	Telematics	Tri-Data	Tymnet	Tymnet
COMMENTS	CCITT X.25 software support; public or private networks. 3270 support; multi-processors (up to 5 CPUs).	Supports networks up to 50 nodes @ 32 devices per node.	Sold as a node in a complete network, compatible with Tymnet's public network.	Sold as a node in a complete network, compatible with Tymnet's public net-work; also available in a dual config-uration; optional redundancy features.

All About Communications Processors

SUPPLIER AND MODEL	Tymnet Engine	Tymnet ATC (Asynchronous Terminal Concentrator)		
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	—		
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No		
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply		
Max. no. of active hosts supported simultaneously	does not apply	Does not apply		
IBM emulation	Does not apply	Does not apply		
Remote line concentrator	Pack. switch-prot.conv.	Yes		
Maximum no. of hosts served by one concentrator	Configuration dependent	Configuration dependent		
Host-independent network processor	Yes	Yes		
Store-and-forward message switching processor	Yes	No		
Distributed processing node	No	No		
Terminal controller	Yes	Yes		
Network architecture compliance	Tymnet proprietary — X.25 based	Tymnet proprietary — X.25 based		
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	Configuration dependent	10		
2000 to 9600 bps	Configuration dependent	10		
Over 9600 bps	Configuration dependent	No		
Highest line speed supported (bps)	74K	9.6K		
Effect on line capacity, if all lines are full-duplex	None	None		
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes		
Terminal-initiated applications switching	Yes	Yes		
Comm. processor-initiated dynamic line reconfig.	No	No		
Protocol conversion	Yes	Async to network		
Code conversion	ASCII, Baudot, EBCDIC	No		
Error control	Check sum w/ retrans.	Check sum w/ retrans.		
Automatic transmission speed detection	Yes	110 to 9600 bps		
Automatic disconnect of inactive dial-up terminals	Yes	Yes		
SYSTEM CHARACTERISTICS				
Processor	Tymnet/proprietary	Tymnet-utilizing LSI-11		
Main memory word size, bits	32	16		
Main memory storage capacity, bytes	4M	60K		
Level of data unit transferred across I/O channel	Byte	Byte		
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	Interrupt		
Mass storage	DMA and Interrupt	Does not apply		
Other peripherals	DMA and Interrupt	Does not apply		
I/O, back-up, and diagnostic peripherals supported	Disk	None		
Support for remote console	Yes	Yes		
Communications operating software:				
Operating system implemented in	Software with firmware assist	Firmware		
IPL method	Auto down-disk/Eng/host	Internal self load		
Additional software supported	Validation, oper./acct. util., netwrk mgmt. & control, E-Mail	None		
User programmability	Yes, via user selected parameters	No		
Software separately priced	All	No		
Approx. proportion of currently installed systems supplied as turnkey systems	All	100 percent		
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	55,000 (approx.)	3,300		
Monthly maintenance, $	Coverage dependent	Coverage dependent		
Monthly lease/rental, $	Contact vendor	Contact vendor		
Maximum practical configuration:				
Purchase price, $	120,000 (approx.)	—		
Monthly maintenance, $	Coverage dependent	—		
Monthly lease/rental, $	Contact vendor	—		
Is maintenance bundled with lease/rental?	No	No		
Date of first delivery	1978	1984		
Number of systems installed to date	1,100	300		
Serviced by	Tymnet	Tymnet		
COMMENTS	Sold as a node or supervisor in a complete network, compatible with Tymnet's public network; optional redundancy features.	—		

Communications Processors

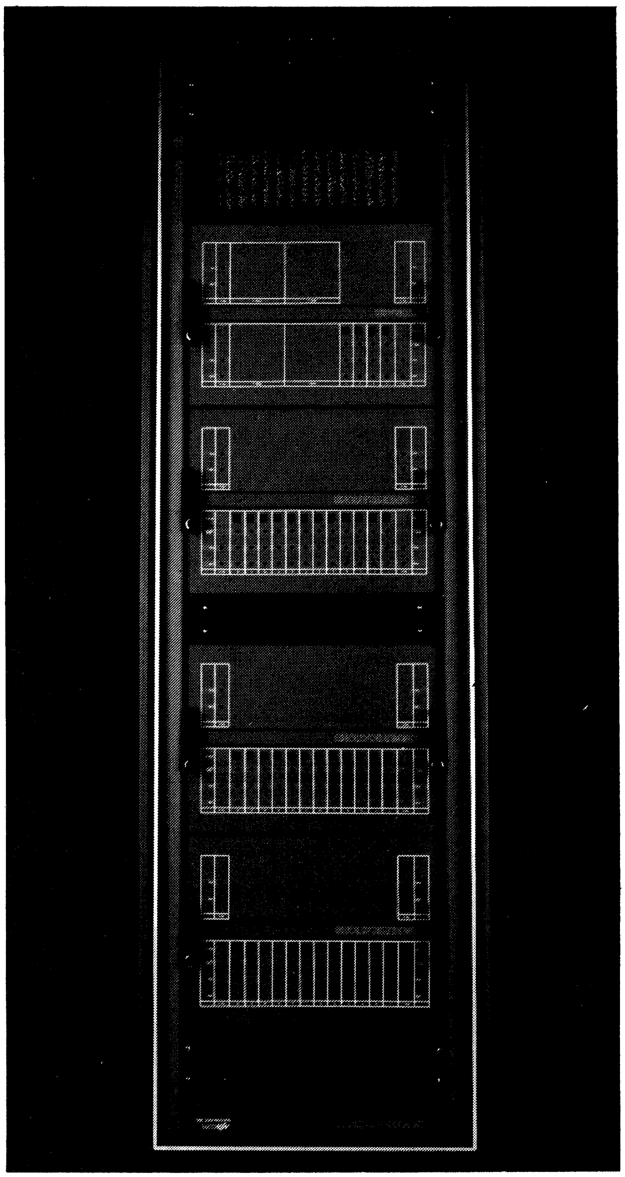
This report discusses the functions of a communications processor, which can be defined as a multifunctional device that may serve as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. The report also covers communications processor design, its place in modern network architectures, the evolution of the communications processor, the general advantages and restrictions of today's communications processors, and the state of the communications processor marketplace.

The rapid evolution of microprocessor-driven, single-function devices such as protocol converters, terminal controllers, and X.25 PADs caused Datapro, in 1984, to sharpen its definition of a communications processor to include only truly multifunctional, intelligent devices dedicated to networking. Look for information on Conversion Systems and Terminal Controllers behind Tab C23 in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS.

This report also includes comparison charts outlining the major characteristics of 69 communications processors from over 33 vendors.

Communications processors can be defined as multifunctional, program-controlled, digital computers dedicated to communications and able to serve as control points, or nodes, in a data communications network.

In general, such a processor performs one or more of three major functions: front-end processing, intelligent switching, and concentration. A *front-end processor* serves as a locally attached peripheral device to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management either under the control of a master (usually front-end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches.



M/A-Com's CP9000 Series II. Packet Network provides CCITT standardized X.25 interfaces, X.75 gateways, and other features like X.121 addressing and closed user group facilities.

Each of the three major functions is a combination of some or all of the following subfunctions:

- physical transmission and reception of data
- data buffering and queueing
- multiplexing
- message framing and unframing
- control of transmission errors
- message sequencing
- protocol conversion
- message pacing and flow control

Communications Processors

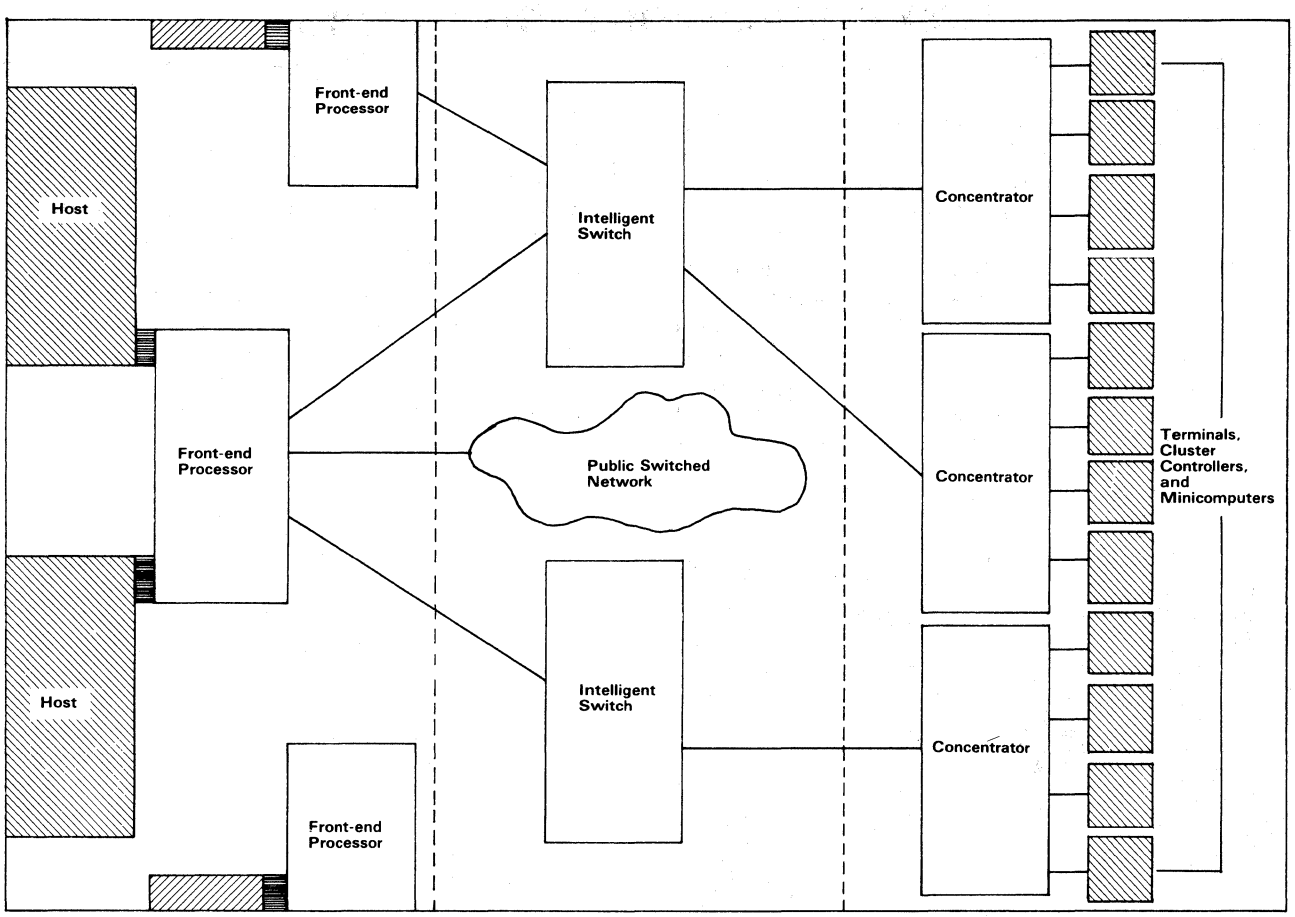


Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

- message or packet assembly and disassembly
- route selection
- session establishment and disconnection
- formatting of data for use by specific host or terminal applications
- reporting and logging of device or transmission errors or failures
- fallback switching in case of host, device, or transmission line failure
- gather and recording of network performance and traffic statistics.

The most sophisticated communications processors, especially those marketed primarily as front ends by mainframe computer vendors, can perform all of these tasks. Indeed, in a large, complex network governed by one or more mainframe hosts, a front end must perform all but the last three in the normal course of its operations. Front-end processing is the most complex task a communications processor can perform.

Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialogue with a host computer, and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators, and change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch simply establishes an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor can perform, and communications processors acting as concentrators can easily be confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, packet assembler/disassemblers (PADs), and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional

Communications Processors

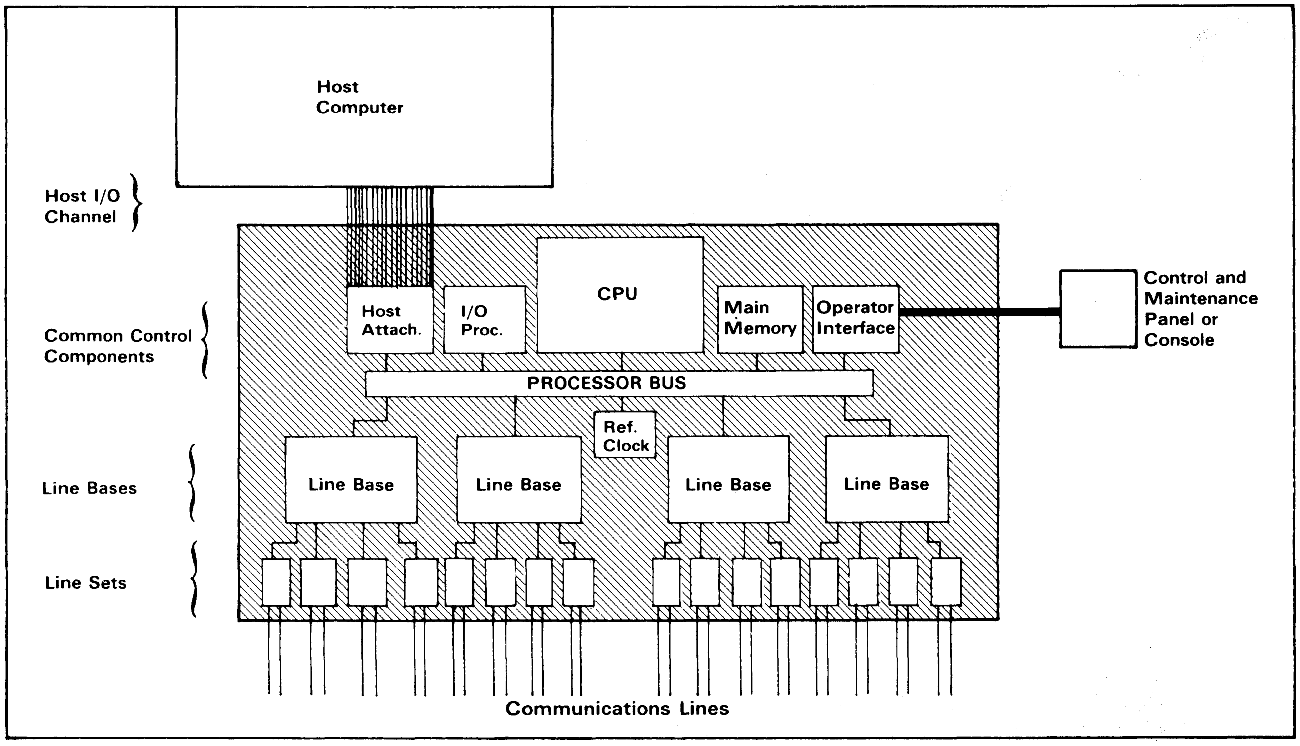


Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor may contain more than one host interface, several I/O processors, and many more line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change on the network. An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly: accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached devices. Some sophisticated terminal controllers, notably IBM's 3274s, can perform some or all of these functions. A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy: a concentrator can concentrate data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3705 acting as a remote node (concentrator) and an IBM 3274 within that concentrator's domain. A user can build an entire network from intelligent concentrators communicating with one another as peers, but cannot do the same with cluster controllers.

COMMUNICATIONS PROCESSOR DESIGN

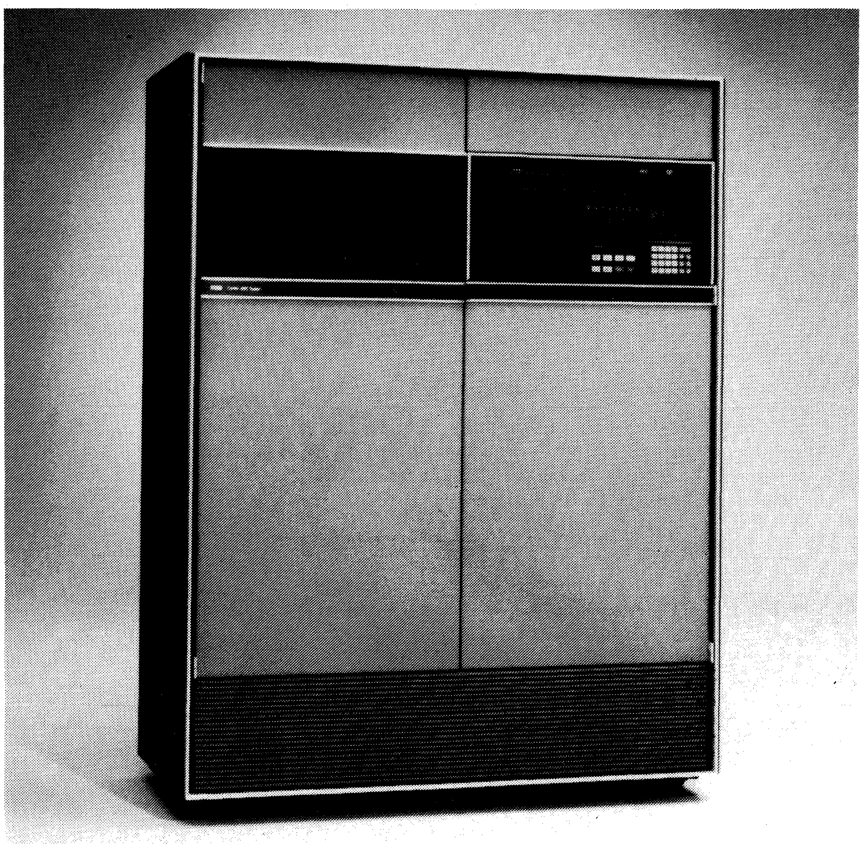
The basic design of almost all communications processors follows the same, three-tiered, hierarchical plan—a plan that they share in general with their close cousins the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy along with its associated main memory; it controls the communications processor's operation according to the rules and parameters of its operating software, and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session establishment, application-level formatting, and error logging, and delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the reference clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to

Communications Processors



NCR Comten's 3690 Communications Processor is the largest and most capable of their IBM-compatible communications processors. The 3690 supports twice the main memory and communications line attachments of the IBM 3725.

the attached host channel, and transmits it up the channel to the host; for data coming from the host, it performs the same process in reverse. The host interface's principal function is conversion of data from the communications processor's internal word size to that of the host computer. Some communications processors contain one or more input/output (I/O) processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generated by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for the timing of signals at different data rates.

The operator interface allows a human operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the above-mentioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor and a group of attached communications lines that share a common synchronization pattern, line speed, and sometimes, protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommodate from 8 to 32 line bases, each of which handles from two to eight line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

Communications Processors

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the back plane or a side plane of the processor's cabinet. The physical bus architecture, made popular in the design of minicomputers, allows for easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, it also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might need to replace only one line base and eight line sets, rather than having to swap out an entire front-end processor. The hierarchical design extends the communications processors' functionality over time and helps to protect the user's investment in the face of changing technology. Fig. 2 shows the hierarchical configuration of a generalized communications processor.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices. Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, Burroughs's BNA, and Sperry's DCA. Open architectures include the CCITT's X.25 packet switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standard (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most often as a front end, and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies from architecture to architecture. In Sperry's DCA the DCP-Series front end has control over many Presentation-layer functions, while in IBM's SNA, the host's access method, along with software residing in the 327X terminal controllers, handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all the mainframe architectures, the same communications processor models that serve as front ends can also function as intelligent switches and as remote concentrators. In these functions, the communications usually appear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture can also perform another important function in conjunction with any of the other three, that of an intelligent gateway. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet switched data networks using the X.25 protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers through a uniform set of complementary protocols. Designed specifically for public data networks, the X.25 protocols provide ultimately for the establishment of virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices, computers or terminals, at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols. Since, in a public network, the network provider is responsible for network management, the X.25 communications processors in such a network carry a heavy load of access, error, and class-of-service control, along with many provisions for statistical recording of traffic and usage data that can be sorted by individual user account. Communications processors, such as GTE Telenet's TP4000, designed to function as switches in public networks are the likeliest to support high-capacity attached storage devices such as disk and tape drives.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture. Table 1 shows the protocols supported by various vendors' communications processors.

Transparent architectures are a relatively new development offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without much of the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some such products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system to provide these functions.

Communications Processors

TABLE 1. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Amnet						
N6000/XAS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	NCR, Burroughs
N6000/XPS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	Tinet, Visa
N6000/XTS	N600/XAP PAD	N600/XMU PAD	N600/XMU PAD	No	Yes/DCE	PARS, Burroughs
Auscom 8911A	Yes	Yes	Yes	Yes	Yes	Custom protocols available on request
BBN Communications C/30	Yes	Yes	Yes	No	Yes	Telex
Burroughs Corp.						
CP9558-1/CP9572	Yes	Yes	Yes	Yes	Yes	Most Burroughs protocols
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
Cableshare						
CSI Data Concentrator	Yes	No	No	No	Yes	—
LSI-X.25 Front-End	Yes	No	No	No	GTE Telenet, Tymnet, Euronet	Uninet, Datapac PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	Yes	No	No	No	Yes	Same as above, and Telex
LSI-X.25 Host Port Concentrator	Yes	No	No	No	Yes	Same as above, and Telex
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200, UTS
Codex 6520	Yes	Yes	No	No	No	Telex, & IBM 2741, 2848, 2260
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data						
2551-3 & 2551-4	Yes	Yes	No	No	GTE Telenet, Tymnet, Datapac, Transpac, BPO, ITT	—
DCA 355	Yes	Yes	Yes	Yes	GTE Telenet, ITT, RCA	DEC DDCMP—trunk only
335	Yes	Yes	No	No	GTE Telenet Tymnet, Datapac, Uninet, Autonet, PSS	—
375	Yes	Yes, IBM 3270 BSC	No	No	Yes, Telenet, Tymnet, Uninet, Transpac, Datapac	Accunet, Cylix, PSS, Autonet
GTE Telenet						
TP4000 Series	Yes	Yes	No	Yes (HDLC X.25)	GTE Telenet	IBM 2741
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	GTE Telenet	—
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
Icot						
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	NCR, AIRINC
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400
CrystaLink 254	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S

Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

Communications Processors

TABLE 1. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
CrystaLink 257	Yes	Yes	Yes	HDLC	Yes	NCR 279, VISA, Tinet, Burroughs P/S
Infotron						
990NP Network Processor	Yes	Yes	Yes	Yes	Yes	Virtually all are supported
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	No	Request price quotation
Distributed Network Processor Series	Yes	Yes	Future	Yes	Future	Request price quotation
M/A-Com DCC						
CP 9000 Series I	No	No	No	Yes	Yes	—
CP 9000 Series II	Yes	Yes	Yes	HDLC (LAPB)	Yes, Uninet	X.75
Memorex 1270	Yes	Yes	No	Via VAN	Telenet, Datapac, PSS, Tymnet, Transpac, Datex-P	Sabre, Swift, SITA
Memotec MPAC 2500	No	No	No	Yes	Yes	No
Micom Micro800	Yes	No	No	No	Yes, Telenet, Tymnet, Datapac, Transpac, Datex-P, Telepac	No
Micro860	Async	No	No	No	No	—
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Transpac, Datapac	83B3
3670 Model 85	Yes	Yes	Yes	Yes	GTE Telenet, Tymnet, Uninet, Transpac, Datapac, Datex-P, UKPSS	—
3690 (A5-E5, T1-U1)	Yes	Yes	Yes	Yes	Yes	83B3
721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
5620	Yes	Yes	Yes	Yes	Yes	—
NTX						
3800 Model 1	No	Yes	No	No	No	NDLC (extended HDLC)
3800 Model 2	No	No	No	No	No	NDLC (extended HDLC)
Paradyne Pix/Pixnet	Yes	No	No	Paradyne SDLC	No	—
Pixnet—XL	No	No	No	HDLC, LAPD	—	—
Periphonics T-Comm	Yes	Yes	Yes	No	No	Fedwire, credit card networks, ATM networks
Telemarketer	Yes	Yes	No	No	No	—
VoicePac	Yes	Yes	Yes	No	No	—
CommStar	Yes	Yes	Yes	No	No	—
VoiceBox	Yes	Yes	Yes	No	No	—
Sperry						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Yes	REM1, NTR
Tandem 6100	Yes	Yes	Yes	Yes	Yes	Burroughs, Tinet; NCR
Telefile						
Telepac	Yes	Yes	Yes	No	All major U.S. and European networks	—
Telematics						
VAX FEP	Yes	No	No	Yes	Yes	—
Net 25	Yes	No	No	Yes	Yes	—
Series 1	Yes	No	No	Yes	Yes	—
Westinghouse Canada						
W1655/656	Yes	Mid 1983	Mid 1983	Yes	Mid 1983	PARS

Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

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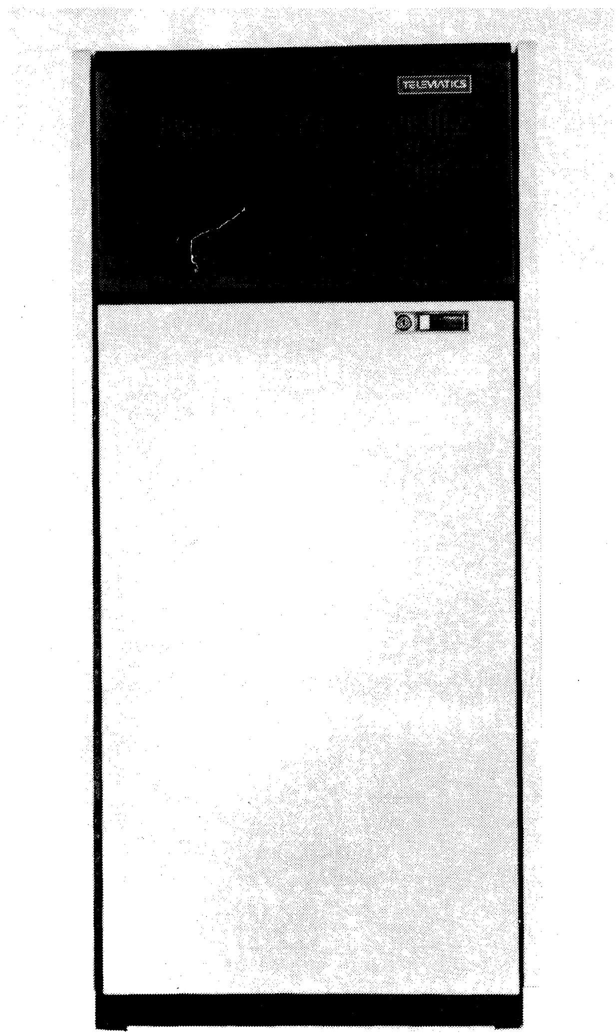
THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it came into being in the mid to late 1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hardwired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and performing simple error notification for the host.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform any of a number of functions more efficiently than a mainframe, and incidentally also provided the bus architecture that gives communications processors their modularity and flexibility. The ARPAnet, the first large-scale packet switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the intelligent virtual circuit switch, the first functional communications processor.



The Telematics' Series 1 Processor is a 32-bit CPU based on the Motorola 68000 chip set.

A later development in minicomputer applications created the distributed processor, a small computer, dedicated to part of a larger application, that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications handling under software control. Indeed, network architectures from such minicomputer vendors as DEC and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the increasing cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures, and to a large extent, made such architectures possible.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing, and of the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

One further development produced the communications processor as we know it today: the microprocessor. The advent of cheap silicon intelligence allows designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger and more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization each is to use. Some newer systems are composed entirely of redundant, microprocessor-controlled modules, each of which can perform any of the functions of any other with the proper software load; such a processor is actually a distributed communications network in a box.

The advent of the microprocessor has also begun to blur the distinction between traditional communications processors and less broadly functional devices such as multiplexers and terminal controllers, and has created a new class of intelligent protocol converters dedicated to a task that was

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once economical only as a function within a multifunctional communications controller. Now, even modems can detect, report, and in some cases correct transmission errors, and sense the conditions of transmission lines. The old definition of a communications processor as a computer that has been programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3725.

In answer to this shifting definition, Datapro created a section in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS, Tab C23, entitled Conversion Systems/Terminal Controllers. In this section, the reader will find information on many product categories formerly covered in this report: protocol converters, intelligent terminal controllers, and PADs, to name three. To complement the C23 section, we have sharpened the focus of this C13 report to include only true, multifunctional communications processors.

ADVANTAGES AND RESTRICTIONS

The principal advantage of a communications processor as a networking tool is the physical and logical separation of the networking function from the application of its end users. Whatever its architecture, such a network can function for any application, can grow in size without qualitative change to accommodate new applications, and can accommodate new applications through the installation of relatively standard, intelligent components. In simpler terms, the user does not have to redesign and rebuild a modular network to accommodate a change in the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they can accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design can survive several breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

In operation, a network controlled by communications processors can survive the total failure of one or more of its host processors. In a multihost network, front-end processors can switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows for a graceful degradation of service in the event of a host failure, perhaps allowing users time to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

Also in operation, the communications processor still fulfills its original purpose; relieving the host of the overhead generated in keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid 1970s when the first communications processors appeared, and thanks to the ever-lower cost of memory and processing power, some of today's communications processors are bigger, faster, and more powerful than that era's mainframes. They need to be.

Among the restrictions of today's communications processors are complexity and incompatibility. In an era of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer should meddle. Most require that their programs be written in an arcane, assembler-level language, sometimes with the benefit of pregenerated macros in the host access method, often without.

Even with recent advances in simplicity and modularity, configuring a communications processor to suit a specific network or application can be difficult. With today's microprocessor technology, the better communications processors are the simpler; as an example, IBM's new 3725 Communication Controller sports a parts list only half as long as that of the older 3705. The trend is toward fewer components each of which can do more, but most communications processors are still lagging a bit behind that trend.

Despite the advent of open architectures and the impending arrival of truly standard protocols, the integration of terminals, computers, and protocols foreign to a given vendor's architecture remains difficult. The gateway function is a plus, but it is cumbersome and often expensive. Most vendors are beginning to offer some level of IBM compatibility through their communications processors, but balk at anything beyond concession to the obvious market leader.

THE CURRENT MARKETPLACE

The market for full-scale communications processors can be broken down into four segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM; packet-switching processors marketed as components of large, vendor-independent private networks; and intelligent concentrators designed to serve in transparent network architectures.

In the IBM world, IBM sells 90 percent of the communications processors. The remaining 10 percent accounts for some of the most intense competition in data communications. Within that market, NCR Comten is the clear leader, followed by Amdahl and Computer Communications Inc., Memorex, and NTX.

The other mainframe vendors, Burroughs, Control Data, Honeywell, NCR, and Sperry do not really compete with one another in the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Honeywell's Datanet 8 line features a broad array of compatibility

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KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS

The comparison charts that follow this report list the major characteristics of 68 commercially available communications processors. The text below explains the chart entries, in order of their appearance on the charts.

Computer systems interfaced. For processors that serve IBM and plug compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug-compatibles. For processors operating in open network architectures, we list "Most major vendors."

Functional Configurations

Front-end Processors. A "yes" for this entry indicates that the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously. A third entry lists the degree of IBM emulation the processor can perform.

Remote line concentrator. A "yes" for this entry indicates that the processor in question can serve as a line concentrator remote from any host processor in its network. The entry below lists the number of hosts that concentrator can serve at one time.

Host-independent network processor. A "yes" for this entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Store-and-forward message switching processor. A "yes" for this entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Distributed processing node. Most true communications processors are not able to perform applications processing, however, some, including a few intelligent concentrators, can support some distributed applications in addition to their principal networking function. This class of communications processor is becoming rarer.

Terminal controller. A "yes" for this entry indicates that the processor in question can function as a terminal controller within its architecture.

Network architecture compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device, or it may support the prearchitectural protocols of the vendor(s) whose hosts it supports.

Communications line capacity. The five sections of this entry all deal with the number of lines a communications processor can support within specific ranges of data rates. The first three list the maximum number of **half-duplex** communications lines the processor can support within the three specified speed ranges. The fourth lists the highest data rate the processor can support. The fifth lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

Communications Features/Functions

Entries under this heading list a number of major functions a communications processor can perform, but that not all communications processors **do** perform.

Multiplexing/demultiplexing. A "yes" for this entry indicates that the processor in question can function as a multiplexer.

Terminal-initiated application switching. A "yes" for this entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications processor initiated dynamic line reconfiguration. Dynamic line configuration is another name for fallback switching. A "yes" for this entry indicates that the processor in question can switch a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure, without operator intervention.

Protocol conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error control. This entry specifies which of the available schemes for error detection (e.g., Parity, LRC, or CRC) the processor in question uses.

Automatic transmission speed detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic disconnect of inactive dial-up terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

System Characteristics

Processor type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Main memory word size, bits. In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main memory storage capacity, bytes. This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a time-shared or interrupt basis.

Level of data unit transferred across I/O channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte, or block).

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS (Continued)

Type of data transfer supported between memory and a) communications lines, b) mass storage, and c) other peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components have share control of main memory with the CPU, and can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, backup, and diagnostic peripherals supported. Most communications processors interact only with their attached hosts and terminals, and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information, and feature diagnostic consoles for direct operator intervention.

Support for remote console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Communications operating software:

Operating system implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) onboard the processor, or in some combination of these.

IPL method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from onboard read-only memory.

Additional software supported. This entry lists any network control or applications software that the processor in question can support.

User programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native assembler language.

Software separately priced. This entry shows to what extent the communications processor's operating software is bundled with the cost of the hardware.

Approximate proportion of currently installed systems supplied as turnkey systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

Pricing and Availability. Entries under this header list purchase, lease (or rental) and maintenance pricing for minimum and maximum configurations, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product. □

software. Sperry's DPC Series goes farther than most in providing host-independent networking.

Among vendors of private networks, the two U.S. public network leaders, Tymnet and GTE Telenet have solid offerings. Other vendors include Amnet, and BBN Communications, designers of the original ARPAnet and recently gone commercial.

A number of vendors offer intelligent concentrators, often at the high ends of lines of statistical multiplexers. Among these are Infotron, Micom, and Codex.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose communications products are shown in the comparison charts that follow.

Amdahl Corporation, 1250 East Arques Avenue P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

Amnet, Inc., 101 Morse Street P.O. Box 412, Watertown, MA 02172. Telephone (617) 923-1850.

Auscom, Inc., 2007 Kramer Lane Suite 102, Austin, TX 75758. Telephone (512) 836-8080.

BBN Communications, 70 Fawcett Street, Cambridge, MA 02238. Telephone (617) 497-2800.

Burroughs Corporation, Burroughs Place, Detroit, MI 48232. Telephone (313) 972-7000.

Cableshare, 20 Enterprise Drive P.O. Box 5880, London, Ontario, Canada N6A 4L6. Telephone (519) 686-2900.

Century Analysis, 80 Berry Drive, Pacheco, CA 94553. Telephone (415) 680-7800.

CHI Corporation, 26055 Emery Road, Cleveland, OH 44128. Telephone (216) 831-2622.

Codex Corporation, 20 Codex Corporation, 20 Cabot Boulevard, Mansfield, MA 02048. Telephone (617) 364-2000.

Computer Communications Inc., 2610 Columbia Street, Torrance, CA 90503. Telephone (213) 320-9101.

Control Data Corporation, 8160 34th Avenue South, Minneapolis, MN 55420. Telephone (612) 853-8100.

Digital Communications Associates, Inc. (DCA), 303 Technology Park, Norcross, GA 30092. Telephone (404) 448-1400.

GTE Telenet Communications Corp., 8229 Boone Boulevard, Vienna, VA 22180. Telephone (703) 442-1000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, MA 02154. Telephone (617) 895-6000.

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Icot Corporation, 830 Maude Avenue, Mountain View, CA 94043. Telephone (415) 964-4635.

Infotron Systems Corporation, 9 North Olney Avenue, Cherry Hill, NJ 08003. Telephone (609) 424-9400.

International Business Machines Corporation, Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, AZ 85029. Telephone (602) 944-1543.

M/A-COM Telecommunications Div., Comm. Network Group, 11717 Exploration Lane, Germantown, MD 20874. Telephone (301) 428-5500.

Memorex, San Tomas at Central Expressway, Santa Clara, CA 95052. Telephone (408) 987-3593.

Memotec, 4940 Fisher, Montreal, Quebec, Canada H4T 1J7. Telephone (514) 738-4781.

Micom Systems, Inc., 20151 Nordhoff Avenue, Chatsworth, CA 91311. Telephone (213) 882-6890.

NCR Comten, 2700 Snelling Avenue North, St. Paul, MN 55113. Telephone (612) 638-7777.

NTX Communications Corporation, 508 Tasman Drive, Sunnyvale, CA 94089. Telephone (408) 747-1444.

Paradyne Corporation, 8550 Ulmerton Road, Largo, FL 33540. Telephone (813) 530-2000.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, NY 11716. Telephone (516) 467-0500.

Sperry Corporation, Computer Systems Division, P.O. Box 500, Blue Bell, PA 19424. Telephone (215) 542-4011.

Tandem Computer, Corporate Headquarters, 19191 Vallco Parkway, Cupertino, CA 95104. Telephone (408) 725-6000.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, CA 92714. Telephone (714) 557-6660.

Telematics International, Inc., Crown Center, 1415 NW 62nd Street, Fort Lauderdale, FL 33309. Telephone (305) 772-3070.

Tri-Data, 505 East Middlefield Road, Mountain View, CA 94039-7505. Telephone (415) 969-3700.

Tymnet, Inc. 2710 Orchard Parkway, San Jose, CA 95134. Telephone (408) 946-4900.

Westinghouse Canada, Inc., 777 Walkers Line, P.O. Box 5009, Burlington, Ontario, Canada L0R 1T0. Telephone (416) 528-8811. □

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SUPPLIER AND MODEL	Amdahl 4705*	Amdahl 4705E*	Amnet N6000/XAS	Amnet N6000/XPS
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All IBM and Amdahl compatible mainframes	All IBM- and Amdahl-compatible mainframes	Most vendors	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	4	4	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	4	4	Does not apply	Does not apply
IBM emulation	270X/370X, EP, NCP, ACF	270X/3708, EP, NCP, ACF	Does not apply	Does not apply
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	112	1,024
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA	SNA	OSI X.25	OSI X.25
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	352	352	112	1,024
2000 to 9600 bps	352	352	112	1,024
Over 9600 bps	Application-dependent	Application-dependent	28	256
Highest line speed supported (bps)	64K	64K	64K	64K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	S/S, BSC, SDLC to X.25	S/S, BSC, SDLC to X.25	Yes	Yes
Code conversion	ASCII/EBCDIC via soft.	ASCII/EBCDIC via soft.	Yes	Yes
Error control	LRC and CRC	LRC and CRC	Yes	Yes
Automatic transmission speed detection	50-9600 bps via soft.	50-9600 bps via soft.	PAD	PAD
Automatic disconnect of inactive dial-up terminals	Yes	Yes	PAD	PAD
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Multi-microprocessor	Multi-microprocessor
Main memory word size, bits	18	18	16	16
Main memory storage capacity, bytes	512K	1024K	Up to 1M	Up to 4M
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Byte & block	Byte & block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	—	None	DMA and Interrupt	DMA and Interrupt
Other peripherals	—	None	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette as diagnostic peripheral	Diskette (diagnostic)	Yes	Yes
Support for remote console	No	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Software
IPL method	Download from host	Download from host	Local & remote IPL	Local & remote IPL
Additional software supported	Comm-pro	Comm-pro	Utilities	Utilities
User programmability	Yes	Yes	Yes/restricted	Yes/restricted
Software separately priced	Yes	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	Does not apply	Does not apply
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	50,225	52,400	25,000	75,000
Monthly maintenance, $	448	360	Info. not available	Info. not available
Monthly lease/rental, $	1,444 (2-yr. lease)	2,935 (2-yr. lease)	Info. not available	Info. not available
Maximum practical configuration:				
Purchase price, $	327,970	300,000+	100,000	1,000,000
Monthly maintenance, $	2,682	500	Info. not available	Info. not available
Monthly lease/rental, $	14,196 (2-yr. lease)	7,200 (2-yr. lease)	Info. not available	Info. not available
Is maintenance bundled with lease/rental?	No	No	Info. not available	Info. not available
Date of first delivery	November 1979	April 1983	Info. not available	Info. not available
Number of systems installed to date	700	700	Info. not available	Info. not available
Serviced by	Amdahl	Amdahl	Amnet	Amnet
COMMENTS	Operates with IBM 3705 and 3705/Comm-pro software, with up to 1.8 times the 3705 throughput capacity. *1984 Information	Operates with IBM 3705 and 3705/Comm-pro software, with up to 2.4 times the 3705 throughput capacity. *1984 information	Dynamic packet routing Dist. Net. Mgmt. Auto-call.	Redundant hardware, Dist. Net. Mgmt. Auto-call, Dynamic routing.

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SUPPLIER AND MODEL	Amnet N6000/XTS	Auscom 8911A	BBN Communications Corp. C/30 PSN	Burroughs CP3680/ CP3680-01*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	IBM 360, 370, 43XX, 308X and plug-compatibles	Most vendors	Burroughs B2000, B3000, and B4000 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	2	Does not apply	4
Max. no. of active hosts supported simultaneously	Does not apply	2	Does not apply	4
IBM emulation	Does not apply	Any IBM control unit	No	No
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	512	2	Does not apply	4
Host-independent network processor	Yes	Yes	Yes(Packet switch node)	No
Store-and-forward message switching processor	No	Yes	No	Yes
Distributed processing node	No	Yes	No	Yes
Terminal controller	No	Yes	No	Yes
Network architecture compliance	OSI X.25	Most LANs and custom	X.25	BNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	512	Application-dependent	44	288 async., 72 sync.
2000 to 9600 bps	512	Application-dependent	44	40
Over 9600 bps	128	Application-dependent	32	40
Highest line speed supported (bps)	64K	56K	64K bps	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	—
Terminal-initiated applications switching	Yes	Yes	Yes	—
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	—
Protocol conversion	Yes	Yes	No	Yes
Code conversion	Yes	Yes	No	Yes
Error control	Yes	Yes	LRC; CRC; EDAC	—
Automatic transmission speed detection	PAD	None	No	—
Automatic disconnect of inactive dial-up terminals	PAD	Yes	Yes	—
SYSTEM CHARACTERISTICS				
Processor	Multi-microprocessor	DEC LSI-11	BBNCC	—
Main memory word size, bits	16	16	20	—
Main memory storage capacity, bytes	Up to 2M	256K	512K	—
Level of data unit transferred across I/O channel	Byte and block	Byte	Byte; block	—
Type of data transfer supported between memory and:				
Communications lines	DMA, Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	DMA, Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Other peripherals	DMA, Interrupt	DMA and Interrupt	Does not apply	—
I/O, back-up, and diagnostic peripherals supported	Console, printer, disk	Disk, diskette, mag. tape	Remote console	—
Support for remote console	Yes	Yes	Yes	—
Communications operating software:				
Operating system implemented in	Software	Software and firmware	Software and firmware	Combination software and firmware
IPL method	Local and remote IPL	From diskette or tape	Download	Download from host
Additional software supported	Utilities	Program Dei	Diagnostics; performance measure	NDL, DCS
User programmability	Yes, on restricted basis	User-created programs	No	Yes, via user-selected parameters
Software separately priced	Yes	All except diagnostics	None	All
Approx. proportion of currently installed systems supplied as turnkey systems	Does not apply	90%	All	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	14,995	62,000	64,050 (3680)
Monthly maintenance, $	Info. not available	By component	Time/distance	535
Monthly lease/rental, $	Info. not available	Not available	None	2,415 (3-yr. lease)
Maximum practical configuration:				
Purchase price, $	500,000	19,750	69,000	124,950 (3680+ -01)
Monthly maintenance, $	Info. not available	By component	Time/distance	1,010
Monthly lease/rental, $	Info. not available	Not available	None	2,310 (3-yr. lease)
Is maintenance bundled with lease/rental?	Info. not available	No	Does not apply	—
Date of first delivery	January 1983	July 1980	1981	January 1978
Number of systems installed to date	12	600	Over 500	200
Serviced by	Amnet	Auscom	BBNCC	Burroughs
COMMENTS	Dynamic routing Distributed Net Management Autocall.	Designed as a programmable IBM channel interface or FEP emulating standard control units; additional lines supported with extended chassis.	Dynamic packet routing; logical addressing; remote monitoring; unattended operation.	Redundant system *1984 information.

Communications Processors

SUPPLIER AND MODEL	Burroughs CP9558-1/ CP9572*	Cableshare CSI Data Concentrator*	Cableshare LSI-X.25 Front-End Processor*	Cableshare LSI-X.25 Host Port Concentrator*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles	All computers using ASCII serial communication ports	DEC PDP-11 and VAX	All hosts supporting async. communications
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	16	1	32 async channels
Max. no. of active hosts supported simultaneously	—	16	1	32
IBM emulation	—	No	No	No
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	12	16	1	32
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	Yes	Yes	No	Yes
Network architecture compliance	BNA, SNA	X.25	X.25, OSI	X.25, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	47	16	127	32
2000 to 9600 bps	—	16	127	32
Over 9600 bps	12	16	127	32
Highest line speed supported (bps)	19.2K	56K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	—	Yes	Yes	Yes
Terminal-initiated applications switching	—	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	—	No	No	No
Protocol conversion	—	Async to X.25	Async./X.25	Async./X.25
Code conversion	ASCII to EBCDIC	None	1	Baudot/ASCII
Error control	—	X.25 procedures	Info. not available	Info. not available
Automatic transmission speed detection	—	Yes	No	Yes, 110-9600 bps
Automatic disconnect of inactive dial-up terminals	—	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	B920	Intel 8088	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23
Main memory word size, bits	16; multiprocessors	16	16	16
Main memory storage capacity, bytes	1.2M	192K	64K	64K
Level of data unit transferred across I/O channel	Byte	Block	Block	Info. not available
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Info. not available
Mass storage	DMA	None	None	Info. not available
Other peripherals	—	None	None	Info. not available
I/O, back-up, and diagnostic peripherals supported	Mag. tape, floppy and hard disk	Console	FEP console	Console
Support for remote console	—	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software and firmware	Software	Software
IPL method	—	Internal self-load	Download from host	Internal self-load
Additional software supported	—	None	None	None
User programmability	—	Yes, via user-selected parameters	No	No
Software separately priced	—	None	Info. not available	Info. not available
Approx. proportion of currently installed systems supplied as turnkey systems	—	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	22,559 (9572)	3,000	13,450	Contact vendor
Monthly maintenance, $	75	None	100	70
Monthly lease/rental, $	729 (3-yr. lease)	Not available	None	None
Maximum practical configuration:				
Purchase price, $	29,401 (9558-1)	5,600	16,450	Contact vendor
Monthly maintenance, $	200	None	125	100
Monthly lease/rental, $	1,033 (3-yr. lease)	Not available	—	—
Is maintenance bundled with lease/rental?	Yes	No	—	—
Date of first delivery	October 1980	June 1, 1983	November 1978	March 1980
Number of systems installed to date	1,000	No	75	25
Serviced by	Burroughs	Cableshare	Digital Equipment Corp.	Digital Equipment Corp.
COMMENTS	*1984 information.	*1984 information.	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; *1984 information.	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; *1984 information.

Communications Processors

SUPPLIER AND MODEL	Cableshare LSI-X.25 Intelligent Concentrator*	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor	Codex 6520
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All async terminals	DEC PDP Series, NCR Century & Criterion	Sperry 1100 Series	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	32 async channels	None	8	4
Max. no. of active hosts supported simultaneously	32	Multiple	8	2
IBM emulation	No	No	No	270X, 370X
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	32	Multiple	Unlimited	Does not apply
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	Yes	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	X.25, OSI	Yes	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	24	Over 1000	240
2000 to 9600 bps	32	24	300	Config.—dependent
Over 9600 bps	32	24	150	Config.—dependent
Highest line speed supported (bps)	19.2K	19.2K	64K	230.4K
Effect on line capacity, if all lines are full-duplex	Halved	None	To 56K	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	No
Terminal-initiated applications switching	No	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Async/X.25	Planned	Yes; all protocols	ASCII/2741
Code conversion	Baudot/ASCII	Planned	ASCII/EBCDIC/XS3	ASCII/EBCDIC
Error control	—	Yes	LRC, BCC, and CRC	LRC and CRC
Automatic transmission speed detection	Yes, 110-9600 bps	No	Yes, 110-19.2K bps	Yes; 135 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	No	Site option	No
SYSTEM CHARACTERISTICS				
Processor	LSI-11/2 or PDP-11/23	CAI-108/116/124	Perkin-Elmer 3200	CCI 801
Main memory word size, bits	16	16	32	16
Main memory storage capacity, bytes	64K	1M	4M	64K
Level of data unit transferred across I/O channel	Info. not available	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Info. not available	Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	Info. not available	Interrupt	DMA and Interrupt	DMA and Interrupt
Other peripherals	Info. not available	Interrupt	FEP console	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Console	FEP Console	Console, patch panel	FEP console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Combination software and firmware	Software
IPL method	Internal self-load	Download from host	Host/self-load/disk.	From host or diskette
Additional software supported	None	—	Simulator and other utilities	—
User programmability	No	Via user-selected parameters	Yes, via user-selected parameters	—
Software separately priced	Info. not available	No	X.25; X780 package, uniscope term. emulator	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	6,500	35,000	Contact vendor
Monthly maintenance, $	70	Software 25; h/w 150	300	—
Monthly lease/rental, $	None	—	None	—
Maximum practical configuration:				
Purchase price, $	Contact vendor	10,950	500,000	—
Monthly maintenance, $	100	Software 25; h/w 150	Info. not available	—
Monthly lease/rental, $	—	—	None	—
Is maintenance bundled with lease/rental?	—	No	No	—
Date of first delivery	March 1980	December 1981	1977	January 1980
Number of systems installed to date	125	570	69	Info. not available
Serviced by	Digital Equipment Corp.	CAI	Chi Corporation	Codex
COMMENTS	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; *1984 information.	CAI implementation uses Motorola 68000, flow control, load-leveling, raw line class selection, error correction, terminal key-ahead buffering.	Dynamic routing; two async. screen editors; automatic terminal protocol detection; redundancy; multiple local and remote hosts; UTS simulation; UTS on X.25 network.	

Communications Processors

SUPPLIER AND MODEL	Computer Communications CC-6	Computer Communications CC-8	Computer Communications CC-80/85	Control Data 2551-3
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX,43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	CDC Cyber 170,CDC Cyber 180, Cyber 70, Cyber 6000 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	4	7	2
Max. no. of active hosts supported simultaneously	2	4	7	1
IBM emulation	270X/370X EP	270X/370X EP	270X/370X EP	No
Remote line concentrator	No	No	No	Yes
Maximum no. of hosts served by one concentrator	Does not apply	Does not apply	Does not apply	8
Host-independent network processor	No	No	Yes	No
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	No	No	No	Yes
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	240	1232	32
2000 to 9600 bps	32	120	120	32
Over 9600 bps	4	32	120	4 @ 19.2K; 2 @ 56K
Highest line speed supported (bps)	56K	230.4K	230.4K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	No	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	No	No	No	No
Code conversion	Yes	Yes	Yes	Yes
Error control	Parity, LRC and CRC	Parity, LRC and CRC	Parity, LRC and CRC	Yes
Automatic transmission speed detection	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 100 to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CCI 601	CCI 801	CCI 8001/8501	CDC 2551-3
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	64K	64K	256K	256K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte and control
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	None
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Control panel	FEP CRT console, diskette, printer	Disk (40-200 MB), mag tape, FEP CRT, printer	Console, cassette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Combination of software and firmware
IPL method	Download from host	From host/diskette	From host/disk	Download from host
Additional software supported	Assembler, utilities, diagnostics	Value-added options assembler loader, utilities, diagnostics	Value-added options, custom software, assembler, loader, utilities	None
User programmability	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes
Software separately priced	None	Value-added options	Options and custom sys.	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	90%	95%	98%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	24,990	39,840	68,000/115,640	36,955
Monthly maintenance, $	150	296	246/426	433
Monthly lease/rental, $	802 (3-yr.); 1048 (rental)	1,224 (3-yr.); 1,600 (rental)	1,932 (3-yr. lease)	1,067 (3-yr. lease)
Maximum practical configuration:				
Purchase price, $	51,368	181,200	674,050	68,570
Monthly maintenance, $	405	1,593	3,344	751
Monthly lease/rental, $	1,742 (3-yr.); 2,263 (rental)	5,858 (3-yr.); 7,635 (rental)	17,523 (3-yr. lease)	2,048 (3-yr. lease)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	No
Date of first delivery	November 1981	1976	1975	January 1983
Number of systems installed to date	25	250	417	Info. not available
Serviced by	Computer Comm.	Computer Comm.	Computer Comm.	Control Data Corp.
COMMENTS	Auto-poll, auto-baud rate detect, auto-dial, multihost support, user programmability, field upgradability, reverse channel.	Auto-poll, auto-baud rate detect, speed & code conversion, auto dump, auto load, multi host support, terminal initiated line sel., etc.	Used mainly for custom store-and-forward message switches, electronic mail, & high speed transaction processing systems (e.g., airline reservations).	Predecessor was 2550 products, first shipped in 1976.

Communications Processors

SUPPLIER AND MODEL	Control Data 2551-4	Digital Communications Associates System 355	Digital Communications Associates System 335	Digital Communications Associates System 375
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	CDC Cyber 170, CDC Cyber 180, Cyber 6000 Series, Cyber 70	Most vendors	Most vendors	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	DEC-10; FEP-10 opt.	No	DEC-10, FEP-10 (opt.)
Max. no. of hosts channel-attachable to front-end	2	44	Does not apply	100+
Max. no. of active hosts supported simultaneously	1	22+	Does not apply	100+
IBM emulation	No	No	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	8	Unrestricted	Unrestricted	100+
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	Yes	INA	INA	INA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	254	44 trunks, 120 lines	34 trunks, 60 lines	114 trunks, 120 lines
2000 to 9600 bps	254	44 trunks, 120 lines	34 trunks, 60 lines	114 trunks, 120 lines
Over 9600 bps	4 @ 19.2K; 2 @ 56K	22 trunks	17 trunks	57 trunks
Highest line speed supported (bps)	56K	19.2K	19.2K	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Async./X.25	Async. to X.25	Async/X.25
Code conversion	Yes	Yes	No	No
Error control	Yes	Yes-ARQ	Yes—ARQ	Yes - ARQ
Automatic transmission speed detection	Yes; 100 to 1200 bps	110 to 9600 bps	110 to 9600 bps	110 - 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CDC 2551-4	Z80A	Z80As	280A
Main memory word size, bits	16	8	8	8
Main memory storage capacity, bytes	256K	1472K (64K per Z80A)	384K	3776K
Level of data unit transferred across I/O channel	Byte and control	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	None	Interrupt	Interrupt	Interrupt
Other peripherals	DMA and Interrupt	Interrupt	Interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	Console, cassette	Dual floppy disk; disk; diagnos.built-in	Dual floppy disk; disk; diagnos.built-in	Dual call. tape unit; disk diag. built-in
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Software and firmware	Comb. firmware/software
IPL method	Download from host	Internal self-load	Downline/int. self-load	Internal self-load
Additional software supported	None	Configuration tape generator	Configuration tape generator	Configuration tape generator
User programmability	Yes	Yes; via user-selected parameters/programs	User-selected parameters; programs	Yes, via user-selected parameter programs
Software separately priced	All	Utilities plus X.25	Utilities plus X.25	Utilities plus X.25
Approx. proportion of currently installed systems supplied as turnkey systems	98%	5%	5%	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	48,648	12,000 and up	6,795	16,995
Monthly maintenance, $	483	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	1,403 (3-yr. lease)	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	157,478	144,145	27,925	234,165
Monthly maintenance, $	1,540	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	5,093 (3-yr. lease)	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	January 1983	October 1980	1983	December 1984
Number of systems installed to date	Info. not available	Infor. not available	Info. not available	Infor. not available
Serviced by	Control Data Corp.	DCA, third party	DCA, third party	DCA, third party
COMMENTS	Predecessor was 2550 product, first shipped in 1976.	Supports host selection, port contention, full line and modem control facilities; handles up to 44 high-speed trunk lines; symmetric multi-proc.; supp. up to 23 Z80As.	Supports host selection, port contention, full line and modem control facilities. Functions with 1 to 4 trunks.	Diagnostics plus error checking; X.25 gateway interface; advanced features software; full transparency, data concentration; host select ion, and camp-on network management.

Communications Processors

SUPPLIER AND MODEL	GTE Telenet TP4000 Series*	Honeywell Information Systems Datanet 8	ICOT Corporation CrystaLink 254	ICOT Corporation CrystaLink 257
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Honeywell DPS 88, DPS 8, and DPS 7	ICOT CrystaLink 254	ICOT CrystaLink 257
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Packet switch	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	4	No	No
Max. no. of active hosts supported simultaneously	128	4	8	28
IBM emulation	None	Yes	3270 BSC, SNA/SDLC	3270 BSC, SNA/SDLC
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	128	4	8	28
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	X.25 virtual circuit switching	Honeywell DSA (ISO)	SNA, BSC, NCR	SNA, BSC, NCR
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	128		—
2000 to 9600 bps	48	Load-dependent		—
Over 9600 bps	12 to 28	Load-dependent		28 (all sync)
Highest line speed supported (bps)	56K	56K	8(all sync)	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	Load-dependent	28	28
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes (by host program)	No	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	No	Yes	Yes
Code conversion	Yes	No	Yes	Yes
Error control	Parity, LRC, CRC	Yes	Yesa	Yes
Automatic transmission speed detection	110 to 1200 bps	Yes; 110, 300, 1200 bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes; optional, variable	No	No
SYSTEM CHARACTERISTICS				
Processor	MOS technology 6502B	Datanet 8 (Honeywell)	Multi-Intel 8088	Intel 8088
Main memory word size, bits	8	16	128K bytes	128K bytes
Main memory storage capacity, bytes	256K	1536K	128K bytes	128K bytes
Level of data unit transferred across I/O channel	Info. not available	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt and DMA	Async. bus	Interrupt	Interrupt
Mass storage	None	Async. bus	Mail box	Mail box
Other peripherals	None	Async. bus	—	—
I/O, back-up, and diagnostic peripherals supported	GTE Telenet NCC	Console, diskette	Host console	Host console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Firmware	Firmware
IPL method	Downline load from NCC	Host, local, or VIP	Download from host	Download from host
Additional software supported	PAD support	Additional on host for administration and control	No	No
User programmability	Yes, via user-selected X.3 parameters	Yes, via user-selected parameters	User selected parameters	User selected parameters
Software separately priced	All	All	No	No
Approx. proportion of currently installed systems supplied as turnkey systems	100%	Software is customer installable	100%	100%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	37,000-49,500	42,565	5200 and up	7,200 and up
Monthly maintenance, $	215-300	259	—	—
Monthly lease/rental, $	GTE Telenet tariff	1,432 (5-yr. lease)	—	—
Maximum practical configuration:				
Purchase price, $	76,500-157,200	210,465	15,000	30,000
Monthly maintenance, $	495-995	1,138	—	—
Monthly lease/rental, $	GTE Telenet tariff	7,615 (5-yr. lease)	—	—
Is maintenance bundled with lease/rental?	Yes	Yes	No	No
Date of first delivery	Mid 1978	Info. not available	1981	1981
Number of systems installed to date	Contact vendor	Over 1000	—	—
Serviced by	Sorbus	Honeywell	ICOT, third party w/NCR	ICOT, third party w/ NCR
COMMENTS	Multiple Microprocessor Line Card (LPU), common logic redundancy and power supply supported; performs virtual circuit switching; auto. virtual circuit recovery/rerouting. *1984		IBM 2780/3780 BSC emulation.	2780/3780 BSC emulation

Communications Processors

SUPPLIER AND MODEL	Infotron 990NP Network Processor	IBM 3705-II Models E1 through L4	IBM 3705-80 Models M81 through M83	IBM 3725
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	—	IBM S/370, 30XX, and 43XX; S/360 in 270X emulation mode only	IBM S/370, 30XX, and 43XX; S/370 in 270X emulation mode only	IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	None	4	2	8
Max. no. of active hosts supported simultaneously	Over 10 hosts	4	2	6
IBM emulation	3270 BSC	270X/370X	270X/370X	270X and 3705 with EP
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	Over 10 hosts	1	Does not apply	8
Host-independent network processor	Yes	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	Proprietary	SNA	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	640	352	16	256 with 3726 expansion
2000 to 9600 bps	From 120 to 640	352	16	256 with 3726 expansion
Over 9600 bps	120	32	Info. not available	128 with 3726 expansion
Highest line speed supported (bps)	56K bps	230.4K	57.6K	230.4K bps
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	Capacity halved	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	Yes
Terminal-initiated applications switching	Yes	No	No	No
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	Yes
Protocol conversion	No	Yes	Yes	Yes
Code conversion	No	Yes	Yes	Yes
Error control	Yes	LRC and CRC	LRC and CRC	LRC and CRC
Automatic transmission speed detection	Yes (Up to 9600 bps)	Yes, via optional soft.	Yes; via optional soft.	Yes, via opt. software
Automatic disconnect of inactive dial-up terminals	Yes	No	No	No
SYSTEM CHARACTERISTICS				
Processor	6502/8086/80186	Proprietary	Proprietary	Proprietary
Main memory word size, bits	—	18	18	18
Main memory storage capacity, bytes	—	512K	256K	1M
Level of data unit transferred across I/O channel	Does not apply	Block	Block	Block
Type of data transfer supported between memory and:	D			
Communications lines	DMA and Interrupt	DMA	DMA	DMA
Mass storage	Does not apply	DMA	DMA	DMA
Other peripherals	Does not apply	DMA	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Console/diskette	None	None	FEP console
Support for remote console	Yes	No	No	Yes, up to 150 meters (492 feet)
Communications operating software:				
Operating system implemented in	Combination firmware & software	Software	Software	Software
IPL method	EEPROM	Download from host	Download from host	Internal self-load
Additional software supported	Does not apply	NCCF, NPDA	NCCF, NPDA	NCCF, NPDA, ACF/NCP-PEP, EP/3725
User programmability	Yes, via console	Yes	Yes	Yes
Software separately priced	Some	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	25%	None	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	20,000	38,230 (E1)	36,600 (M81)	32,000
Monthly maintenance, $	Contact vendor	147	219	190
Monthly lease/rental, $	Contact vendor	1,635 (2-yr. lease)	1,465 (2-yr. lease); 1,721 (rental)	1,390 (rental)
Maximum practical configuration:				
Purchase price, $	100,000	107,040 (L4)	52,600 (M83)	75,000
Monthly maintenance, $	Contact vendor	447	239	213
Monthly lease/rental, $	Contact vendor	6,290 (2-yr. lease)	2,265 (2-yr. lease); 2,661 (rental)	3,260 (rental)
Is maintenance bundled with lease/rental?	No	Yes	Yes	No
Date of first delivery	1982	August 1976	August 1981	1983
Number of systems installed to date	2,000	50,000	Info. not available	Info. not available
Serviced by	Infotron	IBM	IBM	IBM
COMMENTS	The 990NP provides adaptive routing; comprehensive network management features; bisync emulation (remote polling); X.25 gateway support; Async/BSC/BOP/SDLC support.			HONE Configurator CF-3725 should be consulted for actual number of operable lines, depending on line speeds, protocols, 3 other variable factors.

Communications Processors

SUPPLIER AND MODEL	Lemcom Systems CMC-4	Lemcom Systems CMC-8	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	S/360, IBM S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	1	1	64
Max. no. of active hosts supported simultaneously	1	1	1	64
IBM emulation	270X, 370X, EP	270X, 370X, EP	270X, 370X, EP	270X, 370X, EP
Remote line concentrator	No	No	No	Yes
Maximum no. of hosts served by one concentrator	Does not apply	Does not apply	Does not apply	64
Host-independent network processor	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	Optional
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Optional
Network architecture compliance	Does not apply	Does not apply	Does not apply	DMMA
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4	8	32	6500
2000 to 9600 bps	4	8	32	1500
Over 9600 bps	3	6	24	250
Highest line speed supported (bps)	56K	56K	56K	57.6K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	No	Yes
Terminal-initiated applications switching	No	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	Optional	Optional	Optional	Optional
Code conversion	Optional	Optional	Optional	Optional
Error control	LRC and CRC	LRC and CRC	LRC and CRC	LRC and CRC
Automatic transmission speed detection	Optional—300, 1200	Optional—300, 1200	Optional—300, 1200	110 to 19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6800	Motorola 6800	Motorola 6809
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	40K	80K	320K	15M
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	DMA and Interrupt
Mass storage	None	None	None	DMA and Interrupt
Other peripherals	None	None	None	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	FEP console	FEP console	FEP console	FEP console and bubble memory
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Software
IPL method	Internal self-load	Internal self-load	Internal self-load	Self-/manual-/down-load
Additional software supported	Problem determination aids	Problem determination aids	Problem determination aids	Channel prog. simulator & prob. determin. aids
User programmability	User-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	Utilities only	Utilities only	Utilities only	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	None	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,000	16,000	20,000	25,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	20,000	30,000	60,000	500,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	March 1977	November 1980	March 1979	1981
Number of systems installed to date	330	65	125	225
Serviced by	Various	Various	Various	Various
COMMENTS	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee.	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee.	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts.	Distributed MPU FEP; up to 256 MPUs can be programmed to perform various comm. processing functions; front-end polling, dynamic applic. selec., & multi-console support avail.

Communications Processors

SUPPLIER AND MODEL	M/A-COM DCC CP9000 Series I	M/A-COM DCC CP9000 Series II	Memorex Communications Group 1270 Terminal Control Unit	Memotec Data Inc. MPAC 2500*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via serial interface	Most vendors via communications interface	IBM S/370, 30XX, 43XX, and compatibles	Most vendors
FUNCTIONAL CONFIGURATIONS		N		
Front-end processor	No	No	Yes	No
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply	2	Does not apply
Max. no. of active hosts supported simultaneously	Does not apply	Does not apply	2	Does not apply
IBM emulation	Does not apply	Does not apply	270X, 370X EP	Does not apply
Remote line concentrator	Yes	Yes	No	Yes (packet switch)
Maximum no. of hosts served by one concentrator	No limit	No limit	Does not apply	Port dependent
Host-independent network processor	Yes	Yes	No	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	Yes	Yes	No	Yes
Terminal controller	Yes	No	Yes	No
Network architecture compliance	No	X.25	VAN	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	640	96	8
2000 to 9600 bps	128	640	70	8
Over 9600 bps	128	160	6	8
Highest line speed supported (bps)	56K bps	64K bps	56K	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes, for VAN	No
Terminal-initiated applications switching	No	Yes	Yes	Does not apply
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	Yes
Protocol conversion	No	No	X.25/BSC/ASCII	No
Code conversion	No	No	ASCII/BCD	Code-transparent
Error control	No	Yes	Yes	FCS
Automatic transmission speed detection	No	No	Yes, 50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	No	No	No	Yes
SYSTEM CHARACTERISTICS				
Processor	6502 and Z80	Mult. Intel 186 & 286	Info. not available	Z80
Main memory word size, bits	8	16	Info. not available	8
Main memory storage capacity, bytes	4M bytes	Over 50MB	Info. not available	Approx. 60K
Level of data unit transferred across I/O channel	Byte	Byte, block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	Interrupt	DMA and Interrupt
Mass storage	Interrupt	DMA		None
Other peripherals	None	DMA and Interrupt		None
I/O, back-up, and diagnostic peripherals supported	Diskette	Diskette, diagnostic terminal, hard disk	Console w/VANS	Async. terminals
Support for remote console	Yes	Yes	No	Remote configuration
Communications operating software:				
Operating system implemented in	Software	Comb. of software and firmware	Firmware	Software (EPROM)
IPL method	From host/diskette	Downline, loc. disk load	Internal self-load	Internal self-load
Additional software supported	Assembler & LOGOS compilers & linker system diagnostics	X.25 packet netwrk w/ control centr., prog. dev. and diag. tools	None	Diagnostics
User programmability	User created programs	Yes, via user selected parameters & programs	No	User-selected parameters
Software separately priced	All	All	Yes	Options only
Approx. proportion of currently installed systems supplied as turnkey systems	None	All	All	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Approx. 30,000	Contact vendor	14,900	8,060
Monthly maintenance, $	Application dependent	Contact vendor	126	60
Monthly lease/rental, $	Offered as options; contact vendor	Contact vendor	543 mo. (3-yr. lease)	Not available
Maximum practical configuration:				
Purchase price, $	Approx. 200,000	Contact vendor	45,000	10,590
Monthly maintenance, $	Application dependent	Contact vendor	250	60
Monthly lease/rental, $	Offered as options; contact vendor	Contact vendor	1,450 (3-yr. lease)	Not available
Is maintenance bundled with lease/rental?	No	Contact vendor	No	No
Date of first delivery	1977	1984	1970	1981
Number of systems installed to date	600	—	2,100	Info. not available
Serviced by	M/A-COM DCC	M/A-COM	Memorex	Memotec and distrib.; Honeywell; Abbex.
COMMENTS	Communications features and functions programmable by user.	Comp. Netwrk Contr. Sys avail. for managing net wrk of Series II nodes; Pack. Switch. cluster & pwr supply redun.; onbrd encryp. (DES) cap.; dynamic virtual circuit routing; user acc. cont rl., acct. & data coll.	Hard-wired data communications controller.	*1984 information.

Communications Processors

SUPPLIER AND MODEL	Micom Micro800/X.25	Micom Micro 860	NCR Comten 3650	NCR Comten 5620
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most	Most vendors	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom	IBM 360/370, 303X, 308X, 43XX, compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply	2	2
Max. no. of active hosts supported simultaneously	Does not apply	Does not apply	2	2
IBM emulation	Does not apply	No	270X, 370X, ACF/NCP	Yes
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	24	Does not apply	Unlimited	1
Host-independent network processor	Yes	Yes	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	X.25	None	SNA/CNA	SNA/CNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	24	8	128	32
2000 to 9600 bps	24	8	128	32
Over 9600 bps	Info. not available	8	32 to 128	—
Highest line speed supported (bps)	19.2K bps	19.2K bps	230.4K	64K bps
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	Yes	Yes
Code conversion	No	No	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Yes	110 to 9600 bps	110 to 9600 bps	
Automatic disconnect of inactive dial-up terminals	Yes	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Z80A; Z80B	Z80B	Proprietary	Proprietary
Main memory word size, bits	8	8	32	32
Main memory storage capacity, bytes	64K	64K bytes	1M	1M to 4M
Level of data unit transferred across I/O channel	Byte	Byte	Byte or block	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	DMA	DMA
Mass storage	None	Interrupt	DMA	DMA
Other peripherals	None	None	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Async terminals	None	Diskette, cassette	Hard disk
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Software	Software
IPL method	Int. self/downline load	Internal self-load	See comments	—
Additional software supported	None	Does not apply	NDP, CLSS1, Codel 59	NDP, CLSS1, Codel 59
User programmability	User-selected parameters	Yes, user selected parameters	Yes, via user-sel. par. & user programs	Yes
Software separately priced	Options only	None	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	2,050	2,550	41,000	22,000
Monthly maintenance, $	Info. not available	Does not apply	261	Contact vendor
Monthly lease/rental, $	Info. not available	Does not apply	1,250 (2-yr. lease)	Contact vendor
Maximum practical configuration:				
Purchase price, $	6,250	3,250	103,300	54,000
Monthly maintenance, $	Info. not available	Does not apply	559	Contact vendor
Monthly lease/rental, $	Info. not available	Does not apply	3,280 (2-yr. lease)	Contact vendor
Is maintenance bundled with lease/rental?	No	Does not apply	No	Contact vendor
Date of first delivery	1982	1983	March 1975	4th quarter, 1985
Number of systems installed to date	2,000	—	1,800	—
Serviced by	Independent distributors	Independent, distributors	NCR Comten	NCR Comten
COMMENTS		Interconnects 4 or 8 Micro 800/2 composites.	Manual load from diskette and download from host.	Handles application switching, routing, polling, automated dialing, error recovery, & multiplexing for up to 32 lines. Runs all of NCR Comten's networking products.

Communications Processors

SUPPLIER AND MODEL	NCR Comten 3690 Models A8-E8	NCR Comten 3690 Model T8	NCR Comten 721-II	NTX Communications Corporation NTX 3800—Model 2
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom	IBM S/370, 30XX, 308X, 43XX, and compatibles	NCR JRX, VRX Systems	IBM and plug-compatible mainframes
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	8	2	2	4
Max. no. of active hosts supported simultaneously	8	2	2	2
IBM emulation	270X/370X, ACF/NCP	270X, 370X, ACF/NCP	No	CTCA
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Does not apply
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA/CNA	SNA/CNA	CNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	512	128	99	8
2000 to 9600 bps	512	128	52-99	8
Over 9600 bps	128 to 512	32 to 128	10 at 56K	8
Highest line speed supported (bps)	230.4K	230.4K	56K	6.312M
Effect on line capacity, if all lines are full-duplex	None	None	None	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	No
Terminal-initiated applications switching	Yes	Yes	No	Does not apply
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	No
Protocol conversion	Yes	Yes	No	No
Code conversion	Yes	Yes	No	No
Error control	Yes	Yes	Yes	CRC
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Info. not available
Main memory word size, bits	32	32	16	Info. not available
Main memory storage capacity, bytes	4M	1M	1,024K	96K
Level of data unit transferred across I/O channel	Byte or block	Byte, block, or file	Byte and block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Interrupt
Mass storage	DMA	DMA	—	None
Other peripherals	DMA	DMA	DMA	None
I/O, back-up, and diagnostic peripherals supported	Diskette	Diskette	Cassette	Internal diag. processor
Support for remote console	Yes	Yes	No	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software or firmware	Software	Proprietary host-based software
IPL method	See comments	Load from host/disk	Load from cassette	Info. not available
Additional software supported	NDP, CLSS1, Codel 59	NDP, CLSS1, Codel 59	No	None
User programmability	Yes, via user-sel. par. & user programs	Yes, via user-created programs	No	Configuration macros
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	Info. not available
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	105,000	66,000	46,000	163,340
Monthly maintenance, $	415	366	370	400
Monthly lease/rental, $	3,600 (2-yr. lease)	2,257 (2-yr.lease)	1,637/yr.	5,709 (1-year lease)
Maximum practical configuration:				
Purchase price, $	300,000	108,500	95,000	240,805
Monthly maintenance, $	1,700	518	577	628
Monthly lease/rental, $	8,500 (2-yr. lease)	2,935 (2-yr. lease)	3,500	8,902
Is maintenance bundled with lease/rental?	No	No	Yes	No
Date of first delivery	June 1978	January 1980	1976	Info. not available
Number of systems installed to date	–	–	Approx. 1,200	Info. not available
Serviced by	NCR Comten	NCR Comten	NCR Comten	NTX
COMMENTS	Manual load from diskette and download from host.			Supports multiple 1.544M bps cross-domain links over terrestrial or satellite facilit. Supported by ACF/VTAM with NTX Cross Domain Control Program; full circuit redundancy.

Communications Processors

SUPPLIER AND MODEL	NTX Communications Corporation NTX 3800—Model 1	Paradyne Pix/Pixnet	Paradyne Pixnet-XL	Periphonics T-Comm*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM and plug-compatible mainframes	IBM S/370, 30XX, 43XX, and compatibles	IBM/370, 43XX, 30XX, and compatibles	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	1	2	12 per processor
Max. no. of active hosts supported simultaneously	2	Multiple	Multiple	12 per processor
IBM emulation	270X, 37X5 EP	Does not apply	Does not apply	370X, 3803, 3272, 2848
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	Multiple	Multiple	7
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	Yes	No	Yes
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	BSC	None	OSI-modeled	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	8	None	None	520
2000 to 9600 bps	8	Application-dependent	Application dependent	520
Over 9600 bps	8	3 full-duplex	16 full-duplex	520
Highest line speed supported (bps)	6.312M	56K bps	2.048M bps	56K
Effect on line capacity, if all lines are full-duplex	Halved	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	No
Terminal-initiated applications switching	Does not apply	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	Yes
Protocol conversion	No	Async/3270; PC/3270	Async/3270, PC/3270	Yes
Code conversion	No	ASCII/EBCDIC	ASCII, EBCDIC	Yes
Error control	CRC	Yes	CRC	Yes, all industry std.
Automatic transmission speed detection	No	Yes	No	With specified modems
Automatic disconnect of inactive dial-up terminals	No	Info. not available	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Info. not available	Proprietary	Proprietary	DEC PDP-11
Main memory word size, bits	Info. not available	16	16 bit	16
Main memory storage capacity, bytes	96K	128K	2M	64K to 5M
Level of data unit transferred across I/O channel	Block; byte	Byte	Block, byte	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and Interrupt	DMA and Interrupt	Interrupt
Mass storage	None	None	DMA and Interrupt	DMA and Interrupt
Other peripherals	None	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Internal diag. processor	Mag. tape; console	Diskette	CRT, printer, mag. tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Host-based software	Combination software, firmware, hardware	Combination firmware/software	Proprietary
IPL method	Info. not available	Intern. self-load, man.	Internal	From host or diskette
Additional software supported	None	Utilities	Utilities	Network Definition Utility, Voice Dialog Utility
User programmability	Access method macros	Self-configuring	No, vendor supported	Yes, via user-selected parameters, programs
Software separately priced	None		None	All
Approx. proportion of currently installed systems supplied as turnkey systems	Info. not available	All	All	80%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	145,730	Contact vendor	Contact vendor	50,000
Monthly maintenance, $	474	Contact vendor	Contact vendor	Approx. 400
Monthly lease/rental, $	5,754 (1-year lease)	Contact vendor	Contact vendor	Variable
Maximum practical configuration:				
Purchase price, $	233,005	Contact vendor	Contact vendor	250,000
Monthly maintenance, $	730	Contact vendor	Contact vendor	2,000
Monthly lease/rental, $	9,347	Contact vendor	Contact vendor	Variable
Is maintenance bundled with lease/rental?	No	Contact vendor	No	No
Date of first delivery	Info. not available	April 1976	December 1984	1980
Number of systems installed to date	Info. not available	Over 5,000	—	500
Serviced by	NTX	Paradyne	Paradyne	Periphonics
COMMENTS	Supports multiple 1.544M bps links using IBM BSC; full circuit redundancy.	Pix/Pixnet permits remote peripherals and CRTs to access multiple IBM hosts and applications as locally attac. devices without remote TP software and with no software maintenance.	Pixnet-XL allows remote peripherals, CRTs, IBM 3800 & Xerox 8700 laser printers, and other peripherals to access IBM hosts as locally attached devices. No host or TP software is required.	Data/voice on same line, voice response system; network interface; nodal; solid state audio; integrated services. 1984 information

Communications Processors

SUPPLIER AND MODEL	Periphonics Telemarketer*	Periphonics Voicepac*	Periphonics CommStar*	Periphonics VoiceBox*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	3780/3270; most major vendors	Most major vendors	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes, dstrb. app. proc.	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Info. not available	3	12/processor	3
Max. no. of active hosts supported simultaneously	Info. not available	3	12/processor	3
IBM emulation	Info. not available	Most std. interfaces	370X; 3803; 327X; 2848	Yes
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	3	7	3
Host-independent network processor	Yes	No	Yes	Optional
Store-and-forward message switching processor	Electronic orders	No	Yes	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	No	SNA	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	20	78	520	32
2000 to 9600 bps	20	78	520	32
Over 9600 bps	20	78	520	32
Highest line speed supported (bps)	9.6K	9600	9600	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	ASCII/EBCDIC	Yes
Error control	Industry standards	All industry standards	Industry standard	Industry standard
Automatic transmission speed detection	No	No	With specified modems	With specified modems
Automatic disconnect of inactive dial-up terminals	If selected	Yes		
SYSTEM CHARACTERISTICS				
Processor	Multi 32 bit and 16 bit	LSI 11/23; PDP-11S	Daul 32 bit and 16 bit	LSI 11/23
Main memory word size, bits	32 + 7 1	16	32 bit ECC; 16 bit ECC	16
Main memory storage capacity, bytes	1-2M	64-256KB w/Peripacs	Up to 3M	128K
Level of data unit transferred across I/O channel	Internal 2 or 4 bytes	Byte or block	2 or 4 bytes	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt and DMA	Interrupt	DMA and Interrupt	Interrupt
Mass storage	DMA	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	CRT; ptr.; tape; disk	Yes	Console; prtr.; modem; disk;diskette;mag. tp.	Yes
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	UNIX based	Proprietary software	Real-Time, UNIX-based	Proprietary software
IPL method	Hard disk	Download or disk load	Self-load from disk	EPROM based
Additional software supported	Network Definition Utility, Voice Dialog Utility; Rel. DBMS	I/O Gen, Pave; Param	Network def; ATM switching; DBMS; high-level langs.	None
User programmability	Yes	Yes, voice dialog & basic edit functions	Yes	Yes
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	100%	75%	Info. not available	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	60,000	25,000	75,000	20,000
Monthly maintenance, $	Approx. 600	250 min., variable	400	Approx. 200
Monthly lease/rental, $	Variable	Variable	Variable	Variable
Maximum practical configuration:				
Purchase price, $	90,000	150,000	300,000	50,000
Monthly maintenance, $	Contact vendor	250	2,500	250 minimum
Monthly lease/rental, $	Variable	Variable	Variable	Variable
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1983	1981	1984	1983
Number of systems installed to date	—	200	—	—
Serviced by	Periphonics	Periphonics	Periphonics	Periphonics
COMMENTS	Electronic order entry system w/voice response and handheld terminal support. 1984 information	Handles data and voice interchangeably via a single I/O port; can concentrate, convert protocol & code, and serve as a network node. *1984 information.	A user-programmable comm. switching system w/extensive library of terminal and network interfaces. *1984 information	A solid state unit that can concentrate, convert protocol and code, serve as a network node, and provide voice response. *1984 information

Communications Processors

SUPPLIER AND MODEL	Sperry DCP/10	Sperry DCP/20	Sperry DCP/40	Tandem Computers 6100 Communications Subsystem*
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Sperry Series 1100, Series 90	Sperry Series 1100, Series 90	Sperry Series 1100, Series 90	Tandem NonStop II and NonStop TXP
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	4	16	2 per 15 lines
Max. no. of active hosts supported simultaneously	1	3	16	2 per 15 lines
IBM emulation	Info. not available	No	No	None
Remote line concentrator	Info. not available	Yes	Yes	Contact vendor
Maximum no. of hosts served by one concentrator	Info. not available	No specific limit	No specific limit	Does not apply
Host-independent network processor	Info. not available	Yes (init. host load)	Yes (init. host load)	Contact vendor
Store-and-forward message switching processor	Info. not available	Custom	Custom	Contact vendor
Distributed processing node	Info. not available	No	No	Contact vendor
Terminal controller	Info. not available	No	No	Yes
Network architecture compliance	Info. not available	DCA	DCA	Contact vendor
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	6 sync, 24 async.	47 sync; 192 async.	255 sync; 1023 async.	360
2000 to 9600 bps	6 sync, 24 async.	47	255	360
Over 9600 bps	6 sync, 24 async.	47	140	360
Highest line speed supported (bps)	Info. not available	64K	64K	56K
Effect on line capacity, if all lines are full-duplex	Info. not available	None	None	No effect
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Info. not available	Yes	Yes	No
Terminal-initiated applications switching	Info. not available	Yes	Yes	Contact vendor
Comm. processor-initiated dynamic line reconfig.	Info. not available	Yes	Yes	Yes
Protocol conversion	Info. not available	Yes	Yes	Contact vendor
Code conversion	Info. not available	Yes	Yes	Yes
Error control	Info. not available	Yes	Yes	Yes
Automatic transmission speed detection	Info. not available	Yes, 110 to 19.2 bps	Yes 110 to 19.2K bps	No
Automatic disconnect of inactive dial-up terminals	Info. not available	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Sperry DCP/10	Sperry DCP/20	Sperry DCP/40	Proprietary
Main memory word size, bits	16	16	16	8
Main memory storage capacity, bytes	512K	512K	3.5M	64K per line
Level of data unit transferred across I/O channel	Info. not available	Block	Block	Block
Type of data transfer supported between memory and:	Info. not available			
Communications lines		DMA	DMA	DMA
Mass storage	Info. not available	DMA	DMA	DMA
Other peripherals	Info. not available	DMA	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Info. not available	Console, disk, diskette mag. tape	Console, disk, mag. tape	Integrated with system
Support for remote console	Info. not available	Yes	Yes	Contact vendor
Communications operating software:				
Operating system implemented in	Info. not available	Combination software and firmware	Combination software and firmware	Software and firmware
IPL method	Info. not available	Host download & disk.	Host download & disk.	Download from host
Additional software supported	Info. not available	File transfer	File transfer	Contact vendor
User programmability	Info. not available	Yes, via user-created programs	Yes, via user created programs	Contact vendor
Software separately priced	Info. not available	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	10%	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	20,000	47,350	103,600	25,840
Monthly maintenance, $	100	245	590	128
Monthly lease/rental, $	450 (5-year lease)	1,080 (5-year lease)	2,340 (5-year lease)	Does not apply
Maximum practical configuration:				
Purchase price, $	40,000	135,000	480,000	Contact vendor
Monthly maintenance, $	220	700	2,500	Contact vendor
Monthly lease/rental, $	990 (5-year lease)	2,800 (5-year lease)	10,000 (5-year lease)	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	Does not apply
Date of first delivery	December 1983	January 1982	September 1979	April 1983
Number of systems installed to date	Info. not available	Info. not available	Info. not available	
Serviced by	Sperry	Sperry	Sperry	Tandem
COMMENTS				*1984 information.

Communications Processors

SUPPLIER AND MODEL	Telefile Computer Products Telepac	Telematics VAX Front-end Processor	Telematics NET 25	Telematics Series 1
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Standalone or Telefile T80 Series	DEC VAX 11/730, 11/750, and 11/780 systems	Most	Most
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	8	4	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	8	4	Does not apply	Does not apply
IBM emulation	None	No	No	No
Remote line concentrator	Yes	Yes	Yes (packet switch)	Yes
Maximum no. of hosts served by one concentrator	12	4	4	4
Host-independent network processor	Yes	Yes	No	No
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	Yes	Yes	No	No
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	X.25	None	None	None
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	280	400	800	800
2000 to 9600 bps	280	80 to 400	160 to 800	160 to 800
Over 9600 bps	280	80	160	160
Highest line speed supported (bps)	19.2K bps	64K	64K	64K
Effect on line capacity, if all lines are full-duplex	None	Halved	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async to 3270 BSC/SDLC	No	No	No
Code conversion	ASCII to EBCDIC	No	No	No
Error control	Parity, LRC and CRC	Yes	Yes	Yes
Automatic transmission speed detection	50 to 9600 bps	50 bps—19.2K bps	50 bps—19.2K bps	50 bps—19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes			
SYSTEM CHARACTERISTICS				
Processor	M68000	MC68000/Telematics S1	MC68000/Telematics S1	MC68000/Telematics S1
Main memory word size, bits	16	32	32	32
Main memory storage capacity, bytes	64K Bytes MOS RAM	16M	16M	16M
Level of data unit transferred across I/O channel	Byte or block	Block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	DMA and Interrupt	DMA	DMA	DMA
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	FEP console, disk, diskette, mag tape	Removable disk (5M bytes)	Removable disk (5M bytes)	Removable disk (5M bytes)
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software & firmware	Software	Software	Software
IPL method	Int. selfload, dskt.	Manual from disk	Disk or remote port	Disk or remote port
Additional software supported	Program dev. software, utilities	Pascal; C	Pascal; C	Pascal; C
User programmability	Yes, via user-selected parameters	Yes	Yes	Yes
Software separately priced	Special applications only	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	80%	None	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	17,100	42,950	45,900	26,000
Monthly maintenance, $	114	455	275	150
Monthly lease/rental, $	570 (3 yrs.)	None	None	None
Maximum practical configuration:				
Purchase price, $	18,810	171,800	220,000	185,000
Monthly maintenance, $	126	1,820	1,320	1,110
Monthly lease/rental, $	627 (3 yrs.)	None	None	None
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	October 1980	October 1983	February 1984	December 1983
Number of systems installed to date	40	Info. not available	Info. not available	Info. not available
Serviced by	Telefile	Telematics	Telematics	Telematics
COMMENTS	Prov. mode for mult. CCITT X.25 pub. or priv. packet netwk.; Sup. all ASCII based hosts and terminals; interface to SNA/SDLC networks.			

Communications Processors

SUPPLIER AND MODEL	Tri-Data Netway 200	Tymnet Micro-Engine	Tymnet Mini-Engine	Tymnet Engine
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply		–
Max. no. of active hosts supported simultaneously	Does not apply	–		–
IBM emulation	Does not apply			
Remote line concentrator	Yes	Packet switch	Packet switch	Packet switch
Maximum no. of hosts served by one concentrator	4	Depends on config.	Depends on configu.	Depends on config.
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	SNA; X.25	Tymnet proprietary (Tymnet II)	Tymnet proprietary (Tymnet II)	Tymnet proprietary (Tymnet II)
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	6	Depends on configur.	Depends on configur.	Depends on configur.
2000 to 9600 bps	6	Depends on configur.	Depends on configur.	Depends on configur.
Over 9600 bps	6	Depends on configur.	Depends on configur.	Depends on configur.
Highest line speed supported (bps)	56K	19.2K bps	74K bps	74K bps
Effect on line capacity, if all lines are full-duplex	None	Increased	Increased	Increased
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	No	No	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Any supported/any sup.	Any supported/any sup.	Any supported/any sup.
Code conversion	ASCII to EBCDIC	ASCII/2741/Baud./EBCD	ASCII/2741/Baud./EBCD	ASCII/2741/Baud./EBCD
Error control	Parity; LRC; CRC	Parity; CRC	Parity; CRC	Parity; CRC
Automatic transmission speed detection	No	Yes	Yes	Yes
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Z80A	Proprietary	Proprietary	Proprietary
Main memory word size, bits	8 bits	32	32	32
Main memory storage capacity, bytes	256K	512K	1M	2M
Level of data unit transferred across I/O channel	Byte	Does not apply	Does not apply	Halfword
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	DMA and Interrupt	Does not apply	Does not apply	DMA
Other peripherals	DMA and Interrupt	Does not apply	Does not apply	DMA
I/O, back-up, and diagnostic peripherals supported	Diskette	None	None	Disk; mag. tape; console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Microcode	Microcode	Microcode
IPL method	Rem. download or manual	Download from Engine	Download from Engine	From disk or tape*
Additional software supported	CP/M, Macro 80, Wordstar, Plink II	Validation utilities; operations utilities; acctg. utilities; Net. mgt. and control; msg.	Switching	Yes
User programmability	Yes	Yes	Yes	Yes
Software separately priced	All but O.S.	Utilities	Utilities	Utilities
Approx. proportion of currently installed systems supplied as turnkey systems	90%	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	7,920	10,000 (approx.)	40,000 (approx.)	70,000 (approx.)
Monthly maintenance, $	Info. not available	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Info. not available	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	15,000	16,120 (approx.)	70,000 (approx.)	130,000 (approx.)
Monthly maintenance, $	Info. not available	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Info. not available	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	Info. not available	No	No	No
Date of first delivery	April 1983	1983	1981	1978
Number of systems installed to date	120	200	210	850
Serviced by	Tri-Data	Tymnet	Tymnet	Tymnet
COMMENTS	Supports networks up to 50 nodes @ 32 devices per node.	Engines sold as components of complete, custom networks compatible with Tymnet's public network.	Engines sold as components of complete, custom networks compatible with Tymnet's public network.	Engines sold as components of complete, custom networks compatible with Tymnet's public network. *Or downline from other engine

Communications Processors

SUPPLIER AND MODEL	Westinghouse Canada Electronic Systems Division W1655/1656*			
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM PARS, Sperry Uniscope 100 & UTS20			
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No			
Max. no. of hosts channel-attachable to front-end	Does not apply			
Max. no. of active hosts supported simultaneously	Does not apply			
IBM emulation	Does not apply			
Remote line concentrator	Yes			
Maximum no. of hosts served by one concentrator	4			
Host-independent network processor	No			
Store-and-forward message switching processor	Yes			
Distributed processing node	No			
Terminal controller	Yes			
Network architecture compliance	None			
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	16			
2000 to 9600 bps	16 at 4800; 8 at 9600			
Over 9600 bps	None			
Highest line speed supported (bps)	19.2K			
Effect on line capacity, if all lines are full-duplex	Capacity reduced			
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No			
Terminal-initiated applications switching	No			
Comm. processor-initiated dynamic line reconfig.	No			
Protocol conversion	U100/P1024			
Code conversion	IPARS/P1024			
Error control	Yes			
Automatic transmission speed detection	No			
Automatic disconnect of inactive dial-up terminals	No			
SYSTEM CHARACTERISTICS				
Processor	Intel 8085 (dual)			
Main memory word size, bits	8			
Main memory storage capacity, bytes	32K			
Level of data unit transferred across I/O channel	Block			
Type of data transfer supported between memory and:				
Communications lines	Interrupt			
Mass storage	DMA and interrupt			
Other peripherals	Interrupt			
I/O, back-up, and diagnostic peripherals supported	Yes			
Support for remote console	Yes			
Communications operating software:				
Operating system implemented in	Firmware			
IPL method	Download, EPROMs			
Additional software supported	Info. not available			
User programmability	No			
Software separately priced	Specials			
Approx. proportion of currently installed systems supplied as turnkey systems	25%			
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	12,000			
Monthly maintenance, $	Info. not available			
Monthly lease/rental, $	Third party			
Maximum practical configuration:				
Purchase price, $	20,000			
Monthly maintenance, $	Info. not available			
Monthly lease/rental, $	Third party			
Is maintenance bundled with lease/rental?	No			
Date of first delivery	September 1976			
Number of systems installed to date	300			
Serviced by	Third party			
COMMENTS	Remote line polling; *1984 information.			

Communications Processors

A communications processor is a multifunctional, program-controlled, digital computer dedicated to communications and able to serve as a control point, or node, in a data communications network.

In general, such a processor performs one or more of three major functions: front-end processing, intelligent switching, and concentration. A *front-end processor* serves as a locally attached peripheral device to one or more large computers dedicated to applications processing, relieving them of the overhead involved in message handling and network control. An *intelligent switch* routes messages among the network's various end points and participates in the network's control and management either under the control of a master (usually front end) processor or as a peer of other intelligent switches. A *concentrator* controls a community of terminals, clusters of terminals, or distributed applications processors; gathers, queues, and multiplexes their transmissions onto one or more high-speed network trunks; and participates in the network's control and management, again either under the direction of a master processor or as a peer of other concentrators and switches.

Each of the three major functions is a combination of some or all of the following subfunctions:

- physical transmission and reception of data
- data buffering and queueing
- multiplexing
- message framing and unframing
- control of transmission errors
- message sequencing
- protocol conversion
- message pacing and flow control
- message or packet assembly and disassembly
- route selection
- session establishment and disconnection
- formatting of data for use by specific host or terminal applications
- reporting and logging of device or transmission errors or failures
- fallback switching in case of host, device, or transmission line failure
- gather and recording of network performance and traffic statistics.

A communications processor is a multifunctional device that may serve as a front end to a mainframe, as an intelligent switch, or as a remote concentrator. This report describes these broad functions in detail, and also covers communications processor design, the place of the communications processor in modern network architectures, the evolution of the communications processor, the general advantages and restrictions of today's communications processors, and the state of the communications processor marketplace.

The rapid evolution of microprocessor-driven, single-function devices such as protocol converters, terminal controllers, and X.25 PADs has caused Datapro to sharpen its definition of a communications processor to include only truly multifunctional, intelligent devices dedicated to networking. Look for information on Conversion Systems and Terminal Controllers behind Tab C23 in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS.

This report also includes comparison charts outlining the major characteristics of 68 true communications processors from over 30 vendors, and user ratings from 536 users reporting on an installed base of 2735 communications processors.

The most sophisticated communications processors, especially those marketed primarily as front ends by mainframe computer vendors, can perform all of these tasks. Indeed, in a large, complex network governed by one or more mainframe hosts, a front end must perform all but the last three in the normal course of its operations. Front-end processing is the most complex task a communications processor can perform.

Intelligent switching is slightly less complex, since the communications processor acting as a dedicated switch need not carry on a running dialogue with a host computer, and is not responsible for the end-to-end establishment and disconnection of sessions. Still, an intelligent switch, in normal operation, must perform all but the last five basic functions. An intelligent switch differs from a simple switch, such as a port selection and contention device, because it must monitor the network's traffic and performance, either under the control of a master processor (usually a front end) or as a peer among other intelligent switches and concentrators, and change its behavior, notably the routing and pacing of messages, according to the information it receives. A simple switch simply establishes ▷

Communications Processors

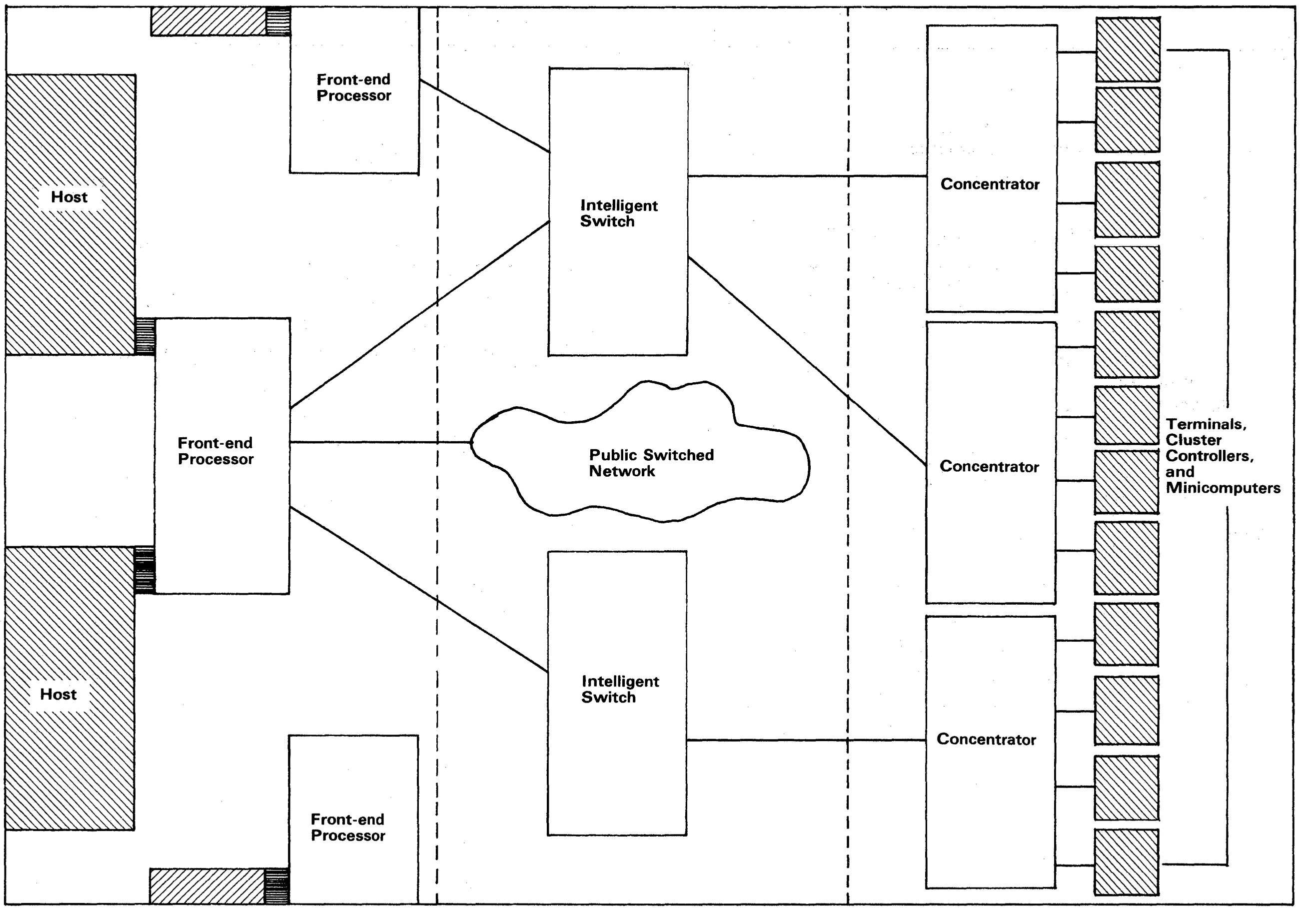


Figure 1. A communications processor can function as a front end for one or more host computers, as an intelligent switching node not attached directly to any applications equipment, or as a remote terminal concentrator.

an information path according to instructions it receives from a user or computer on one end of the connection.

Concentration is the least complex task a communications processor can perform, and communications processors acting as concentrators can easily be confused with less sophisticated, single-function devices such as statistical multiplexers, protocol converters, packet assembler/disassemblers (PADs), and terminal cluster controllers. Indeed, with the widespread use of microprocessors and the declining cost of silicon intelligence, many devices at the high ends of these lines are beginning to approach the functional breadth of true communications processors. The difference is that true communications processing, concentration included, is a dynamic process involving feedback from other intelligent devices in the network. Statistical multiplexing, protocol conversion, and packet assembly/disassembly are basically static processes that do not change as conditions change on the network. An intelligent concentrator participates in the control of the network, either under the direction of a master processor or as a peer of other concentrators and switches, receiving status information from the network and changing its behavior accordingly: accelerating or withholding transmissions, initiating diagnostic procedures for pathways and devices in its local domain, and controlling access to the network from its locally attached devices. Some sophisticated terminal controllers, notably IBM's 3274s, can perform some or all of these functions. A concentrator differs from a sophisticated terminal cluster controller by its position in the network's hierarchy: a concentrator can concentrate data from a number of cluster controllers, while a cluster controller concentrates data only from a number of individual terminals. As an example, consider the relative positions in an SNA network of an IBM 3705 acting as a remote node (concentrator) and an IBM 3274 within that concentrator's domain. A user can build an entire network from intelligent concentrators communicating with one another as peers, but cannot do the same with cluster controllers.

COMMUNICATIONS PROCESSOR DESIGN

The basic design of almost all communications processors follows the same, three-tiered, hierarchical plan—a plan that they share in general with their close cousins the digital PBXs, and more generally with a number of other data communications components.

The device's central processing unit (CPU) sits at the top of the hierarchy along with its associated main memory; it controls the communications processor's operation according to the rules and parameters of its operating software, and, in front-end configurations, in conjunction with instructions from the host computer. In general, the CPU performs the complex or dynamic tasks such as addressing, route selection, protocol conversion, access control, session

Communications Processors

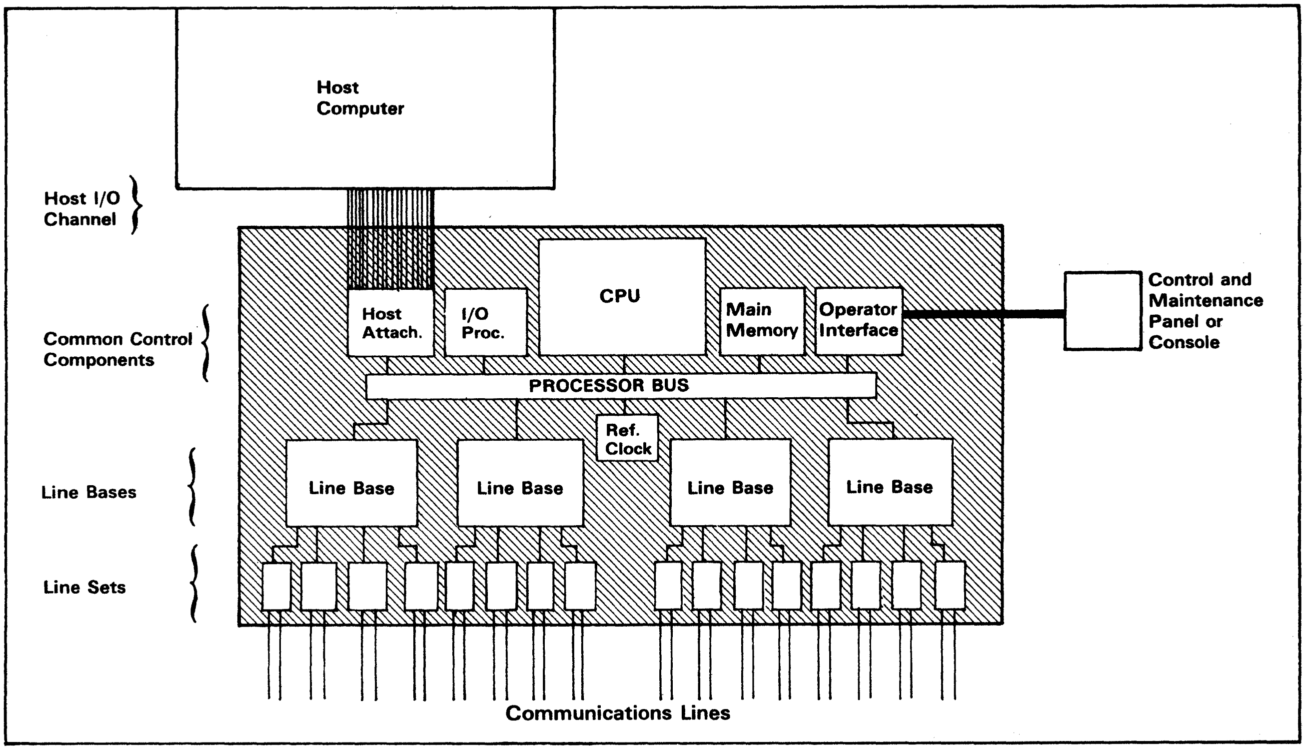


Figure 2. The diagram shows the hierarchical, bus-based architecture of a typical communications processor. Such a processor may contain more than one host interface, several I/O processors, and many more line bases. Each line base serves communications lines of a specific synchronization, speed, and protocol. Each line set serves lines with a specific physical interface. The modular arrangement of line bases and line sets on the processor bus allows easy configuration and reconfiguration.

establishment, application-level formatting, and error logging, and delegates the rote operations to subsidiary components.

In most communications processors, some components operating under the direction of the CPU perform general functions involving the operation of the whole communications processor, while others perform functions dedicated to specific groups of lines. Among the former are the host interfaces, the input/output (I/O) processors, the reference clock, and the operator interface. Among the latter are the processor's line bases and line sets.

Communications processors configured as front ends must have at least one host interface. The host interface handles communications between the front-end processor and the host's byte or block multiplexer, or selector channel. The host interface buffers data from the front end's CPU, assembles it into parallel bit streams of a format specific to the attached host channel, and transmits it up the channel to the host; for data coming from the host, it performs the same process in reverse. The host interface's principal function is conversion of data from the communications processor's internal word size to that of the host computer. Some communications processors contain one or more input/output (I/O) processors that transfer data between the CPU and attached storage peripherals, such as disk or tape drives. In some cases, the I/O processors arbitrate among the various line bases for access to main memory and to the CPU, handling interrupts generates by the line bases or host interfaces to gain the attention of the CPU, or controlling the line bases' and host interfaces' access to main memory. In communications processors with more than one I/O processor, each I/O processor usually controls a set complement of storage units or communications lines.

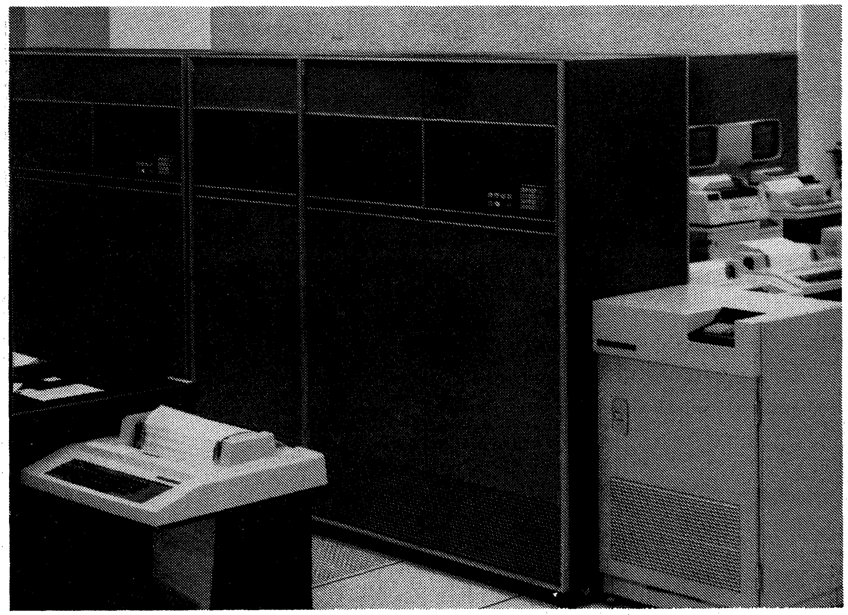
The reference clock generates a timing signal used by all other components of the communications processor. In many systems, reference timing is a function of the CPU. Some systems have separate reference clocks for the timing of signals at different data rates.

The operator interface allows a human operator to monitor and control the communications processor and to run diagnostic tests. In newer and more sophisticated systems, the operator interface works under software control from a dedicated console, which usually contains a CRT or similar display unit and a printer for logging. In most communications processors, the operator interface works through a front panel that contains a number of manual switches and indicator lights.

All of the above-mentioned devices perform functions that are shared among all communications lines; they sit just below the CPU in the communications processor's internal hierarchy. On the network side, the "business end" of a communications processor, the line bases and line sets complete the hierarchy.

A line base, sometimes called an attachment base, interface base, or interface module, handles communications at the Data Link layer between the communications processor

Communications Processors



Model 3690 is the largest and most capable of NCR Comten's IBM-compatible communications processors. The newest models can support up to 4M bytes of main memory.

and a group of attached communications lines that share a common synchronization pattern, line speed, and sometimes, protocol. Each line base usually contains a dedicated microprocessor that performs such functions as framing and stripping, message buffering, message sequencing, synchronization, and error detection under the direction of the CPU. Most current communications processors accommodate from 8 to 32 line bases, each of which handles from two to eight line sets.

A line set handles communications at the Physical layer between its attached line base and from one to eight communications lines. All the communications lines attached to a given line set must use the same physical interface at roughly the same data rate. The line set handles serialization of data and interface-level control signaling.

All the components of the communications processor communicate with one another over a parallel data bus, usually located along the backplane or a side plane of the processor's cabinet. The physical bus architecture, made popular in the design of minicomputers, allows for easy installation and replacement of parts. In a hierarchical architecture such as that of most communications processors, it also makes for easy reconfiguration. To replace asynchronous communications over voice grade lines with HDLC communications over wideband or satellite circuits for a 16-line segment of a network, a user might need to replace only one line base and eight line sets, rather than having to swap out an entire front-end processor. The hierarchical design extends the communications processors functionality over time and helps to protect the user's investment in the face of changing technology. Figure 2 shows the hierarchical configuration of a generalized communications processor.

COMMUNICATIONS PROCESSORS AND NETWORK ARCHITECTURES

The implementation of network architectures is perhaps the most important ongoing theme in the development of data communications. In general, there are two kinds of network architectures: those designed to provide communications among computers and terminals from a specific vendor, and those designed to provide open communications regardless of the vendor of the communicating devices. Mainframe vendor architectures include IBM's SNA, Honeywell's DSA, Burroughs's BNA, and Sperry's DCA. Open architectures include the CCITT's X.25 packet switching specification and several "transparent" network schemes marketed by communications vendors. The communications processor is the most important element in both vendor-specific and open architectures. In the following paragraphs, we will use the International Organization for Standard (ISO) reference model for Open Systems Interconnection (OSI) to examine the different roles that communications processors play in different kinds of network architectures.

In network architectures designed by mainframe computer vendors, the communications processor functions most often as a front end, and controls communications in conjunction with one or more software systems in the host computer. In general, the front-end processor handles the Data Link through Session layers of the ISO model, with host software implementing the Presentation and Application layers. The balance varies from architecture to architecture. In Sperry's DCA the DCP-Series front end has control over many Presentation-layer functions, while in IBM's SNA, the host's access method, along with software residing in the 327X terminal controllers, handles communications down to the Session layer, with the 37XX front end acting almost as a channel-attached packet switch. The range of control assigned to front-end processors in other mainframe architectures varies between those extremes.

In all the mainframe architectures, the same communications processor models that serve as front ends can also function as intelligent switches and as remote concentrators. In these functions, the communications usually ap-

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pear in smaller configurations than in the front-end role. Communications processors working in mainframe architecture can also perform another important function in conjunction with any of the other three, that of an intelligent gateway. In this application, the communications processor provides the interface between the mainframe network and communications facilities outside the architecture, particularly public, packet-switched data networks using the X.25 protocols.

The function of a communications processor differs between the two kinds of open architectures. In a full-scale open architecture such as X.25, the communications processor serves entirely as an intelligent packet switch, implementing the Data Link through Transport layers through a uniform set of complementary protocols. Designed specifically for public data networks, the X.25 protocols provide ultimately for the establishment of virtual circuits, or logical paths through the network, for devices from any vendor. Communicating devices, computers or terminals, at either end of the virtual circuit must handle the Session, Presentation, and Application layers according to their own protocols. Since, in a public network, the network provider is responsible for network management, the X.25 communications processors in such a network carry a heavy load of access, error, and class-of-service control, along with many provisions for statistical recording of traffic and usage data that can be sorted by individual user account. Communications processors, such as GTE Telenet's TP4000, designed to function as switches in public networks are the likeliest to support high-capacity attached storage devices such as disk and tape drives.

Communications processors operating in full-scale X.25 configurations seldom perform a gateway function. The user must provide compatibility with the network's standard protocols, either through an X.25 software package that resides in a participating host or its front-end processor, or through a packet assembler/disassembler (PAD) that handles the Physical and Data Link layers of the architecture.

Transparent architectures are a relatively new development offered by vendors of communications equipment as a low-cost alternative to mainframe architectures and full-scale X.25 implementations. These architectures are usually stripped-down versions of X.25 without much of the network administration and class-of-service overhead necessary to operate a public or very large private network. In these architectures, the communications processor functions primarily as a switching concentrator, providing services at the Data Link, Network, and Transport layers. Most such concentrators have evolved at the high ends of lines of statistical multiplexers, adding the crucial routing and flow control features that qualify them as communications processors. Some such products offer integrated network management functions such as error logging and performance statistics, but most rely on a separate, complementary network management system to provide these functions.

THE EVOLUTION OF THE COMMUNICATIONS PROCESSOR

The communications processor as we currently know it came into being in the mid- to late-1970s, the result of the merger of several separate developments in both communications and data processing. Its direct ancestors were hard-wired communications controllers such as the IBM 270X and Sperry Univac CCM, relatively unintelligent combinations of large multiplexers and cabling concentrators designed to perform only the basic, rote operations of communications handling. These devices provided a physical map of the network for the host, basically allowing it to find each physical line in its logical polling sequence and performing simple error notification for the host.

Two developments in the late 1960s provided the technical base for the modern communications processor: the minicomputer and the ARPAnet. The minicomputer provided a small, relatively inexpensive, software-controlled machine that could perform any of a number of functions more efficiently than a mainframe, and incidentally also provided the bus architecture that gives communications processors their modularity and flexibility. The ARPAnet, the first large-scale packet-switched data network, provided the fundamental design principles for all current data communications architectures. One of these principles was the intelligent virtual circuit switch, the first functional communications processor.

A later development in minicomputer applications created the distributed processor, a small computer, dedicated to part of a larger application, that performed, as one of its necessary functions, communications with its peers in a distributed network. Distributed processing contributed the idea of intelligent communications handling under software control. Indeed, network architectures from such minicomputer vendors as DEC and Hewlett-Packard are applications of later communications developments onto the framework of distributed processing among minicomputers.

The lower cost of dedicated processing in small computers and the increasing cost of mainframe processing power made the idea of a dedicated small computer to off-load intelligent communications handling from the mainframe economically practical. The first intelligent front ends, such as IBM's 3704, predate modern network architectures, and to a large extent, made such architectures possible.

In the late 1970s, IBM's SNA and the ISO's OSI model, the earliest general network architectures, advanced the idea of data communications as an entirely separate function from applications processing, and of the network as a physical entity separate from its participating hosts and terminals. The best way to implement a physically separate communications function is through a system of small computers dedicated to communications. Such communications processors could be placed at the front end of the mainframe, or could function independently as concentrators and switches within their respective architectures.

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One further development produced the communications processor as we know it today: the microprocessor. The advent of cheap silicon intelligence allows designers to implement the hierarchical scheme of the typical communications architecture in hardware, with dedicated microprocessors performing low-level functions and reporting to larger and more complex processors at the higher levels. Indeed, some line bases in present-day communications processors are programmable, receiving downloads from the units' CPUs that describe the protocol and synchronization each is to use. Some newer systems are composed entirely of redundant, microprocessor-controlled modules, each of which can perform any of the functions of any other with the proper software load; such a processor is actually a distributed communications network in a box.

The advent of the microprocessor has also begun to blur the distinction between traditional communications processors and less broadly functional devices such as multiplexers and terminal controllers, and has created a new class of intelligent protocol converters dedicated to a task that was once economical only as a function within a multifunctional communications controller. Now, even modems can detect, report, and in some cases correct transmission errors, and sense the conditions of transmission lines. The old definition of a communications processor as a computer that has been programmed to perform one or more control and/or processing functions in a data communications network now includes everything from modems and dedicated monitoring equipment up to the IBM 3725.

In answer to this shifting definition, Datapro has created a new section in Volume 2 of DATAPRO REPORTS ON DATA COMMUNICATIONS, Tab C23, entitled Conversion Systems/Terminal Controllers. In the new section, the reader will find information on many product categories formerly covered in this report: protocol converters, intelligent terminal controllers, and PADs, to name three. To complement the new section, we have sharpened the focus of this report to include only true, multifunctional communications processors.

ADVANTAGES AND RESTRICTIONS

The principal advantage of a communications processor as a networking tool is the physical and logical separation of the networking function from the application of its end users. Whatever its architecture, such a network can function for any application, can grow in size without qualitative change to accommodate new applications, and can accommodate new applications through the installation of relatively standard, intelligent components. In simpler terms, the user does not have to redesign and rebuild a modular network to accommodate a change in the network's ultimate purpose.

Programmable, software-controlled communications processors are an especially handy tool in such standalone networks because they can accommodate not only changes in application but also the effects of technical progress. A software-controlled communications processor with a good design can survive several breakthroughs in networking technique through relatively simple upgrades. The newer, microprocessor-controlled line bases, and even line sets, provide an even more flexible buffer against obsolescence.

In operation, a network controlled by communications processors can survive the total failure of one or more of its host processors. In a multihost network, front-end processors can switch users from applications in a failed host to similar or identical applications in a backup host, perhaps elsewhere on the network. In a single-host network, a functioning front end allows for a graceful degradation of service in the event of a host failure, perhaps allowing users time to terminate their tasks before total system failure, or allowing communications among distributed application processors in the absence of the controlling host.

Also in operation, the communications processor still fulfills its original purpose; relieving the host of the overhead generated in keeping track of a network. Today's networks are orders of magnitude more complex than those of the mid-1970s when the first communications processors appeared, and thanks to the ever-lower cost of memory and processing power, some of today's communications processors are bigger, faster, and more powerful than that era's mainframes. They need to be.

Among the restrictions of today's communications processors are complexity and incompatibility. In an era of user-friendly hardware and software, the communications processor remains a device with which only a trained engineer should meddle. Most require that their programs be written in an arcane, assembler-level language, sometimes with the benefit of pregenerated macros in the host access method, often without.

Even with recent advances in simplicity and modularity, configuring a communications processor to suit a specific network or application can be difficult. With today's microprocessor technology, the better communications processors are the simpler; as an example, IBM's new 3725 Communication Controller sports a parts list only half as long as that of the older 3705. The trend is toward fewer components each of which can do more, but most communications processors are still lagging a bit behind that trend.

Despite the advent of open architectures and the impending arrival of truly standard protocols, the integration of terminals, computers, and protocols foreign to a given vendor's architecture remains difficult. The gateway function is a plus, but it is cumbersome and often expensive. Most vendors are beginning to offer some level of IBM compatibility through their communications processors, but balk at anything beyond concession to the obvious market leader.

THE CURRENT MARKETPLACE

In 1984, the market for full-scale communications processors breaks down into four segments: IBM and plug-compatible communications processors for the IBM mainframe environment; communications processors dedicated to the mainframe architectures of vendors other than IBM;

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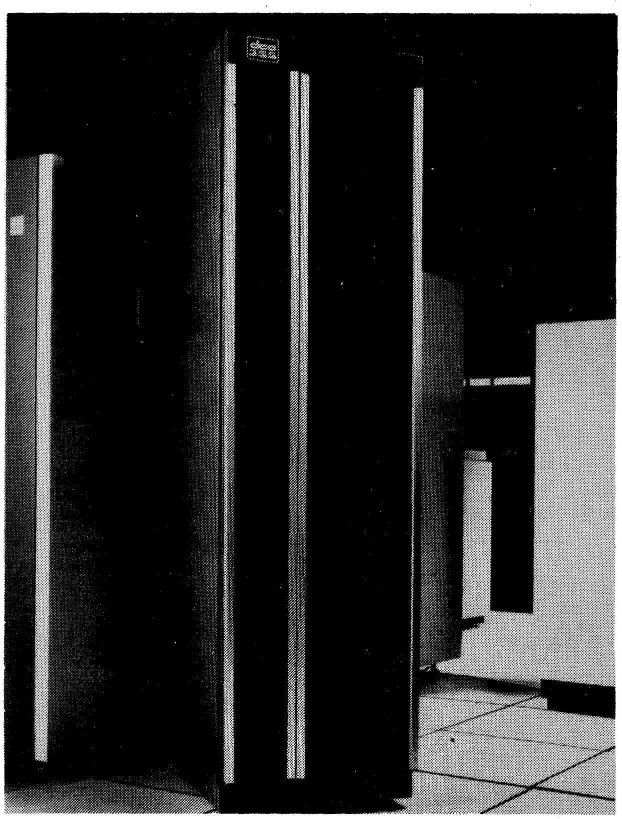
packet-switching processors marketed as components of large, vendor-independent private networks; and intelligent concentrators designed to serve in transparent network architectures.

In the IBM world, IBM sells 90 percent of the communications processors. The remaining 10 percent accounts for some of the most intense competition in data communications. Within that market, NCR Comten is the clear leader, followed by Amdahl and Computer Communications Inc., Memorex, and new entrant NTX.

The other mainframe vendors, Burroughs, Control Data, Honeywell, NCR, and Sperry do not really compete with one another in the communications processing marketplace. Each features a line of communications processors dedicated to its network architecture, and each line of communications processors has its merits. Honeywell's Datanet 8 line features a broad array of compatibility software. Sperry's DPC Series goes farther than most in providing host-independent networking.

Among vendors of private networks, the two U.S. public network leaders, Tymnet and GTE Telenet have solid offerings. Other vendors include Amnet, and BBN Communications, designers of the original ARPAnet and recently gone commercial.

A number of vendors offer intelligent concentrators, often at the high ends of lines of statistical multiplexers. Among these are Infotron, Micom, and Codex.



The DCA 355 from Digital Communications Associates can function as a remote concentrator or as a standalone intelligent switch.

USER EXPERIENCE

Datapro is proud to present the 1984 edition of our Network Users Survey. The survey is based on results received from questionnaires mailed to a cross section of *Data Communications* magazine subscribers.

Survey Methodology—Datapro designed and produced a questionnaire and mailed it in November 1983 to approximately 10,000 addresses selected at random from a cross section of *Data Communications'* U.S. end-user subscriber base.

The questionnaire contained 37 questions, and was divided into six basic parts. In the first part, users were asked to provide information concerning the general characteristics of their data communications networks. In each of the remaining five parts, the users were asked to specify within a given category the types of data communications equipment and services being used in their networks, and to provide usage information and equipment ratings on each type. The five categories of equipment/services included: transmission facilities, communications and network processors, modems, line multiplexers, and testing and monitoring equipment. The questionnaire allowed the user to rate up to two (or in some cases, three) vendor/model types within each category of equipment. (Reproduction of the form was permitted so that additional vendor/model types within a given product category could be rated.) The results of each of these five parts will be shown only in the Datapro report to which they are applicable. This report contains a summary of the user ratings provided by respondents to the Communications and Network Processors section.

When Datapro received the returns, they were audited by our senior level editors. All forms were carefully examined for validity before being sent for tabulation. The *Data Communications* labels were used for initial validation and identification. Responses to specific questionnaire sections or individual questions were disqualified whenever a vendor/model identity was omitted, user ratings were not assigned, a vested interest on the part of the respondent was judged to exist, or incomprehensible or unreasonable answers were given.

By the editorial cut-off of January 9, 1984, Datapro had processed 600 valid forms, which were then shipped to Mathematica Policy Research, Inc. for key entry and tabulation by computer. Summary information was prepared in the form of totals, percentages, or weighted averages, as appropriate for each question. Weighted averages were computed in a manner similar to most college grading systems: "Excellent" is weighted as 4, "Good" as 3, "Fair" as 2, and "Poor" as 1. The tallied numbers for each value were then multiplied by the corresponding weight, and the average taken by dividing the sum of the products by the total number of responses for that category.

Datapro suggests that the reader use the information presented with discretion. The individual equipment ratings are not presented to readers as the major consideration in making an acquisition decision. Rather, the ratings and

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TABLE 1. USER RATINGS OF COMMUNICATIONS PROCESSORS

Communications Processor Manufacturer and Model	Number of User Responses	Number of Units Installed	Overall Performance					Ease of Installation					Ease of Operation					Ease of Expansion				
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Amdahl																						
4705	15	86	3.7	11	4	0	0	3.4	8	7	0	0	3.5	10	5	0	0	3.2	3	6	6	0
Burroughs																						
B874	10	18	3.6	7	2	1	0	3.3	4	5	1	0	3.4	5	4	1	0	3.0	4	3	2	1
DCP	7	14	3.4	4	2	1	0	2.9	2	2	3	0	3.0	3	1	3	0	3.0	3	1	3	0
Other & unspecified	13	210	2.7	3	4	5	1	2.6	2	5	5	1	2.8	3	5	4	1	2.0	2	3	1	7
Subtotals	30	242	3.2	14	8	7	1	2.9	8	12	9	1	3.0	11	10	8	1	2.6	9	7	6	8
CCI																						
CC8	3	5	3.7	2	1	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3.0	1	1	1	0
Other & unspecified	3	12	3.3	1	2	0	0	3.0	0	3	0	0	3.0	0	3	0	0	2.7	0	2	1	0
Subtotals	6	17	3.5	3	3	0	0	3.0	1	4	1	0	3.2	1	5	0	0	2.8	1	3	2	0
Control Data																						
C1000	6	55	2.7	0	4	2	0	2.5	0	3	3	0	2.5	0	3	3	0	2.2	0	2	3	1
2550	3	6	2.7	0	2	1	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	0	3	0	0
Other & unspecified	3	5	2.7	0	2	1	0	2.7	1	1	0	1	2.3	1	0	1	1	2.7	1	1	0	1
Subtotals	12	66	2.7	0	8	4	0	2.7	1	7	3	1	2.6	1	6	4	1	2.5	1	6	3	2
Codex																						
6000	6	13	3.0	2	3	0	1	2.5	1	2	2	1	2.7	1	3	1	1	2.7	1	2	3	0
Digital Communications Associates																						
115	4	30	3.5	2	2	0	0	3.0	0	4	0	0	3.0	1	2	1	0	3.3	2	1	1	0
355	9	34	3.3	3	6	0	0	3.0	2	5	2	0	3.1	3	4	2	0	3.6	5	4	0	0
Subtotals	13	64	3.4	5	8	0	0	3.0	2	9	2	0	3.1	4	6	3	0	3.5	7	5	1	0
GTE Telenet																						
TP4000	3	72	2.3	0	1	2	0	2.3	0	2	0	1	2.3	0	2	1	0	1.7	0	0	2	1
Honeywell																						
Datanet	12	51	3.5	7	4	1	0	3.0	2	8	2	0	3.2	4	6	2	0	3.0	2	8	2	0
Other	5	59	2.8	1	3	0	1	2.4	1	0	4	0	3.0	1	3	1	0	2.2	1	1	1	2
Subtotals	17	110	3.3	8	7	1	1	2.8	3	8	6	0	3.1	5	9	3	0	2.8	3	9	3	2
IBM																						
3704	8	10	3.6	5	3	0	0	2.8	2	4	1	1	3.0	2	3	2	0	2.2	1	1	2	2
3705-II	8	51	3.9	7	1	0	0	3.5	4	4	0	0	3.3	3	4	1	0	2.8	1	5	2	0
3705-80	9	13	3.7	6	3	0	0	3.0	2	5	2	0	3.0	1	7	1	0	2.6	1	3	2	1
Unspecified 3705	205	858	3.5	117	81	6	1	3.7	50	120	30	3	3.1	57	112	31	4	2.8	34	102	52	16
3725	21	70	3.5	9	11	0	1	3.2	8	9	4	0	3.3	7	12	1	0	3.1	6	10	5	0
Other & unspecified	14	93	3.4	7	6	1	0	3.1	4	6	4	0	3.0	4	8	1	1	2.6	2	6	4	2
Subtotals	265	1,095	3.5	151	105	7	2	3.1	70	150	41	4	3.1	74	146	37	5	2.8	45	127	67	21
Memorex																						
1270	15	36	3.7	10	5	0	0	3.1	4	9	2	0	3.3	6	8	1	0	2.7	2	8	4	1
Micom																						
600	5	13	3.8	4	1	0	0	3.8	4	1	0	0	3.6	3	2	0	0	3.4	3	1	1	0
NCR Comten																						
721	3	7	3.3	1	2	0	0	2.3	0	1	2	0	3.0	0	3	0	0	3.0	0	3	0	0
3650	21	59	3.6	12	7	1	1	3.4	8	12	0	1	3.2	5	14	1	0	3.0	3	14	3	0
3670	3	17	3.7	2	1	0	0	3.7	2	1	0	0	3.3	1	2	0	0	3.0	1	1	1	0
3690	28	264	3.4	15	9	4	0	3.2	8	15	4	0	3.2	6	21	0	0	2.7	7	18	2	0
Other & unspecified	11	54	3.4	4	5	0	0	3.0	1	7	1	0	3.1	3	6	2	0	2.9	2	5	2	1
Subtotals	65	401	3.4	34	24	5	1	3.2	19	36	7	1	3.2	15	46	3	0	3.1	13	41	8	1
Paradyne																						
All models	5	7	2.8	2	0	3	0	2.6	1	1	3	0	2.6	1	1	3	0	2.8	2	0	3	0
Periphonics																						
TC7	3	4	3.0	0	3	0	0	2.7	0	2	1	0	3.0	1	1	1	0	2.0	0	1	1	1
Sperry																						
GCS	3	5	3.3	2	0	1	0	3.3	2	0	1	0	3.7	2	1	0	0	3.3	2	0	1	0
DCP40	7	13	2.6	1	4	0	2	2.3	1	2	1	2	3.0	3	1	1	1	3.3	3	2	1	0
Other & unspecified	8	111	3.1	2	5	1	0	2.6	0	5	3	0	2.6	0	5	3	0	2.6	2	3	1	2
Subtotals	18	129	2.9	5	9	2	2	2.6	3	7	5	2	2.9	5	7	4	1	3.0	7	5	3	2
Tymnet																						
All models	3	3	3.3	1	2	0	0	3.0	2	0	0	1	3.7	2	1	0	0	2.7	1	1	0	1
All Others	55	470	3.3	26	22	4	2	3.0	17	25	9	4	3.1	20	24	8	3	2.8	16	17	11	8
Grand Totals	536	2,828	3.4	276	213	35	10	3.2	144	282	91	16	3.1	160	181	77	12	2.7	114	239	124	48

Communications Processors

TABLE 1. USER RATINGS OF COMMUNICATIONS PROCESSORS (Continued)

Communications Processor Manufacturer and Model	Hardware Reliability					Quality of Manufacturers Software/ firmware					Ease of Programming					Quality of Manufacturers Maintenance Service					Quality of Manufacturers Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Amdahl																									
4705	3.7	10	5	0	0	3.3	7	6	2	0	3.3	6	5	2	0	3.5	9	5	1	0	3.5	9	5	0	1
Burroughs																									
B874	3.5	7	1	2	0	2.8	1	6	3	0	2.7	1	6	2	1	2.8	1	6	3	0	2.6	0	7	2	1
DCP	3.4	3	4	0	0	3.1	1	6	0	0	3.4	3	4	0	0	2.9	1	4	2	0	2.0	0	1	5	1
Other & unspecified	2.7	3	3	4	1	2.3	1	5	3	3	2.5	2	4	4	2	2.5	3	2	5	2	1.8	0	2	6	4
Subtotals	3.2	13	8	6	1	2.7	3	17	6	3	2.8	6	14	6	3	2.7	5	12	10	2	2.1	0	10	13	6
CCI																									
CC8	3.0	1	1	1	0	3.3	1	2	0	0	3.0	1	1	1	0	2.3	1	0	1	1	2.7	1	1	0	1
Other & unspecified	3.7	2	1	0	0	2.3	0	2	1	0	2.5	0	1	1	0	2.7	0	2	1	0	2.7	1	0	2	0
Subtotals	3.3	3	2	1	0	2.8	1	4	1	0	2.8	1	2	2	0	2.5	1	2	2	1	2.7	2	1	2	1
Control Data																									
C1000	2.3	0	3	2	1	2.7	1	2	3	0	1.8	0	1	1	2	2.0	0	2	2	2	2.0	0	2	2	2
2550	2.7	0	2	1	0	1.7	0	1	0	2	2.3	0	2	0	1	3.3	1	2	0	0	2.7	1	0	2	0
Other & unspecified	2.5	0	1	1	0	1.3	0	0	1	2	1.0	0	0	0	2	2.7	0	2	1	0	2.3	0	1	2	0
Subtotals	2.5	0	6	4	1	2.1	1	3	4	4	1.8	0	3	1	5	2.5	1	6	3	2	2.3	1	3	6	2
Codex																									
6000	3.2	2	3	1	0	2.0	0	2	2	2	2.4	1	2	0	1	2.3	1	0	5	0	2.3	0	3	2	1
Digital Communications Associates																									
115	3.0	1	2	1	0	3.3	1	3	0	0	3.0	1	1	1	0	3.0	1	2	1	0	3.0	1	2	1	0
355	3.4	5	3	1	0	2.9	1	6	2	0	2.9	2	2	3	0	2.7	1	4	4	0	3.0	2	5	2	0
Subtotals	3.3	6	5	2	0	3.0	2	9	2	0	2.9	3	3	4	0	2.8	2	6	5	0	3.0	3	7	3	0
GTE Telenet																									
TP4000	2.7	0	2	1	0	1.5	0	0	1	1	2.3	0	2	1	0	2.0	0	1	1	1	2.0	0	1	1	1
Honeywell																									
Datanet	3.3	6	5	0	1	2.8	3	5	3	1	1.8	0	1	5	2	3.3	5	6	1	0	2.8	0	10	2	0
Other	3.0	2	2	0	1	2.6	1	2	1	1	2.6	1	2	1	1	2.8	2	1	1	1	2.6	1	2	1	1
Subtotals	3.2	8	7	0	2	2.8	4	7	4	2	2.2	1	3	6	3	3.1	7	7	2	1	2.5	1	12	3	1
IBM																									
3704	3.4	5	1	0	1	2.7	1	4	1	1	2.6	0	4	3	0	3.1	3	3	0	1	2.6	0	5	1	1
3705-II	3.9	7	1	0	0	3.9	7	1	0	0	3.0	0	6	0	0	3.5	5	2	1	0	3.3	4	2	2	0
3705-80	3.6	6	2	1	0	3.6	6	2	1	0	2.7	0	7	0	1	3.3	4	4	1	0	3.2	3	5	1	0
Unspecified 3705	3.7	138	61	5	0	3.3	70	113	15	1	2.7	25	87	49	14	3.4	99	89	14	1	3.2	84	83	33	2
3725	3.5	3	18	0	0	3.2	3	18	0	0	2.8	3	10	2	2	3.4	8	11	1	0	3.2	6	14	1	0
Other & unspecified	3.4	2	8	4	0	2.9	2	8	4	0	2.3	1	4	6	2	3.3	7	5	1	1	2.9	4	6	3	1
Subtotals	3.6	161	91	10	1	3.2	89	146	21	2	2.8	30	118	60	19	3.4	126	114	18	3	3.2	101	115	41	4
Memorex																									
1270	3.5	7	8	0	0	3.1	4	3	2	0	3.0	2	4	0	1	3.2	3	12	0	0	3.1	4	9	2	0
Micom																									
600	3.8	4	1	0	0	3.2	2	2	1	0	3.8	3	1	0	0	3.0	1	3	1	0	2.6	1	1	3	0
NCR Comten																									
721	3.0	0	3	0	0	3.3	1	2	0	0	3.0	0	2	0	0	3.0	0	3	0	0	3.3	1	2	0	0
3650	3.6	14	6	1	0	3.0	5	10	3	1	2.9	3	11	5	0	3.3	11	4	4	0	3.2	8	8	3	1
3670	3.3	2	0	1	0	3.0	0	3	0	0	3.0	0	3	0	0	3.7	2	1	0	0	3.0	1	1	1	0
3690	3.5	15	11	2	0	2.7	4	12	7	2	2.6	1	12	10	2	3.1	8	14	5	0	2.8	5	12	9	1
Other & unspecified	3.2	5	2	3	0	2.4	1	4	2	2	2.2	1	3	2	3	2.8	1	6	2	0	2.4	0	5	4	1
Subtotals	3.4	36	22	7	0	2.8	11	31	12	5	2.4	5	31	17	3	3.2	22	28	11	0	2.9	15	28	17	3
Paradyne																									
All models	2.0	1	1	0	3	2.0	1	1	0	3	2.5	1	0	3	0	2.6	1	1	3	0	2.4	1	0	4	0
Periphonics																									
TC7	2.3	0	1	2	0	2.7	0	2	1	0	2.0	0	1	1	1	2.3	0	1	2	0	2.7	0	2	1	0
Sperry																									
GCS	3.3	2	0	1	0	3.3	1	2	0	0	3.0	1	1	1	0	3.7	2	1	0	0	3.3	2	0	1	0
DCP40	2.3	1	2	1	2	1.9	0	0	6	1	2.7	2	1	4	0	2.6	1	3	2	1	2.4	1	2	3	1
Other & unspecified	3.4	3	5	0	0	2.8	1	4	3	0	2.5	0	4	4	0	2.8	2	3	2	1	2.8	2	2	4	0
Subtotals	3.0	6	7	2	2	2.5	2	6	9	1	2.6	3	6	9	0	2.8	5	7	4	2	2.7	5	4	8	1
Tymnet																									
All models	3.7	2	1	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3.0	1	1	1	0	2.7	1	0	2	0
All Others	3.1	19	23	10	3	2.8	14	21	10	6	2.7	13	11	7	8	2.9	12	23	9	4	2.8	14	18	11	8
Grand Totals	3.4	278	193	46	13	3.0	142	263	84	29	2.7	76	208	119	44	3.2	197	229	75	16	2.0	158	219	119	29

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other information should be used as guides to potential strengths and weaknesses that may call for further investigation in selecting the most suitable equipment for your needs.

THE RESULTS

The first part of the Network Users Survey consisted of nine questions that solicited information on the general characteristics of the users' networks. Taken together, the results provide a brief summary of the extent and complexity of these users' network configurations.

First, the users were asked to indicate the number of sites that are linked by their networks, with the following results:

	Number of Responses	Percent of Responses
1 to 3 sites	78	13
4 to 10 sites	105	18
11 to 25 sites	105	18
26 to 50 sites	84	15
Over 50 sites	212	36
	584	100

These results present a fairly even spread of network sizes, with half the users in the 1-to-25 site range, and the other half in the 25-and-over range. Note that no distinction is made here as to the type or intelligence of the devices located at any site.

The second question asked the number of computers participating as hosts. As you can see, over 70 percent of these users are operating in multiple-host environments:

	Number of Responses	Percent of Responses
1 host	168	29
2 to 4 hosts	260	44
5 to 10 hosts	83	14
Over 10 hosts	76	13
	587	100

This adds some degree of clarity to the responses to Question 1, as well as developing a better picture of the level of sophistication of these users.

The users were also asked to indicate the total number of end-user workstations (CRTs, teleprinters, etc.) in use on their networks:

	Number of Responses	Percent of Responses
1 to 10	28	5
11 to 25	36	6
26 to 100	106	18
100 to 500	224	38
Over 500	195	33
	589	100

When examined in conjunction with Questions 1 and 2, these results characterize the typical respondent to the survey as having a network configuration consisting of approximately 25 sites, two or three hosts, and between 200 and 300 terminals (an average of 10 per site).

This year's results, though based on a somewhat smaller user sample (600 responses compared with 699 for the 1983 survey), show a marked consistency with our 1983 results when these three questions are compared. For instance, in the 1983 survey, 34 percent of the respondents indicated that their network consisted of 50 or more sites. This year, the number was 36 percent. In 1983, 24 percent of the respondents stated that their networks contained 5 or more hosts; this year's survey showed that the number had increased slightly, to 27 percent. For the number of terminals, 1983's survey showed that 69 percent of the respondents were using at least 100 terminals on their networks. In this year's survey, the percentage was 71 percent. In each case, this year's results indicate a continuation of the trend of growth in the size of user networks that we observed in our 1983 results survey results; however, this year's survey shows a slower rate of growth than between 1982 and 1983.

Another question asked the users to identify the overall network architecture with which their networks comply, with the following results:

	Number of Responses	Percent of Total Responses
IBM BSC (non-SNA environment)	284	40
IBM SNA	241	34
Digital Equipment DNA and DECnet	60	8
Hewlett-Packard DSN	23	3
Sperry DCA	17	2
Burroughs BNA	16	2
Honeywell DSE or DSA	15	2
Prime Primenet	10	1
Data General Xodiac	7	1
Other vendor-supplied architecture	102	14
None, or user-supplied architecture	92	13

The number of responses totals 817, indicating that a significant number of the respondents are using more than one of the listed architectures in their networks. As was the case in our 1983 survey, the largest group of users is still operating in an IBM BSC environment. However, the gap of 6 percent between BSC responses and SNA responses continues to narrow (the gap was 8 percent last year, and 14 percent in 1982), indicating that the acceptance of that architecture continues to grow. Interestingly, 13 percent of the respondents (down from 18 percent in 1983) are not complying with any vendor-supplied architectural scheme, presumably either because their environments do not currently require it (but potentially may in the future) or because they have found other satisfactory alternatives.

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The users were also asked to indicate the primary protocols supported by their networks:

	Number of Responses	Percent of Total Responses
Asynchronous	373	52
IBM BSC	366	51
IBM SDLC	244	34
X.25 packet-level	89	12
Other bit-oriented synchronous protocol (e.g., ANSI ADCCP, ISO HDLC, Sperry, UDLC, or Burroughs BDLC)	69	10
Other byte-oriented synchronous protocol (e.g., DEC DDCMP)	65	9
Other	46	6

These results correlate with the results of the preceding question, showing that a large number of users are using more than one protocol in their network. ASCII and IBM BSC are the most widely used protocols with IBM SDLC coming in a distant third place. The high response for multiple protocol usage suggests that many of these users are still in various stages of migration to SNA.

The users were asked to identify which vendors' systems are functioning as hosts. The following list summarizes their responses:

	Number of Responses	Percent of Total Responses
IBM	402	56
DEC	145	20
Amdahl	69	10
Burroughs	49	7
Sperry	51	7
Hewlett-Packard	49	7
Honeywell	40	6
Data General	34	5
Prime	32	4
Control Data	32	4
NCR	21	3
National Advanced Systems	18	3
Other	73	10

As was the case last year, IBM came out well ahead of all other vendors, while DEC placed second with a strong showing. Many of the users are using more than one vendors' systems as hosts, indicating that the multiple-host environments represented in Question 2 are frequently multiple-vendor environments as well.

We also asked these users to indicate which, if any, teleprocessing monitor software packages they are using.

	Number of Responses	Percent of Total Responses
IBM CICS and CICS/VS	271	38
Cullinane IDMS-DC	24	3
Sperry CMS and CMS/1100	18	3
Cincom Environ/1	9	1
Software AG Com-plete	8	1
SDA Intercomm or Minicomm	6	1
ADR Datacom/DC	6	1
Westinghouse Westi	3	1
Other	97	14
None	145	20

These results indicate that, although IBM software is of course predominant, various alternatives are sought out by many users.

Another question requested that the users indicate any commercial local area networks they operate, have installed now, and any that they plan to implement in the coming year.

	Number of Responses: Installed Now	Number of Responses: Planned for 1984
IBM 8100 Loop	36	6
Ethernet	26	34
Datapoint ARCnet	15	1
Wang WangNet	14	14
Network Systems Corp. Hyperchannel	9	8
IBM Series/1 Ring	7	13
Ungermann-Bass Net/One	5	10
Sytek LocalNet	5	7
Interactive Systems/ 3M Videodata	5	5
Nestar	4	3
Prime Ringnet	4	1
Other	28	28
	158	130

Putting aside the possibility that a few users may have indicated more than one type of local network, approximately 26 percent of these users currently have a local area network installed. This compares to last year's comparable figure of 17 percent, representing a significant increase. The IBM 8100 Loop, with 36 networks in use, is the predominant LAN installed, but if these users carried out their plans, Ethernet will surpass it in 1984.

The final question in the first part of the questionnaire provided a list of ten possible sources of networking problems, and asked the respondent to indicate whether they

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Amdahl Comm. Systems Div.						
3400 Series	Yes	Yes	Yes	Yes	Yes	IBM 2741
4410 Network Processor	No	No	No	Yes (HDLC)	Yes	X.75
Amnet Nucleus 6000	Yes	Yes	Yes	Yes	Yes	X.75, other PADs
Auscom 8911A	Yes	Yes	Yes	Yes	Yes	Custom protocols available on request
BBN Communications C/30	Yes	Yes	Yes	No	Yes	Telex
Burroughs Corp.						
CP9558-1/CP9572	Yes	Yes	Yes	Yes	Yes	Most Burroughs protocols
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
Cableshare						
CSI Data Concentrator	Yes	No	No	No	Yes	—
LSI-X.25 Front-End	Yes	No	No	No	GTE Telenet, Tymnet, Euronet	Uninet, Datapac PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	Yes	No	No	No	Yes	Same as above, and Telex
LSI-X.25 Host Port Concentrator	Yes	No	No	No	Yes	Same as above, and Telex
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200, UTS
Codex 6520	Yes	Yes	No	No	No	Telex, & IBM 2741, 2848, 2260
Commex						
DNP 4/6/16	Yes	Yes	Early 1984	Yes	Early 1984	Various POS & custom protocols
CMC 4 & CMC 32	Yes	Yes	No	No	No	—
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data						
2551-3 & 2551-4	Yes	Yes	No	No	GTE Telenet, Tymnet, Datapac, Transpac, BPO, ITT	—
DCA 355	Yes	Yes	Yes	Yes	GTE Telenet, ITT, RCA	DEC DDCMP—trunk only
335	Yes	Yes	No	No	GTE Telenet Tymnet, Datapac, Uninet, Autonet, PSS	—
GTE Telenet						
TP4000 Series	Yes	Yes	No	Yes (HDLC X.25)	GTE Telenet	IBM 2741
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, + 10 DDNs	VIP, PVE, RCI, LHDLC
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	GTE Telenet	—
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
Icot						
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	NCR, AIRINC
25X (253, 254, 257)	Yes	Yes	Yes	No	No	PARS, SITA, P1024, U400
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	No	Request price quotation
Distributed Network Processor Series	Yes	Yes	Future	Yes	Future	Request price quotation
Memorex 1270	Yes	Yes	No	Via VAN	Telenet, Datapac, PSS, Tymnet, Transpac, Datex-P	Sabre, Swift, SITA
Memotec MPAC 2500	No	No	No	Yes	Yes	No
Micom Micro800	Yes	No	No	No	Yes, Telenet, Tymnet, Datapac, Transpac, Datex-P, Telepac	No
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Transpac, Datapac	83B3
3670 Model 85	Yes	Yes	Yes	Yes	GTE Telenet, Tymnet, Uninet, Transpac, Datapac, Datex-P, UKPSS	—
3690 (A5-E5, T1-U1)	Yes	Yes	Yes	Yes	Yes	83B3
721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
North American Philips						
MARC	Yes	No	Yes	Yes (HDLC)	Yes	83B3, Telex, & Cidin
NTX						
3800 Model 1	No	Yes	No	No	No	NDLC (extended HDLC)
3800 Model 2	No	No	No	No	No	NDLC (extended HDLC)
Paradyne Pix/Pixnet	Yes	No	No	Paradyne SDLC	No	—
Periphonics T-Comm	Yes	Yes	Yes	No	No	Fedwire, credit card networks, ATM networks
Telemarketer	Yes	Yes	No	No	No	—
VoicePac	Yes	Yes	Yes	No	No	—
CommStar	Yes	Yes	Yes	No	No	—
VoiceBox	Yes	Yes	Yes	No	No	—
Raytheon						
Raynet I, II, III, & IV	Yes	Yes	Yes	Yes	No	PARS, Univac, SITA
Sperry-Univac						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Yes	REM1, NTR
Starnet Data Systems Protex Industries Starnet II	Yes	Yes	To be released	To be released	To be released	—
Tandem 6100	Yes	Yes	Yes	Yes	Yes	Burroughs, Tinet; NCR
Telefile						
FECP-X	Yes	Yes	No	No	No	—
Telepac	Yes	Yes	Yes	No	All major U.S. and European networks	—
Telematics						
VAX FEP	Yes	No	No	Yes	Yes	—
Net 25	Yes	No	No	Yes	Yes	—
Series 1	Yes	No	No	Yes	Yes	—
Thomas Engineering						
MZ-80	Yes	Yes	Yes	No	No	Honeywell VIP
8770/20	Yes	Yes	No	No	No	Honeywell VIP
TRT Data Products, Norfield Comm.						
System 300	Yes	No	No	No	No	—
System 400	Yes	Yes	No	No	No	—
System 500	Yes	Yes	Yes	Yes	Yes	—
Westinghouse Canada						
W1655/656	Yes	Mid 1983	Mid 1983	Yes	Mid 1983	PARS

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS

The comparison charts that follow this report list the major characteristics of 68 commercially available communications processors. The text below explains the chart entries, in order of their appearance on the charts.

Computer systems interfaced. For processors that serve IBM and plug compatible mainframe computers, we assume that they serve the entire, upward-compatible IBM line (IBM 370, 303X, 308X, and 43XX) along with the major plug-compatibles. For processors operating in open network architectures, we list "Most major vendors."

Functional Configurations

Front-end Processors. A "yes" for this entry indicates that the processor in question can serve as a channel-attached front end to a mainframe computer. The next two entries list the maximum number of hosts that can be channel attached, and the number of those hosts that can be active simultaneously. A third entry lists the degree of IBM emulation the processor can perform.

Remote line concentrator. A "yes" for this entry indicates that the processor in question can serve as a line concentrator remote from any host processor in its network. The entry below lists the number of hosts that concentrator can serve at one time.

Host-independent network processor. A "yes" for this entry indicates that the processor in question can control a network of open architecture without the direction of a host computer.

Store-and-forward message switching processor. A "yes" for this entry indicates that the processor in question can function as a standalone, store-and-forward message switch.

Distributed processing node. Most true communications processors are not able to perform applications processing, however, some, including a few intelligent concentrators, can support some distributed applications in addition to their principal networking function. This class of communications processor is becoming rarer.

Terminal controller. A "yes" for this entry indicates that the processor in question can function as a terminal controller within its architecture.

Network architecture compliance. Some communications processors function exclusively within their vendors' network architectures; others support open architectures such as X.25. If a processor supports no network architecture, it may be a "transparent" device, or it may support the prearchitectural protocols of the vendor(s) whose hosts it supports.

Communications line capacity. The five sections of this entry all deal with the number of lines a communications processor can support within specific ranges of data rates. The first three list the maximum number of **half-duplex** communications lines the processor can support within the three specified speed ranges. The fourth lists the highest data rate the processor can support. The fifth lists the effect (if any) that converting all lines to **full-duplex** operation would have on capacity. Where such a conversion has an effect, it usually cuts the maximum in half.

Communications Features/Functions

Entries under this heading list a number of major functions a communications processor can perform, but that not all communications processors **do** perform.

Multiplexing/demultiplexing. A "yes" for this entry indicates that the processor in question can function as a multiplexer.

Terminal-initiated application switching. A "yes" for this entry indicates that the processor in question supports the selection of applications within a session between an attached terminal and an attached host, at the terminal's request.

Communications processor initiated dynamic line reconfiguration. Dynamic line configuration is another name for fallback switching. A "yes" for this entry indicates that the processor in question can switch a session from a connection involving a failed line or communications processor component to a healthy connection when it senses the failure, without operator intervention.

Protocol conversion. The most common protocol conversion is from asynchronous ASCII to the synchronous trunk protocol specified by a given architecture (e.g., IBM's BSC or SDLC, or X.25's LAP-B). This entry specifies the types of protocol conversion the processor in question can perform.

Code conversion. The most common code conversion is from ASCII to IBM's EBCDIC. This entry indicates which code conversions the processor in question can perform.

Error control. This entry specifies which of the available schemes for error detection (e.g., Parity, LRC, or CRC) the processor in question uses.

Automatic transmission speed detection. If the processor in question can sense the data rate of a given transmission without intervention from the operator or user, this entry lists the speeds it can sense.

Automatic disconnect of inactive dial-up terminals. Many communications processors can sense activity on their attached terminals and disconnect a terminal session if it has been inactive for a specified period of time. A "yes" for this entry indicates that the processor in question can do so.

System Characteristics

Processor type. This entry lists the vendor and model of the communications processor's CPU. Many communications processors use standard OEM microprocessors such as the Z80 or the MC68000.

Main memory word size, bits. In most cases, the main memory word size is also the width of the processor's internal transmission path along its bus.

Main memory storage capacity, bytes. This entry lists the capacity of main memory in the communications processor in question. Large main memory capacity is useful for transmission with modern, high-speed protocols in which large blocks of data must be stored for retransmission in case of error. Abundant main memory is also useful for the performance of a number of high-level functions on a time-shared or interrupt basis.

Level of data unit transferred across I/O channel. Communications processors configured as front ends transfer data to and from the host through an I/O channel. The width, in bits, of the I/O channel, coupled with the communications processor's main memory word size, yields the level of data transferred (e.g., byte, or block).

Communications Processors

KEY TO THE COMMUNICATIONS PROCESSORS COMPARISON CHARTS (Continued)

Type of data transfer supported between memory and a) communications lines, b) mass storage, and c) other peripherals. In some communications processors, only the CPU has access to main memory, and other components, such as line bases and I/O processors must interrupt the CPU to read or write information in main memory. In others, microprocessors in the subsidiary components have share control of main memory with the CPU, and can read and write memory on their own. The latter process is called Direct Memory Access (DMA).

I/O, backup, and diagnostic peripherals supported. Most communications processors interact only with their attached hosts and terminals, and rely on host disk systems for storage and on host software for detailed diagnostics. Some newer models, however, support local disk storage for control software, traffic, and support information, and feature diagnostic consoles for direct operator intervention.

Support for remote console. Some processors that support local operators consoles can also support an operator's console attached over communications lines.

Communications operating software:

Operating system implemented in. This entry indicates how the processor in question stores its control program: wired directly and inflexibly into the hardware, in software that must be loaded into memory from the outside, in firmware (local read-only memory) onboard the processor, or in some combination of these.

IPL method. This entry indicates how the processor in question receives its initial program load: from its host processor, from a locally attached diskette activated by an operator, or from onboard read-only memory.

Additional software supported. This entry lists any network control or applications software that the processor in question can support.

User programmability. This entry indicates the degree of control users have over the control programs in the communications processor. Some are programmable in the sense that users can select among a number of preset configuration parameters, usually from a menu. Others are fully programmable, usually through an assembler-level language. Mainframe front-end processors usually use a subset of their hosts' access methods implemented in macros; other programmable communications processors use a native assembler language.

Software separately priced. This entry shows to what extent the communications processor's operating software is bundled with the cost of the hardware.

Approximate proportion of currently installed systems supplied as turnkey systems. A turnkey system is a system with which the user need not participate in the configuration design; the user can simply "turn the key" and have a working system. Conversely, a turnkey system is one for which the user is denied the privilege of a custom configuration.

Pricing and Availability. Entries under this header list purchase, lease (or rental) and maintenance pricing for minimum and maximum configurations, whether maintenance is bundled with the lease or rental price, the product's date of first delivery, the number of processors of that model the vendor has installed to date, and the provider of service and maintenance for the product. □

had had any problems related to each possible source, with these results:

	Percent of Total Responses: Severe or frequent problems	Less Severe or occasional problems	No problems
Local loops	15	35	24
Nonlocal comm. lines	13	45	15
Front-end software	5	32	34
Terminals	4	54	17
Host software	4	43	27
Terminal controllers	3	36	29
Modems	2	48	27
Host hardware	2	38	33
Front-end hardware	2	24	39
Multiplexers	2	23	36

Not unexpectedly, the area of these users' networks that causes the most headaches is their communications lines. Although few users experience severe or frequent problems with their terminals, these devices seem to be the greatest single source of minor or sporadic problems. The least frequently experienced source of problems is multiplexer equipment.

The remaining parts of the questionnaire focused on specific categories of networking services and equipment. Users were asked to list the specific vendors and types of equipment they are using in their networks, and to provide user ratings based on their experiences with each. Each section of the questionnaire asked the user to provide the manufacturers and model numbers of each type of equipment currently in use, the number of units installed, and ratings in specific categories of user experience relevant to that specific equipment category. A summary of the results of these questions for all modem models is shown in Table 1.

The Datapro Research staff extends a sincere thanks to all for responding so enthusiastically to our 1984 Network Users Survey. Without your participation, it could not have been the success it is, and we hope that this compendium of user experience will be of significant value to you. We look forward to hearing from you again.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose communications products are shown in the comparison charts that follow.

Amdahl Corporation, 1250 East Arques Avenue P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

Amdahl Communications Systems Division, 2500 Walnut Avenue, Marina Del Rey, CA 90291. Telephone (213) 822-3202.

Communications Processors

Amnet, Inc., 101 Morse Street P.O. Box 412, Watertown, MA 02172. Telephone (617) 923–1850.

Auscom, Inc., 2007 Kramer Lane Suite 102, Austin, TX 75758. Telephone (512) 836–8080

BBN Communications, 33 Moulton St., Cambridge, MA 02238. Telephone (617) 497–2800

Burroughs Corporation, Burroughs Place, Detroit, MI 48232. Telephone (313) 972–7000.

Cableshare, 20 Enterprise Drive P.O. Box 5880, London, Ontario Canada N6A 4L6. Telephone (519) 686–2900

Century Analysis, 114 Center Avenue, Pacheco, CA 94553. Telephone (415) 680–7800.

CHI Corporation, 26055 Emery Road, Cleveland, OH 44128. Telephone (216) 831–2622.

Codex Corporation, 20 Codex Corporation, 20 Cabot Boulevard, Mansfield, MA 02048. Telephone (617) 364–2000.

Commex, 141 Central Park Avenue South, Hartsdale, NY 10530. Telephone (914) 328–0600.

Computer Communications Inc., 2610 Columbia Street, Torrance, CA 90503. Telephone (213) 320–9101.

Control Data Corporation, 8160 34th Avenue South, Minneapolis, MN 55420. Telephone (612) 853–8100.

Digital Communications Associates, Inc., 303 Technology Park, Norcross, GA 30092. Telephone (404) 448–1400.

GTE Telenet Communications Corp., 8229 Boone Boulevard, Vienna, VA 22180. Telephone (703) 442–1000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, MA 02154. Telephone (617) 895–6000.

International Business Machines Corporation, Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, AZ 85029. Telephone (602) 944–1543.

Memorex, San Tomas at Central Expressway, Santa Clara, CA 95052. Telephone (408) 987–3593.

Memotec, 4940 Fisher, Montreal, Quebec, Canada H4T 1J7. Telephone (514) 738–4781.

Micom Systems, Inc., 20151 Nordhoff Avenue, Chatsworth, CA 91311. Telephone (213) 882–6890.

NCR Comten, 2700 Snelling Avenue North, St. Paul, MN 55113. Telephone (612) 638–7777.

North American Philips Corporation, Communications Systems Division, 55 Knightsbridge Road, Piscataway, NJ 08854. Telephone (201) 457–0400.

NTX Communications Corporation, 4251 Burton Drive, Santa Clara, CA 95054. Telephone (408) 496–1110.

Paradyne Corporation, 8550 Ulmerton Road, Largo, FL 33540. Telephone (813) 530–2000.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, NY 11716. Telephone (516) 467–0500.

Raytheon, 1415 Boston/Providence Turnpike, Norwood, MA 02062. Telephone (617) 762–6700.

Sperry Corporation, Computer Systems Division, P.O. Box 500, Blue Bell, PA 19424. Telephone (215) 542–4011.

Tandem Computer, Corporate Headquarters, 19191 Vallco Parkway, Cupertino, CA 95104. Telephone (408) 725–6000.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, CA 92714. Telephone (714) 557–6660.

Telematics International, Inc., Crown Center, 1415 NW 62nd Street, Fort Lauderdale, FL 33309. Telephone (305) 772–3070.

Tri-Data, 505 East Middlefield Road, Mountain View, CA 94039-7505. Telephone (415) 969–3700.

TRT Data Products, Norfield Communications Division, 3 Depot Place P.O. Box 549, Norwalk, CT 06855. Telephone (203) 853–2777.

Tymnet, Inc. 2710 Orchard Parkway, San Jose, CA 95134. Telephone

Westinghouse Canada, Inc., 777 Walkers Line, P.O. Box 5009, Burlington, Ontario Canada L0R 1T0. Telephone (416) 528–8811. □

Communications Processors

SUPPLIER AND MODEL	Amdahl 4705	Amdahl 4705E	Amdahl Communications Systems Division 3400 Series	Amdahl Communications Systems Division 4410 Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All IBM and Amdahl compatible mainframes	All IBM- and Amdahl-compatible mainframes	Most major vendors	All X.25 equipped vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	4	4	—	—
Max. no. of active hosts supported simultaneously	4	4	—	—
IBM emulation	270X/370X, EP, NCP, ACF	270X/3708, EP, NCP, ACF	—	—
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Network—dependent	Network—dependent
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network architecture compliance	SNA	SNA	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	352	352	100	104
2000 to 9600 bps	352	352	100	104
Over 9600 bps	Application-dependent	Application-dependent	Network-dependent	52
Highest line speed supported (bps)	64K	64K	19.2K	64K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None; see Comments
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	S/S, BSC, SDLC to X.25	S/S, BSC, SDLC to X.25	No	No
Code conversion	ASCII/EBCDIC via soft.	ASCII/EBCDIC via soft.	No	No
Error control	LRC and CRC	LRC and CRC	CRC	CRC
Automatic transmission speed detection	50-9600 bps via soft.	50-9600 bps via soft.	50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	CA 2/40	Proprietary
Main memory word size, bits	18	18	16	16
Main memory storage capacity, bytes	512K	1024K	208K	768K
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	—	None	DMA and interrupt	—
Other peripherals	—	None	DMA and interrupt	—
I/O, back-up, and diagnostic peripherals supported	Diskette as diagnostic peripheral	Diskette (diagnostic)	Diskette and self diagnostics	—
Support for remote console	No	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Combination of software and firmware
IPL method	Download from host	Download from host	From disk. & DP node	Load from diskette
Additional software supported	Comm-pro	Comm-pro	—	—
User programmability	Yes	Yes	Yes	Yes, via user-selected parameters
Software separately priced	Yes	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	50,225	52,400	200,000	127,000
Monthly maintenance, $	448	360	2,000	1,600
Monthly lease/rental, $	1,444 (2-yr. lease)	2,935 (2-yr. lease)	—	Federal govt. only
Maximum practical configuration:				
Purchase price, $	327,970	300,000+	5,000,000	300,000
Monthly maintenance, $	2,682	500	50,000	3,000
Monthly lease/rental, $	14,196 (2-yr. lease)	7,200 (2-yr. lease)	—	Federal govt. only
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	November 1979	April 1983	June 1982	1979
Number of systems installed to date	700	700	Over 75	Over 50
Serviced by	Amdahl	Amdahl	Amdahl	Amdahl
COMMENTS	Operates with IBM 3705 and 3705/Comm-pro software, with up to 1.8 times the 3705 throughput capacity	Operates with IBM 3705 and 3705/Comm-pro software, with up to 2.4 times the 3705 throughput capacity	Handles mix of async. and sync. traffic; used in multi-vendor environment; proprietary packet switching; supports satellite transmissions; 1983 information	Full duplex transmission only has Modulo 128 satellite support; 4410 performs self-diagnostics; supports CCITT X.25; 1983 information

Communications Processors

SUPPLIER AND MODEL	Amnet Nucleus 6000	Auscom 8911A	BBN Communications Corp. C/30 PSN	Burroughs CP3680/ CP3680-01
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	IBM 360, 370, 43XX, 308X and plug-compatibles	Most vendors	Burroughs B2000, B3000, and B4000 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	2	Does not apply	4
Max. no. of active hosts supported simultaneously	Does not apply	2	Does not apply	4
IBM emulation	Does not apply	Any IBM control unit	No	No
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	1024	2	Does not apply	4
Host-independent network processor	Yes	Yes	Yes(Packet switch node)	No
Store-and-forward message switching processor	No	Yes	No	Yes
Distributed processing node	No	Yes	No	Yes
Terminal controller	No	Yes	No	Yes
Network architecture compliance	OSI	Most LANs and custom	X.25	BNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	1024	Application-dependent	22	288 async., 72 sync.
2000 to 9600 bps	1024	Application-dependent	22	40
Over 9600 bps	512	Application-dependent	22	40
Highest line speed supported (bps)	64K	56K	56K bps	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	—
Terminal-initiated applications switching	Yes	Yes	Yes	—
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	—
Protocol conversion	Yes	Yes	No	Yes
Code conversion	Yes	Yes	No	Yes
Error control	Yes	Yes	LRC; CRC; EDAC	—
Automatic transmission speed detection	Yes	None	No	—
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	—
SYSTEM CHARACTERISTICS				
Processor	Multi-microprocessor	DEC LSI-11	BBNCC	—
Main memory word size, bits	16	16	16	—
Main memory storage capacity, bytes	1M	256K	128K	—
Level of data unit transferred across I/O channel	Byte and block	Byte	Byte; block	—
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA and interrupt	DMA and Interrupt	DMA and interrupt
Mass storage	DMA	DMA and interrupt	DMA and Interrupt	DMA
Other peripherals	DMA	DMA and interrupt	Does not apply	—
I/O, back-up, and diagnostic peripherals supported	Console, printer, disk	Disk, diskette, mag. tape	Remote console	—
Support for remote console	Yes	Yes	Yes	—
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software and firmware	Software and firmware	Combination software and firmware
IPL method	Download from NMC	From diskette or tape	Download	Download from host
Additional software supported	Program development utilities	Program Dei	Diagnostics; performance measure	NDL, DCS
User programmability	Yes, on restricted basis	User-created programs	No	Yes, via user-selected parameters
Software separately priced	Software options	All except diagnostics	None	All
Approx. proportion of currently installed systems supplied as turnkey systems	Info. not available	90%	All	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	14,995	58,000	64,050 (3680)
Monthly maintenance, $	Info. not available	By component	Time/distance	535
Monthly lease/rental, $	Info. not available	Not available	None	2,415 (3-yr. lease)
Maximum practical configuration:				
Purchase price, $	200,000	19,750	65,000	124,950 (3680+ -01)
Monthly maintenance, $	Info. not available	By component	Time/distance	1,010
Monthly lease/rental, $	Info. not available	Not available	None	2,310 (3-yr. lease)
Is maintenance bundled with lease/rental?	No	No	Does not apply	—
Date of first delivery	January 1983	July 1980	1981	January 1978
Number of systems installed to date	Info. not available	250	Over 500	200
Serviced by	Amnet/third party	Auscom	BBNCC	Burroughs
COMMENTS	Supports 4 to 1024 ports, many protocols, packet-switching, dynamic routing; part of an integrated private data network product line	Designed as a programmable IBM channel interface or FEP emulating standard control units; additional lines supported with extended chassis	Dynamic packet routing; logical addressing; remote monitoring; unattended operation	Redundant system 1983 information

Communications Processors

SUPPLIER AND MODEL	Burroughs CP9558-1/ CP9572	Cableshare CSI Data Concentrator	Cableshare LSI-X.25 Front-End Processor	Cableshare LSI-X.25 Host Port Concentrator
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles	All computers using ASCII serial communication ports	DEC PDP-11 and VAX	All hosts supporting async. communications
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	16	1	32 async. channels
Max. no. of active hosts supported simultaneously	—	16	1	32
IBM emulation	—	No	No	No
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	12	16	1	32
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	Yes	Yes	No	Yes
Network architecture compliance	BNA, SNA	X.25	X.25, OSI	X.25, OSI
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	47	16	127	32
2000 to 9600 bps	—	16	127	32
Over 9600 bps	12	16	127	32
Highest line speed supported (bps)	19.2K	56K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	—	Yes	Yes	Yes
Terminal-initiated applications switching	—	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	—	No	No	No
Protocol conversion	—	Async to X.25	Async./X.25	Async./X.25
Code conversion	ASCII to EBCDIC	None	1	Baudot/ASCII
Error control	—	X.25 procedures	Info. not available	Info. not available
Automatic transmission speed detection	—	Yes	No	Yes, 110-9600 bps
Automatic disconnect of inactive dial-up terminals	—	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	B920	Intel 8088	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23
Main memory word size, bits	16; multiprocessors	16	16	16
Main memory storage capacity, bytes	1.2M	192K	64K	64K
Level of data unit transferred across I/O channel	Byte	Block	Block	Info. not available
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Info. not available
Mass storage	DMA	None	None	Info. not available
Other peripherals	—	None	None	Info. not available
I/O, back-up, and diagnostic peripherals supported	Mag. tape, floppy and hard disk	Console	FEP console	Console
Support for remote console	—	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software and firmware	Software	Software
IPL method	—	Internal self-load	Download from host	Internal self-load
Additional software supported	—	None	None	None
User programmability	—	Yes, via user-selected parameters	No	No
Software separately priced	—	None	Info. not available	Info. not available
Approx. proportion of currently installed systems supplied as turnkey systems	—	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	22,559 (9572)	3,000	13,450	4,335
Monthly maintenance, $	75	None	100	70
Monthly lease/rental, $	729 (3-yr. lease)	Not available	None	None
Maximum practical configuration:				
Purchase price, $	29,401 (9558-1)	5,600	16,450	18,500
Monthly maintenance, $	200	None	125	100
Monthly lease/rental, $	1,033 (3-yr. lease)	Not available	—	—
Is maintenance bundled with lease/rental?	Yes	No	—	—
Date of first delivery	October 1980	June 1, 1983	November 1978	March 1980
Number of systems installed to date	1,000	No	75	25
Serviced by	Burroughs	Cableshare	Digital Equipment Corp.	Digital Equipment Corp.
COMMENTS	1983 information	1983 information	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; 1983 information	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; 1983 information

Communications Processors

SUPPLIER AND MODEL	Cableshare LSI-X.25 Intelligent Concentrator	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor	Codex 6520
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All async. terminals	DEC PDP Series, NCR Century & Criterion	Univac 1100 Series	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	32 async. channels	None	8	4
Max. no. of active hosts supported simultaneously	32	Multiple	8	2
IBM emulation	No	No	No	270X, 370X
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	32	Multiple	Unlimited	Does not apply
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	Yes	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	X.25, OSI	Yes	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	24	Over 1000	240
2000 to 9600 bps	32	24	300	Config.—dependent
Over 9600 bps	32	24	150	Config.—dependent
Highest line speed supported (bps)	19.2K	19.2K	64K	230.4K
Effect on line capacity, if all lines are full-duplex	Halved	None	To 56K	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	No
Terminal-initiated applications switching	No	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Async./X.25	Planned	Yes; all protocols	ASCII/2741
Code conversion	Baudot/ASCII	Planned	ASCII/EBCDIC/XS3	ASCII/EBCDIC
Error control	—	Yes	LRC, BCC, and CRC	LRC and CRC
Automatic transmission speed detection	Yes, 110-9600 bps	No	Yes, 110-19.2K bps	Yes; 135 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	No	Site option	No
SYSTEM CHARACTERISTICS				
Processor	LSI-11/2 or PDP-11/23	CAI-108/116/124	Perkin-Elmer 3200	CCI 801
Main memory word size, bits	16	16	32	16
Main memory storage capacity, bytes	64K	1M	4M	64K
Level of data unit transferred across I/O channel	Info. not available	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Info. not available	Interrupt	DMA and interrupt	DMA and interrupt
Mass storage	Info. not available	Interrupt	DMA and interrupt	DMA and interrupt
Other peripherals	Info. not available	Interrupt	FEP console	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	Console	FEP Console		FEP console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Combination software and firmware	Software
IPL method	Internal self-load	Download from host	Host/self-load/disk.	From host or diskette
Additional software supported	None	—	Simulator and other utilities	—
User programmability	No	Via user-selected parameters	Yes, via user-selected parameters	—
Software separately priced	Info. not available	No	X.25; X780 simulators	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	4,335	6,500	30,000	Contact vendor
Monthly maintenance, $	70	Software 25; h/w 150	200	—
Monthly lease/rental, $	None	—	None	—
Maximum practical configuration:				
Purchase price, $	18,500	10,950	500,000	—
Monthly maintenance, $	100	Software 25; h/w 150	Info. not available	—
Monthly lease/rental, $	—	—	None	—
Is maintenance bundled with lease/rental?	—	No	No	—
Date of first delivery	March 1980	December 1981	1977	January 1980
Number of systems installed to date	125	350	50	Info. not available
Serviced by	Digital Equipment Corp.	CAI	Chi Corporation	Codex
COMMENTS	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration; 1983 information	CAI implementation uses Motorola 68000, flow control, load-leveling, raw line class selection, error correction, terminal key-ahead buffering	Dynamic routing; two async. screen editors; automatic terminal protocol detection; redundancy; multiple local and remote hosts; UTS simulation; UTS on X.25 network	

Communications Processors

SUPPLIER AND MODEL	Commex, Ltd DNP 4/6/16	Commex, Ltd CMC-4 and CMC-32	Computer Communications CC-6	Computer Communications CC-8
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX,43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	64	1	2	4
Max. no. of active hosts supported simultaneously	64	1	2	4
IBM emulation	270X, 370X EP	270X, 370X EP	270X/370X EP	270X/370X EP
Remote line concentrator	Yes	No	No	No
Maximum no. of hosts served by one concentrator	64	Does not apply	Does not apply	Does not apply
Host-independent network processor	Optional	No	No	No
Store-and-forward message switching processor	Optional	No	No	No
Distributed processing node	Optional	No	No	No
Terminal controller	No	No	Yes	Yes
Network architecture compliance	Future	None	No	No
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	See Comments	32	32	240
2000 to 9600 bps	See Comments	32	32	120
Over 9600 bps	See Comments	24	4	32
Highest line speed supported (bps)	56K	56K	56K	230.4K
Effect on line capacity, if all lines are full-duplex	Half aggregate data rate	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	Yes	Yes
Terminal-initiated applications switching	Yes	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	Yes
Protocol conversion	Optional	Optional	No	No
Code conversion	Optional	Optional	Yes	Yes
Error control	LRC and CRC	LRC and CRC	Parity, LRC and CRC	Parity, LRC and CRC
Automatic transmission speed detection	Yes; 110-19.2K bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Mot. 6809 & Sig. 8X300	Motorola 6800	CCI 601	CCI 801
Main memory word size, bits	8	8	16	16
Main memory storage capacity, bytes	15M	320K	64K	64K
Level of data unit transferred across I/O channel	Byte and block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	Interrupt	DMA and interrupt	DMA and interrupt
Mass storage	DMA and interrupt	None	DMA and interrupt	DMA and interrupt
Other peripherals	DMA and interrupt	None	DMA and interrupt	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	FEP consoles and bubble memory	FEP console, others optional	Control panel	FEP CRT console, diskette, printer
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Firmware	Software	Software
IPL method	Load from bubble mem.	Internal self-load	Download from host	From host/diskette
Additional software supported	Network generator, trace, on-line and off-line diagnostics	Full system diagnostics	Assembler, utilities, diagnostics	Value-added options assembler loader, utilities, diagnostics
User programmability	Yes, via user-selected parameters	Custom	Yes, via user parameters and programs	Yes, via user parameters and programs
Software separately priced	None	None	None	Value-added options
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	90%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	34,770	24,990	39,840
Monthly maintenance, $	—	120	150	296
Monthly lease/rental, $	—	890 (3-yr. lease)	802 (3-yr.); 1048 (rental)	1,224 (3-yr.); 1,600 (rental)
Maximum practical configuration:				
Purchase price, $	—	65,645	51,368	181,200
Monthly maintenance, $	—	275	405	1,593
Monthly lease/rental, $	—	1,950 (3-yr. lease)	1742 (3-yr.); 2263 (rental)	5,858 (3-yr.); 7,635 (rental)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	Yes
Date of first delivery	June 1981	November 1977	November 1981	1976
Number of systems installed to date	Approximately 50	Approximately 100	14	220
Serviced by	Commex, third party	Commex, third party	Computer Comm.	Computer Comm.
COMMENTS	Mod., pack. bus arch.; DNP 4 handles up to 13 lines plus cons.; DNP 6, up to 23 lines plus cons.; DNP 16, up to 83 lines plus cons. per cabinet (1300 lines max. per system)	Commex sells communications processors manufactured by Lemcom and labeled with the Commex name	Auto-poll, auto-baud rate detect, auto-dial, multihost support, user programmability, field upgradability, reverse channel	Auto-poll, auto-baud rate detect, speed & code conversion, auto dump, auto load, multi host support, terminal initiated line sel., etc.

Communications Processors

SUPPLIER AND MODEL	Computer Communications CC-80/85	Control Data 2551-3	Control Data 2551-4	Digital Communications Associates System 355
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	CDC Cyber 170, Cyber 70, Cyber 6000 Series	CDC Cyber 170, Cyber 70, Cyber 6000 Series	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	DEC-10; FEP-10 opt.
Max. no. of hosts channel-attachable to front-end	7	2	2	8
Max. no. of active hosts supported simultaneously	7	1	1	8
IBM emulation	270X/370X EP	No	No	No
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	8	8	Unrestricted
Host-independent network processor	Yes	No	No	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	No	No	Yes
Network architecture compliance	No	Yes	Yes	INA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	1232	32	254	44
2000 to 9600 bps	120	32	254	44
Over 9600 bps	120	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	22
Highest line speed supported (bps)	230.4K	56K	56K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	No	Async./X.25
Code conversion	Yes	Yes	Yes	No
Error control	Parity, LRC and CRC	Yes	Yes	Yes-ARQ
Automatic transmission speed detection	Yes; 110 to 1200 bps	Yes; 100 to 1200 bps	Yes; 100 to 1200 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CCI 8001/8501	CDC 2551-3	CDC 2551-4	Z80A
Main memory word size, bits	16	16	16	8
Main memory storage capacity, bytes	256K	256K	256K	1472K (64K per Z80A)
Level of data unit transferred across I/O channel	Byte	Byte and control	Byte and control	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	DMA and interrupt	None	None	Interrupt
Other peripherals	DMA and interrupt	DMA and interrupt	DMA and interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	Disk (40-200 MB), mag tape, FEP CRT, printer	Console, cassette	Console, cassette	Dual cass. tape unit; disk; diagnos.built-in
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Combination of software and firmware	Combination of software and firmware
IPL method	From host/disk	Download from host	Download from host	Internal self-load
Additional software supported	Value-added options, custom software, assembler, loader, utilities	None	None	Configuration tape generator
User programmability	Yes, via user parameters and programs	Yes	Yes	Yes; via user-selected parameters/programs
Software separately priced	Options and custom sys.	All	All	Utilities only
Approx. proportion of currently installed systems supplied as turnkey systems	95%	98%	98%	5%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	68,000/115,640	36,955	48,648	12,000 and up
Monthly maintenance, $	246/426	433	483	Contact vendor
Monthly lease/rental, $	1,932 (3-yr. lease)	1,067 (3-yr. lease)	1,403 (3-yr. lease)	Contact vendor
Maximum practical configuration:			157,478	
Purchase price, $	674,050	68,570	1,540	144,145
Monthly maintenance, $	3,344	751	5,093 (3-yr. lease)	Contact vendor
Monthly lease/rental, $	17,523 (3-yr. lease)	2,048 (3-yr. lease)		Contact vendor
Is maintenance bundled with lease/rental?	Yes	No	No	Contact vendor
Date of first delivery	1975	January 1983	January 1983	October 1980
Number of systems installed to date	396	Info. not available	Info. not available	Over 200
Serviced by	Computer Comm.	Control Data Corp.	Control Data Corp.	DCA, third party
COMMENTS	Used mainly for custom store-and-forward message switches, electronic mail, & high speed transaction processing systems (e.g., airline reservations)			Supports host selection, port contention, full line and modem control facilities; handles up to 44 high-speed trunk lines; symmetric multi-proc.; supp. up to 23 Z80As

Communications Processors

SUPPLIER AND MODEL	Digital Communications Associates System 335	GTE Telenet TP4000 Series	Honeywell Information Systems Datanet 8	IBM 3705-II Models E1 through L4
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Most vendors	Honeywell DPS 8, DPS 66, and DPS 64	IBM S/370, 30XX, and 43XX; S/360 in 270X emulation mode only
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Packet switch	Yes	Yes
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply	4	4
Max. no. of active hosts supported simultaneously	Does not apply	128	4	4
IBM emulation	No	None	Yes	270X/370X
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unrestricted	128	4	1
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	No
Terminal controller	Yes	No	Yes	No
Network architecture compliance	INA	X.25 virtual circuit switching	Honeywell DSA (ISO)	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	34	128	128	352
2000 to 9600 bps	34	48	Load-dependent	352
Over 9600 bps	17	12 to 28	Load-dependent	32
Highest line speed supported (bps)	19.2K	56K	56K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	Load-dependent	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes (by host program)	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	No
Protocol conversion	Async. to X.25	Yes	No	Yes
Code conversion	No	Yes	No	Yes
Error control	Yes—ARQ	Parity, LRC, CRC	Yes	LRC and CRC
Automatic transmission speed detection	110 to 9600 bps	110 to 1200 bps	Yes; 110, 300, 1200 bps	Yes, via optional soft.
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes; optional, variable	No
SYSTEM CHARACTERISTICS				
Processor	Z80As	MOS technology 6502B	Datanet 8 (Honeywell)	Proprietary
Main memory word size, bits	8	8	16	18
Main memory storage capacity, bytes	384K	256K	1536K	512K
Level of data unit transferred across I/O channel	Byte	Info. not available	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	Interrupt and DMA	Async. bus	DMA
Mass storage	Interrupt	None	Async. bus	DMA
Other peripherals	Interrupt	None	Async. bus	DMA
I/O, back-up, and diagnostic peripherals supported	Dual cass. tape unit; disk; diagnos.built-in	GTE Telenet NCC	Console, diskette	None
Support for remote console	Yes	Yes	Yes	No
Communications operating software:				
Operating system implemented in	Software and firmware	Combination of software and firmware	Combination of software and firmware	Software
IPL method	Downline/int. self-load	Downline load from NCC	Host, local, or VIP	Download from host
Additional software supported	Configuration tape generator	PAD support	Additional on host for administration of control	NCCF, NPDA
User programmability	User-selected parameters; programs	Yes, via user-selected X.3 parameters	Yes, via user-selected parameters	Yes
Software separately priced	Utilities only	All	All	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	5%	100%	Software is customer installable	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	6,795	37,000-49,500	42,565	38,230 (E1)
Monthly maintenance, $	Contact vendor	215-300	259	147
Monthly lease/rental, $	Contact vendor	GTE Telenet tariff	1,432 (5-yr. lease)	1,635 (2-yr. lease)
Maximum practical configuration:				
Purchase price, $	Contact vendor	76,500-157,200	210,465	107,040 (L4)
Monthly maintenance, $	Contact vendor	495-995	1,138	447
Monthly lease/rental, $	Contact vendor	GTE Telenet tariff	7,615 (5-yr. lease)	6,921 (2-yr. lease)
Is maintenance bundled with lease/rental?	Contact vendor	Yes	Yes	Yes
Date of first delivery	1983	Mid 1978	Info. not available	August 1976
Number of systems installed to date	Info. not available	1300	Over 1000	50,000
Serviced by	DCA, third party	Sorbus	Honeywell	IBM
COMMENTS	Supports host selection, port contention, full line and modem control facilities. Functions with 1 to 4 trunks	Multiple Microprocessor Line Card (LPU), common logic redundancy and power supply supported; performs virtual circuit switching; auto. virtual circuit recovery/rerouting.		

Communications Processors

SUPPLIER AND MODEL	IBM 3705-80 Models M81 through M83	IBM 3725	Lemcom Systems CMC-4	Lemcom Systems CMC-8
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, and 43XX; S/370 in 270X emulation mode only	IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341	S/360, IBM S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	8	1	1
Max. no. of active hosts supported simultaneously	2	6	1	1
IBM emulation	270X/370X	270X and 3705 with EP	270X	270X
Remote line concentrator	No	Yes	No	No
Maximum no. of hosts served by one concentrator	Does not apply	8	Does not apply	Does not apply
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA	SNA	Does not apply	Does not apply
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	16	256 with 3726 expansion	4	8
2000 to 9600 bps	16	256 with 3726 expansion	4	8
Over 9600 bps	Info. not available	128 with 3726 expansion	3	6
Highest line speed supported (bps)	57.6K	230.4K bps	56K	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	No	No
Terminal-initiated applications switching	No	No	No	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	No
Protocol conversion	Yes	Yes	Optional	Optional
Code conversion	Yes	Yes	Optional	Optional
Error control	LRC and CRC	LRC and CRC	LRC and CRC	LRC and CRC
Automatic transmission speed detection	Yes; via optional soft.	Yes, via opt. software	Optional—300, 1200	Optional—300, 1200
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Motorola 6800	Motorola 6800
Main memory word size, bits	18	18	8	8
Main memory storage capacity, bytes	256K	1M	40K	80K
Level of data unit transferred across I/O channel	Block	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	Interrupt	Interrupt
Mass storage	DMA	DMA	None	None
Other peripherals	DMA	DMA	None	None
I/O, back-up, and diagnostic peripherals supported	None	FEP console	FEP console	FEP console
Support for remote console	No	Yes, up to 150 meters (492 feet)	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Firmware	Firmware
IPL method	Download from host	Internal self-load	Internal self-load	Internal self-load
Additional software supported	NCCF, NPDA	NCCF, NPDA, ACF/NCP-PEP, EP/3725	Problem determination aids	Problem determination aids
User programmability	Yes	Yes	User-selected parameters	Yes, via user-selected parameters
Software separately priced	Yes	Yes	Utilities only	Utilities only
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	36,600 (M81)	32,000	14,000	16,000
Monthly maintenance, $	219	190	Contact vendor	Contact vendor
Monthly lease/rental, $	1,370 (2-yr. lease); 1,610 (rental)	1,390 (rental)	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	52,600 (M83)	75,000	20,000	30,000
Monthly maintenance, $	229	213	Contact vendor	Contact vendor
Monthly lease/rental, $	2,120 (2-yr. lease); 2,491 (rental)	3,260 (rental)	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	Yes	No	Contact vendor	Contact vendor
Date of first delivery	August 1981	Fourth quarter 1983	March 1977	November 1980
Number of systems installed to date	Info. not available	Info. not available	330	45
Serviced by	IBM	IBM	Various	Various
COMMENTS		HONE Configurator CF-3725 should be consulted for actual number of operable lines, depending on line speeds, protocols, 3 other variable factors	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee

Communications Processors

SUPPLIER AND MODEL	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series	M/A-COM DCC CP9000	M/A-COM DCC Micro-Node
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	Most vendors via serial interface	Most vendors via serial interface
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	1	64	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	1	64	Does not apply	Does not apply
IBM emulation	270X	270X, 370X, EP	Does not apply	Does not apply
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	64	No limit	No limit
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	Optional	Yes	Yes
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Optional	Yes	Yes
Network architecture compliance	Does not apply	DMMA	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	6500	480	128
2000 to 9600 bps	32	1500	240 to 480	128
Over 9600 bps	24	250	60 to 120	128
Highest line speed supported (bps)	56K	57.6K	56K	56K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	No	No
Terminal-initiated applications switching	No	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	No
Protocol conversion	Optional	Optional	No	No
Code conversion	Optional	Optional	No	No
Error control	LRC and CRC	LRC and CRC	No	No
Automatic transmission speed detection	Optional—300, 1200	110 to 19.2K bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6809	6502 and Z80	6502 and Z8000
Main memory word size, bits	8	8	8	8 and 16
Main memory storage capacity, bytes	320K	15M	4M bytes	64K
Level of data unit transferred across I/O channel	Byte	Byte and block	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	None	DMA and interrupt	Interrupt	Interrupt
Other peripherals	None	DMA and interrupt	None	None
I/O, back-up, and diagnostic peripherals supported	FEP console	FEP console and bubble memory	Diskette	Diskette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software	Software	Combination of software and firmware
IPL method	Internal self-load	Self-/manual-/down-load	From host/diskette	From host/diskette
Additional software supported	Problem determination aids	Channel prog. simulator & prob. determin. aids	Assembler & LOGOS compilers & linker system diagnostics	System diagnostics
User programmability	Yes, via user-selected parameters	Yes, via user-selected parameters	User created programs	User created programs
Software separately priced	Utilities only	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	25%	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	20,000	25,000	Approx. 30,000	Approx. 25,000
Monthly maintenance, $	Contact vendor	Contact vendor	Application dependent	Application dependent
Monthly lease/rental, $	Contact vendor	Contact vendor	Offered as options; contact vendor	Offered as option; contact vendor
Maximum practical configuration:				
Purchase price, $	60,000	500,000	Approx. 200,000	Approx. 150,000
Monthly maintenance, $	Contact vendor	Contact vendor	Application dependent	Application dependent
Monthly lease/rental, $	Contact vendor	Contact vendor	Offered as options; contact vendor	Offered as option; contact vendor
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	No	No
Date of first delivery	March 1979	1981	1977	1980
Number of systems installed to date	115	120	575	55
Serviced by	Various	Various	M/A-COM DCC	M/A-COM DCC
COMMENTS	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts	Distributed MPU FEP; up to 256 MPUs can be programmed to perform various comm. processing functions; front-end polling, dynamic applic. selec., & multi-console support avail.	Communications features and functions programmable by user; 1983 information	Multi-processor designed for fail-safe operation; all components totally redundant; communication features and functions programmable by user

Communications Processors

SUPPLIER AND MODEL	Memorex Communications Group 1270 Terminal Control Unit	Memotec Data Inc. MPAC 2500	Micom Micro800/X.25	NCR Comten 3650
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	Most vendors	Most	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	No	No	Yes
Max. no. of hosts channel-attachable to front-end	2	Does not apply	Does not apply	2
Max. no. of active hosts supported simultaneously	2	Does not apply	Does not apply	2
IBM emulation	270X, 370X EP	Does not apply	Does not apply	270X, 370X, ACF/NCP
Remote line concentrator	No	Yes (packet switch)	Yes	Yes
Maximum no. of hosts served by one concentrator	Does not apply	Port dependent	24	Unlimited
Host-independent network processor	No	Yes	Yes	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	No	No	No
Network architecture compliance	VAN	X.25	X.25	SNA/CNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	96	8	24	128
2000 to 9600 bps	70	8	24	128
Over 9600 bps	6	8	Info. not available	32 to 128
Highest line speed supported (bps)	56K	9600	19.2K bps	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes, for VAN	No	Yes	Yes
Terminal-initiated applications switching	Yes	Does not apply	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	X.25/BSC/ASCII	No	No	Yes
Code conversion	ASCII/BCD	Code-transparent	No	Yes
Error control	Yes	FCS	Yes	Yes
Automatic transmission speed detection	Yes, 50 to 9600 bps	No	Yes	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Info. not available	Z80	Z80A; Z80B	Proprietary
Main memory word size, bits	Info. not available	8	8	32
Main memory storage capacity, bytes	Info. not available	Approx. 60K	64K	1M
Level of data unit transferred across I/O channel	Byte	Block	Byte	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and Interrupt	DMA and Interrupt	DMA
Mass storage		None	None	DMA
Other peripherals		None	None	DMA
I/O, back-up, and diagnostic peripherals supported	Console w/VANS	Async. terminals	None	Diskette, cassette
Support for remote console	No	Remote configuration	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software (EPROM)	Software	Software
IPL method	Internal self-load	Internal self-load	Int. self/downline load	See comments
Additional software supported	None	Diagnostics	None	NDP, CLSS1, Codel 58
User programmability	No	User-selected parameters	User-selected parameters	Yes, via user-sel. par. & user programs
Software separately priced	Yes	Options only	None	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	75%	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,900	8,060	2,050	44,000
Monthly maintenance, $	126	60	Info. not available	363
Monthly lease/rental, $	543 mo. (3-yr. lease)	Not available	Info. not available	1,700 (2-yr. lease)
Maximum practical configuration:				
Purchase price, $	45,000	10,590	4,600	125,000
Monthly maintenance, $	250	60	Info. not available	631
Monthly lease/rental, $	1,450 (3-yr. lease)	Not available	Info. not available	4,150 (2-yr. lease)
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1970	1981	1982	March 1975
Number of systems installed to date	2,100	Info. not available	750	1,560
Serviced by	Memorex	Memotec and distrib.; Honeywell; Abbex	Independent distributors	NCR Comten
COMMENTS	Hard-wired data communications controller; 1983 information			Manual load from diskette and download from host

Communications Processors

SUPPLIER AND MODEL	NCR Comten 3670	NCR Comten 3670 Model 85	NCR Comten 3690 Models A8-E8	NCR Comten 3690 Model T1
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom	IBM S/370, 30XX, 308X, 43XX, and compatibles	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom	IBM S/370, 30XX, 308X, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	4	2	8	2
Max. no. of active hosts supported simultaneously	4	2	8	2
IBM emulation	270X, 370X, ACF/NCP	270/370X, NCP, ACF/NLP	270X/370X, ACF/NCP	270X, 370X, ACF/NCP
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Unlimited
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA/CNA	SNA, CNA	SNA/CNA	SNA/CNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	384	128	512	128
2000 to 9600 bps	384	128	512	128
Over 9600 bps	96 to 284	16 to 128	128 to 512	32 to 128
Highest line speed supported (bps)	230.4K	230.4K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Proprietary
Main memory word size, bits	32	32	32	32
Main memory storage capacity, bytes	512K	512K	4M	1M
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Byte or block	Byte, block, or file
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	DMA
Mass storage	DMA	DMA	DMA	DMA
Other peripherals	DMA	—	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Cassette	—	Diskette	Diskette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Combination of software or firmware
IPL method	See comments	See comments	See comments	Load from host/disk
Additional software supported	NDP, CLSS1, Codel 58	ComtenNDP, Codel 58, and CLSS1	NDP, CLSS1, Codel 58	NDP, CLSS1, Codel 58
User programmability	Yes, via user-sel. par. & user programs	Yes, via user-selected parameters	Yes, via user-sel. par. & user programs	Yes, via user-created programs
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	90,000	34,500	105,000	66,000
Monthly maintenance, $	270	290	442	366
Monthly lease/rental, $	3,000 (2-yr. lease)	1,260 (2-yr. lease)	3,600 (2-yr. lease)	2,257 (2-yr.lease)
Maximum practical configuration:				
Purchase price, $	350,000	52,000	375,000	108,500
Monthly maintenance, $	2,000	550	2,000	518
Monthly lease/rental, $	11,600 (2-yr. lease)	2,000 (2-yr. lease)	12,000 (2-yr. lease)	2,935 (2-yr. lease)
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	March 1972	1982	June 1978	January 1980
Number of systems installed to date	450	—	1030	100
Serviced by	NCR Comten	NCR Comten	NCR Comten	NCR Comten
COMMENTS	Manual load from diskette and download from host	Manual load from diskette and download from host	Manual load from diskette and download from host	

Communications Processors

SUPPLIER AND MODEL	NCR Comten 721-II	North American Philips Communications System Division MARC	NTX Communications Corporation NTX 3800—Model 1	NTX Communications Corporation NTX 3800—Model 2
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	NCR Century, Criterion, 8XX5 Systems	IBM S/370 and compatibles; Philips DS714	IBM and plug-compatible mainframes	IBM and plug-compatible mainframes
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	Unlimited	4	4
Max. no. of active hosts supported simultaneously	2	Unlimited	2	2
IBM emulation	No	270X, 370X	CTCA	270X, 37X5 EP
Remote line concentrator	Yes	Yes	No	No
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Does not apply	Does not apply
Host-independent network processor	Yes	Yes	No	No
Store-and-forward message switching processor	No	Yes	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	No	Yes	No	No
Network architecture compliance	CNA	Upon request	SNA	BSC
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	99	Configuration-dependent	8	8
2000 to 9600 bps	52-99	Configuration-dependent	8	8
Over 9600 bps	10 at 56K	Configuration-dependent	8	8
Highest line speed supported (bps)	56K	19.2K	6.312M	6.312M
Effect on line capacity, if all lines are full-duplex	None	Configuration-dependent	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	No
Terminal-initiated applications switching	No	Yes	Does not apply	Does not apply
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	No
Protocol conversion	No	Yes, domestic, int'l.	No	No
Code conversion	No	ASCII/EBCDIC	No	No
Error control	Yes	CRC	CRC	CRC
Automatic transmission speed detection	No	110 to 9600	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Z80B 8-b.,Philips 16-b.	Info. not available	Info. not available
Main memory word size, bits	16	8 or 16	Info. not available	Info. not available
Main memory storage capacity, bytes	512K	64K or more	96K	96K
Level of data unit transferred across I/O channel	Byte and block	Byte or block	Block	Block; byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA and interrupt	Interrupt	Interrupt
Mass storage	—	DMA and interrupt	None	None
Other peripherals	DMA	DMA and interrupt	None	None
I/O, back-up, and diagnostic peripherals supported	Cassette	CRT, printer, disk drive, mag. tape	Internal diag. processor	Internal diag. processor
Support for remote console	No	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Proprietary host-based software	Host-based software
IPL method	Load from cassette	Internal self-load	Info. not available	Info. not available
Additional software supported	No	No	None	None
User programmability	No	Yes, via user-created programs	Configuration macros	Access method macros
Software separately priced	All	No	All	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	95%	Info. not available	Info. not available
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	41,720	30,000 (inc. software)	163,340	145,730
Monthly maintenance, $	209	Info. not available	400	474
Monthly lease/rental, $	1,205	Configuration-dependent	5,709 (1-year lease)	5,754 (1-year lease)
Maximum practical configuration:				
Purchase price, $	100,400	200,000	240,805	233,005
Monthly maintenance, $	502	Info. not available	628	730
Monthly lease/rental, $	3,500	Configuration-dependent	8,902	9,347
Is maintenance bundled with lease/rental?	Yes	No	No	No
Date of first delivery	1976	January 1980	Info. not available	Info. not available
Number of systems installed to date	Approx. 1,200	125	Info. not available	Info. not available
Serviced by	NCR Comten	M. V. Philips	NTX	NTX
COMMENTS		Modular, microprocessor-based distributed processing system including standard operating system hardware & application packages; 1983 information	Supports multiple 1.544M bps cross-domain links over terrestrial or satellite facilit. Supported by ACF/VTAM with NTX Cross Domain Control Program; full circuit redundancy.	Supports multiple 1.544M bps links using IBM BSC; full circuit redundancy.

Communications Processors

SUPPLIER AND MODEL	Paradyne Pix/Pixnet	Periphonics T-Comm	Periphonics Telemarketer	Periphonics Voicepac
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	Most major vendors	3780/3270; most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes, dstrb. app. proc.	Yes
Max. no. of hosts channel-attachable to front-end	1	12 per processor	Info. not available	3
Max. no. of active hosts supported simultaneously	Multiple	12 per processor	Info. not available	3
IBM emulation	Does not apply	370X, 3803, 3272, 2848	Info. not available	Most std. interfaces
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	Multiple	7	Does not apply	3
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	Yes	Electronic orders	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	None	SNA	No	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	None	520	20	78
2000 to 9600 bps	Application-dependent	520	20	78
Over 9600 bps	3 full duplex	520	20	78
Highest line speed supported (bps)	56K	56K	9.6K	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Async/3270; PC/3270	Yes	Yes	Yes
Code conversion	ASCII/EBCDIC	Yes	Yes	Yes
Error control	Yes	Yes, all industry std.	Industry standards	All industry standards
Automatic transmission speed detection	Yes	With specified modems	No	No
Automatic disconnect of inactive dial-up terminals	Info. not available	Yes	If selected	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	DEC PDP-11	Multi 32 bit and 16 bit	LSI 11/23; PDP-11S
Main memory word size, bits	16	16	32 + 7	16
Main memory storage capacity, bytes	128K	64K to 5M	1-2M	64-256KB w/Peripacs
Level of data unit transferred across I/O channel	Byte	Byte or block	Internal 2 or 4 bytes	Byte or block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	Interrupt	Interrupt and DMA	Interrupt
Mass storage	None	DMA and interrupt	DMA	DMA and Interrupt
Other peripherals	DMA and interrupt	DMA and interrupt	DMA & interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	Mag. tape; console	CRT, printer, mag. tape	CRT; ptr.; tape; disk	Yes
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination software, firmware, hardware	Proprietary	UNIX based	Proprietary software
IPL method	Intern. self-load, man.	From host or diskette	Hard disk	Download or disk load
Additional software supported	Utilities	Network Definition Utility, Voice Dialog Utility	Network Definition Utility, Voice Dialog Utility; Rel. DBMS	I/O Gen, Pave; Param
User programmability	Self-configuring	Yes, via user-selected parameters, programs	Yes	Yes, voice dialog & basic edit functions
Software separately priced		All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	80%	100%	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	50,000	60,000	25,000
Monthly maintenance, $	Contact vendor	Approx. 400	Approx. 600	250 min., variable
Monthly lease/rental, $	Contact vendor	Variable	Variable	Variable
Maximum practical configuration:				
Purchase price, $	Contact vendor	250,000	90,000	150,000
Monthly maintenance, $	Contact vendor	2,000	Contact vendor	250
Monthly lease/rental, $	Contact vendor	Variable	Variable	Variable
Is maintenance bundled with lease/rental?	Contact vendor	No	No	No
Date of first delivery	April 1976	1980	1983	1981
Number of systems installed to date	Over 4,500	500	New product	200
Serviced by	Paradyne	Periphonics	Periphonics	Periphonics
COMMENTS	Pix/Pixnet permits remote peripherals and CRTs to access multiple IBM hosts and applications as locally attac. devices without remote TP software and with no software maintenance	Data/voice on same line, voice response system; network interface; nodal; solid state audio; integrated services	Electronic order entry system w/voice response and handheld terminal support	Handles data and voice interchangeably via a single I/O port; can concentrate, convert protocol & code, and serve as a network node

Communications Processors

SUPPLIER AND MODEL	Periphonics CommStar	Periphonics VoiceBox	Raytheon Data Systems Raynet I, II, III	Raytheon Data Systems Raynet IV
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	IBM, Sperry mainframes and compatibles	IBM, Sperry mainframes and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	12/processor	3	16	16
Max. no. of active hosts supported simultaneously	12/processor	3	Interface-dependent	Interface-dependent
IBM emulation	370X; 3803; 327X; 2848	Yes	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	7	3	1(R-I); 8(R-II&R-III)	8
Host-independent network processor	Yes	Optional	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	Yes
Distributed processing node	Yes	Yes	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	SNA	SNA	Yes	Yes
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	520	32	47	47
2000 to 9600 bps	520	32	47	47
Over 9600 bps	520	32	Varies	Varies
Highest line speed supported (bps)	9600	9600	56K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	ASCII/EBCDIC	Yes	Yes	Yes
Error control	Industry standard	Industry standard	Yes	Yes
Automatic transmission speed detection	With specified modems	With specified modems	No	No
Automatic disconnect of inactive dial-up terminals			No	No
SYSTEM CHARACTERISTICS				
Processor	Daul 32 bit and 16 bit	LSI 11/23	RDS-7500	RDS-7500
Main memory word size, bits	32 bit ECC; 16 bit ECC	16	16	16
Main memory storage capacity, bytes	Up to 3M	128K	256K	256K
Level of data unit transferred across I/O channel	2 or 4 bytes	Byte or block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and Interrupt	Interrupt	DMA	DMA
Mass storage	DMA and Interrupt	DMA and Interrupt	DMA	DMA
Other peripherals	DMA and Interrupt	DMA and Interrupt	DMA and interrupt	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	Console; prtr.; modem; disk;diskette;mag. tp.	Yes	Console, cassette, printer	Console, cassette, printer
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Real-Time, UNIX-based	Proprietary software	Combination of software and firmware	Combination of software and firmware
IPL method	Self-load from disk	EPROM based	From host, cass., dsk.	Host download, cass.
Additional software supported	Network def; ATM switching; DBMS; high-level langs.	None	None	None
User programmability	Yes	Yes	Yes; via user-selected parameters	Yes; via user selected parameters
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	Info. not available	75%	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	75,000	20,000	60,000	100,000
Monthly maintenance, $	400	Approx. 200	Info. not available	—
Monthly lease/rental, $	Variable	Variable	Info. not available	—
Maximum practical configuration:				
Purchase price, $	300,000	50,000	700,000	40,000
Monthly maintenance, $	2,500	250 minimum	Info. not available	—
Monthly lease/rental, $	Variable	Variable	Info. not available	—
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1984	1983	1978; 1980(R-II&R-III)	1980
Number of systems installed to date	New product	New Product	Over 100	Info. not available
Serviced by	Periphonics	Periphonics	Raytheon Data Systems	Raytheon Data Systems
COMMENTS	A user-programmable comm. switching system w/extensive library of terminal and network interfaces	A solid state unit that can concentrate, convert protocol and code, serve as a network node, and provide voice response.	Raynet I sup. network control func., redundancy option; Raynet II prov. all Raynet I cap. plus host selec.; Raynet III prov. all Raynet II cap. plus protocol conversion	Raynet IV provides all Raynet III capabilities plus message switching

Communications Processors

SUPPLIER AND MODEL	Sperry DCP/10	Sperry DCP/20	Sperry DCP/40	Tandem Computers 6100 Communications Subsystem
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Sperry Series 1100, Series 90	Sperry Series 1100, Series 90	Sperry Series 1100, Series 90	Tandem NonStop II and NonStop TXP
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	4	16	2 per 15 lines
Max. no. of active hosts supported simultaneously	1	3	16	2 per 15 lines
IBM emulation	Info. not available	No	No	None
Remote line concentrator	Info. not available	Yes	Yes	Contact vendor
Maximum no. of hosts served by one concentrator	Info. not available	No specific limit	No specific limit	Does not apply
Host-independent network processor	Info. not available	Yes (init. host load)	Yes (init. host load)	Contact vendor
Store-and-forward message switching processor	Info. not available	Custom	Custom	Contact vendor
Distributed processing node	Info. not available	No	No	Contact vendor
Terminal controller	Info. not available	No	No	Yes
Network architecture compliance	Info. not available	DCA	DCA	Contact vendor
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	6 sync, 24 async.	47 sync; 192 async.	255 sync; 1023 async.	360
2000 to 9600 bps	6 sync, 24 async.	47	255	360
Over 9600 bps	6 sync, 24 async.	47	140	360
Highest line speed supported (bps)	Info. not available	64K	64K	56K
Effect on line capacity, if all lines are full-duplex	Info. not available	None	None	No effect
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Info. not available	Yes	Yes	No
Terminal-initiated applications switching	Info. not available	Yes	Yes	Contact vendor
Comm. processor-initiated dynamic line reconfig.	Info. not available	Yes	Yes	Yes
Protocol conversion	Info. not available	Yes	Yes	Contact vendor
Code conversion	Info. not available	Yes	Yes	Yes
Error control	Info. not available	Yes	Yes	Yes
Automatic transmission speed detection	Info. not available	Yes, 110 to 19.2 bps	Yes 110 to 19.2K bps	No
Automatic disconnect of inactive dial-up terminals	Info. not available	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Sperry DCP/10	Sperry DCP/20	Sperry DCP/40	Proprietary
Main memory word size, bits	16	16	16	8
Main memory storage capacity, bytes	512K	512K	3.5M	64K per line
Level of data unit transferred across I/O channel	Info. not available	Block	Block	Block
Type of data transfer supported between memory and:	Info. not available			
Communications lines		DMA	DMA	DMA
Mass storage	Info. not available	DMA	DMA	DMA
Other peripherals	Info. not available	DMA	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Info. not available	Console, disk, diskette, mag. tape	Console, disk, mag. tape	Integrated with system
Support for remote console	Info. not available	Yes	Yes	Contact vendor
Communications operating software:				
Operating system implemented in	Info. not available	Combination software and firmware	Combination software and firmware	Software and firmware
IPL method	Info. not available	Host download & disk.	Host download & disk.	Download from host
Additional software supported	Info. not available	File transfer	File transfer	Contact vendor
User programmability	Info. not available	Yes, via user-created programs	Yes, via user created programs	Contact vendor
Software separately priced	Info. not available	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	10%	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	20,000	47,350	103,600	25,840
Monthly maintenance, $	100	245	590	128
Monthly lease/rental, $	450 (5-year lease)	1,080 (5-year lease)	2,340 (5-year lease)	Does not apply
Maximum practical configuration:				
Purchase price, $	40,000	135,000	480,000	Contact vendor
Monthly maintenance, $	220	700	2,500	Contact vendor
Monthly lease/rental, $	990 (5-year lease)	2,800 (5-year lease)	10,000 (5-year lease)	Contact vendor
Is maintenance bundled with lease/rental?	No	No	No	Does not apply
Date of first delivery	December 1983	January 1982	September 1979	April 1983
Number of systems installed to date	20	80	1,200	New product
Serviced by	Sperry	Sperry	Sperry	Tandem
COMMENTS				

Communications Processors

SUPPLIER AND MODEL	Telefile Computer Products FECP-X	Telefile Computer Products Telepac	Telematics VAX Front-end Processor	Telematics NET 25
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Xerox Sigma 5-9 and Telefile T80 Series	Standalone or Telefile T80 Series	DEC VAX 11/730, 11/750, and 11/780 systems	Most
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	No
Max. no. of hosts channel-attachable to front-end	6	8	4	Does not apply
Max. no. of active hosts supported simultaneously	3	8	4	Does not apply
IBM emulation	None	None	No	No
Remote line concentrator	Yes	Yes	Yes	Yes (packet switch)
Maximum no. of hosts served by one concentrator	Network-dependent	12	4	4
Host-independent network processor	No	Yes	Yes	No
Store-and-forward message switching processor	Yes	Yes	No	No
Distributed processing node	Yes	Yes	Yes	No
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	None	X.25	None	None
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	256	280	400	800
2000 to 9600 bps	256	280	80 to 400	160 to 800
Over 9600 bps	None	280	80	160
Highest line speed supported (bps)	9600	19.2K bps	64K	64K
Effect on line capacity, if all lines are full-duplex	None	None	Halved	Halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Async to 3270 BSC/SDLC	No	No
Code conversion	ASCII/EBCDIC	ASCII to EBCDIC	No	No
Error control	No	Parity, LRC and CRC	Yes	Yes
Automatic transmission speed detection	110 to 9600 bps	50 to 9600 bps	50 bps—19.2K bps	50 bps—19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes		
SYSTEM CHARACTERISTICS				
Processor	TCP-16	M68000	MC68000/Telematics S1	MC68000/Telematics S1
Main memory word size, bits	16	16	32	32
Main memory storage capacity, bytes	128K	64K Bytes MOS RAM	16M	16M
Level of data unit transferred across I/O channel	Byte	Byte or block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	DMA and Interrupt	DMA and Interrupt
Mass storage	None	DMA and interrupt	DMA	DMA
Other peripherals	None	DMA and interrupt	DMA and Interrupt	DMA and Interrupt
I/O, back-up, and diagnostic peripherals supported	None	FEP console, disk, diskette, mag tape	Removable disk (5M bytes)	Removable disk (5M bytes)
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software & firmware	Software	Software
IPL method	Download from host	Int. selfload, dskt.	Manual from disk	Disk or remote port
Additional software supported	None	Program dev. software, utilities	Pascal; C	Pascal; C
User programmability	Info. not available	Yes, via user-selected parameters	Yes	Yes
Software separately priced	Special applications only	Special applications only	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	25%	80%	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	35,000	30,000	42,950	45,900
Monthly maintenance, $	425	350	455	275
Monthly lease/rental, $	712 (3-yr. lease)	615/3 yrs.	None	None
Maximum practical configuration:				
Purchase price, $	600,000	95,000	171,800	220,000
Monthly maintenance, $	4,700	1,100	1,820	1,320
Monthly lease/rental, $	12,200 (3-yr. lease)	1,950 (3 yrs.)	None	None
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1976	October 1980	October 1983	February 1984
Number of systems installed to date	10	17	Info. not available	Info. not available
Serviced by	Telefile	Telefile	Telematics	Telematics
COMMENTS	Hardware and software compatible with all Xerox and Telefile mainframes; 1983 information	Prov. mode for mult. CCITT X.25 pub. or priv. packet netwk.; Sup. all ASCII based hosts and terminals; interface to SNA/SDLC networks; 1983 information		

Communications Processors

SUPPLIER AND MODEL	Telematics Series 1	Tri-Data Netway 200	TRT Data Products Norfield Communications System 500	Tymnet Micro-Engine
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most	Most major vendors	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	Does not apply	Does not apply	Does not apply	Does not apply
Max. no. of active hosts supported simultaneously	Does not apply	Does not apply	Does not apply	
IBM emulation	No	Does not apply	Does not apply	
Remote line concentrator	Yes	Yes	No	Packet switch
Maximum no. of hosts served by one concentrator	4	4	Does not apply	Depends on configu.
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	Yes	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	None	SNA; X.25	Yes	Tymnet proprietary (Tymnet II)
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	800	6	512	Depends on configur.
2000 to 9600 bps	160 to 800	6	32	Depends on configur.
Over 9600 bps	160	6	24	Depends on configur.
Highest line speed supported (bps)	64K	56K	56K	19.2K bps
Effect on line capacity, if all lines are full-duplex	Halved	None	70%	Increased
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	Yes	Yes	Any supported/any sup.
Code conversion	No	ASCII to EBCDIC	Yes	ASCII/2741/Baud./EBCD
Error control	Yes	Parity; LRC; CRC	Yes	Parity; CRC
Automatic transmission speed detection	50 bps—19.2K bps	No	Yes	Yes
Automatic disconnect of inactive dial-up terminals		No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	MC68000/Telematics S1	Z80A	Perkin-Elmer 3230	Proprietary
Main memory word size, bits	32	8 bits	32	32
Main memory storage capacity, bytes	16M	256K	4M	512K
Level of data unit transferred across I/O channel	Block	Byte	Info. not available	Does not apply
Type of data transfer supported between memory and:		DMA and Interrupt		DMA and Interrupt
Communications lines	DMA and Interrupt		Info. not available	
Mass storage	DMA	DMA and Interrupt	Info. not available	Does not apply
Other peripherals	DMA and Interrupt	DMA and Interrupt	Info. not available	Does not apply
I/O, back-up, and diagnostic peripherals supported	Removable disk (5M bytes)	Diskette	Info. not available	None
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Microcode
IPL method	Disk or remote port	Rem. download or manual	Manual loading disk.	Download from Engine
Additional software supported	Pascal; C	CP/M	Info. not available	Validation utilities; operations utilities; acctg. utilities; Net. mgt. and control; msg.
User programmability	Yes	Yes	No	Yes
Software separately priced	Yes	All but O.S.	Info. not available	Utilities
Approx. proportion of currently installed systems supplied as turnkey systems	None	90%	None	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	26,000	7,920	250,000	10,000 (approx.)
Monthly maintenance, $	150	Info. not available	500	Contact vendor
Monthly lease/rental, $	None	Info. not available	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	185,000	15,000	1,000,000	16,120 (approx.)
Monthly maintenance, $	1,110	Info. not available	3,000	Contact vendor
Monthly lease/rental, $	None	Info. not available	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	No	Info. not available	No	No
Date of first delivery	December 1983	April 1983	1982	1983
Number of systems installed to date	Info. not available	120	Info. not available	200
Serviced by	Telematics	Tri-Data	Norfield	Tymnet
COMMENTS		Supports networks up to 254 nodes @ 32 devices per node.	Custom systems available; 1983 information	Engines sold as components of complete, custom networks compatible with Tymnet's public network

Communications Processors

SUPPLIER AND MODEL	Tymnet Mini-Engine	Tymnet Engine	Westinghouse Canada Electronic Systems Division W1655/1656	
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Most major vendors	IBM PARS, Sperry Uniscope 100 & UTS20	
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	
Max. no. of hosts channel-attachable to front-end			Does not apply	
Max. no. of active hosts supported simultaneously			Does not apply	
IBM emulation			Does not apply	
Remote line concentrator	Packet switch	Packet switch	Yes	
Maximum no. of hosts served by one concentrator	Depends on configu.	Depends on configu.	4	
Host-independent network processor	Yes	Yes	No	
Store-and-forward message switching processor	No	Yes	Yes	
Distributed processing node	No	No	No	
Terminal controller	Yes	Yes	Yes	
Network architecture compliance	Tymnet proprietary (Tymnet II)	Tymnet proprietary (Tymnet II)	None	
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	Depends on configur.	Depends on configur.	16	
2000 to 9600 bps	Depends on configur.	Depends on configur.	16 at 4800; 8 at 9600	
Over 9600 bps	Depends on configur.	Depends on configur.	None	
Highest line speed supported (bps)	74K bps	74K bps	19.2K	
Effect on line capacity, if all lines are full-duplex	Increased	Increased	Capacity reduced	
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	
Terminal-initiated applications switching	No	No	No	
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	
Protocol conversion	Any supported/any sup.	Any supported/any sup.	U100/P1024	
Code conversion	ASCII/2741/Baud./EBCD	ASCII/2741/Baud./EBCD	IPARS/P1024	
Error control	Parity; CRC	Parity; CRC	Yes	
Automatic transmission speed detection	Yes	Yes	No	
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Intel 8085 (dual)	
Main memory word size, bits	32	32	8	
Main memory storage capacity, bytes	1M	1M	32K	
Level of data unit transferred across I/O channel	Does not apply	Halfword	Block	
Type of data transfer supported between memory and:	DMA and Interrupt	DMA and Interrupt		
Communications lines			Interrupt	
Mass storage	Does not apply	DMA	DMA and interrupt	
Other peripherals	Does not apply	DMA	Interrupt	
I/O, back-up, and diagnostic peripherals supported	None	Disk; mag. tape; console	Yes	
Support for remote console	Yes	Yes	Yes	
Communications operating software:				
Operating system implemented in	Microcode	Microcode	Firmware	
IPL method	Download from Engine	From disk or tape*	Download, EPROMs	
Additional software supported	Switching		Info. not available	
User programmability	Yes	Yes	No	
Software separately priced	Utilities	Utilities	Specials	
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	25%	
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	40,000 (approx.)	70,000 (approx.)	12,000	
Monthly maintenance, $	Contact vendor	Contact vendor	Info. not available	
Monthly lease/rental, $	Contact vendor	Contact vendor	Third party	
Maximum practical configuration:				
Purchase price, $	70,000 (approx.)	130,000 (approx.)	20,000	
Monthly maintenance, $	Contact vendor	Contact vendor	Info. not available	
Monthly lease/rental, $	Contact vendor	Contact vendor	Third party	
Is maintenance bundled with lease/rental?	No	No	No	
Date of first delivery	1981	1978	September 1976	
Number of systems installed to date	210	850	300	
Serviced by	Tymnet	Tymnet	Third party	
COMMENTS	Engines sold as components of complete, custom networks compatible with Tymnet's public network	Engines sold as components of complete, custom networks compatible with Tymnet's public network *Or downline from other engine	Remote line polling; 1983 information	

Communications Processors

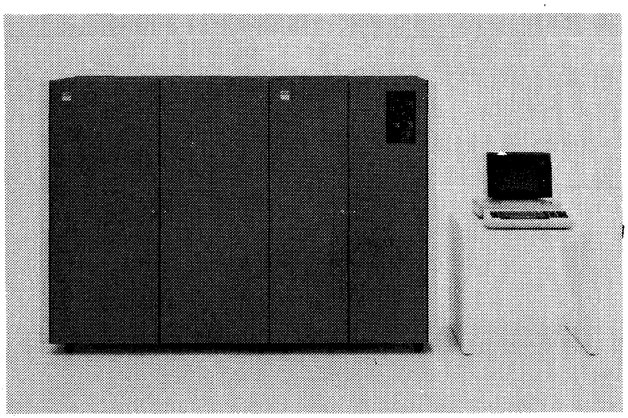
The primary function of a communications processor is front-end processing, to relieve the host computer of such tasks as protocol and code conversion, line control of communications circuits between the host computer and remote terminals, and error correction. Communications processors serving also as multiplexers, concentrators, distributed processing nodes, and processors independent of a host are becoming more prevalent. The comparison chart section of this report outlines the major characteristics of some 78 products offered by 40 different vendors. We have also reported on the experience of 742 users representing 5,606 installed communications processor systems.

Communications processors are computers that have been programmed to perform one or more control and/or processing functions in a data communications network.

The trend continues toward providing multi-functional products. Like the computer industry as a whole, communications processor vendors are capitalizing on improved technology and delivering highly flexible but cost-effective products based on the latest microprocessor, memory, and other high-tech components. Processors functioning as communications line multiplexers, host independents, concentrators, protocol converters, switches, terminal controllers and/or distributed processing nodes are starting to flourish as communication processor multifunctionality becomes increasingly common.

This trend has taken its toll, by attrition or consolidation, among traditional front-end processor vendors. For example, in 1982, Rockwell-Collins discontinued marketing their front-end processors. NCR and its Comten subsidiary consolidated their operations, with all products now headquartered at the NCR Comten facility in St. Paul, Minnesota. Burroughs Corporation retrenched itself by acquiring Systems Research, Inc., a small but innovative independent specializing in Burroughs-oriented communications systems. Burroughs further strengthened its position by acquiring Memorex, whose 1270 Terminal Control Unit has one of the largest customer bases of the IBM front-end processor emulators. Similarly, Amdahl acquired Tran Telecommunications.

Despite any setbacks that have occurred, most analysts predict a healthy growth rate of about 20 percent per year through 1985. Most vendors have continued to enhance their existing communications processor product lines, and several new products are available such as the IBM 3725 Communications Controller, the BetaCom Professional Communications Manager (PCM), the Cableshare CSI Data Concentrator, and the Periphonics Datapac, Voicepac, and Telemarketer. Users can choose from a wide variety of communications systems that support increasingly sophisticated front-end processing, intelligent remote concentration, network processing, and other communications processing capabilities.


The new IBM 3725 Communications Controller supports up to 8 hosts, 256 lines, and 1,024K bytes of storage. Compared to the 3705-II, it handles larger networks, contains more main memory, and offers simplified machine structure.

Developmental Factors

Several major developments have led to the dramatic increase in the use of communications processors, and to their continual development into machines with progressively higher capacity, capability, and compatibility.

The first major development was recognizing that the data communications functions must be segregated from other data processing functions. This resulted in modular communications software packages and communications interfaces that permit alteration of the communications environment without major surgery to the hardware and the software. It also permits the organization of communications processing functions, relative to other processing functions, along assembly-line principles. The assembly-line technique segments a job into discrete elements for exclusive execution by specialized persons or equipment; the assembly-line total output significantly exceeds the output of the same persons or equipment with each performing the total job. The development of specialized components to perform essential line handling functions resulted in the front-end processor, which freed the host processor of this time consuming task. A front-end/host configuration is able to handle a significantly greater data volume than a single processor with equivalent power that performs both the line handling and the data processing function.

The second major development was the introduction of the microprocessor. Now a standard item utilized in all

Communications Processors

types of electronic componentry, the microprocessor permits implementation of sophisticated processing functions at increasingly low cost. Complex communications processing tasks once handled by special-purpose hard-wired controllers are now accomplished by inexpensive microcomputers that, when properly designed and programmed, are no more complicated to deal with than disk drives. And the fact that the costs of transmission facilities continue to increase justifies placement of communications processing equipment throughout the data communications network, as well as at the host site.

Technical innovations in the use of microprocessors continues to improve price/performance of new communications processors. For example, throughput capabilities are enhanced by using multiple microprocessors within the communications processor to perform specialized functions. Altering the microcode or stored logic (either directly by the user or indirectly by such features as IBM's Extended Facilities) has added a new dimension to throughput improvement techniques. Multiport memory access has facilitated warm-start back-up systems. Virtual operating systems are taken for granted and full-capability data base management systems are being given serious consideration by installations previously reluctant to accept the associated CPU overhead.

Intimately tied to the evolution of intelligence for *communications* processing equipment is the parallel development of intelligence for remote *data* processing equipment. The assembly-line concept can be extended to all segments of a network, in which many small systems perform specific, specialized communications *and* data processing tasks independently of the host computer. This decentralized or distributed data processing has given rise to a new type of data processing module: the small processor or minicomputer which performs both data and communications processing. Honeywell's DPS/6 and Sperry Univac's V77 family of minicomputers are two examples of processors which can serve either as stand-alone processors, or as distributed systems which offer significant communications control capabilities.

A third, and often overlooked, influence on the development of communications processors is the effort on the part of most vendors towards standardization, particularly for lower-level activities, such as physical interfacing and connection establishment, maintenance, and release functions. This on-going effort, along with hardware architectural improvements, is reducing the investment, inventory, and software support necessary to support a variety of different terminal and line disciplines, which are different for few justifiable reasons. Standardization, in addition to reducing costs to existing users, will continually increase the user base that can economically justify the use of electronic communications in their operations.

For higher level functions, most of the large mainframe and minicomputer manufacturers have codified their own communications standards by setting down a set of rules, or "network architecture," that governs how its software and hardware products can be used to create a network structure. IBM's Systems Network Architecture, DEC's DECnet, Sperry Univac's Distributed Communications Architecture, and Honeywell's Distributed Systems Environment are examples of such architectures.

Although not compatible with one another, most of these architectures generally follow the recommendations of the European-based International Standards Organization (ISO), which has suggested a reference model for network architectures called Open Systems Interconnection (OSI).

Among the standards recognized by OSI are ISO's HDLC link-level protocol and the CCITT X.25 packet-switching interface. Minor variations of the international HDLC or IBM's version of HDLC, which is called SDLC, are now supported by many suppliers of communications equipment. Moreover, in the past year, many vendors have announced CCITT packet-level X.25 support in the United States. The X.25 capability permits interconnection of equipment via private (dedicated) or public packet-switching networks. Several public packet-switching networks are now or will soon be operational in the U.S., including Tymnet, GTE Telenet, Uninet, and CompuServe. An X.25 package offered with a communications processor product is generally certified as compatible with one or more of these public data networks.

The direction of the communications processor market is intimately involved in the development of these and similar standards, since the communications processor is a primary vehicle for their implementation. As the trend towards standardization progresses, the market for communications processors should continue to strengthen.

Communications Processor Components

The essential components of every communications processing system are the following:

1. *Processor.* The processor element is a stored-program digital computer of almost any size. It must have its own main memory, but it may or may not use on-line peripheral devices. The processors should have excellent interrupt and/or direct memory access (DMA) handling and strong bit manipulation capabilities.

2. *Central processor interface.* When acting as a front-end, the communications processor must include the proper hardware interface to permit it to connect directly to a standard input/output channel of the central processing unit (or host computer). Such an interface should permit the host computer to communicate with the front-end processor as if it were a standard peripheral device control unit, requiring little, if any, operating system software modification. When

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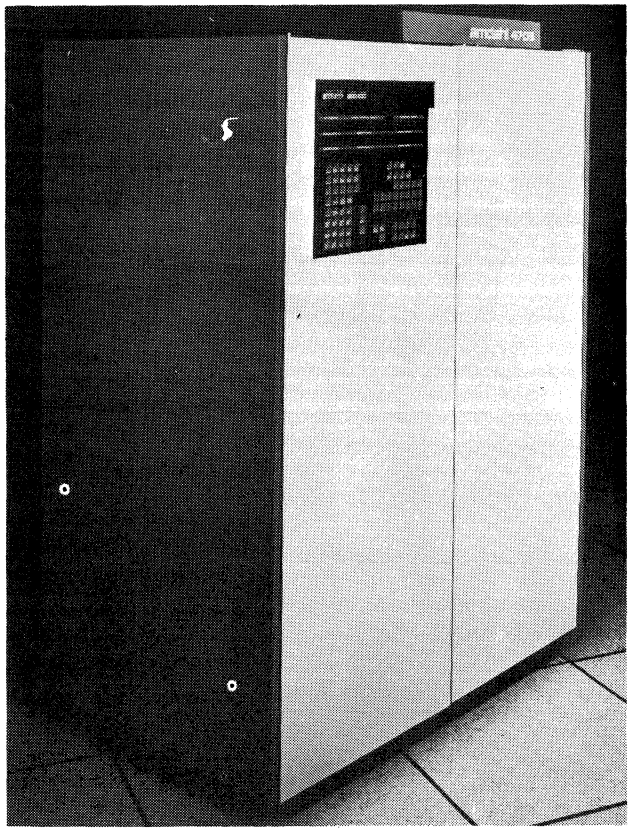
acting as a remote processor, support for data communications line interfacing that connects the processor with the host computer(s) must be provided.

3. *Communications multiplexer.* This component provides a logically independent data channel into the communications processor's main memory for every transmission line being served. The multiplexer serves as the communications processor's functional interface with the data transmission lines. Control of incoming and outgoing data is coordinated between the multiplexer and the processor via interrupts or direct memory access (DMA).

4. *Line interface units.* These components are hard-wired devices that link the multiplexer with the modems that terminate each communications line. Like the modems, the line interface units are specifically tailored to serve the speed transmission characteristics of the lines they terminate. The lines are, in turn, generally selected according to the transmission requirements of the remote terminal devices.

5. *Software/firmware.* The communications processing hardware components become an integrated, functioning system only through the inclusion of stored-program logic (either firmware or software)—some generalized, and some highly specialized. The programs should include terminal control, line control, message control, and central system interface procedures. Depending on the supplier, the user may have to provide some portion of the software required to implement specific requirements.



The Amdahl 4705 Communications Processor is functionally equivalent to and software-compatible with the IBM 3705-II. The Amdahl system is smaller, faster, and less expensive than the 3705.

Communications Processor Functions

Because a communications processor is essentially a computer, it can be programmed to perform an almost limitless variety of functions. But in its role as controller of a data communications network, the specific functions generally programmed are those that relate to data and message control. The following functions are the most important ones offered with the more comprehensive communications processing systems. Some systems will not provide all these functions, as all are not required in specific installations.

1. *Line control.* This involves the periodic polling of terminals to determine readiness to transmit and receive data. Automatic call answering, acknowledgment, and dial-up can also be handled.

2. *Character and message assembly.* Bits are assembled (and disassembled) into parallel characters, and control characters are recognized to permit the assembly and disassembly of entire messages. Data can be handled at varying line speeds and in synchronous or asynchronous formats, with start-stop bits and synchronizing characters handled automatically.

3. *Code and protocol conversion.* The data transmission codes (such as Baudot, ASCII, etc.) and protocol-prescribed formats are converted into structures that are equivalent to the host's native data code (such as EBCDIC) or conform to the formats of more efficient protocol procedures.

4. *Data and message editing.* This is a general function that can include application-oriented reformatting, removal of spaces and zeros (and other kinds of data compression), and other data restructuring to permit more efficient data transmission and more efficient processing by the host computer.

5. *Error control.* Using both hardware and software techniques, the communications processor can detect and correct data transmission errors before they reach the host computer.

6. *Message buffering and queuing.* The communications processor can buffer several messages in its main memory before passing them to the host computer, with the intention of interrupting that computer as infrequently as possible. Also, if the host computer

cannot process incoming messages as fast as they arrive into the system, the communications processor can queue these messages in its own auxiliary storage units, such as disks, or magnetic tape units, and can transfer these messages to the host computer when processing time becomes available. Queue management can be arranged in several different ways, including a system of priorities.

7. *Message switching.* When the communications processor serves more than one host computer, it will analyze message headers and addresses and send each incoming message to the proper destination. This situation can occur when several computers share a data communications network while each remains dedicated to specific applications.

8. *Message answering.* Certain messages, such as simple inquiries, can be completely processed by the communications processor without any contact with the central data processing system. Since many communications processors permit attachment of on-line auxiliary storage units, these processors can store and access their own private data bases. Some systems also permit the communications processors to directly access the auxiliary storage subsystems and data files of the host computer.

9. *Message recording.* Vital inbound messages can be passed on to the host computer while being simultaneously recorded in the communications processor's auxiliary storage. Such message recording can assist in system restart operations in case the central system should malfunction and lose either its messages or the results of processing the messages. Also, it may be advisable in some systems to store a journal record of every message received during each processing period.

10. *Statistics recording.* The communications processor can keep a running record of all data communications traffic, including such statistics as total number of messages processed, number of messages delivered to each destination, number of line errors, average length of time in queue, number of busy signals, etc. These statistics can be dumped on demand or in the form of reports at the end of each processing cycle.

Other application-oriented functions can be programmed by the communications processor supplier, by the user, or by some combination of the two. It must be remembered, however, that the communications processor, like the host computer, has only a finite amount of processing power. The more functions that are added to it in order to relieve the host computer, the more likely it is to run out of power, especially in active, growing communications networks. A communications processor pushed beyond its capacity will result in lost messages and, ultimately, in system failure.

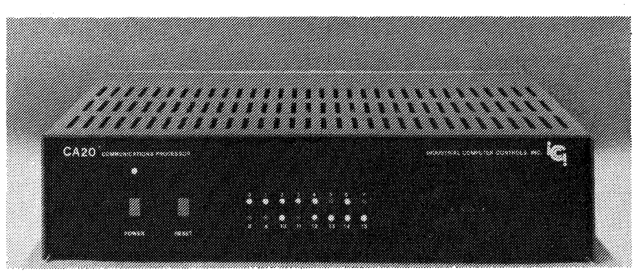
Advantages of Communications Processing

Communications processors are enjoying increased popularity in various parts of data communications systems because they are proving to be more and more effective on a price/performance basis. Factors that contribute to their price/performance edge include the following:

1. *Flexibility.* Communications processors are designed to handle many line speeds and transmission characteristics in uniform or interchangeable circuitry and to support a wide variety of remote terminals from the mainframe and independent suppliers, regardless of their transmission speeds, line control conventions, synchronization techniques, and data codes. Because they can be modified at any time and at comparatively low cost by user or vendor, they are eminently well suited to handling key roles in data communications systems, which are typically characterized by bewildering variety and constant change. As advances in communication line facilities are made by the common carriers and as new, faster, and lower-cost transmission services are offered by the independent companies, the communications processor's flexibility becomes eminently important in guarding against system obsolescence.

2. *Expandability.* Communications processors permit relatively easy growth of the data communications network, principally by adding line interface units and modifying the control programs.

3. *Distribution of labor.* These processors can be programmed to perform varying amounts of productive processing, often in conjunction with their own on-line peripheral devices, they can share portions of the overall processing load with other processors in the system—including the central processor. Peak loads can be more effectively handled and critical bottlenecks more likely avoided. In the case of a front-end processor, controlling the entire data communications subsystem will relieve the system's central processing unit on two counts: processing time and main memory space. Central control of data communications networks can consume 40 to 50 percent of the available processing time in typical situations. The resident software control routines can easily consume in excess



The CA20 Terminal Controller of Industrial Computer Controls Incorporated replaces an IBM 3274 cluster controller in an IBM 3270 network and allows asynchronous devices to communicate with the host processor as IBM 3278 terminals.

Communications Processors

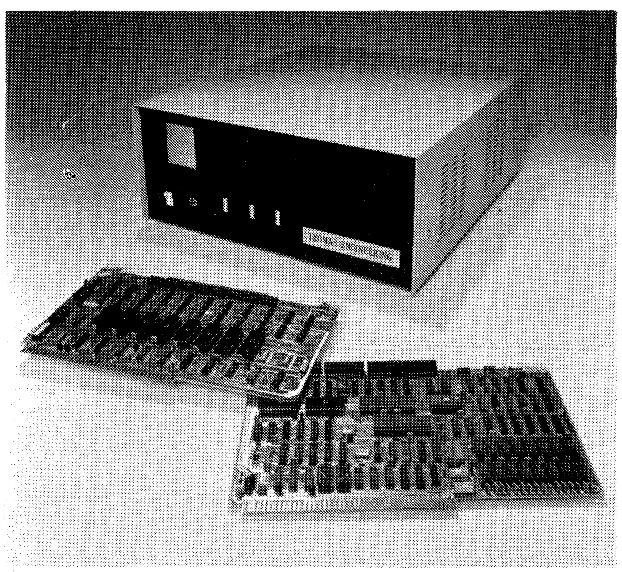
of 50K bytes and frequently use up to 300K bytes or more of main memory space, depending on the functions performed. Efficient utilization of communications processors can provide almost full relief in both processing time and memory space overheads. (If the host processor is not overburdened, the need for a programmable unit may be harder to justify.)

4. *Fail-soft capability*. In data communications systems that include at least one other computer, programmable communications processors can provide some form of continued system operation when one or more of the other computers become inoperative. The degree and effectiveness of this fail-soft capability depend not only on the capabilities of the processor, but also, perhaps more importantly, on the skill displayed by the system architect in making provisions for redundant components and fall-back procedures.

5. *Independent processing*. When communications processors are not involved in their principal data communications tasks, they can often be used as standalone data processing systems if their configuration includes some peripheral input/output devices. Simple media conversion tasks, such as card-to-tape and tape-to-print, can be valuable by-products from these otherwise communications-oriented processors, and localized time-sharing can yield added benefits. In off-line mode, the processor can also be adapted to serve specialized I/O devices, such as plotters and OCR devices, that the central system may not be able to handle.

Potential Problems

Communications processors deserve careful investigation because of the vast variety of equipment currently available. Such investigations should include as many probing questions as possible, because there are potentially serious pitfalls to be avoided.



The MZ-80 of Thomas Engineering Company connects a variety of ASCII CRTs to a host system over a high-speed line. Features include protocol conversion, terminal and line concentration, terminal controller and device emulation, and local processing.

One potential problem is that of overloading the communications processor, with the resultant loss of data. Sophisticated data and message control programs will consume large quantities of the communications processor's computing and memory facilities, just as they do in a centrally-based communications system. A tendency toward overloading can easily negate any apparent advantages of expandability and growth potential.

Another vital issue is software. The body of software required for terminal control, line control, and message control activities, not to mention application-oriented preprocessing, is unquestionably complex. The prospective user must determine whether or not the supplier is capable of supplying this software, at what level of completeness, with what assurance of bug-free stability, with what chances of interfacing smoothly with the central system software, and with how much installation assistance. Obviously, if the software doesn't work properly, the system is of little value. From another point of view, a system whose software works but performs very few and very basic functions may be inadequate for present or future needs.

Another consideration is that some communications processor hardware/software combinations may require far more time and effort to install and start up than others, especially when the supplier of the communications processor equipment is different from that of the host computer system. Apart from the traditional problems (real or imagined) of divided vendor responsibility, there exists the very real problem of integrating two completely different sets of hardware and software.

A currently operational data communications installation that is considering replacing hard-wired communications controller(s) with a more sophisticated communications processor must carefully evaluate the problems of conversion. Beyond the usual problems of data integrity and the logistics of arranging the conversion process, the user may also be faced with the prospect of modifying either his central system control software or the body of application programs that use the communications network.

Evaluating a communications processing system on a cost/value basis is extremely complex and can be almost meaningless when performed in the abstract. Costs will vary with the size and diversity of the network being controlled, with the size and processing power of the communications processor, with the number of control and preprocessing functions incorporated (software is expensive, whether hidden in a "bundled" system price or not), and with the number of on-line peripheral devices.

Adding functions that will permit use of "foreign" terminals, relieve the central processor of intolerable overheads, and allow independent and back-up processing may increase the costs but will also increase the value. In order to evaluate the cost of the communications processor in terms of the potential cost savings throughout the system, an effort must be made to associate specific dollar figures with the expected values to be derived from one data communications system versus another. In summary, it should be clear that costs and values of communications processing can be assessed only in terms of specific situations and specific systems.

Sources of Supply

One of the most interesting aspects of the story on communications processors is that computer users can now obtain them from literally dozens of vendors, with differing product implications depending on the source selected.

Designers of the data communications system will probably first contact the supplier of their present or planned mainframe computer to investigate its offerings in the area of data communications. If communications processors are strongly promoted as the best (sometimes only) way in which to construct efficient, fully supported systems, the designers will usually go along with the recommendations of the mainframe supplier. The designers are comforted by the belief that their data communications subsystem will be fully supported and will interface efficiently with the central processing system. It is in this regard that developments such as IBM's SNA and DEC's DECnet increase in importance to systems designers.

But not all mainframe suppliers are equally advanced in their data communications product line, and not all offer a selection of communications processors supported with product-line software. Users not fully satisfied with the offerings of their mainframe supplier can investigate the wares of other promising suppliers, most of whom offer assurances that their communications processors can be "plug-compatible" with either the hard-wired or programmable communications controllers of the mainframe supplier, or at least with its data communications hardware and software interfaces.

The minicomputer manufacturers constitute one prominent group of suppliers who are actively pursuing the communications processor market with products that can either stand alone or interface smoothly with the mainframe equipment of other suppliers. Almost any currently marketed minicomputer is capable of serving as the fundamental building block of a communications processor, and many include communications hardware and specialized software packages to permit them to serve effectively as complete communications processing products.

A major source of integrated communications processing products is the independent systems houses, especially those that specialize in data communications systems. Companies such as these will generally provide complete hardware/software packages, including communications and central computer interfaces. In many cases they will accept full responsibility for the design and implementation of the entire data communications system. Such independent companies are generally well qualified in producing effective data communications systems, but prospective buyers of such systems must still consider the effects on the total system of dividing responsibility between at least two principal suppliers (communications and central system) and assure themselves that the products and systems of the several involved suppliers will indeed interface properly and function harmoniously.

Regardless of which type of supplier is selected, the buyer should show partiality to those vendors who will not only guarantee turnkey installation of their equipment but will also provide plans for future growth. If the user is faced with the formidable task of interfacing and integrating a variety of impressive but highly dissimilar communications and processing equipment, the proposed system may never get past the design stage.

Buying Guidance

The communications processing products have not matured to the point where their descriptive terminology is standardized or consistent. As a result, prospective buyers must make every effort to determine exactly what they will be getting and what they will not. The sales brochures and technical manuals are often not sufficiently informative (and sometimes downright misleading).

For example, two distinctly different kinds of front-end processors exist. The first and more basic variety is designed to simply replace the functions and services of the central system's hard-wired controller. It is meant to be a plug-compatible replacement, requiring few, if any, changes to the central system's communications control software or the user's application programs. It does not necessarily relieve the central system of any software control overheads, but simply provides a more flexible interface to the communications network for accommodation of additional and varied lines and terminals in the future.

Examples of this type of front-end processor are the many available units designed to replace or "emulate" the IBM 2701 Data Adapter Unit and the IBM 2702 and 2703 Transmission Control Units. These front-end processors function with the IBM System/360 or System/370 computer systems through the standard IBM BTAM, QTAM, TCAM, and VTAM communications control software.

The second and more powerful variety of front-end processor is designed to replace not only the functions and services of the hard-wired controller, but also most or all of the data communications control functions normally performed by the central system's processing unit and resident software. This variety of front-end processor, by freeing the central processing unit for productive work,

Communications Processors

provides valuable advantages in data communications flexibility and in systems throughput.

It is possible that a user may want to install the basic kind of front-end processor initially and then gradually add functions to it to relieve the central processing unit's communications overheads. However, the user must make sure that the selected front-end processor has enough processing and memory capacity to permit the gradual build-up of substantial message control routines, and that the various responsibilities of both the vendor and the user are clearly assigned.

In the case of systems performing line concentration, network node, and remote processing tasks, an equally wide range of capabilities is represented by current product offerings.

Another buyer's tip is to look for the word "turnkey." Turnkey installation of communications processors usually means that the supplier takes on full responsibility for hardware, software, and interfaces required to essentially "plug in" the product. From a user's point of view, this approach is highly desirable, since it can save money, time, and aggravation. But the user must still evaluate the promised functions of a product being offered on a turnkey basis. It may still be a somewhat limited product.

A low list price can be totally misleading, since it may include only the basic processor hardware and an associated communications multiplexer. The cost and effort of establishing the proper interfaces and writing the all-important software can be dropped squarely on the buyer, who may have been trapped by an attractive low-price bid.

Since software development is such a critical question, the buyer should determine early in the proceedings exactly what software is provided with the basic system and at the basic price. If certain software is lacking, such as specific remote terminal handlers or message queuing routines, then implementation and integration responsibilities should be clearly fixed, and with firm price quotations.

The smart buyer will also ask the competing bidders for clear statements of service and support after installation. Because data communications subsystems can be complex and demanding in any environment, it is an extremely valuable system feature to have the prospective supplier of the communications processor assume full operating and service responsibility for the externally controlled communications network that is directed by the product.

When considering a communications processor from a source other than the supplier of the central computer equipment, the buyer should insist on receiving concrete performance data, drawn from installed systems, to substantiate the supplier's claims. The buyer should beware if the supplier refuses to verify his claims with actual case studies. As further evidence of proven performance, the buyer should personally contact as many previous users as possible, probing for their degree of satisfaction and also for the extent to which the installed systems reflect the buyer's own intended system design and functional objectives. However, even in highly specialized reference accounts, meaningful information can be derived regarding the supplier's competence and willingness to help and the basic reliability of the hardware/software package.

When the proposed supplier is a major mainframe manufacturer, the buyer will also want evidence of proven performance. This evidence should apply to the overall performance of the total, integrated data processing system, and not just the communications subsystem. When the mainframe supplier offers a choice of several levels of processing capability (as several now do), then the buyer will again want specific, tangible performance data to justify selection of one over the other. Of course, the mainframe supplier can forcibly persuade adoption of one model over the other, even without offering convincing performance data, by simply indicating that the newer product will receive all future support and that the former one will be essentially dropped from the product line.

User Experience

Datapro is proud to present the 1983 edition of our Network Users Survey. The survey is based on results received from questionnaires mailed to a cross-section of *Data Communications* magazine subscribers.

Survey Methodology

A questionnaire was designed and produced by Datapro and mailed by *Data Communications* personnel in November 1982 to approximately 10,000 addresses selected at random from a cross-section of *Data Communications'* U.S. end-user subscriber base.

The questionnaire contained 37 questions, and was divided into six basic parts. In the first part, users were asked to provide information concerning the general characteristics of their data communications networks. In each of the remaining five parts, the users were asked to specify within a given category the types of data communications equipment and services being used in their networks, and to provide usage information and equipment ratings on each type. The five categories of equipment/services included: transmission facilities, communications and network processors, modems, line multiplexers, and testing and monitoring equipment. The questionnaire allowed the user to rate up to two (or in some cases, three) vendor/model types within each category of equipment. (Reproduction of the form was permitted so that additional vendor/model types within a given product category could be rated.) The results of each of these five parts will be shown only in the Datapro report to which they are applicable. This report contains a summary of the user ratings provided by respondents to the Communications and Network Processors section.

Communications Processors

TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS

Communication Processor Manufacturer and Model	Number of User Responses	Number of Units Installed	Overall Performance					Ease of Installation					Ease of Operation					Ease of Expansion				
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Amdahl																						
4705	14	24	3.6	9	4	1	0	3.3	5	8	1	0	3.4	7	6	1	0	3.3	6	6	2	0
Others & unspecified	5	14	3.4	2	3	0	0	3.0	1	3	1	0	3.0	1	3	1	0	3.2	1	4	0	0
Subtotals	19	38	3.5	11	7	1	0	3.2	6	11	2	0	3.3	8	9	2	0	3.3	7	10	2	0
Burroughs																						
B1000	5	5	3.2	1	4	0	0	3.4	2	3	0	0	3.6	3	2	0	0	2.8	1	2	2	0
B874	14	22	3.6	8	6	0	0	3.1	7	3	2	2	3.4	6	7	1	0	3.1	5	5	4	0
CP3680	3	5	3.7	2	1	0	0	3.3	2	0	1	0	3.0	1	1	1	0	2.7	1	1	0	1
CP9000	5	158	3.0	1	3	1	0	2.6	1	2	1	1	2.8	0	4	1	0	2.6	0	4	0	1
DCP	7	15	3.4	3	4	0	0	3.0	0	6	0	0	2.9	1	4	2	0	2.7	0	6	0	1
Others & unspecified	11	187	3.3	3	8	0	0	2.9	2	6	3	0	3.2	3	7	1	0	2.7	2	5	3	1
Subtotals	45	392	3.4	18	26	1	0	3.0	14	20	7	3	3.2	14	25	6	0	2.8	9	23	9	4
CCI																						
CC80	3	21	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	2.3	0	1	2	0
Others & unspecified	4	4	3.5	2	2	0	0	3.5	2	2	0	0	3.3	1	3	0	0	3.3	2	1	1	0
Subtotals	7	25	3.6	4	3	0	0	3.4	3	4	0	0	3.3	2	5	0	0	2.9	2	2	3	0
Control Data																						
2551	5	9	2.6	0	4	0	1	2.6	0	3	2	0	3.2	2	2	1	0	3.0	1	3	1	0
Others & unspecified	11	47	2.7	1	7	2	1	2.7	0	8	3	0	2.7	0	8	3	0	2.2	0	4	5	2
Subtotals	16	56	2.7	1	11	2	2	2.7	0	11	5	0	2.9	2	10	4	0	2.4	1	7	6	2
Data General, all Models	3	257	3.0	0	3	0	0	2.7	0	2	1	0	3.0	1	1	1	0	3.0	1	1	1	0
DCA																						
355	7	19	3.0	2	4	0	1	2.9	1	4	2	0	3.1	2	4	1	0	3.4	3	4	0	0
Others & unspecified	3	23	3.7	2	1	0	0	3.3	1	2	0	0	3.0	0	3	0	0	3.3	1	2	0	0
Subtotals	10	42	3.2	4	5	0	1	3.0	2	6	2	0	3.1	2	7	1	0	3.4	4	6	0	0
DEC																						
PDP 11/20	4	26	3.5	2	2	0	0	3.8	3	1	0	0	3.8	3	1	0	0	2.5	0	3	0	1
PDP 11/40	6	48	3.3	4	1	0	1	3.0	2	2	2	0	3.2	4	0	1	1	1.8	1	0	2	3
Other PDP II Models	9	175	3.3	4	4	1	0	3.0	2	5	2	0	3.2	2	7	0	0	3.3	3	4	1	0
VAX II	6	18	3.2	1	5	0	0	3.2	1	5	0	0	3.2	2	3	1	0	3.3	3	2	1	0
1134	3	7	3.3	1	2	0	0	3.0	0	3	0	0	3.0	0	3	0	0	2.3	1	0	1	1
1170	5	20	3.4	2	3	0	0	3.2	1	4	0	0	3.0	2	1	2	0	2.6	0	3	2	0
Others & unspecified	7	115	3.3	2	5	0	0	3.1	1	6	0	0	2.9	1	4	2	0	2.7	1	3	3	0
Subtotals	40	409	3.3	16	22	1	1	3.2	10	26	4	0	3.2	14	19	6	1	2.7	9	15	10	5
Gandalf PACX	3	9	3.3	1	2	0	0	2.7	0	2	1	0	2.3	0	1	2	0	3.0	1	1	1	0
GTE Telenet																						
TP 3010	3	175	2.3	0	1	2	0	3.3	1	2	0	0	2.7	0	2	1	0	2.7	0	2	1	0
TP 4000	7	28	3.0	1	5	1	0	2.4	1	2	3	1	3.0	2	3	2	0	2.8	0	5	1	0
Subtotals	10	203	2.8	1	6	3	0	2.7	2	4	3	1	2.9	2	5	3	0	2.8	0	7	2	0
Hewlett-Packard																						
HP1000	4	109	3.8	3	1	0	0	3.5	2	2	0	0	3.8	3	1	0	0	3.5	2	2	0	0
HP3000	7	18	3.6	4	3	0	0	3.4	3	4	0	0	3.4	3	4	0	0	3.4	3	4	0	0
Others & unspecified	3	13	3.0	1	1	1	0	3.7	2	1	0	0	3.7	2	1	0	0	*	1	1	0	0
Subtotals	14	140	3.5	8	5	1	0	3.5	7	7	0	0	3.6	8	6	0	0	3.5	6	7	0	0
Honeywell																						
Datanet 6661	6	15	3.3	2	4	0	0	3.3	3	2	1	0	3.5	3	3	0	0	2.8	1	3	2	0
Level 6	9	39	3.0	2	5	2	0	3.0	1	7	1	0	2.8	0	7	2	0	3.1	2	6	1	0
6000	9	24	3.0	1	7	1	0	2.9	1	6	2	0	2.9	0	8	1	0	2.8	1	5	3	0
Others & unspecified	7	199	2.7	0	5	2	0	2.4	0	3	4	0	2.4	1	2	3	1	2.0	0	2	3	2
Subtotals	31	277	3.0	5	21	5	0	2.9	5	18	8	0	2.9	4	20	6	1	2.7	4	16	9	2
IBM																						
3705	280	1125	3.5	149	121	9	1	3.0	69	153	46	6	3.0	81	137	48	11	2.7	46	120	88	20
3704	19	22	3.5	10	9	0	0	3.3	7	10	0	1	3.2	7	9	1	1	2.4	2	7	6	3
Series/1	12	30	3.2	6	3	2	1	2.8	1	8	3	0	3.0	3	6	3	0	3.1	5	4	2	1
8100	4	40	3.5	3	0	1	0	3.3	2	1	1	0	3.0	2	1	0	1	3.3	2	1	1	0
System 7	3	10	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	2.7	1	1	0	1
4331	7	8	3.3	2	5	0	0	3.1	3	3	0	1	3.3	4	1	2	0	3.1	3	3	0	1
4341	9	14	3.4	4	5	0	0	3.4	4	5	0	0	3.2	3	5	1	0	3.1	3	4	2	0
Others & unspecified	8	9	3.5	5	2	1	0	3.1	2	5	1	0	3.0	3	2	3	0	2.0	1	1	3	3
Subtotals	342	1258	3.5	181	146	13	2	3.1	89	187	51	8	3.1	104	163	58	13	2.7	63	141	102	29
Memorex 1270	17	35	3.4	11	2	3	1	3.1	7	4	6	0	3.1	8	4	4	1	2.6	6	2	5	4
Micom																						
600	5	8	3.2	1	4	0	0	3.0	1	3	1	0	3.2	1	4	0	0	3.0	1	3	1	0
Others & unspecified	3	13	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0	3.3	1	2	0	0
Subtotals	8	21	3.5	4	4	0	0	3.4	4	3	1	0	3.5	4	4	0	0	3.1	2	5	1	0
Modcomp, all models	6	45	3.0	1	4	1	0	3.0	1	4	1	0	3.2	1	5	0	0	2.8	1	4	0	1
NCR Comten																						
3650	14	85	3.6	8	6	0	0	3.1	4	7	3	0	3.2	7	4	2	1	3.1	5	6	3	0
3670	10	36	3.7	7	3	0	0	3.4	5	4	1	0	3.2	3	6	1	0	3.3	4	5	1	0
3690	27	137	3.6	17	10	0	0	3.2	8	14	4	0	3.2	11	11	3	2	3.3	11	13	3	0
Others & unspecified	16	93	3.1	6	7	2	1	2.9	3	7	3	1	2.9	3	8	4	0	2.5	2	8	1	4
Subtotals	67	351	3.5	38	26	2	1	3.1	20	32	11	1	3.1	24	29	10	3	3.1	22	32	8	4

LEGEND: Weighted Average (WA) is based on assigning a weight of 4 to each user rating of Excellent (E), 3 to Good, 2 to Fair, and 1 to Poor (P).
*Weighted Average for less than 3 responses is considered invalid.
**Memorex 1270 Quality of Manufacturer's Software/Firmware and Ease of Programming responses were judged invalid because the unit is hardwired.

Communications Processors

TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS

Communication Processor Manufacturer and Model	Hardware Reliability					Quality of Manufacturer's Software/Firmware					Ease of Programming					Quality of Manufacturer's Maintenance Service					Quality of Manufacturer's Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Amdahl																									
4705	3.6	9	5	0	0	3.2	4	6	2	0	2.8	3	4	4	1	3.2	8	3	1	2	3.1	6	3	3	1
Others & unspecified	3.4	2	3	0	0	3.2	1	4	0	0	3.3	1	2	0	0	3.4	2	3	0	0	3.4	2	3	0	0
Subtotals	3.6	11	8	0	0	3.2	5	10	2	0	2.9	4	6	4	1	3.3	10	6	1	2	3.2	8	6	3	1
Burroughs																									
B1000	3.2	1	4	0	0	3.2	2	2	1	0	3.2	1	4	0	0	3.2	1	4	0	0	2.6	0	3	2	0
B874	3.6	9	4	1	0	2.7	2	8	2	2	2.8	2	6	3	1	2.6	1	9	2	2	2.1	0	7	2	5
CP3680	3.7	2	1	0	0	3.0	1	1	1	0	*	0	1	1	0	3.3	1	2	0	0	2.7	1	0	2	0
CP9000	3.2	2	2	1	0	2.0	0	2	1	2	1.6	0	1	1	3	2.8	1	2	2	0	2.0	1	1	0	3
DCP	3.4	3	4	0	0	3.0	3	2	1	1	3.4	4	2	1	0	2.6	0	4	3	0	1.7	0	1	3	3
Others & unspecified	3.0	2	7	2	0	2.8	2	6	2	1	2.8	3	4	3	1	2.5	2	2	6	1	2.4	2	3	3	3
Subtotals	3.3	19	22	4	0	2.8	10	21	8	6	2.8	10	18	9	5	2.7	6	23	13	3	2.2	4	15	12	14
CCI																									
CC80	3.0	0	3	0	0	3.0	1	1	1	0	2.7	0	2	1	0	3.0	0	3	0	0	2.0	0	0	3	0
Others & unspecified	3.5	2	2	0	0	3.5	2	2	0	0	3.7	2	1	0	0	3.5	2	2	0	0	3.5	2	2	0	0
Subtotals	3.3	2	5	0	0	3.3	3	3	1	0	3.2	2	3	1	0	3.3	2	5	0	0	2.9	2	2	3	0
Control Data																									
2551	2.4	0	3	1	1	2.0	0	1	2	1	2.0	0	1	2	1	2.4	0	3	1	1	2.2	0	2	2	1
Others & unspecified	2.4	0	6	3	2	2.4	1	5	2	3	2.3	0	4	1	2	3.0	2	8	0	1	2.4	0	6	2	2
Subtotals	2.4	0	9	4	3	2.3	1	6	4	4	2.2	0	5	3	3	2.8	2	11	1	2	2.3	0	8	4	3
Data General, all models	3.0	0	3	0	0	2.7	0	2	1	0	3.0	1	1	1	0	3.0	0	3	0	0	3.0	0	3	0	0
DCA																									
355	2.7	1	4	1	1	2.4	0	4	2	1	2.3	0	2	4	0	2.4	0	4	2	1	2.4	0	4	2	1
Others & unspecified	3.6	2	1	0	0	3.3	1	2	0	0	*	0	1	1	0	2.7	0	2	1	0	2.7	0	2	1	0
Subtotals	3.0	3	5	1	1	2.7	1	6	2	1	2.3	0	3	5	0	2.5	0	6	3	1	2.5	0	6	3	1
DEC																									
PDP 11/20	3.8	3	1	0	0	3.3	1	2	0	0	3.3	1	3	0	0	2.8	0	3	1	0	2.8	0	3	1	0
PDP 11/40	3.2	2	3	1	0	2.3	1	0	1	1	2.8	2	2	1	1	2.7	1	3	1	1	2.8	1	4	0	1
Other PDP 11 models	3.3	4	4	1	0	2.8	2	4	0	2	3.1	3	4	0	1	2.3	2	2	2	3	2.4	1	4	2	2
VAX 11	3.5	3	3	0	0	3.0	1	4	1	0	3.0	1	4	1	0	2.7	0	5	0	1	2.5	1	2	2	1
1134	3.3	1	2	0	0	3.3	1	2	0	0	2.7	0	2	1	0	3.0	0	3	0	0	2.7	0	2	1	0
1170	3.0	1	3	1	0	3.2	2	2	1	0	2.8	1	2	2	0	3.5	2	2	0	0	3.2	2	2	1	0
Others & unspecified	2.9	1	4	2	0	2.7	0	6	0	1	3.0	1	5	1	0	2.3	0	3	2	1	2.1	0	2	4	1
Subtotals	3.3	15	20	5	0	2.9	8	20	3	4	3.0	9	22	6	2	2.7	5	21	6	6	2.6	5	19	11	5
Gandalf PACX	3.3	1	2	0	0	2.7	0	2	1	0	*	0	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0
GTE Telenet																									
TP 3010	2.0	0	1	1	1	1.3	0	0	1	2	1.3	0	0	1	2	1.7	0	0	2	1	1.3	0	0	1	2
TP 4000	3.0	2	3	2	0	2.3	0	2	4	0	2.3	0	2	0	1	2.5	0	3	3	0	2.2	0	1	5	0
Subtotals	2.7	2	4	3	1	2.0	0	2	5	2	1.8	0	2	1	3	2.2	0	3	5	1	1.9	0	1	6	2
Hewlett-Packard																									
HP1000	3.8	3	1	0	0	3.0	1	2	1	0	3.7	2	1	0	0	3.3	1	3	0	0	2.8	1	1	2	0
HP 3000	3.6	5	1	1	0	3.4	4	2	1	0	3.4	3	4	0	0	3.6	4	3	0	0	3.0	2	3	2	0
Others & unspecified	3.3	2	0	1	0	3.0	1	1	1	0	*	1	1	0	0	3.3	2	0	1	0	3.0	1	1	1	0
Subtotals	3.6	10	2	2	0	3.2	6	5	3	0	3.5	6	6	0	0	3.4	7	6	1	0	2.9	4	5	5	0
Honeywell																									
Datanet 6661	3.5	3	3	0	0	2.8	1	3	2	0	2.6	1	2	1	1	3.5	3	3	0	0	3.0	1	4	1	0
Level 6	2.9	1	6	2	0	2.8	0	7	1	0	2.9	0	6	1	0	2.9	2	4	3	0	2.4	0	4	5	0
6000	3.0	1	7	1	0	2.9	1	6	2	0	2.8	1	5	3	0	2.8	1	6	1	1	2.7	1	5	2	1
Others & unspecified	2.7	0	5	2	0	2.0	0	2	3	2	1.8	0	0	3	1	2.1	0	2	4	1	1.6	0	0	4	3
Subtotals	3.0	5	21	5	0	2.7	2	18	8	2	2.6	2	13	8	2	2.8	6	15	8	2	2.4	2	13	12	4
IBM																									
3705	3.6	181	83	10	1	3.1	78	162	31	4	2.6	28	106	76	23	3.3	112	36	27	3	3.0	74	133	56	10
3704	3.5	10	7	1	0	3.3	6	12	0	0	2.7	2	11	2	2	3.4	10	6	1	1	3.0	6	7	4	1
Series/1	3.4	7	3	2	0	2.8	2	6	3	1	2.7	0	8	4	0	3.1	3	7	2	0	3.2	4	6	2	0
8100	3.3	3	0	0	1	3.0	2	1	0	1	2.5	1	0	3	0	3.3	2	1	1	0	3.3	2	1	1	0
System 7	2.7	1	0	2	0	2.7	1	1	0	1	*	1	0	0	1	2.7	1	1	0	1	2.0	1	0	0	2
4331	3.9	6	1	0	0	2.6	1	3	2	1	2.7	0	5	0	1	2.9	2	2	3	0	2.4	1	3	1	2
4341	3.4	4	5	0	0	3.1	2	6	1	0	3.0	1	7	1	0	3.0	2	5	2	0	3.1	2	6	1	0
Others & unspecified	3.6	6	1	1	0	3.0	1	6	1	0	2.2	0	1	5	0	2.9	2	3	3	0	2.5	0	5	2	1
Subtotals	3.6	218	100	16	2	3.1	93	197	38	8	2.6	33	138	91	27	3.3	134	161	39	5	3.0	90	161	67	16
Memorex 1270	3.4	11	2	3	1	**	6	4	3	1	**	4	3	1	1	3.1	7	4	6	0	2.9	6	4	6	1
Micom																									
600	3.6	3	2	0	0	3.2	1	4	0	0	2.6	1	1	3	0	2.4	1	1	2	1	2.6	1	1	3	0
Others & unspecified	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0	4.0	3	0	0	0
Subtotals	3.8	6	2	0	0	3.5	4	4	0	0	3.1	4	1	3	0	3.0	4	1	2	1	3.1	4	1	3	0
Modcomp, all models	2.8	1	3	2	0	3.2	1	4	0	0	3.2	1	5	0	0	3.2	1	5	0	0	2.8	1	4	0	1
NCR Comten																									
3650	3.6	9	4	1	0	2.9	6	3	3	2	2.6	2	3	4	1	3.4	7	6	1	0	3.0	6	3	4	1
3670	3.3	5	3	2	0	3.0	3	4	3	0	2.8	1	4	3	0	3.0	3	4	3	0	2.7	2	4	3	1
3690	3.6	16	11	0	0	2.9	7	11	6	2	2.6	1	13	8	1	3.3	12	11	2	1	2.8	8	7	9	2
Others & unspecified	2.9	4	9	0	3	2.8	2	10	2	2	2.4	0	8	2	3	2.9	4	8	2	2	2.6	0	10	5	1
Subtotals	3.4	34	27	3	3	2.9	18	28	14	6	2.6	4	28	17	5	3.2	26	29	8	3	2.8	16	24	21	5

LEGEND: Weighted Average (WA) is based on assigning a weight of 4 to each user rating of Excellent (E), 3 to Good, 2 to Fair, and 1 to Poor (P).
*Weighted Average for less than 3 responses is considered invalid.
**Memorex 1270 Quality of Manufacturer's Software/Firmware and Ease of Programming responses were judged invalid because the unit is hardwired.

Communications Processors

TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS (Continued)

Communication Processor Manufacturer and Model	Number of User Responses	Number of Units Installed	Overall Performance					Ease of Installation					Ease of Operation					Ease of Expansion				
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Paradyne, all models	4	5	4.0	4	0	0	0	2.8	0	3	1	0	3.8	3	1	0	0	3.8	3	1	0	0
Periphonics TComm 7	4	6	3.0	0	4	0	0	2.8	0	3	1	0	3.0	1	2	1	0	2.5	0	2	2	0
Prime, all models	6	199	3.2	1	5	0	0	3.2	2	2	1	0	2.8	0	5	1	0	3.0	1	3	1	0
Sperry																						
CSP	5	15	2.6	0	3	2	0	2.4	0	2	3	0	2.4	0	2	3	0	1.4	0	0	2	3
DCP/40	11	23	2.9	1	8	2	0	3.0	1	9	1	0	2.5	0	6	4	1	3.2	2	9	0	0
V76	3	8	3.3	2	0	1	0	2.7	1	1	0	1	3.0	1	1	1	0	2.7	1	0	2	0
V77	3	305	3.3	2	0	1	0	2.7	1	1	0	1	2.7	1	1	0	1	2.7	1	1	0	1
Others & unspecified	6	8	2.7	2	1	2	1	2.8	1	3	0	1	3.2	2	3	1	0	2.7	2	1	2	1
Subtotals	28	359	2.9	7	12	8	1	2.8	4	16	4	3	2.7	4	13	9	2	2.6	6	11	6	5
Tandem																						
Non-Stop II	4	10	3.5	2	2	0	0	3.8	3	1	0	0	3.5	2	2	0	0	3.7	2	1	0	0
Others & unspecified	6	67	3.8	5	1	0	0	3.5	3	3	0	0	3.3	3	2	1	0	3.7	4	2	0	0
Subtotals	10	77	3.7	7	3	0	0	3.6	6	4	0	0	3.4	5	4	1	0	3.7	6	3	0	0
All Others	52	1668	3.1	17	25	9	1	3.0	17	20	12	2	3.1	18	24	8	2	2.8	14	18	13	5
Grand Totals	742	5606	3.4	340	342	50	10	3.1	199	389	122	18	3.1	229	362	123	23	2.8	168	317	181	61

LEGEND: Weighted Average (WA) is based on assigning a weight of 4 to ech user rating of Excellent (E), 3 to Good, 2 to Fair, and 1 to Poor (P).
*Weighted Average for less than 3 responses is considered invalid.
**Memorex 1270 Quality of Manufacturer's Software/Firmware and Ease of Programming responses were judged invalid because the unit is hardwired.

When Datapro received the returns, they were audited by our senior level editors. All forms were carefully examined for validity before being sent for tabulation. The *Data Communications* labels were used for initial validation and identification. Responses to specific questionnaire sections or individual questions were disqualified whenever a vendor/model identity was omitted, user ratings were not assigned, a vested interest on the part of the respondent was judged to exist, or incomprehensible or unreasonable answers were given.

By the editorial cut-off of January 14, 1983, Datapro had processed 699 valid forms, which were then shipped to Mathematica Policy Research, Inc. for key entry and tabulation by computer. Summary information was prepared in the form of totals, percentages, or weighted averages, as appropriate for each question. Weighted averages were computed in a manner similar to most college grading systems: "Excellent" is weighted as 4, "Good" as 3, "Fair" as 2, and "Poor" as 1. The tallied numbers for each value were then multiplied by the corresponding weight, and the average taken by dividing the sum of the products by the total number of responses for that category.

Datapro suggests that the reader use the information presented with discretion. The individual equipment ratings are not presented to readers as the major consideration in making an acquisition decision. Rather, the ratings and other information should be used as guides to potential strengths and weaknesses that may call for further investigation in selecting the most suitable equipment for your needs.

The Results

The first part of the Network Users Survey consisted of nine questions that solicited information of the general characteristics of the users' networks. Taken together, the results provide a brief summary of the extent and complexity of these users' network configurations.

First, the users were asked to indicate the number of sites that are linked by their networks, with the following results:

	Number of Responses	Percent of Responses
1 to 3 sites	126	18
4 to 10 sites	132	19
11 to 25 sites	119	17
26 to 50 sites	80	12
Over 50 sites	231	34
	688	100

These results present a fairly even spread of network sizes, with half the users in the 1-to-25 site range, and the other half in the 25-and-over range. Note that no distinction is made here as to the type or intelligence of the devices located at any site.

The second question asked the number of computers participating as hosts. As you can see, nearly 60 percent of these users are operating in multiple-host environments:

	Number of Responses	Percent of Responses
1 host	191	28
2 to 4 hosts	328	48
5 to 10 hosts	97	14
Over 10 hosts	71	10
	687	100

This adds some degree of clarity to the responses to Question 1, as well as developing a better picture of the level of sophistication of these users.

The users were also asked to indicate the total number of end-user workstations (CRTs, teleprinters, etc.) that are in use on their networks:

Communications Processors

TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS (Continued)

Communication Processor Manufacturer and Model	Hardware Reliability					Quality of Manufacturer's Software/Firmware					Ease of Programming					Quality of Manufacturer's Maintenance Service					Quality of Manufacturer's Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Paradyne, all models	4.0	4	0	0	0	3.5	2	2	0	0	*	2	0	0	0	3.5	3	1	0	0	3.8	3	1	0	0
Periphonics TComm 7	3.8	3	1	0	0	3.5	2	2	0	0	*	0	1	1	0	3.3	1	3	0	0	2.3	0	1	2	0
Prime, all models	3.2	1	5	0	0	2.8	0	3	1	0	3.0	1	3	1	0	2.6	1	2	1	1	2.4	0	3	1	1
Sperry																									
CSP	2.4	1	1	2	1	2.2	0	1	4	0	1.3	0	0	1	2	2.6	0	3	2	0	2.2	0	2	2	1
DCP/40	3.1	4	5	1	1	2.4	0	5	4	1	1.7	0	2	2	5	2.8	1	7	3	0	2.5	0	6	4	1
V76	3.0	1	1	1	0	2.3	0	1	2	0	2.0	1	0	0	2	1.7	0	1	0	2	2.0	0	1	1	1
V77	3.3	2	0	1	0	3.0	0	3	0	0	2.0	1	0	0	2	1.7	0	1	0	2	2.3	0	2	0	1
Others & unspecified	3.2	2	3	1	0	2.7	0	4	2	0	1.8	0	1	2	2	3.3	3	2	1	0	2.5	1	2	2	1
Subtotals	3.0	10	10	6	2	2.5	0	14	12	1	1.7	2	3	5	13	2.6	4	14	6	4	2.4	1	13	9	5
Tandem																									
Non-Stop II	4.0	4	0	0	0	3.5	2	2	0	0	3.8	3	1	0	0	3.5	2	2	0	0	3.0	2	1	0	1
Others & unspecified	3.8	5	1	0	0	3.5	3	3	0	0	2.8	1	3	2	0	3.2	3	0	2	1	3.0	2	2	2	0
Subtotals	3.9	9	1	0	0	3.5	5	5	0	0	3.2	4	4	2	0	3.3	5	2	2	1	3.0	4	3	2	1
All others	3.1	19	21	9	2	2.9	10	26	13	1	2.7	11	16	9	8	2.7	12	15	16	6	2.7	10	18	13	7
Grand Totals	3.4	384	274	62	15	3.0	177	384	119	36	2.7	100	283	168	70	3.1	237	337	119	37	2.8	161	313	183	67

LEGEND: Weighted Average (WA) is based on assigning a weight of 4 to ech user rating of Excellent (E), 3 to Good, 2 to Fair, and 1 to Poor (P).
*Weighted Average for less than 3 responses is considered invalid.
**Memorex 1270 Quality of Manufacturer's Software/Firmware and Ease of Programming responses were judged invalid because the unit is hardwired.

	Number of Responses	Percent of Responses
1 to 10	41	6
11 to 25	46	7
26 to 100	123	18
100 to 500	250	36
Over 500	224	33
	684	100

When examined in conjunction with Questions 1 and 2, these results characterize the median respondent to the survey as having a network configuration consisting of approximately 25 sites, two or three hosts, and between 200 and 300 terminals (an average of 10 per site).

Although we are not in a position to draw any formal conclusions, since this year's user sample consists of different respondents than last year, some interesting observations can be made when the two years' responses to these three questions are compared. (The size of the respondent group is approximately the same: 631 respondents in 1982 versus 699 respondents in 1983.)

For example, this year's respondents' networks appear larger in several respects:

- Number of sites—last year, only 25 percent of the respondents reported networks of 50 or more sites; this year, 34 percent indicate they are operating networks of this magnitude.

- Number of hosts—last year, only 14 percent of the respondents stated that their networks contain 5 or more hosts; this year, 24 percent reported on networks of 5 or more hosts.

- Number of terminals—last year, 55 percent of the respondents specified that their networks include over 100 terminals; this year, 69 percent indicated that their networks had at least 100 terminals. Of this group, 24 percent of last year's respondents had networks with over 500 terminals; this year's comparable figure is 33 percent.

The implication of these figures can certainly not be denied, that networks are growing in number and in size, and becoming increasingly pervasive.

Another question asked the users to identify the overall network architecture with which their networks comply, with the following results:

	Number of Responses	Percent of Total Responses
IBM BSC (non SNA) environment	328	48
IBM SNA	274	40
Digital Equipment DNA and DECnet	48	7
Hewlett-Packard DSN	26	4
Burroughs BNA	19	3
Honeywell DSE or DSA	17	2
Prime PrimeNet	17	2
Sperry Univac DCA	16	2
Other vendor-supplied architecture	127	19
None, or user-supplied architecture	125	18

The number of responses totals 997, indicating that a large number of the respondents are using more than one of the listed architectures in their networks. As we anticipated, the largest group of users is still operating in an IBM BSC environment. However, the gap of eight percent between BSC responses and SNA responses continues to narrow (last year, the gap was 14 percent), indicating that the acceptance of that architecture is becoming more widespread. Interestingly, 18 percent of the resondents are not complying with any vendor-supported architectural scheme, presumably either because their environments do not currently require it (but potentially may in the future) or because they have found other satisfactory alternatives.

The users were also asked to indicate the primary protocols supported by their networks:

Communications Processors

	Number of Responses	Percent of Total Responses
Asynchronous	434	63
IBM BSC	433	63
IBM SDLC	279	40
Other bit-oriented synchronous protocol (e.g., ANSI ADCCP, ISO HDLC, Sperry Univac UDLC, or Burroughs BDLC)	81	12
X.25 packet-level	80	12
Other byte-oriented synchronous protocol (e.g., DEC DDCMP)	75	11
Other	52	8

These results correlate to the results of the preceding question, showing that a large number of users are using more than one protocol in their network. ASCII and IBM BSC are the most widely used protocols, with IBM SDLC coming in a distant third place. The high response for multiple protocol usage suggests that many of these users are still in various stages of migration to SNA.

The users were requested to identify which vendors' systems are functioning as hosts. The following list summarizes their responses:

	Number of Responses	Percent of Total Responses
IBM	464	67
DEC	137	20
Amdahl	81	12
Burroughs	61	9
Hewlett-Packard	50	7
Sperry Univac	45	7
Honeywell	43	6
Prime	35	5
Data General	30	4
Control Data	27	4
NCR	21	3
National Advanced Systems	19	3
Other	89	13

As expected, IBM came out well ahead of all other vendors; however, DEC placed second with a strong showing. Many of the users are using more than one vendors' systems as hosts, indicating that the multiple-host environments represented in Question 2 are frequently multiple-vendor environments as well.

The same users were asked to identify which communications processor equipment they are using, with the following results:

	Number of Responses	Percent of Responses
IBM	3212	46
NCR Comten	67	9
Burroughs	45	6
DEC	40	5
Honeywell	31	4
Sperry Univac	28	4
Amdahl	19	3
Memorex	17	2
Control Data	16	2
Other	137	18

Apparently, at least 21 percent of all IBM mainframe users surveyed rely on non-IBM communications processor equipment. This may indicate that the IBM 3705 has reached its maturity. IBM customers are looking elsewhere for increased functions.

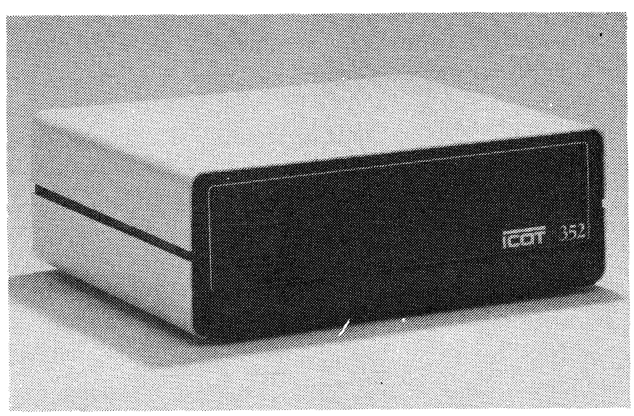
Communication processor users were then asked to specify what primary functions their equipment performed:

	Number of Responses	Percent of Responses
Front-end processing	465	67
Terminal controller functions	238	34
Remote line concentration	161	23
Applications switching	119	17
Distributed processing node functions	88	12
Message/packet switching	74	10
Stand-alone network processing	71	10
X.25 PAD or gateway functions	54	7
Other	11	1

The total percent of responses is more than 100 because some users listed more than one primary function. These figures reflect the increased versatility communications processors now provide.

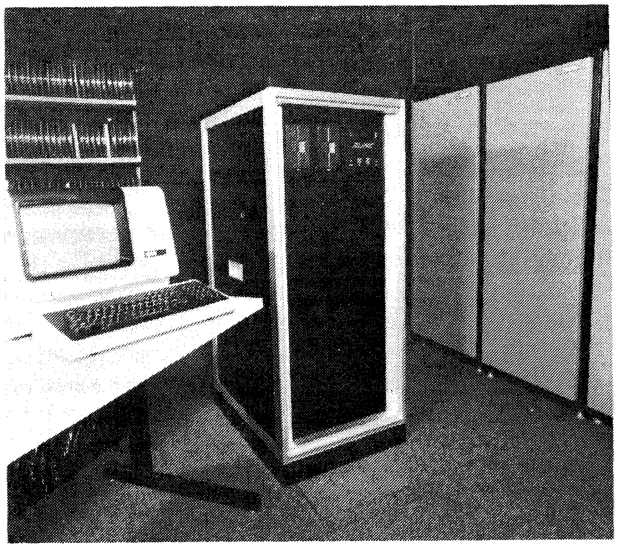
We also asked these users to indicate which, if any, teleprocessing monitor software packages they are using.

	Number of Responses	Percent of Total Responses
IBM CICS and CICS/VS	294	43
Sperry Univac CMS CMS/1100	17	2
Cullinane IDMS-DC	14	2
Cincom Environ/1	12	2
Software AG Com-plete	10	1
SDA Intercomm or Minicomm	8	1
Westinghouse Westi	6	1
ADR Datacom/DC	6	1
NCR VRX Tran-Pro	4	1
Other	113	16
None	180	27



The Icot 351 and 352 Virtual Terminal Systems, designed specifically for communications processing, allow a mixture of synchronous and asynchronous transmission lines at speeds up to 19.2K bps. Model 351 accommodates six asynchronous terminal line connections; Model 352 accommodates twelve.

Communications Processors



The Telepac DPC of Telefile Computer Products provides an interface to X.25-based networks or compatible concentrators. It supports all ASCII hosts and terminals.

These results indicate that, although IBM software is of course predominant, various alternatives are sought out by many users.

Another question requested that the users indicate any commerical *local* networks which they operate, have installed now, and any that they plan to implement in the coming year.

	Number of Responses	
	Installed Now	Planned for 1983
Xerox Ethernet	17	14
Datapoint ARCnet	15	7
Network Systems Corp. Hyperchannel	12	8
Prime Ringnet	11	4
Sytek LocalNet	10	12
Wang WangNet	10	23
Ungermann-Bass Net/One	8	20
Interactive Systems/3M Videodata	7	7
Other vendors' Ethernet	5	14
Amdax CableNet	4	1
Nestar Cluster One	2	6
Other	19	34
	120	150

Putting aside the possibility that a few users may have indicated more than one type of local network, approximately 17 percent of these users currently have a local area network installed. This compares to last year's comparable figure of 14 percent, representing a slight increase. Depending on how many *current* users indicated that they plan *additional* networks in 1983, (as opposed to new users installing their very first local networks), the 1983 total of LAN users to as high as 370, or 39 percent of all respondents.

The final question in the first part of the questionnaire provided a list of ten possible sources of networking problems, and asked the respondent to indicate whether the had had any problems related to each possible source, with these results:

	Percent of Total Responses		
	Severe or Frequent Problems	Less severe or occasional problems	No problems
Local loops	14	40	32
Non-local comm. lines	12	57	17
Host software	7	54	29
Front-end software	6	43	36
Terminals	6	67	19
Terminal controllers	4	46	33
Front-end hardware	3	40	43
Host hardware	3	48	38
Modems	3	56	35
Multiplexers	2	23	46

Not unexpectedly, the area of these users' networks that causes the most headaches is their communications lines. Although few users experience severe or frequent problems with their terminals, these devices seem to be the greatest single source of minor or sporadic problems. The least frequently experienced source of problems is multiplexer equipment.

The remaining parts of the questionnaire focused on specific categories of networking services and equipment. Users were asked to list the specific vendors and types of equipment they are using in their networks, and to provide user ratings based on their experiences with each. Each section of the questionnaire asked the user to provide the manufacturers and model numbers of each type of equipment currently in use, the number of units installed, and ratings in specific categories of user experience relevant to that specific equipment category. A summary of the results of these questions for all communications processor models is shown in Table 1.

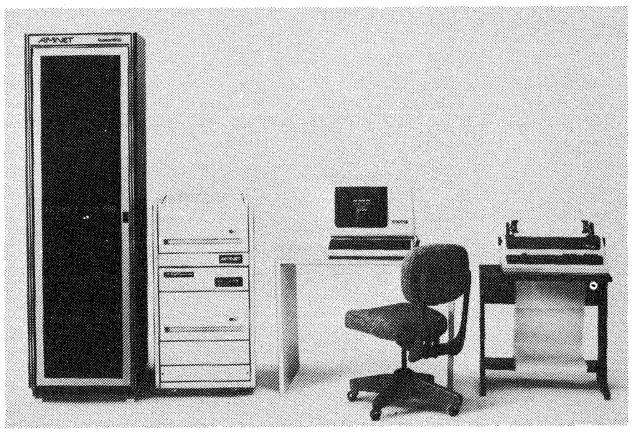
The Datapro Research staff extends a sincere thanks to all for responding so enthusiastically to our 1983 Network Users Survey. Without your participation, it could not have been the terrific success it is, and we hope that this compendium of user experience will be of significant value to you. We look forward to hearing from you again.

Comparison Charts

The key functional characteristics of some 78 commercially available communications processors representing 40 manufacturers are presented in the accompanying comparison charts. Most of the information in the charts was supplied by the vendors during February 1983. The Datapro Research staff greatly appreciates their cooperation in the preparation of this survey.

All of the comparison chart entries are explained in the following paragraphs along with discussions of their

Communications Processors



The modular Amnet Nucleus 6000 can be used as a remote line concentrator or a host-independent network processor, and performs packet-switching and dynamic routing in private data networks.

significance to prospective buyers of communications processors.

Computer Systems Interfaced

The *manufacturers and models* listed show all computers which may be interfaced by the communications processor product shown. In the case of a front-end processor that interfaces with IBM mainframes, we generally list only current IBM computers, although the unit may also support a System/360 or other older systems. The word "compatibles" references IBM plug-compatible mainframe vendors. These vendors include Amdahl, Magnuson, NAS, Control Data, and others. Some vendors make custom interfaces while others use industry-standard connections. Both will be mentioned when applicable.

Functional Configurations

A *front-end processor* is a computer which has been programmed either by software or firmware for the purpose of handling communications activity between a host and its network. The front-end processor allows the host to devote more valuable machine cycles to other applications. The most significant application of communications processors, in terms of both frequency of use and level of complexity, is front-end processing.

The communications processor may replace a hard-wired communications controller as the interface between the central data processing system and the data communications network. The IBM 270X family and Memorex 1270 are examples of hard-wired controllers. (The Memorex 1270, unlike the IBM 270X, remains in active production; although this product is not a communications processor by our definition, we have included it in these charts due to its immense popularity in and influence on the current communications processor market).

The concept of front-end processing essentially involves off-loading or removing the data communications control function from the central processing unit and setting it up as an external, largely self-contained system. The front-end processor not only receives and transmits all data passing through the network, but also, and significantly, can be programmed to pre- and post-process this data in a variety of ways in order to relieve the system's central processing unit from time-consuming overhead activities related to message formatting and control. This decentralized approach to the distribution of processing labor permits both the communications and central processors to perform their primary functions in parallel and with little interference. Data is passed between the processors only when necessary and with as high a degree of efficiency as is possible in circuit design.

A front-end processor is by definition directly channel-attached to the host it is serving. This distinguishes the front-end processor from a processor which helps to perform similar off-loading responsibilities from a more remote location.

Some front-end processors may be directly channel-attached to more than one host. The *maximum number of hosts channel-attachable to the front-end* specifies the number of physical connections that may exist, and the *maximum number of active hosts supported simultaneously* represents the number of concurrent logical connections that a front-end is able to support. Some front-end processors that permit two or more direct channel-attachments allow only one channel to be active at a time; the other channel(s) act only as a back-up in emergency situations, or more frequently, during maintenance operations. Other front-end processors can maintain multiple active channel connections, either to one, or to more than one, host, so that multiple host applications or systems, each accessed by a dedicated channel, may be serviced simultaneously.

Many front-end processors feature the ability to provide *emulation* of IBM's communications systems. This allows the user to replace an aging IBM 270X communications controller or 370X communications processor with a more modern system, without requiring the user to rewrite software which was developed long ago on the older device.

A *remote line concentrator* is found at a remote location, and compresses several communications lines into a single high-speed line for transmission to the host. It differs slightly from the multiplex/demultiplex process by being more software intensive and providing software compatibility with host(s) it is serving. The *maximum number of hosts served by one concentrator* refers to the number of hosts that the communications processor can support concurrently in this remote configuration.

A *host-independent network processor* may reside anywhere in the network and typically performs a wide range of networking duties. Its function in the network is transparent to end-user devices, and thus it provides no software compatibility with any host. It may perform concentration, protocol conversion, and switching

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII/ async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Action/Honeywell Mercury Message Mgmt. Sys.	Yes	Yes	Yes	No	No	8A1, 83B3, 85A, SITA, ARINC, TWX, Telex
Amdahl 4705	Yes	Yes	Yes	No	GTE Telenet, Tymnet, Datapac	—
Amdahl Comm. Systems Div.						
3400 Series	Yes	Yes	Yes	Yes	Yes	IBM 2741
4410 Network Processor	No	No	No	Yes (HDLC)	Yes	X.75
Amnet Nucleus 6000	Yes	Yes	Yes	Yes	Yes	X.75, other PADs
Auscom 8911	Yes	Yes	Yes	Yes	Yes	Custom protocols available on request
BBN Computer C/30-50	Yes	Yes	Yes	Yes	Yes	Telex
Braegen B40	No	Yes	Yes	No	No	—
Burroughs Corp.						
CP9558-1/CP9572	Yes	Yes	Yes	Yes	Yes	Most Burroughs protocols
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols; some IBM protocols
Cableshare						
CSI Data Concentrator	Yes	No	No	No	Yes	—
LSI-X.25 Front-End	Yes	No	No	No	GTE Telenet, Tymnet Euronet	Uninet, Datapac, PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	Yes	No	No	No	Yes	Same as above, and Telex
LSI-X.25 Host Port Concentrator	Yes	No	No	No	Yes	Same as above, and Telex
Centennial Computer Corp. 2000/3000	Yes	Yes	No	No	Yes	Uniscope 100, 200, & 1004
Century Analysis OSI	Yes	No	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200, UTS
Codex 6520	Yes	Yes	No	No	No	Telex, & IBM 2741, 2848, 2260
Commex						
DNP 4/6/16	Yes	Yes	Early 1984	Yes	Early 1984	Various POS & custom protocols
CMC 4 & CMC 32	Yes	Yes	No	No	No	—
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	GTE Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data 2551-3 & 2551-4	Yes	Yes	No	No	GTE Telenet, Tymnet, Datapac, Transpac, BPO, ITT	—
Datastream						
774	Yes	Yes	No	No	No	—
776	Yes	Yes	No	No	No	—
874	Yes	No	Yes	No	No	—
DCA 355	Yes	Yes	Yes	Yes	GTE Telenet, Tymnet, Datapac, Transpac, BPO ITT, RCA	DEC DDCMP—trunk only
GTE Telenet						
TP3005	Yes	No	No	Yes (HDLC X.25)	GTE Telenet	—
TP3010	Yes	Yes	Yes	Yes (HDLC X.25)	GTE Telenet, Datapac, BPSS, KDD	Telex
TP3010-II	Yes	Yes	Yes	Yes (HDLC X.25)	GTE Telenet	Telex
TP4000 Series	Yes	Yes	No	Yes (HDLC X.25)	GTE Telenet	IBM 2741
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	GTE Telenet, Tymnet + 10 DDNs	VIP, PVE, RCI, LHDLC

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

Communications Processors

TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII/ async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	GTE Telenet	—
3705-80	Yes	Yes	Yes	No	GTE Telenet	—
3725	Yes	Yes	Yes	No	GTE Telenet	—
ICCI						
CA20 BSC	Yes	Yes	No	No	No	—
CA20 SNA	Yes	No	Yes	No	No	—
ICOT						
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	NCR, AIRINC
25X (253, 254, 257)	Yes	Yes	Yes	No	No	PARS, SITA, PI024, U400
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	No	Request price quotation
Distributed Network Processor Series	Yes	Yes	Future	Yes	Future	Request price quotation
M/A-Com DCC						
CP9000 & MicroNode	No	No	No	No	No	—
Memorex 1270	Yes	Yes	No	Via VAN	Telenet, Datapac, PSS, Tymnet, Transpac, DATEX-P	Sabre, Swift, SITA
Modcomp 3108 & 3109	Yes	Yes	No	Yes	Yes	—
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Transpac, Datapac	83B3
3670 Model 85	Yes	Yes	Yes	Yes	GTE Telenet, Tymnet, Uninet, Transpac, Datapac, Datex-P, UKPSS	—
3690 (A5-E5, T1-U1)	Yes	Yes	Yes	Yes	Yes	83B3
721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
North American Philips						
MARC	Yes	No	Yes	Yes (HDLC)	Yes	83B3, Telex, & Cidin
Paradyne Pix/Pixnet	No	No	No	Paradyne SDLC	No	—
Periphonics T-Comm 80	Yes	Yes	Yes	Yes	Optional	Requests for specific interfaces will be evaluated as needed, if not standard products
Raytheon						
Raynet I, II, III, & IV	Yes	Yes	Yes	Yes	No	PARS, Univac, SITA
Sperry-Univac						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Yes	REM1, NTR
Starnet Data Systems Protex Industries Starnet II	Yes	Yes	To be released	To be released	To be released	—
Tandem Non-Stop II	Yes	Yes	Yes	Yes	Yes	Swift, Burroughs
Telefile						
FECP-X	Yes	Yes	No	No	No	—
Telepac	Yes	Yes	Yes	No	All major U.S. and European networks	—
Thomas Engineering						
MZ-80	Yes	Yes	Yes	No	No	Honeywell VIP
8770/20	Yes	Yes	No	No	No	Honeywell VIP
TRT Data Products, Norfield Comm.						
System 300	Yes	No	No	No	No	—
System 400	Yes	Yes	No	No	No	—
System 500	Yes	Yes	Yes	Yes	Yes	—
Westinghouse Canada						
W1655/656	Yes	Mid 1983	Mid 1983	Yes	Mid 1983	PARS

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

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functions and, unlike a front-end processor or remote concentrator, generally makes no distinction between connections to terminals and connections to computer ports.

A *store and forward message switching processor* is similar to a network processor because it, too, is usually host-independent. Unlike the network processor, however, it performs no data manipulations. It simply receives strings of numerics and/or characters (messages), deciphers the address for whom the message is intended and relays the unopened message to its destination point. It can also hold the message on a storage unit, such as disk or magnetic tape, for later delivery at a predetermined specified time or upon demand. Frequently, message switching functions are integrated into a more sophisticated system, which may operate in other applications besides message switching, and in fact, processors designed to provide *only* message switching of voice-grade lines were deemed not to meet the criteria for inclusion in this report.

A computer may be described as a *distributed processing node* when it not only performs communications processing functions but also has the ability to process off-line end-user applications (i.e., accounts receivable, payroll, etc.). It is usually located at a site remote from the host, and supports its own terminals, which can access local or host applications.

Many general-purpose minicomputers have refined this capability to an art form, combining intimate network involvement with attention to locally-initiated processes. Since the thrust of this report deals strictly with dedicated communications processor products, we do not focus great attention on general-purpose minicomputers that may be configured with communications processing applications. For a more expansive view of minicomputers that may operate this type of environment, please see report C13-010-201 entitled "Communications Capabilities of Minicomputers and Small Business Computers" in Datapro Reports on Data Communications.

Many remote communications processors, because they are capable of supporting a network of terminals, can act as *terminal controllers*. By performing concentration and pre-processing tasks for transmission into the network, they act as a door through which the terminals they support may access the network. Note again that the role of terminal controller is generally one of several that may be played by a communications processor; for information on dedicated terminal controller products, we refer you to Section C21 and C25 of Datapro Reports on Data Communications.

Most mainframe computer and minicomputer vendors have a definite approach by which their entire product line, from small to large systems, may be interconnected for communications. This *network architecture* is actually a philosophy that the vendor feels optimizes resources within a network. IBM's System Network Architecture (SNA) and Digital Equipment's DECnet represent two network architectures with approaches designed to meet the needs of their customers and installed base. Depending upon the types of products the computer vendor offers, the network architecture may be very simple, and easy for independent vendors to comply with, or highly structured, and very difficult to comply with. As we enter the mid-1980s, issues of standardization are hot, and the ability to comply with a computer vendor's network discipline may prove to be the great success or complete downfall of many companies providing communications processor products.

Most processors have a physical limit to the number of lines that they may support. However, the practical limits of *communications line capacity* usually varies depending upon line speed. Whether a line is operating at full- or half-duplex also has an *effect on line capacity*. For this reason, properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 9600 bps, and over 9600 bps. The number of low-speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium- and high-speed lines represent the outer limits of the throughput capabilities. On some systems, using full-duplex lines halves the line capacity, since two channels are required per line, and whether this effect occurs is also indicated.

Communications Features/Functions

One of the features of a communications processor is support of a variety of terminals throughout the network. The more *terminal protocols supported*, the more versatile the processor may be in providing network compatibility. Among the more common protocols supported are ASCII, IBM's BSC and SDLC, ANSI's ADCCP, ISO's HDLC, Burrough's BDLC, and Sperry Univac's UDLC. See Table 2 for a complete list of terminal protocols supported.

The *X.25 packet-level* protocol is now being supported by many communications processor vendors in the U.S. The support varies from a simple interface to a full "gateway" function, which generally includes packet assembly and disassembly, routing, and flow control for multiple terminal devices. Although utilized in some private packet-switching network, the X.25 support is generally used to gain access to public packet-switching networks, or Value-Added Networks (VAN), such as Tymnet and Telenet. Since the implementation of the X.25 protocol may vary, each of the public carriers have established a certification process by which a particular vendor's version of X.25 can be guaranteed to be compatible with their network. In the charts, you'll find a listing of those VANs on which the

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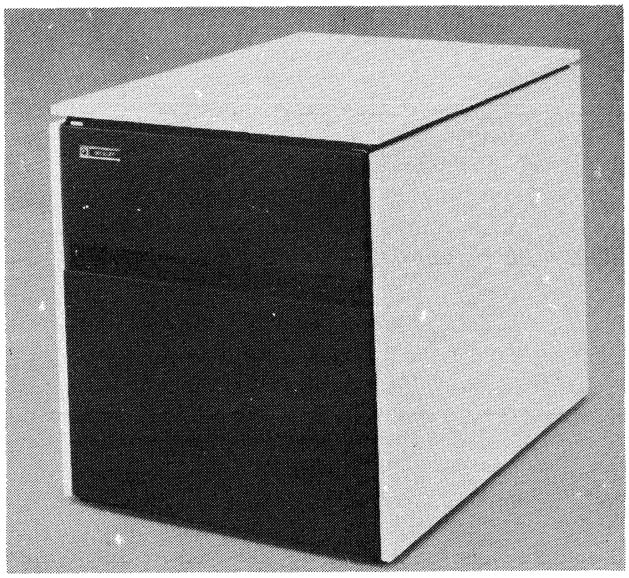

Braegen Corporation's B40 communications processor interfaces to IBM S/370, 303X, 43XX Series and compatible computers.

vendor's X.25 package is certified (e.g., IBM X.25 certified by GTE Telenet).

Other protocol possibilities allow the vendor to specify what other support they provide. A frequent response is Passenger Airline Reservation System (PARS), which is actually a combination application and protocol.

Many communications processors routinely perform *multiplexing/demultiplexing* operations. This process allows several communications lines to be compressed into one high-speed line. The data is then burst across the line and upon reaching its destination returned to its original state. This method is less sophisticated than concentrating, but an equally effective way to reduce line charges. Although intelligence resides at both ends, it is basically a hardware function and does not require software compatibility with the host.

An important function of many communications processors is the ability to allow a terminal to access multiple applications residing within one host, or to access more than one host. Some network processors that do not distinguish between terminals and host ports can make connections between any two termination points in the network. *Terminal-initiated applications switching* permits the terminal user to specify which application he/she wishes to access, with all addressing and routing performed transparently by the communications processor. Typically, a communications processor with this capability also provides some mechanism—passwords, configurational "class" codes, etc.—by which access authorization and restriction are controlled.

Communications processor-initiated dynamic line reconfiguration allows the user to define and activate a new line, or disable an existing line, from the communications processor console. The process takes place while the system is in an active state; no sysgen is required.

Another housekeeping function performed by some communications processors is *protocol and code conversion*. This feature allows normally incompatible devices and systems to "speak" to one another without any additional interfaces or user intervention. For example, less expensive ASCII terminals may be used to connect to an IBM 3270 application, with necessary conversions performed by the communications processor.

Every processor has some means of detection and *error control*. At the very least, there is typically a parity checking mechanism. Two of the more sophisticated algorithms frequently used are Longitudinal Redundancy Check (LRC) and Cyclical Redundancy Check (CRC).

Some communications processors have the very valuable built-in feature of *automatic transmission speed detection*. This function senses the speed of an incoming transmission and then automatically adjusts the channel interface to receive the call. Without automatic speed detection, each line must be configured for use at a specified speed; consequently, a user must dedicate one or more communications lines for every speed in use. With it, the same user may be able to make more efficient use of fewer lines, and residually, to reduce the number of busy signals on the network.

Some communications processors will *automatically disconnect an inactive dial-up terminal* if that terminal has been silent for a pre-programmed length of time. The automatic disconnection of a dormant terminal has saved many a user unnecessary line charges and non-productive occupation of a host port in situations where terminal operators leave their posts to take a coffee or lunch break without signing off.

System Characteristics

It should be kept in mind that a communications processor is in essence a mini- or microcomputer, specially programmed for communications-specific functions. As such, it shares many attributes with the more common general-purpose type of system.

Processor type specifies the manufacturer and model of the central processor used in the communications system. A vendor may build a processor or get it from another vendor. Motorola, Intel, and Zilog seem to be supplying the majority of processors currently being used. The processor supplies most of the intelligence and is central to the manipulation of data.

Main memory word size (length) is the number of bits that can be stored or retrieved from memory using a single machine cycle. We are currently in the midst of a rapidly-occurring technological revolution that involves

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development and mass production of microprocessors that support increasingly larger word lengths. As 32-bit microprocessors, such as the Motorola 68000, become readily available, older 8-bit and 16-bit chips are expected to be phased out. During this transition, you will find word lengths of eight, 16, and 32 bits represented in the chart entries.

In terms of operations, since a byte is eight bits, these microprocessors neatly accommodate 1-, 2-, and 4-byte processing. For example, a chip that has a 32-bit word length has the ability to process four bytes simultaneously.

The longer word lengths permit greater precision, increased instructions, better performance, and more memory locations to be addressed.

Although 16- and 32-bit systems have the ability to process multiple bytes using a single machine cycle internally, all do not enjoy the same level of sophistication when passing data to external devices. Some vendors have retrofitted the data bus of their systems, which is the pathway by which data is transmitted between the processor and external devices, to accommodate the longer word length used by the processor, thus also maximizing the data transfer process. Others have not.

Main memory storage capacity is dependent on the number of memory locations that can be addressed by the processor. The entry shows the maximum amount of main storage available for each processor, expressed in thousands (K) or millions (M) of bytes.

Front-end processors transfer data across the channel to the host computer at very high-speeds. The *level of data transferred across an I/O channel* is indicative of the sophistication of the system. Less sophisticated communications processors, such as 270X emulators, transfer data one-byte at a time. In order to pass the data more efficiently, higher level front-end processors package transmissions in multiple-byte blocks. Each block consists of a fixed number of bytes. Even more sophisticated systems can handle variable-length data transfers and can transmit an entire file at a time to the host; only a few vendors are capable of performing this function.

The *type of data supported between memory and communications lines, mass storage,* or *other peripherals* refers to the manner in which data is transferred to and from memory. Critical to this process is how much of a disturbance (interruption) the transfer causes in the central processor. Many of the microprocessors used today permit Direct Memory Access (DMA). DMA allows the external device to access the memory to perform read, write, and other memory functions without disturbing the microprocessor's registers or interrupting the microprocessor's processing cycle. Without DMA, an external communications line, peripheral, or other device must interrupt the microprocessor in order to access the memory. The interrupt must be recognized and the device's request processed, thus utilizing valuable machine time and cycles, and contributing to the performance deterioration of the microprocessor. To use an extreme example, this could turn out to be the bottleneck for an entire communications network.

Some communications processors support a variety of external peripheral devices. *I/O* refers to system-related input/output devices, such as a console CRT, printer, tape drive, or disk drive that may be utilized by the processor for system-level activities. Such activities might include system configuration and control, statistics gathering and reporting, and network monitoring. Peripheral devices such as disk drives may also be used as temporary *back-up* storage during an emergency or maintenance outage. The data stored can then be transferred back to the processor once the difficulty has been corrected. Many processors also allow *diagnostic peripherals* like line testers and various network control devices to connect directly to a systems interface established specifically for this purpose. Sometimes these devices may be mounted within the processor and thus be an integral part of the unit. More frequently, they are externally connected to the system via a designated "diagnostics port."

Most communications processors have a local console which is used to perform systems control functions. However, a growing number of processor vendors now offer *support for a remote console*. This feature permits a terminal at a remote site to access the systems operations of the communications processor via dial-up or leased-line facilities, diagnose a problem or make an adjustment, and then restart the system (sysgen) if necessary. Because the remote console has access to all systems functions and operations, several layers of security precautions are usually enforced to safeguard against unauthorized entrance. These may be a combination of hardware and software including a secure port, special firmware, and/or passwords.

Vendors find the remote console function to their liking because they can duplicate a problem, correct it, and advise the customer without leaving their own facility, thus saving on costly overhead associated with field engineering personnel. It's good for the customer because it helps get the processor problem corrected a lot quicker than waiting for a service call.

Communications processors, like other computers, have *operating systems implemented in* firmware, software, or a combination. Firmware is program logic written and stored on a read-only integrated circuit residing inside the processor, and is generally not alterable by the user. Software, of course, is program logic loaded into the processor's main memory from an external source, such as a diskette or a host computer, and is easily modified by a programmer or updated by the vendor. Most operating systems implemented today utilize a combination of software and firmware.

Initial Program Load (IPL) method employed may be internal self-loading initiated by the user simply flipping a switch or pushing a button to start-up the system, (figuratively, the system pulls itself up by its own

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bootstraps, aka "booting"). On some machines, all programs are stored in firmware, and the start-up process is completed by the bootstrap method. In other systems, booting only begins the process of bringing up the machine; the remaining program logic must be manually loaded from a diskette or other media, or downloaded from a host.

For functions not supported by the basic operating system, the communications processor vendor may offer *additional software support* in the form of pre-programmed packages, and/or support *user programmability*. Vendor-supplied software may include various utility programs for routine types of tasks, and programming language compilers or interpreters. Some operating software is parameter-based and permits the user to customize the system's functions and line configuration by selecting applicable parameters from various menus embedded in the operating system. Although this is not true programming, this method, depending on the extent of the menus, can offer great latitude in the formation of communications processing applications.

Some vendors offer *software separately priced*, while others "bundle" it into the total cost. Some vendors may only charge for optional software, such as utilities.

To judge the amount of user-created programs actually being written, we asked the vendors to *approximate the proportion of* their *currently installed systems supplied as turnkey systems*. A turnkey system is a system that becomes immediately operational without additional intervention on the part of the user. Since this type of system is up and running as soon as the "key is turned," it does not require the user to maintain costly on-site personnel in order to maintain hardware or software operations.

Pricing and Availability

We've shown the *purchase price, monthly maintenance*, and *monthly lease/rental* for a *minimum configuration, including all hardware components required for basic operation*. This basic system should be sufficiently functional to perform in applications considered entry-level for this system. The *maximum practical configuration* represents the largest fully configured system that the vendor considers practical to deliver. Because lease and maintenance contracts are not always available from vendors, prices for these items may not appear in a specific chart. In such cases, you might check with the vendor as to whether leases and maintenance are provided by a third party.

We asked if *maintenance is bundled with the lease/rental*. If it is, no additional charge for normal service is applied. However, bundling of service does preclude the option on the part of the user of seeking out a third party maintenance organization or performing "do it yourself" maintenance, unless that user wishes to pay twice for the same service.

The *date of first delivery* is not the announcement date of the product, but the date when the first system of this model was installed on a customer site. The *number of systems installed to date* may help you to discern the magnitude of the market, but does not always reveal the relative merits of a communications processor. Some recently announced products may have great attributes, but a modest installed base. Large installed bases may simply reflect effective marketing or an outdated, but once useful product. Please also refer to our user survey located earlier in this report for more telling data.

As we mentioned previously, a processor may be *serviced by* the vendor, a third party, or other means. Be advised that a vendor listed as performing service may, in reality, only provide factory service. In these cases, the user must mail in a faulty board or part to the vendor's factory for service or replacement. Other vendors may provide full on-site field service and/or a remote diagnostics capability.

When compiling a study of this sort, we sometimes come across a product whose basic characteristics are not completely covered by the designated categories we've delineated. The *comments* help to amplify preceding entries or to explain key elements of a product that may be overlooked in the formal chart entries.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose communications products are shown in the comparison charts that follow.

Action/Honeywell, 4401 Beltwood Parkway South, Dallas, Texas 75234. Telephone (214) 386-3500.

Amdahl Communications Systems Division (formerly Tran Telecommunications), 2500 Walnut Avenue, Marina del Rey, California 90291. Telephone (213) 822-3202.

Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, California 94086. Telephone (408) 746-6000.

Amnet, Inc. (formerly ASI Teleprocessing, Inc.), 101 Morse Street, P.O. Box 412, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Auscom, Inc., 2007 Kramer Lane, Austin, Texas 78758. Telephone (512) 836-8080.

BBN Computer, 33 Moulton Street, Cambridge, Massachusetts 02238. Telephone (617) 497-2800.

Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4200.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Cableshare, Inc., 20 Enterprise Drive, P.O. Box 5880, London, Ontario, Canada N6A 4L6. Telephone (519) 686-2900.

Centennial Computer Products, Inc., 6100 Executive Boulevard, Rockville, Maryland 20852. Telephone (301) 984-9120.

Century Analysis, Inc., 114 Center Avenue, Pacheco, California 94553. Telephone (415) 680-7800.

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Chi Corporation, 21111 Chagrin Boulevard, Cleveland, Ohio 44122. Telephone (216) 991-9000.

Codex Corporation, 20 Cabot Boulevard, Mansfield, Massachusetts 02048. Telephone (617) 364-2000.

Commex, Ltd., 141 Central Park Avenue South, Hartsdale, New York 10530. Telephone (914) 328-0600.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101, extension 321.

Comten, Inc.: see **NCR Comten, Inc.**

Control Data Corporation, 8100 34th Avenue South, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Datastream Communications, Inc., 1115 Space Park Drive, Santa Clara, California 95050. Telephone (408) 727-2980.

Digital Communications Associates, Inc., 303 Research Drive/ Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp.: see **MA/COM DCC Inc.**

GTE Telenet Communications Corporation, 8229 Boone Boulevard, Vienna, Virginia 22180. Telephone (703) 442-1000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 895-6000.

IBM Corporation, Information Systems Group, National Accounts Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

ICCI, 196 Broadway, Cambridge, Massachusetts 02139. Telephone (617) 864-3270.

Icot Corporation, 830 Maude Avenue, Mountain View, California 94039. Telephone (415) 964-4635.

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, Arizona 85029. Telephone (602) 944-1543.

M/A-COM DCC, Inc., 11717 Exploration Lane, Germantown, Maryland 20767. Telephone (301) 428-2708.

Memorex Communications Group, 18922 Forge Drive, Cupertino, California 95014. Telephone (408) 996-9000.

Modular Computer Systems, Inc. (Modcomp), P.O. Box 6099, 1650 West McNab Road, Ft. Lauderdale, Florida 33310. Telephone (305) 974-1380.

NCR Corporation: see **NCR Comten, Inc.**

NCR Comten, Inc., 2700 Snelling Avenue North, St. Paul, Minnesota 55113. Telephone (612) 638-7777.

North American Philips Corporation, Communications Systems Division, 55 Knightsbridge Road, Piscataway, New Jersey 08854. Telephone (201) 457-0400.

Paradyne Corporation, 8550 Ulmerton Road, Largo, Florida 33540. Telephone (813) 530-2000.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, New York 11716. Telephone (516) 467-0500.

Raytheon Data Systems Company, 1415 Boston-Providence Turnpike, Norwood, Massachusetts 02062. Telephone (617) 762-6700.

Sperry Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.

Starnet Data Systems, Protex Industries, Inc., 1331 West Evans Avenue, Denver, Colorado 80223. Telephone (303) 935-3566.

Systems Research, Inc.: see **Burroughs Corp.**

Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 725-6000.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, California 92714. Telephone (714) 557-6660.

Thomas Engineering Company, 1040 Oak Grove Road, Concord, California 94518. Telephone (415) 680-8640.

Tran Telecommunications Corporation: see **Amdahl Communications Systems Division.**

TRT Data Products, Norfield Communications Division, 3 Depot Place, East Norwalk, Connecticut 06855. Telephone (203) 853-2777.

Westinghouse Canada, Incorporated, Electronic Systems Division, 777 Walker's Line, P.O. Box 5009, Burlington, Ontario, Canada L7R 4B3. Telephone (416) 528-8811.□

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SUPPLIER AND MODEL	Action/Honeywell Mercury Message Management System	Amdahl 4705	Amdahl Communications Systems Division 3400 Series	Amdahl Communications Systems Division 4410 Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Amdahl 470, 580 and compatibles	Most major vendors	All X.25 equipped vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	No
Max. no. of hosts channel-attachable to front-end	—	4	—	—
Max. no. of active hosts supported simultaneously	—	4	—	—
IBM emulation	—	270X/370X, EP, NCP, ACF	—	—
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	1	Network—dependent	Network—dependent
Host-independent network processor	Yes	No	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	No	SNA	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	352	100	104
2000 to 9600 bps	128	352	100	104
Over 9600 bps	—	Application-dependent	Network-dependent	52
Highest line speed supported (bps)	19.2K	56K	19.2K	64K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None; see Comments
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	Yes
Protocol conversion	Yes	Async/X.25, MSC/X.25	No	No
Code conversion	Yes	ASCII/EBCDIC via soft.	No	No
Error control	Yes	LRC and CRC	CRC	CRC
Automatic transmission speed detection	Yes	50-9600 bps via soft.	50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Data General Nova 3	Proprietary	CA 2/40	Proprietary
Main memory word size, bits	16	18	16	16
Main memory storage capacity, bytes	512K	512K	208K	768K
Level of data unit transferred across I/O channel	Byte	Byte or block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	DMA	—	DMA and interrupt	—
Other peripherals	DMA	—	DMA and interrupt	—
I/O, back-up, and diagnostic peripherals supported	Disk, mag tape	Diskette as diagnostic peripheral	Diskette and self diagnostics	—
Support for remote console	Yes	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Combination of software and firmware
IPL method	Internal self-load	Download from host	From disk. & DP node	Load from diskette
Additional software supported	None	Comm-pro	—	—
User programmability	Yes, via user-selected parameters	Yes	Yes	Yes, via user-selected parameters
Software separately priced	Yes	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	200,000	50,225	200,000	127,000
Monthly maintenance, $	1,000	448	2,000	1,600
Monthly lease/rental, $	Third party	1,444 (2-yr. lease)	—	Federal govt. only
Maximum practical configuration:				
Purchase price, $	600,000	327,970	5,000,000	300,000
Monthly maintenance, $	3,000	2,682	50,000	3,000
Monthly lease/rental, $	Third party	14,196 (2-yr. lease)	—	Federal govt. only
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	1971	November 1979	June 1982	1979
Number of systems installed to date	95	300	Over 75	Over 50
Serviced by	Honeywell	Amdahl	Amdahl	Amdahl
COMMENTS	Mercury replaces Telecontroller as Action's store-and-forward message switch system with front-end capability	Operates with IBM 3705 and 3705/Comm-pro software, with up to 1.8 times the 3705 throughput capacity	Handles mix of async. and sync. traffic; used in multi-vendor environment; proprietary packet switching; supports satellite transmissions	Full duplex transmission only has Modulo 128 satellite support; 4410 performs self-diagnostics; supports CCITT X.25

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SUPPLIER AND MODEL	Amnet Nucleus 6000	Auscom 8911	BBN Computer C/30-50	BetaCom Corp. PCM (Professional Communications Manager)
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	IBM 370, 30XX, 43XX, and compatibles	Most vendors	IBM personal computers, Televideo 802
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	Yes	Yes, for micros
Max. no. of hosts channel-attachable to front-end	—	2	16	1
Max. no. of active hosts supported simultaneously	—	2	16	1
IBM emulation	—	Any IBM controller	No	—
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	1024	2	16	—
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	Yes	Yes	No
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	OSI	Ethernet, DECnet, Cus.	OSI, U.S. DOD 1822, TCP, IP	BSC
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	1024	16	64	2
2000 to 9600 bps	1024	16	64	—
Over 9600 bps	512	16	64	—
Highest line speed supported (bps)	64K	1M	64K	1200
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	No
Protocol conversion	Yes	Yes	No	Yes
Code conversion	Yes	Programmable	No	Yes
Error control	Yes	Programmable	Yes	Yes
Automatic transmission speed detection	Yes	No	110 to 19.2K bps	—
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Multi-microprocessor	DEC LSI-11	BBN C/30, C/50	Intel 8088
Main memory word size, bits	16	16	16 and 20	8
Main memory storage capacity, bytes	1M	256K	64K to 500K	128K
Level of data unit transferred across I/O channel	Byte and block	Byte	Byte	Byte, file
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA and interrupt	Both	Interrupt
Mass storage	DMA	DMA and interrupt	DMA	—
Other peripherals	DMA	DMA and interrupt	Both	Interrupt
I/O, back-up, and diagnostic peripherals supported	Console, printer, disk	CRT console, disk, disk., mag tape, prt.	Terminal, cassette	Console
Support for remote console	Yes	Yes	Yes	No
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software or firmware	Firmware and software	Firmware
IPL method	Download from NMC	Load disk./tape/host	Download or cassette	Built-in firmware
Additional software supported	Program development utilities	Anything available for DEC LSI-11	Remote monitoring and control utilities, traffic generator utilities	—
User programmability	Yes, on restricted basis	Yes, via user-created programs	Yes, via user-selected parameters	Yes, via menu configurator
Software separately priced	Software options	All, except diagnostics	No	—
Approx. proportion of currently installed systems supplied as turnkey systems	—	90%	95%	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	16,795	25,000	Contact vendor
Monthly maintenance, $	—	By component	—	Contact vendor
Monthly lease/rental, $	—	Not offered	Not offered	Contact vendor
Maximum practical configuration:				
Purchase price, $	200,000	Approx. 25,000	—	Contact vendor
Monthly maintenance, $	—	By component	—	Contact vendor
Monthly lease/rental, $	—	Not offered	Not offered	Contact vendor
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	January 1983	July 1980	November 1979	—
Number of systems installed to date	—	200	—	—
Serviced by	Amnet/third party	Auscom	BBN	—
COMMENTS	Supports 4 to 1024 ports, many protocols, packet-switching, dynamic routing; part of an integrated private data network product line	Designed as a programmable IBM channel interface or FEP by emulating standard IBM control unit; more hosts supported with extended chassis	Complete packet-switch system; monitored and controlled by C/70 Network Operating Center	Printer-spooler

Communications Processors

SUPPLIER AND MODEL	Braegen B40	Burroughs CP3680/ CP3680-01	Burroughs CP9558-1/ CP9572	Cableshare CSI Data Concentrator
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 303X, 43XX Series and compatibles	Burroughs B2000, B3000, and B4000 Series	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles	All computers using ASCII serial communication ports
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	—	4	—	16
Max. no. of active hosts supported simultaneously	—	4	—	16
IBM emulation	3270/1403/2501	No	—	—
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	4	4	12	16
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	Yes	Yes	No
Distributed processing node	No	Yes	Yes	No
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	SNA	BNA	BNA, SNA	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	6	288 async., 72 sync.	47	16
2000 to 9600 bps	6	40	—	16
Over 9600 bps	6	40	12	16
Highest line speed supported (bps)	56K	19.2K	19.2K	56K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	—	—	Yes
Terminal-initiated applications switching	Yes	—	—	Yes
Comm. processor-initiated dynamic line reconfig.	No	—	—	No
Protocol conversion	No	Yes	—	Async to X.25
Code conversion	No	Yes	ASCII to EBCDIC	—
Error control	CRC	—	—	X.25 procedures
Automatic transmission speed detection	No	—	—	Yes
Automatic disconnect of inactive dial-up terminals	No	—	—	Yes
SYSTEM CHARACTERISTICS				
Processor	Braegen	—	B920	Intel 8088
Main memory word size, bits	16	—	16; multiprocessors	16
Main memory storage capacity, bytes	256K	—	1.2M	192K
Level of data unit transferred across I/O channel	Byte	—	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA and interrupt	DMA	DMA
Mass storage	—	DMA	DMA	—
Other peripherals	DMA	—	—	—
I/O, back-up, and diagnostic peripherals supported	FEP diskette	—	Mag. tape, floppy and hard disk	Console
Support for remote console	Yes	—	—	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination software and firmware	Combination of software and firmware	Software and firmware
IPL method	Manual from diskette	Download from host	—	Internal self-load
Additional software supported	None	NDL, DCS	—	—
User programmability	No	Yes, via user-selected parameters	—	Yes, via user-selected parameters
Software separately priced	No	All	—	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	75%	—	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,000	64,050 (3680)	22,559 (9572)	3,000
Monthly maintenance, $	—	535	75	None
Monthly lease/rental, $	300	2,415 (3-yr. lease)	729 (3-yr. lease)	Not available
Maximum practical configuration:				
Purchase price, $	200,000	124,950 (3680+ -01)	29,401 (9558-1)	5,600
Monthly maintenance, $	—	1,010	200	None
Monthly lease/rental, $	3,000	2,310 (3-yr. lease)	1,033 (3-yr. lease)	Not available
Is maintenance bundled with lease/rental?	No	—	Yes	No
Date of first delivery	1981	January 1978	October 1980	June 1, 1983
Number of systems installed to date	Over 300	200	1,000	No
Serviced by	Braegen	Burroughs	Burroughs	Cableshare
COMMENTS	Concurrent support of local 3270, remote 3270, remote job entry, local job entry, screen editor, multiple hosts	Redundant system		

Communications Processors

SUPPLIER AND MODEL	Cableshare LSI-X.25 Front-End Processor	Cableshare LSI-X.25 Host Port Concentrator	Cableshare LSI-X.25 Intelligent Concentrator	Centennial Computer 2000/3000
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	DEC PDP-11 and VAX	All hosts supporting async. communications	All async. terminals	Univac 1100 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	32 async. channels	32 async. channels	16
Max. no. of active hosts supported simultaneously	1	32	32	15
IBM emulation	No	No	No	—
Remote line concentrator	No	Yes	Yes	No
Maximum no. of hosts served by one concentrator	1	32	32	—
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	X.25, OSI	X.25, OSI	X.25, OSI	SNA, CSP
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	127	32	32	150
2000 to 9600 bps	127	32	32	150
Over 9600 bps	127	32	32	75
Highest line speed supported (bps)	19.2K	19.2K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	Halved	Halved	Halved	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	Async./X.25	Async./X.25	Async./X.25	No
Code conversion	1	Baudot/ASCII	Baudot/ASCII	ASCII/EBCDIC
Error control	—	—	—	Yes; LRC and CRC
Automatic transmission speed detection	No	Yes, 110-9600 bps	Yes, 110-9600 bps	Yes; 50-19.2K lps
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23	Proprietary
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	64K	64K	64K	32K (2000) 64K (3000)
Level of data unit transferred across I/O channel	Block	—	—	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	—	—	DMA
Mass storage	—	—	—	—
Other peripherals	—	—	—	—
I/O, back-up, and diagnostic peripherals supported	FEP console	Console	Console	Built-in self diagnostics
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Combination of software and firmware
IPL method	Download from host	Internal self-load	Internal self-load	From diskette or host
Additional software supported	None	None	None	Custom
User programmability	No	No	No	No
Software separately priced	—	—	—	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	100%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	13,450	4,335	4,335	150,000
Monthly maintenance, $	100	70	70	1,500
Monthly lease/rental, $	None	None	None	4,000
Maximum practical configuration:				
Purchase price, $	16,450	18,500	18,500	500,000
Monthly maintenance, $	125	100	100	3,000
Monthly lease/rental, $	—	—	—	13,500
Is maintenance bundled with lease/rental?	—	—	—	No
Date of first delivery	November 1978	March 1980	March 1980	1974 (2000) 1976 (3000)
Number of systems installed to date	75	25	125	50
Serviced by	Digital Equipment Corp.	Digital Equipment Corp.	Digital Equipment Corp.	Centennial Computer
COMMENTS	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration.	DTE or DCE support; supports up to 5 X.25 network links with DTE or DCE configuration.	

Communications Processors

SUPPLIER AND MODEL	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor	Codex 6520	Commex, Ltd DNP 4/6/16
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	DEC PDP Series, NCR Century & Criterion	Univac 1100 Series	IBM S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	None	8	4	64
Max. no. of active hosts supported simultaneously	Multiple	8	2	64
IBM emulation	No	No	270X, 370X	270X, 370X EP
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	Multiple	Unlimited	—	64
Host-independent network processor	Yes	Yes	No	Optional
Store-and-forward message switching processor	Yes	No	No	Optional
Distributed processing node	Yes	No	No	Optional
Terminal controller	Yes	Yes	No	No
Network architecture compliance	Yes	No	No	Future
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	24	Over 1000	240	See Comments
2000 to 9600 bps	24	32	Config.—dependent	See Comments
Over 9600 bps	24	6	Config.—dependent	See Comments
Highest line speed supported (bps)	19.2K	50K	230.4K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	Half aggregate data rate
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Planned	Yes; all protocols	ASCII/2741	Optional
Code conversion	Planned	ASCII/EBCDIC	ASCII/EBCDIC	Optional
Error control	Yes	LRC, BCC, and CRC	LRC and CRC	LRC and CRC
Automatic transmission speed detection	No	Yes, 110-19.2K bps	Yes; 135 to 9600 bps	Yes; 110-19.2K bps
Automatic disconnect of inactive dial-up terminals	No	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	CAI-108/116/124	Perkin-Elmer 3200	CCI 801	Mot. 6809 & Sig. 8X300
Main memory word size, bits	16	32	16	8
Main memory storage capacity, bytes	1M	2M	64K	15M
Level of data unit transferred across I/O channel	Block	Byte	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	Interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Other peripherals	Interrupt	Diagnostic	DMA and interrupt	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	FEP Console		FEP console	FEP consoles and bubble memory
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination software and firmware	Software	Software
IPL method	Download from host	Host/self-load/disk.	From host or diskette	Load from bubble mem.
Additional software supported	—	Simulator and other utilities	—	Network generator, trace, on-line and off-line diagnostics
User programmability	Via user-selected parameters	Yes, via user-selected parameters	—	Yes, via user-selected parameters
Software separately priced	No	X.25 only	—	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	6,500	60,000	Contact vendor	Contact vendor
Monthly maintenance, $	Software 25; h/w 150	700	—	—
Monthly lease/rental, $	—	—	—	—
Maximum practical configuration:				
Purchase price, $	10,950	500,000	—	—
Monthly maintenance, $	Software 25; h/w 150	—	—	—
Monthly lease/rental, $	—	—	—	—
Is maintenance bundled with lease/rental?	No	No	—	Yes
Date of first delivery	December 1981	1977	January 1980	June 1981
Number of systems installed to date	150	35	25	Approximately 50
Serviced by	CAI	Chi Corporation	Codex	Commex, third party
COMMENTS	CAI implementation uses Motorola 68000, flow control, load-leveling, raw line class selection, error correction, terminal key-ahead buffering	Dynamic routing; two async. screen editors; automatic terminal protocol detection; redundancy; multiple local and remote hosts		Mod., pack. bus arch.; DNP 4 handles up to 13 lines plus cons.; DNP 6, up to 23 lines plus cons.; DNP 16, up to 83 lines plus cons. per cabinet (1300 lines max. per system)

Communications Processors

SUPPLIER AND MODEL	Commex, Ltd CMC-4 and CMC-32	Computer Communications CC-6	Computer Communications CC-8	Computer Communications CC-80/85
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX,43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	2	4	7
Max. no. of active hosts supported simultaneously	1	2	4	7
IBM emulation	270X, 370X EP	270X/370X EP	270X/370X EP	270X/370X EP
Remote line concentrator	No	No	No	No
Maximum no. of hosts served by one concentrator	—	—	—	—
Host-independent network processor	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	No	Yes	Yes	Yes
Network architecture compliance	—	No	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	32	240	1232
2000 to 9600 bps	32	32	120	120
Over 9600 bps	24	4	32	120
Highest line speed supported (bps)	56K	56K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	Optional	No	No	No
Code conversion	Optional	Yes	Yes	Yes
Error control	LRC and CRC	Parity, LRC and CRC	Parity, LRC and CRC	Parity, LRC and CRC
Automatic transmission speed detection	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	CCI 601	CCI 801	CCI 8001/8501
Main memory word size, bits	8	16	16	16
Main memory storage capacity, bytes	320K	64K	64K	256K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	—	DMA and interrupt	DMA and interrupt	DMA and interrupt
Other peripherals	—	DMA and interrupt	DMA and interrupt	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	FEP console, others optional	Control panel	FEP CRT console, diskette, printer	Disk (40-200 MB), mag tape, FEP CRT, printer
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software	Software	Software
IPL method	Internal self-load	Download from host	From host/diskette	From host/disk
Additional software supported	Full system diagnostics	Assembler, utilities, diagnostics	Value-added options assembler loader, utilities, diagnostics	Value-added options, custom software, assembler, loader, utilities
User programmability	Custom	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes, via user parameters and programs
Software separately priced	None	None	Value-added options	Options and custom sys.
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	90%	95%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	34,770	24,990	39,840	68,000/115,640
Monthly maintenance, $	120	150	296	246/426
Monthly lease/rental, $	890 (3 yr. lease)	802 (3 yr.); 1048 (rental)	1224 (3 yr.); 1600 (rental)	1,932 (3 yr. lease)
Maximum practical configuration:				
Purchase price, $	65,645	51,368	181,200	674,050
Monthly maintenance, $	275	405	1,593	3,344
Monthly lease/rental, $	1,950 (3 yr. lease)	1742 (3 yr.); 2263 (rental)	5858 (3 yr.); 7635 (rental)	17,523 (3 yr. lease)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	Yes
Date of first delivery	November 1977	November 1981	1976	1975
Number of systems installed to date	Approximately 100	9	200	386
Serviced by	Commex, third party	Computer Comm.	Computer Comm.	Computer Comm.
COMMENTS	Commex sells communications processors manufactured by Lemcom and labeled with the Commex name	Auto-poll, auto-baud rate detect, auto-dial, multihost support, user programmability, field upgradability, reverse channel	Auto-poll, auto-baud rate detect, speed & code conversion, auto dump, auto load, multi host support, terminal initiated line sel., etc.	Used mainly for custom store-and-forward message switches, electronic mail, & high speed transaction processing systems (e.g., airline reservations)

Communications Processors

SUPPLIER AND MODEL	Control Data 2551-3	Control Data 2551-4	Datastream Communications 774	Datastream Communications 776
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	CDC Cyber 170, Cyber 70, Cyber 6000 Series	CDC Cyber 170, Cyber 70, Cyber 6000 Series	IBM & IBM PCM	IBM & IBM PCM
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	2	2	—	—
Max. no. of active hosts supported simultaneously	1	1	—	—
IBM emulation	No	No	3271/3274 BSC	3276 BSC
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	8	8	2	1
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	Yes	Yes
Network architecture compliance	Yes	Yes	BSC	BSC
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	254	—	—
2000 to 9600 bps	32	254	2	1
Over 9600 bps	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	—	—
Highest line speed supported (bps)	56K	56K	9.6K	9.6K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	Async. to 3270 BSC	Async. to 3270 BSC
Code conversion	Yes	Yes	EBCDIC to ASCII	EBCDIC to ASCII
Error control	Yes	Yes	Parity, LRC, CRC	Parity, LRC, CRC
Automatic transmission speed detection	Yes; 100 to 1200 bps	Yes; 100 to 1200 bps	To 9600	To 9600
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CDC 2551-3	CDC 2551-4	Monolithic Z80	Monolithic Z80
Main memory word size, bits	16	16	8	8
Main memory storage capacity, bytes	256K	256K	64K	64K
Level of data unit transferred across I/O channel	Byte and control	Byte and control	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	Interrupt	Interrupt
Mass storage	—	—	—	—
Other peripherals	DMA and interrupt	DMA and interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	Console, cassette	Console, cassette	Mag tape	Mag tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Software	Software
IPL method	Download from host	Download from host	Micro cassette	Micro cassette
Additional software supported	—	—	Diagnostics	Diagnostics
User programmability	Yes	Yes	Yes, user parameters	Yes, user parameters
Software separately priced	All	All	None	None
Approx. proportion of currently installed systems supplied as turnkey systems	98%	98%	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	36,955	48,648	—	—
Monthly maintenance, $	433	483	—	—
Monthly lease/rental, $	1,067 (3 yr. lease)	1,403 (3 yr. lease)	None	None
Maximum practical configuration:				
Purchase price, $	68,570	157,478	—	—
Monthly maintenance, $	751	1,540	—	—
Monthly lease/rental, $	2,048 (3 yr. lease)	5,093 (3 yr. lease)	None	None
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	January 1983	January 1983	November 1980	April 1982
Number of systems installed to date	—	—	650	300
Serviced by	Control Data Corp.	Control Data Corp.	Datastream Communications	Datastream Communications
COMMENTS			Tape-based system supporting up to 2 BSC lines in 8, 12 or 16 port versions; remaining ports for async. terminals or modems; upgradable to redundant and SNA	Tape-based system in 5 and 9 port versions, of which 1 port is BSC with remaining ports for async. terminals or modems

Communications Processors

SUPPLIER AND MODEL	Datastream Communications 874	Digital Communications Associates System 355	GTE Telenet TP3005	GTE Telenet TP3010
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM & IBM PCM	Most vendors	Most vendors	Most vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	DECsystem-10	Local concentrator	Local concentrator
Max. no. of hosts channel-attachable to front-end	—	8	—	—
Max. no. of active hosts supported simultaneously	—	8	4	27
IBM emulation	3274C SNA	No	—	—
Remote line concentrator	2	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	2	Unrestricted	4	27
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	No	No
Network architecture compliance	SNA	INA	X.25	X.25
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	—	124	4	21 to 27
2000 to 9600 bps	2	124	4	4 to 19
Over 9600 bps	—	44	—	—
Highest line speed supported (bps)	19.2K	19.2K	9600 (19.2K netline)	9600 (19.2K netline)
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async. to 3270 SNA	Async./X.25	No	No
Code conversion	EBCDIC to ASCII	No	No	ASCII to EBCDIC
Error control	Parity, LRC, CRC	Yes-ARQ	Parity, LRC, CRC	Parity, LRC, CRC
Automatic transmission speed detection	To 9600	110 to 2400 bps	50 to 1200 bps	50 to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 8086	DCA System 355-Z80A	Zilog Z80A	Zilog Z80A
Main memory word size, bits	16	8	8	8
Main memory storage capacity, bytes	500K	1,472K (64K per Z80A)	64K	64K
Level of data unit transferred across I/O channel	Block	Byte	Byte, block	Byte, block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA and interrupt	DMA and interrupt	DMA and interrupt
Mass storage	—	Interrupt	—	—
Other peripherals	—	Interrupt	Interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	Mag tape	Dual cass. tape unit; all diagnos. built-in	Local terminal, GTE Telenet NCC	Local cons., GTE Telenet NCC, cass. tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Software and firmware	Software and firmware
IPL method	Micro cassette	Internal self-load	Download, EPROM load	Download or cass. load
Additional software supported	Diagnostics	Configuration tape generator	—	—
User programmability	Yes, user parameters	Yes; via user-selected parameters/programs	Yes, via user-selected parameters	Yes, via user-sel. par. or user-created prog.
Software separately priced	None	Utilities only	Maintenance only	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	5%	—	90%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	—	12,000 and up	2,350	7,500
Monthly maintenance, $	—	Contact vendor	30	65
Monthly lease/rental, $	None	Contact vendor	—	800 (public network only)
Maximum practical configuration:				
Purchase price, $	—	144,145	2,350	12,690
Monthly maintenance, $	—	Contact vendor	30	110
Monthly lease/rental, $	None	Contact vendor	—	1,100
Is maintenance bundled with lease/rental?	No	Contact vendor	—	Yes
Date of first delivery	October 1982	October 1980	1983	1979
Number of systems installed to date	100	Over 200	—	2000
Serviced by	Datastream Communications	DCA, third party	GTE Telenet	GTE Telenet
COMMENTS	Tape-based system supporting up to 2 SNA lines in 8, 12 or 16 port versions; remain. ports for async. term. or modems; full 3274 (PU2, LU2) SNA support	Supports host selection, port contention, full line and modem control facilities; handles up to 44 high-speed trunk lines; symmetric multi-proc.; supp. up to 23 Z80As	Local self-configuration program	Redundant communications line processor (CLP) with 64K byte memory

Communications Processors

SUPPLIER AND MODEL	GTE Telenet TP3010-II	GTE Telenet TP4000 Series	Honeywell Information Systems Datanet 8	IBM 3705-II Models E1 through L4
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors	Most vendors	Honeywell DPS 8, DPS 66, and DPS 64	IBM S/370, 30XX, and 43XX; S/360 in 270X emulation mode only
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Local concentrator	Local concentrator	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	—	4	4
Max. no. of active hosts supported simultaneously	26	128	4	4
IBM emulation	—	—	Yes	270X/370X
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	26	Multiple	4	1
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	No
Terminal controller	No	No	Yes	No
Network architecture compliance	X.25	X.25	Honeywell DSA (ISO)	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	21 to 26	50 to 128	128	352
2000 to 9600 bps	4 to 19	24 to 40	Load-dependent	352
Over 9600 bps	—	12 to 16	Load-dependent	32
Highest line speed supported (bps)	9600, (19.2K netline)	56K	56K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	Load-dependent	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes (by host program)	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	No
Protocol conversion	Yes	Yes	No	Yes
Code conversion	Yes	Yes	No	Yes
Error control	Parity, LRC, CRC	Parity, LRC, CRC	Yes	LRC and CRC
Automatic transmission speed detection	50 to 1200 bps	110 to 2400 bps	Yes; 110, 300, 1200 bps	Yes, via optional soft.
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes; optional, variable	No
SYSTEM CHARACTERISTICS				
Processor	Zilog Z80 B	MOS technology 6502A	Datanet 8 (Honeywell)	Proprietary
Main memory word size, bits	8	8	16	18
Main memory storage capacity, bytes	64K	256K	1,536K	512K
Level of data unit transferred across I/O channel	Byte, block	—	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	Async. bus	DMA
Mass storage	—	—	Async. bus	DMA
Other peripherals	Interrupt	—	Async. bus	DMA
I/O, back-up, and diagnostic peripherals supported	GTE Telenet NCC, cassette tape, local con.	GTE Telenet NCC	Console, diskette	—
Support for remote console	Yes	Yes	Yes	No
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Combination of software and firmware	Software
IPL method	Manual or downline	Downline load from NCC	Host, local, or VIP	Download from host
Additional software supported	—	—	Additional on host for administration of control	NCCF, NPDA
User programmability	Yes, via user-created programs	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes
Software separately priced	All	All	All	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	80%	55%	Software is customer installable	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	7,500	37,000-49,500	41,015	38,230 (E1)
Monthly maintenance, $	65	215-300	248	159
Monthly lease/rental, $	800	GTE Telenet tariff	1,281 (5 yr. lease)	1,385 (2 yr. lease)
Maximum practical configuration:				
Purchase price, $	15,345	76,500-157,200	119,868	107,040 (L4)
Monthly maintenance, $	135	495-995	838	485
Monthly lease/rental, $	—	GTE Telenet tariff	3,861 (5 yr. lease)	5,455 (2 yr. lease)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	Yes
Date of first delivery	January 1979	December 1979	Latest model 3rd qtr.	August 1976
Number of systems installed to date	1000	650	Early model over 500	50,000
Serviced by	GTE Telenet	GTE Telenet	Honeywell	IBM
COMMENTS	Redundant Communications Line Processor (CLP) with 64K memory is configurable	Multiple Microprocessor Line Card (LPU) redundancy, common logic redundancy and power supply are supported; performs virtual circuit switching		

Communications Processors

SUPPLIER AND MODEL	IBM 3705-80 Models M81 through M83	IBM 3725	ICCI CA20 BSC	ICCI CA20 SNA
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, and 43XX; S/370 in 270X emulation mode only	IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341	IBM S/370, 30XX, 43XX and compatibles	IBM S/370, 30XX, 43XX and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	2	8	—	—
Max. no. of active hosts supported simultaneously	2	6	—	—
IBM emulation	270X/370X	270X and 3705 with EP	—	—
Remote line concentrator	No	Yes	No	No
Maximum no. of hosts served by one concentrator	—	8	—	—
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	No	No	Yes	Yes
Network architecture compliance	SNA	SNA	BSC (bisync.)	SNA/SDLC
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	16	256 with 3726 expansion	—	—
2000 to 9600 bps	16	256 with 3726 expansion	10	10
Over 9600 bps	—	128 with 3726 expansion	—	—
Highest line speed supported (bps)	57.6K	230.4K bps	19.2K sync., 9.6K async	19.2K sync., 9.6K async
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	No
Protocol conversion	Yes	Yes	Async./3274 BSC	Async./3274 SNA
Code conversion	Yes	Yes	ASCII/EBCDIC	ASCII/EBCDIC
Error control	LRC and CRC	LRC and CRC	CRC-16	CCITT
Automatic transmission speed detection	Yes; via optional soft.	Yes, via opt. software	212-A modem compatible	212-A modem compatible
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Zilog Z80A	Zilog Z80A
Main memory word size, bits	—	18	8	8
Main memory storage capacity, bytes	256K	1M	64K	64K
Level of data unit transferred across I/O channel	Block	Block	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	Interrupt	Interrupt
Mass storage	DMA	DMA	—	—
Other peripherals	DMA	DMA	Interrupt	Interrupt
I/O, back-up, and diagnostic peripherals supported	—	FEP console	—	—
Support for remote console	No	Yes, up to 150 meters (492 feet)	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Firmware	Firmware
IPL method	Download from host	Internal self-load	Internal self-load	Internal self-load
Additional software supported	NCCF, NPDA	NCCF, NPDA, ACF/NCP-PEP, EP/3725	—	—
User programmability	Yes	Yes	No	No
Software separately priced	Yes	Yes	No	No
Approx. proportion of currently installed systems supplied as turnkey systems	—	—	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	36,600 (M81)	86,740	8,600	8,600
Monthly maintenance, $	203	250	60	60
Monthly lease/rental, $	1,370 (2 yr. lease); 1,610 (rental)	3,830 rental	—	—
Maximum practical configuration:				
Purchase price, $	52,600 (M83)	Contact vendor	8,600	8,600
Monthly maintenance, $	221	Contact vendor	60	60
Monthly lease/rental, $	2,120 (2 yr. lease; 2,491 (rental)	Contact vendor	—	—
Is maintenance bundled with lease/rental?	Yes	No	—	—
Date of first delivery	August 1981	Fourth quarter 1983	March 1982	March 1982
Number of systems installed to date	—	—	400	200
Serviced by	IBM	IBM	ICCI	ICCI
COMMENTS		HONE Configurator CF-3725 should be consulted for actual number of operable lines, depending on line speeds, protocols, 3 other variable factors	Second-generation product based on original CA12 technology, of which more than 400 units are currently installed	Second-generation product based on original CA12 technology

Communications Processors

SUPPLIER AND MODEL	Icot 251	Icot 25X (253, 254, 257)	Icot 352	Icot 35X
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Vendors supporting X.25 or async. RS-232-C	Most vendors via serial interface	IBM mainframes that support 3270 terminals	IBM mainframes supporting 3270s; Sperry mainframes supporting UTS-400s
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	8	—	2	17
Max. no. of active hosts supported simultaneously	1	—	2	17
IBM emulation	No	—	Yes	Yes
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	1	18	—	Up to 17
Host-independent network processor	Yes	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	Yes
Terminal controller	Yes	No	Yes	Yes
Network architecture compliance	No	No	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4 to 8	5 to 18	12	5 to 18
2000 to 9600 bps	4 to 8	5 to 18	12	5 to 18
Over 9600 bps	4 to 8	5 to 18	—	—
Highest line speed supported (bps)	9600	19.2K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	No
Protocol conversion	Async./X.25	Yes	Yes	Yes
Code conversion	No	ASCII/EBCDIC & others	Yes	Yes
Error control	Yes, defined by X.25	Yes, protocol conform.	Yes	Yes
Automatic transmission speed detection	Yes, up to 1200 bps	No	Yes, 50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	No	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Zilog Z80	Intel 8085/8088	Intel 8085/8088	Intel 8085/8088
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	24K	128K	64K	128K
Level of data unit transferred across I/O channel	Block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	—	—	—	—
Other peripherals	—	—	—	—
I/O, back-up, and diagnostic peripherals supported	None	None	Supervisory console	Logical console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Firmware
IPL method	Internal self-load	Internal self-load	Internal self-load	Internal self-load
Additional software supported	—	—	—	—
User programmability	Yes, via user-selected parameters	No	User-configurable control tables	User-configurable control tables
Software separately priced	No	No	No	No
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	2,950	10,000	7,600	6,400
Monthly maintenance, $	—	985	85	70
Monthly lease/rental, $	—	—	—	—
Maximum practical configuration:				
Purchase price, $	4,200	50,000	9,850	38,000
Monthly maintenance, $	—	400	110	420
Monthly lease/rental, $	—	—	—	—
Is maintenance bundled with lease/rental?	No	—	—	—
Date of first delivery	April 1982	June 1979	March 1982	September 1981
Number of systems installed to date	78	—	75	40
Serviced by	Icot	Icot	Icot	Icot
COMMENTS	The primary function of Icot 251 X.25 PAD is to allow async. ASCII terminals to access an X.25 network or host computer	These three versions allow protocol/code conversion in multiple protocol environment	Allows ASCII terminals to emulate IBM 3270 using BSC or SDLC protocols	Enables IBM 3270 and Sperry UTS-400 compatible terminals to emulate each other and operate in an IBM and Sperry multi-host environment; three models are 353, 354S and 357S

Communications Processors

SUPPLIER AND MODEL	Lemcom Systems CMC-4	Lemcom Systems CMC-8	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	S/360, IBM S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles	IBM S/360, S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	1	1	64
Max. no. of active hosts supported simultaneously	1	1	1	64
IBM emulation	270X	270X	270X	270X, 370X, EP
Remote line concentrator	No	No	No	Yes
Maximum no. of hosts served by one concentrator	—	—	—	64
Host-independent network processor	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	Optional
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Optional
Network architecture compliance	—	—	—	DMMA
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4	8	32	6500
2000 to 9600 bps	4	8	32	1500
Over 9600 bps	3	6	24	250
Highest line speed supported (bps)	56K	56K	56K	57.6K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	No	Yes
Terminal-initiated applications switching	No	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	Optional	Optional	Optional	Optional
Code conversion	Optional	Optional	Optional	Optional
Error control	LRC and CRC	LRC and CRC	LRC and CRC	LRC and CRC
Automatic transmission speed detection	Optional—300, 1200	Optional—300, 1200	Optional—300, 1200	110 to 19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6800	Motorola 6800	Motorola 6809
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	40K	80K	320K	15M
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	DMA and interrupt
Mass storage	—	—	—	DMA and interrupt
Other peripherals	—	—	—	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	FEP console	FEP console	FEP console	FEP console and bubble memory
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Software
IPL method	Internal self-load	Internal self-load	Internal self-load	Self-/manual-/down-load
Additional software supported	Problem determination aids	Problem determination aids	Problem determination aids	Channel prog. simulator & prob. determin. aids
User programmability	User-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters	Yes, via user-selected parameters
Software separately priced	Utilities only	Utilities only	Utilities only	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	None	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,000	16,000	20,000	25,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	20,000	30,000	60,000	500,000
Monthly maintenance, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly lease/rental, $	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Date of first delivery	March 1977	November 1980	March 1979	1981
Number of systems installed to date	320	25	110	55
Serviced by	Various	Various	Various	Various
COMMENTS	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts; RPQs available for a fee	Microprocessor-directed FEP; front-end polling and console support available; OEM discounts	Distributed MPU FEP; up to 256 MPUs can be programmed to perform various comm. processing functions; front-end polling, dynamic applic. selec., & multi-console support avail.

Communications Processors

SUPPLIER AND MODEL	M/A-COM DCC CP9000	M/A-COM DCC Micro-Node	Memorex Communications Group 1270 Terminal Control Unit	ModComp 3108 & 3109
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most vendors via serial interface	Most vendors via serial interface	IBM S/370, 30XX, 43XX, and compatibles	Modcomp Classic II, CLII45, CLII55, CLII75, IBM S/370; CDC; Cray
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	—	2	4
Max. no. of active hosts supported simultaneously	—	—	2	4
IBM emulation	—	—	270X, 370X EP	No
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	No limit	No limit	—	User programmable
Host-independent network processor	Yes	Yes	No	Yes
Store-and-forward message switching processor	Yes	Yes	No	No
Distributed processing node	Yes	Yes	No	Yes
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	No	No	VAN	Maxnet
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	480	128	96	256
2000 to 9600 bps	240 to 480	128	70	256 to 166
Over 9600 bps	60 to 120	128	6	Application-dependent
Highest line speed supported (bps)	56K	56K	56K	250K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes, for VAN	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	No
Protocol conversion	No	No	X.25/BSC/ASCII	No
Code conversion	No	No	ASCII/BCD	No
Error control	No	No	Yes	CRC
Automatic transmission speed detection	No	No	Yes, 50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	No	No	No	No
SYSTEM CHARACTERISTICS				
Processor	6502 and Z80	6502 and Z8000	—	Modcomp II/45/55/75
Main memory word size, bits	8	8 and 16	—	16
Main memory storage capacity, bytes	4M bytes	64K	—	4M
Level of data unit transferred across I/O channel	Byte	Byte and block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA and interrupt	DMA and interrupt	Interrupt	DMA and interrupt
Mass storage	Interrupt	Interrupt	—	DMA and interrupt
Other peripherals	—	—	—	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette	Diskette	Console w/VANS	Mag. tape and disk
Support for remote console	Yes	Yes	No	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Firmware	Software
IPL method	From host/diskette	From host/diskette	Internal self-load	System-dependent
Additional software supported	Assembler & LOGOS compilers & linker system diagnostics	System diagnostics	—	Cobol, Pascal, Fortran 77
User programmability	Yes—via user created programs	Yes—via user created programs	No	Yes, via user-selected parameters
Software separately priced	All	All	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	All	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Approx. 30,000	Approx. 25,000	14,900	Contact vendor
Monthly maintenance, $	Application dependent	Application dependent	126	—
Monthly lease/rental, $	Offered as options; contact vendor	Offered as option; contact vendor	543 mo. (3 yr. lease)	—
Maximum practical configuration:				
Purchase price, $	Approx. 200,000	Approx. 150,000	45,000	—
Monthly maintenance, $	Application dependent	Application dependent	250	—
Monthly lease/rental, $	Offered as options; contact vendor	Offered as option; contact vendor	1,450 (3 yr. lease)	—
Is maintenance bundled with lease/rental?	No	No	No	—
Date of first delivery	1977	1980	1970	—
Number of systems installed to date	575	55	2,100	—
Serviced by	M/A-COM DCC	M/A-COM DCC	Memorex	Modcomp
COMMENTS	Communications features and functions programmable by user	Multi-processor designed for fail-safe operation; all components totally redundant; communication features and functions programmable by user	Hard-wired data communications controller	Videotex information storage and retrieval system available; satellite network—interprocessor communications link; downline load

Communications Processors

SUPPLIER AND MODEL	NCR Comten 3650	NCR Comten 3670	NCR Comten 3670 Model 85	NCR Comten 3690 Models A5-E5
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom	IBM S/370, 30XX, 308X 43XX, and compatibles; custom	IBM S/370, 30XX, 308X, 43XX, and compatibles	IBM S/370, 30XX, 308X, 43XX, and compatibles; custom
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	4	2	8
Max. no. of active hosts supported simultaneously	2	4	2	8
IBM emulation	270X, 370X, ACF/NCP	270X, 370X, ACF/NCP	270/370X, NCP, ACF/NLP	270X/370X, ACF/NCP
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Unlimited
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	No	No	No	No
Network architecture compliance	SNA/CNA	SNA/CNA	SNA, CNA	SNA/CNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	384	128	512
2000 to 9600 bps	128	384	128	512
Over 9600 bps	32 to 128	96 to 284	16 to 128	128 to 512
Highest line speed supported (bps)	230.4K	230.4K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Proprietary
Main memory word size, bits	32	32	32	32
Main memory storage capacity, bytes	512K	512K	512K	4M
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Byte or block	Byte or block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	DMA
Mass storage	DMA	DMA	DMA	DMA
Other peripherals	DMA	DMA	—	DMA
I/O, back-up, and diagnostic peripherals supported	Diskette, cassette	Cassette	—	Diskette
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Combination of software and firmware
IPL method	See comments	See comments	See comments	See comments
Additional software supported	NDP, CLSS1, Codel 58	NDP, CLSS1, Codel 58	Comten NDP, Codel S8, and CL SS1	NDP, CLSS1, Codel 58
User programmability	Yes, via user-sel. par. & user programs	Yes, via user-sel. par. & user programs	Yes, via user-selected parameters	Yes, via user-sel. par. & user programs
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	90,000	34,500	150,950
Monthly maintenance, $	199	270	290	737
Monthly lease/rental, $	1,500 (2 yr. lease)	3,000 (2 yr. lease)	1,260 (2 yr. lease)	4,580 (2-yr. lease)
Maximum practical configuration:				
Purchase price, $	125,000	350,000	52,000	550,000
Monthly maintenance, $	631	2,000	550	3,365
Monthly lease/rental, $	4,150 (2 yr. lease)	11,600 (2 yr. lease)	2,000 (2 yr. lease)	18,000 (2 yr. lease)
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	March 1975	March 1972	1982	June 1978
Number of systems installed to date	1,425	400	—	700
Serviced by	NCR Comten	NCR Comten	NCR Comten	NCR Comten
COMMENTS	Manual load from diskette and download from host	Manual load from diskette and download from host	Manual load from diskette and download from host	Manual load from diskette and download from host

Communications Processors

SUPPLIER AND MODEL	NCR Comten 3690 Models T1-U1	NCR Comten 721-II	North American Philips Communications System Division MARC	Paradyne Pix/Pixnet
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 308X, 43XX, and compatibles	NCR Century, Criterion, 8XX5 Systems	IBM S/370 and compatibles; Philips DS714	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes; see comments
Max. no. of hosts channel-attachable to front-end	2	2	Unlimited	1
Max. no. of active hosts supported simultaneously	2	2	Unlimited	Multiple
IBM emulation	270X, 370X, ACF/NCP	No	270X, 370X	—
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Multiple
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	Yes	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network architecture compliance	SNA/CNA	CNA	Upon request	—
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	99	Configuration-dependent	—
2000 to 9600 bps	128	52-99	Configuration-dependent	Application-dependent
Over 9600 bps	32 to 128	10 at 56K	Configuration-dependent	3 full duplex
Highest line speed supported (bps)	230.4K	56K	19.2K	56K
Effect on line capacity, if all lines are full-duplex	None	None	Configuration-dependent	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	Yes	Yes
Protocol conversion	Yes	No	Yes, domestic, int'l.	—
Code conversion	Yes	No	ASCII/EBCDIC	—
Error control	Yes	Yes	CRC	Yes
Automatic transmission speed detection	110 to 9600 bps	No	110 to 9600	Yes
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	—
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Z80B 8-b., Philips 16-b.	Proprietary
Main memory word size, bits	32	16	8 or 16	16
Main memory storage capacity, bytes	1M	512K	64K or more	128K
Level of data unit transferred across I/O channel	Byte, block, or file	Byte and block	Byte or block	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA and interrupt	DMA and interrupt
Mass storage	DMA	—	DMA and interrupt	—
Other peripherals	DMA	DMA	DMA and interrupt	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette	Cassette	CRT, printer, disk drive, mag. tape	Mag. tape, console
Support for remote console	Yes	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software or firmware	Software	Combination of software and firmware	Combination software, firmware, hardware
IPL method	Load from host/disk	Load from cassette	Internal selfload	Intern. self-load, man.
Additional software supported	NDP, CLSS2, Codel 58	No	No	Utilities
User programmability	Yes, via user-created programs	No	Yes, via user-created programs	—
Software separately priced	All	All	No	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	95%	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	88,425	41,720	30,000 (inc. software)	Contact vendor
Monthly maintenance, $	419	209	—	—
Monthly lease/rental, $	2,327 (2-yr.lease)	1,205	Configuration-dependent	—
Maximum practical configuration:				
Purchase price, $	108,500	100,400	200,000	—
Monthly maintenance, $	518	502	—	—
Monthly lease/rental, $	2,935 (2-yr. lease)	3,500	Configuration-dependent	—
Is maintenance bundled with lease/rental?	No	Yes	No	—
Date of first delivery	January 1980	1976	January 1980	April 1976
Number of systems installed to date	100	Approx. 1,200	125	Over 3,500
Serviced by	NCR Comten	NCR Comten	M. V. Philips	Paradyne
COMMENTS			Modular, microprocessor-based distributed processing system including standard operating system hardware & application packages	Pix/Pixnet permits remote peripherals and CRTs to access multiple IBM hosts as locally attached devices without remote TP software

Communications Processors

SUPPLIER AND MODEL	Periphonics Datapac	Periphonics T-Comm 80	Periphonics Telemarketer	Periphonics Voicepac
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM, DEC, Burroughs, NCR, HP, Sperry, Tandem minis, most major vend.	Most major vendors	3780/3270	Same as Datapac
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes, dstrb. app. proc.	Yes
Max. no. of hosts channel-attachable to front-end	3	12 per processor	—	3
Max. no. of active hosts supported simultaneously	3	12 per processor	—	3
IBM emulation	Most std. interfaces	370X, 3803, 3272, 2848	—	Most std. interfaces
Remote line concentrator	Yes	Yes	—	Yes
Maximum no. of hosts served by one concentrator	3	7	—	3
Host-independent network processor	Optional	Yes	Yes	No
Store-and-forward message switching processor	No	Yes	Electronic orders	No
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	SNA	SNA	—	SNA
Communications line capacity: No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	78	520	16	78
2000 to 9600 bps	78	520	16	78
Over 9600 bps	78	520	16	78
Highest line speed supported (bps)	9600	56K	9.6K	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Yes	Yes, any supported	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	All industry stds.	Yes, all industry std.	Industry standards	All industry standards
Automatic transmission speed detection	With specified modems	With specified modems	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	If selected	Yes
SYSTEM CHARACTERISTICS				
Processor	LSI 11/23, PDP 11s	DEC PDP-11, LSI-11 mod.	LSI 11/23	LSI 11/23, PDP 11s
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	128KB-1M w/Peripacs	64K to 5M	256KB—1MB w/Peripacs	64-256KB w/Peripacs
Level of data unit transferred across I/O channel	Byte or block	Byte or block	Internal 2 bytes	Same as Datapac
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	Both	DMA and interrupt	DMA	Both
Other peripherals	Both	DMA and interrupt	DMA & interrupt	Both
I/O, back-up, and diagnostic peripherals supported	Yes	CRT, printer, mag. tape	—	Yes
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Proprietary software	Proprietary	EZOS (UNIX based)	Proprietary software
IPL method	Download or diskette	From host or diskette	Hard disk	Download or disk load
Additional software supported	I/O Gen, Param, (Network Definition Util.)	Network Definition Utility, Voice Dialog Utility	Network Definition Utility, Voice Dialog Utility	I/O Gen, Pave, Param
User programmability	Yes, with user selected parameters	Yes, via user-selected parameters, programs	Yes, via user-selected parameters, programs	Yes, voice dialogues & basic edit functions
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	75%	80%	None	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	50,000	60,000	25,000
Monthly maintenance, $	Approx 250 minimum	Approx. 500	Approx. 1%	250 min., variable
Monthly lease/rental, $	Variable w/curr. market	Variable with current market	Variable w/curr. mkt.	Variable w/curr. mkt.
Maximum practical configuration:				
Purchase price, $	120,000	1,000,000	To 180,000 approx.	170,000
Monthly maintenance, $	250 minimum	10,000 (approx. 1%)	Approx. 1%	250 min. variable
Monthly lease/rental, $	Variable w/curr. market	Variable with current market	Variable w/curr. mkt.	Variable w/curr. mkt.
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1983	1978	1983	1981
Number of systems installed to date	—	Information not avail.	—	—
Serviced by	Periphonics	Periphonics Corporation	Periphonics	Periphonics
COMMENTS	The Datapac is a solid state unit that can concentrate, convert protocol & code, serve as a network node, and provide fully integrated services	Data/voice on same line, voice response system, network interface, nodal, solid state audio, integrated services		Handles data and voice interchangeably via a single I/O port; can concentrate, convert protocol & code, and serve as a network node

Communications Processors

SUPPLIER AND MODEL	Raytheon Data Systems Raynet I, II, III	Raytheon Data Systems Raynet IV	Sperry DCP/20	Sperry DCP/40 (Primary Mode)
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM, Sperry mainframes and compatibles	IBM, Sperry mainframes and compatibles	Sperry Series 1100, Series 90	Sperry-Univac Series 1100, Series 90
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	16	16	4	16
Max. no. of active hosts supported simultaneously	Interface-dependent	Interface-dependent	3	16
IBM emulation	No	No	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	1(R-I); 8(R-II&R-III)	8	No specific limit	No specific limit
Host-independent network processor	Yes	Yes	Yes (init. host load)	Yes (init. host load)
Store-and-forward message switching processor	No	Yes	Custom	Custom
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	No	No
Network architecture compliance	Yes	Yes	DCA	DCA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	47	47	47 sync; 192 async.	255 sync; 1023 async.
2000 to 9600 bps	47	47	47	255
Over 9600 bps	Varies	Varies	47	140
Highest line speed supported (bps)	56K	56K	64K	64K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	Yes	Yes	Yes
Protocol conversion	Yes	Yes	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	No	No	Yes, 110 to 19.2 bps	Yes 110 to 19.2K bps
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	RDS-7500	RDS-7500	Sperry DCP/20	Sperry-Univac DCP/40
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	256K	256K	512K	3.5M
Level of data unit transferred across I/O channel	Block	Block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	DMA
Mass storage	DMA	DMA	DMA	DMA
Other peripherals	DMA and interrupt	DMA and interrupt	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Console, cassette, printer	Console, cassette, printer	Console, disk, disk., mag. tape	Console, disk, mag. tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Combination software and firmware	Combination software and firmware
IPL method	From host, cass., dsk.	Host download, cass.	Host download & disk.	Host download & disk.
Additional software supported	—	—	File transfer	File transfer
User programmability	Yes; via user-selected parameters	Yes; via user selected parameters	Yes, via user-created programs	Yes, via user created programs
Software separately priced	All	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	None	10%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	60,000	100,000	45,000	125,000
Monthly maintenance, $	—	—	230	625
Monthly lease/rental, $	—	—	925-5 yr./1,150-1 yr.	2500-5 yr./3200-1 yr.
Maximum practical configuration:				
Purchase price, $	700,000	40,000	135,000	480,000
Monthly maintenance, $	—	—	700	2,500
Monthly lease/rental, $	—	—	2,800-5 yr./ 3,500-1 yr.	10,000-5 yr/12,500-1
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	1978; 1980(R-II&R-III)	1980	January 1982	September 1979
Number of systems installed to date	Over 100	Under 10	25	500
Serviced by	Raytheon Data Systems	Raytheon Data Systems	Sperry	Sperry-Univac
COMMENTS	Raynet I sup. network control func., redundancy option; Raynet II prov. all Raynet I cap. plus host selec.; Raynet III prov. all Raynet II cap. plus protocol conversion	Raynet IV provides all Raynet III capabilities plus message switching		

Communications Processors

SUPPLIER AND MODEL	Starnet Data Systems, Protex Industries Inc. Starnet II	Tandem Non-Stop II	Telefile Computer Products FECP-X	Telefile Computer Products Telepac
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	All microcomputer vendors, most mini vendors	—	Xerox Sigma 5-9 and Telefile T80 Series	Standalone or Telefile T80 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	16	4	6	8
Max. no. of active hosts supported simultaneously	16	10 or more	3	8
IBM emulation	3271, 3274, 3276	Model 7	None	None
Remote line concentrator	Yes, with the Starbus	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	16	10 or more	Network-dependent	12
Host-independent network processor	Yes	Yes	No	Yes
Store-and-forward message switching processor	No	Yes	Yes	Yes
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	No
Network architecture compliance	—	SNA	None	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	—	1000	256	280
2000 to 9600 bps	16	300 to 400	256	280
Over 9600 bps	2	50 to 100	—	280
Highest line speed supported (bps)	19.2K asyn, 56K bisyn.	Up to 80K	9600	19.2K bps
Effect on line capacity, if all lines are full-duplex	None	75% to 50% of capacity	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes, with Starbus	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Async to 3270 BSC	Any protocols	No	Async to 3270 BSC/SDLC
Code conversion	ASCII, EBCDIC, Baudot	ASCII/EBCDIC/Baudot	ASCII/EBCDIC	ASCII to EBCDIC
Error control	—	LRC and CRC	No	Parity, LRC and CRC
Automatic transmission speed detection	None	No	110 to 9600 bps	50 to 9600 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 8085	Proprietary	TCP-16	M68000
Main memory word size, bits	96K	16	16	16
Main memory storage capacity, bytes	—	8M per processor	128K	64K Bytes MOS RAM
Level of data unit transferred across I/O channel	Byte	Block	Byte	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt-poll	DMA	DMA and interrupt	DMA and interrupt
Mass storage	DMA	DMA	—	DMA and interrupt
Other peripherals	Interrupt-poll	DMA	—	DMA and interrupt
I/O, back-up, and diagnostic peripherals supported	—	Disk, mag. tape, & console	—	FEP console, disk, diskette, mag tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Combination of software and firmware	Combination of software and firmware	Combination of software & firmware
IPL method	Internal self-load	Manual-load from disk	Download from host	Int. selfload, dskt.
Additional software supported	None	Cobol, Fortran, Mumps computer, Database, TP monitors	—	Program dev. software, utilities
User programmability	Via user-selected parameters	Yes, via user-created programs	—	Yes, via user-selected parameters
Software separately priced	All	Yes	Special applications only	Special applications only
Approx. proportion of currently installed systems supplied as turnkey systems	All	10%	25%	80%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	5,800	200,000	35,000	30,000
Monthly maintenance, $	80/mo. service cont.	1,000	425	350
Monthly lease/rental, $	Third party	Third party	712 (3 yr. lease)	615/3 yrs.
Maximum practical configuration:				
Purchase price, $	19,500	1,000,000	600,000	95,000
Monthly maintenance, $	160/mo. service cont.	5,000	4,700	1,100
Monthly lease/rental, $	Third party	—	12,200 (3 yr. lease)	1,950 (3 yrs.)
Is maintenance bundled with lease/rental?	Yes	—	No	No
Date of first delivery	June 1981	1976	1976	October, 1980
Number of systems installed to date	15	3,000	10	17
Serviced by	Factory	Tandem	Telefile	Telefile
COMMENTS	Host-independent network node processor; supports multi-vendor interfaces, protocols, & code sets	Rendundant processing provides 100% "up time"	Hardware and software compatible with all Xerox and Telefile mainframes	Prov. mode for mult. CCITT X.25 pub. or priv. packet netwk.; Sup. all ASCII based hosts and terminals; interface to SNA/SDLC networks

Communications Processors

SUPPLIER AND MODEL	Thomas Engineering MZ-80	Thomas Engineering 8770/20	TRT Data Products Norfield Communications System 300	TRT Data Products Norfield Communications System 400
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM/370, 30XX, 43XX, Series 1; Honeywell—all models using VIP	IBM/370, 30XX, 43XX, Series 1; Honeywell—all models using VIP	Most major vendors	Most major vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	—	—	—	—
Max. no. of active hosts supported simultaneously	—	—	—	—
IBM emulation	—	—	—	—
Remote line concentrator	Yes	Yes	—	—
Maximum no. of hosts served by one concentrator	1	1	—	—
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	No	No	Yes	Yes
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	Yes
Network architecture compliance	SNA	No	Yes	Yes
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	32	32	64
2000 to 9600 bps	32	32	8	16
Over 9600 bps	32	32	—	12
Highest line speed supported (bps)	19.2K bps	19.2K bps	9600	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	70%	70%
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	Yes	No	No
Terminal-initiated applications switching	Yes	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	No	No	No	No
Protocol conversion	Async/BSC/VIP/SDLC	Async/BSC; async/VIP	Yes	Yes
Code conversion	ASCII/EBCDIC	ASCII/EBCDIC	Yes	Yes
Error control	Parity, LRC and CRC	Parity, LRC and CRC	Yes	Yes
Automatic transmission speed detection	50 to 200 bps	50 to 200 bps	No	Yes
Automatic disconnect of inactive dial-up terminals	Optional	Optional	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Zilog Z80B	Zilog Z80A	Data General 4X	Data General 4X
Main memory word size, bits	8	8	16	16
Main memory storage capacity, bytes	1M	90K	64K	256K
Level of data unit transferred across I/O channel	Byte and block	Byte and block	—	—
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	—	—
Mass storage	DMA and interrupt	Interrupt	—	—
Other peripherals	Interrupt	—	—	—
I/O, back-up, and diagnostic peripherals supported	—	—	—	—
Support for remote console	—	—	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of firmware/software	Software	Software	Software
IPL method	Cassette/diskette/ROM	Load from diskette	Manual-loading disk.	Manual loading disk.
Additional software supported	Program development system; CP/M—compatible packages	Program development system; CP/M—compatible packages	—	—
User programmability	Yes, via user-created programs	Yes, via user-created programs	No	No
Software separately priced	All	All	—	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	95%	75%	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	4,620 for 4 lines	6,454 for 4 lines	65,000	75,000
Monthly maintenance, $	Third party	Third party	500	600
Monthly lease/rental, $	Third party	Third party	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	12,885-32 lns.,2 dsk.	13,230-32 lines, 2 dsk	100,000	300,000
Monthly maintenance, $	Third party	Third party	1,000	2,000
Monthly lease/rental, $	Third party	Third party	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	—	—	No	No
Date of first delivery	December 1981	November 1978	1975	1978
Number of systems installed to date	150	260	35	20
Serviced by	General Electric	General Electric	Norfield	Norfield
COMMENTS	Sys. prov. emul. of IBM 3277/78 Honeywell VIP 7700 term. using ASCII CRTs, also "pass-thr." supp. of printer & other devices; line speeds indepen. set any comb.	Sys. prov. emul. of IBM 3277 & Honeywell VIP 7700 term. using ASCII CRTs, also sup. of printers & other dev.; line speeds are independently set, in any combination	Custom systems available	Custom systems available

Communications Processors

SUPPLIER AND MODEL	TRT Data Products Norfield Communications System 500	Westinghouse Canada Electronic Systems Division W1655/1656		
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	IBM PARS, Sperry Uniscope 100 & UTS20		
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No		
Max. no. of hosts channel-attachable to front-end	—	—		
Max. no. of active hosts supported simultaneously	—	—		
IBM emulation	—	—		
Remote line concentrator	—	Yes		
Maximum no. of hosts served by one concentrator	—	4		
Host-independent network processor	Yes	No		
Store-and-forward message switching processor	Yes	Yes		
Distributed processing node	Yes	No		
Terminal controller	Yes	Yes		
Network architecture compliance	Yes	—		
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	512	16		
2000 to 9600 bps	32	16 at 4800; 8 at 9600		
Over 9600 bps	24	—		
Highest line speed supported (bps)	56K	19.2K		
Effect on line capacity, if all lines are full-duplex	70%	Capacity reduced		
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing	Yes	No		
Terminal-initiated applications switching	Yes	No		
Comm. processor-initiated dynamic line reconfig.	Yes	No		
Protocol conversion	Yes	U100/P1024		
Code conversion	Yes	IPARS/P1024		
Error control	Yes	Yes		
Automatic transmission speed detection	Yes	No		
Automatic disconnect of inactive dial-up terminals	Yes	No		
SYSTEM CHARACTERISTICS				
Processor	Perkin-Elmer 3230	Intel 8085 (dual)		
Main memory word size, bits	32	8		
Main memory storage capacity, bytes	4M	32K		
Level of data unit transferred across I/O channel	—	Block		
Type of data transfer supported between memory and:				
Communications lines	—	Interrupt		
Mass storage	—	DMA and interrupt		
Other peripherals	—	Interrupt		
I/O, back-up, and diagnostic peripherals supported	—	Yes		
Support for remote console	Yes	Yes		
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Firmware		
IPL method	Manual loading disk.	Download, EPROMs		
Additional software supported	—	—		
User programmability	No	No		
Software separately priced	—	Specials		
Approx. proportion of currently installed systems supplied as turnkey systems	None	25%		
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	250,000	12,000		
Monthly maintenance, $	500	—		
Monthly lease/rental, $	Contact vendor	Third party		
Maximum practical configuration:				
Purchase price, $	1,000,000	20,000		
Monthly maintenance, $	3,000	—		
Monthly lease/rental, $	Contact vendor	Third party		
Is maintenance bundled with lease/rental?	No	No		
Date of first delivery	1982	September 1976		
Number of systems installed to date	0	300		
Serviced by	Norfield	Third party		
COMMENTS	Custom systems available	Remote line polling		

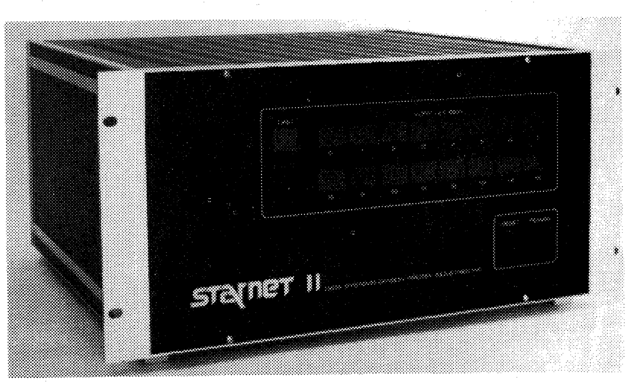
Communications Processors— Management Perspective and Equipment Specifications

A communications processor, is a digital computer that has been specifically programmed to perform one or more control and/or processing functions in a data communications network.

Communications processors do not represent a new product concept. During the computer industry's second generation, in the early 1960s, such processors were offered by several of the major mainframe suppliers. In almost all such early uses, the systems were used primarily in message switching applications, acting simply as a message router and dispatcher in a data communications network. Pioneers included Control Data's 8090/8050, General Electric's DATANET-30, and IBM's 7740. Also, as early as March 1963, Collins Radio Company (now Rockwell-Collins) delivered its first Collins Data Control programmable communications system.

What *is* new is a continually strengthening trend towards providing multi-functional products. Like the computer industry as a whole, communications processor vendors are capitalizing on improved technology and delivering highly flexible but cost-effective products based on the latest microprocessor, memory, and other high-tech components. Processors functioning as communications line multiplexers, host independents, concentrators, protocol converters, switches, terminal controllers and/or distributed processing nodes are starting to flourish as communication processor multifunctionality becomes increasingly common.

This trend continues to take its toll—by attrition or consolidation—among traditional front-end processor vendors. For example, in 1982, Rockwell-Collins discontinued marketing their front-end processors. NCR and its Comten subsidiary have recently consolidated their operations, with all products now headquartered at the NCR Comten facility in St. Paul, Minnesota. Burroughs Corporation has retrenched itself by acquiring Systems Research, Inc., a small but innovative independent specializing in Burroughs-oriented communications systems, and making it a wholly-owned subsidiary. Similarly, Amdahl acquired TRAN Telecommunications.



The Starnet II from Starnet Data Systems is one of an emerging breed of new communications processor products. Introduced in February of 1982, it acts as a host-independent processor, protocol converter, and switching device.

Front-end processing continues to be the main staple of the communications processor market, but increased activity is generated from non-front-end processing products. Communication processors serving as multiplexers, concentrators, protocol and code converters, terminal controllers, distributed processing nodes, and/or processors independent of a host are becoming more prevalent. The comparison chart section of this report outlines the major characteristics of some 71 products offered by 39 different vendors. We have also reported on the experience of 553 users representing 3,270 installed communications processor systems.

Despite any setbacks that have occurred, most analysts predict a healthy growth rate of about 20 percent per year through 1985. Most mainframe vendors have continued to enhance their existing communications processor product lines, and several relatively new lines are available such as Burroughs' CP Series, Sperry Univac's DCP/40, and Amdahl's 4705. Rumors of IBM's replacement of its 3705 have become stronger in recent months, and several industry observers have speculated that its introduction could take place before the end of 1982. Users can now choose from a wide variety of communications systems that support increasingly sophisticated front-end processing, intelligent remote concentration, network processing, and other communications processing capabilities.

Developmental Factors

Several major developments have led to the dramatic increase in the use of communications processors, and to their continual development into machines with progressively higher capacity, capability, and compatibility.

The first major development was recognizing that the data communications functions must be segregated from other data processing functions. This resulted in modular communications software packages and communications interfaces that permit alteration of the communications environment without major surgery to the hardware and software. It also permits the organization of communications processing functions, relative to other processing functions, along assembly-line principles. The assembly-line technique segments a job into discrete elements for exclusive execution by specialized persons or equipment; the assembly-line total output significantly exceeds the output of the same persons or equipment with each performing the total job. The development of specialized components to perform essential line handling functions resulted in the front-end processor, which freed the host processor of this time consuming task. A front-end/host configuration is able to handle a significantly greater data volume than a single processor with equivalent power that performs both the line handling and the data processing function.

The second major development was the introduction of the microprocessor. Now a standard item utilized in all types of electronic componentry, the microprocessor permits implementation of sophisticated processing functions at increasingly low cost. Complex communications processing tasks once handled by special-purpose hard-wired controllers are now accomplished by inexpensive microcomputers that, when properly designed and programmed, are no more complicated to deal with than disk drives. And the fact that the costs of transmission facilities continue to increase rather than decrease justifies placement of communications processing equipment not only at the host site, but throughout the data communications network.

Technical innovations in the use of microprocessors continues to improve price/performance of new communications processors being introduced on today's market. For example, throughput capabilities are enhanced by using multiple microprocessors within the communications processor to perform specialized functions. Altering the microcode or stored logic (either directly by the user or indirectly by such features as IBM's Extended Facilities) has added a new dimension to throughput improvement techniques. Multiport memory access has facilitated warm-start back-up systems. Virtual operating systems are taken for granted and full-capability data base management systems are being given serious consideration by installations previously reluctant to accept the associated CPU overhead.

Intimately tied to the evolution of intelligence for *communications* processing equipment, is the parallel development of intelligence for remote *data* processing equipment. The assembly-line concept can be extended to all segments of a network, in which many small systems perform specific, specialized communications *and* data processing tasks independently of the host computer. This decentralized or distributed data processing has given rise to a new type of data processing module: the small processor or minicomputer which performs both data and communications processing. Honeywell's DPS/6 and Sperry Univac's V77 family of minicomputers are two examples of processors which can serve either as stand-alone processors, or as distributed systems which offer significant communications control capabilities.

A third, and often overlooked, influence on the development of communications processors is the effort on the part of most vendors towards standardization, particularly for lower-level activities, such as physical interfacing and connection establishment, maintenance, and release functions. This on-going effort, along with hardware architectural improvements, is reducing the investment, inventory, and software support necessary to support a variety of different terminal and line disciplines, which are different for few justifiable reasons. Standardization, in addition to reducing costs to existing users, will continually increase the user base that can economically justify the use of electronic communications in their operations.

For higher level functions, most of the large mainframe and minicomputer manufacturers have codified their own communications standards by setting down a set of rules, or "network architecture," that governs how its software and hardware products can be used to create a network structure. IBM's Systems Network Architecture, DEC's DECnet, Sperry Univac's Distributed Communications Architecture, and Honeywell's Distributed Systems Environment are examples of such architectures.

Although not compatible with one another, most of these architectures generally follow the recommendations of the European-based International Standards Organization (ISO), which has suggested a reference model for network architectures called Open Systems Interconnection (OSI).

Among the standards recognized by OSI are ISO's HDLC link-level protocol and the CCITT X.25 packet-switching interface. Minor variations of the international HDLC or IBM's version of HDLC, which is called SDLC, are now supported by many suppliers of communications equipment. Moreover, in the past year, many vendors have announced CCITT packet-level X.25 support in the United States. The X.25 capability permits interconnection of equipment via private (dedicated) or public packet-switching networks. Several public packet-switching networks are now or will soon be operational in the U.S., including Tymnet, Telenet, Uninet, Autonet, and Compunet. An X.25 package offered with a communications processor product is generally certified as compatible with one or more of these public data networks.

The direction of the communications processor market is directly affected by the development of these and similar standards, since the communications processor is a primary vehicle for their implementation. As the trend towards standardization progresses, the market for communications processors should continue to strengthen.

Communications Processor Components

The essential components of every communications processing system are the following:

1. *Processor.* The processor element is a stored-program digital computer of almost any size. It must have its own main memory, but it may or may not use on-line peripheral devices. The processors should have excellent interrupt and/or direct memory access (DMA) handling and strong bit manipulation capabilities.

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2. *Central processor interface.* When acting as a front-end, the communications processor must include the proper hardware interface to permit it to connect directly to a standard input/output channel of the central processing unit (or host computer). Such an interface should permit the host computer to communicate with the front-end processor as if it were a standard peripheral device control unit, requiring little, if any, operating system software modification. When acting as a remote processor, support for data communications line interfacing that connects the processor with the host computer(s) must be provided.

3. *Communications multiplexer.* This component provides a logically independent data channel into the communications processor's main memory for every transmission line being served. The multiplexer serves as the communications processor's functional interface with the data transmission lines. Control of incoming and outgoing data is coordinated between the multiplexer and the processor via interrupts or direct memory access (DMA).

4. *Line interface units.* These components are hard-wired devices that link the multiplexer with the modems that terminate each communications line. Like the modems, the line interface units are specifically tailored to serve the speed transmission characteristics of the lines they terminate. The lines are, in turn, generally selected according to the transmission requirements of the remote terminal devices.

5. *Software/firmware.* The communications processing hardware components become an integrated, functioning system only through the inclusion of stored-program logic (either firmware or software)—some generalized, and some highly specialized. The programs should include terminal control, line control, message control, and central system interface procedures. Depending on the supplier, the user may have to provide some portion of the software required to implement specific requirements.

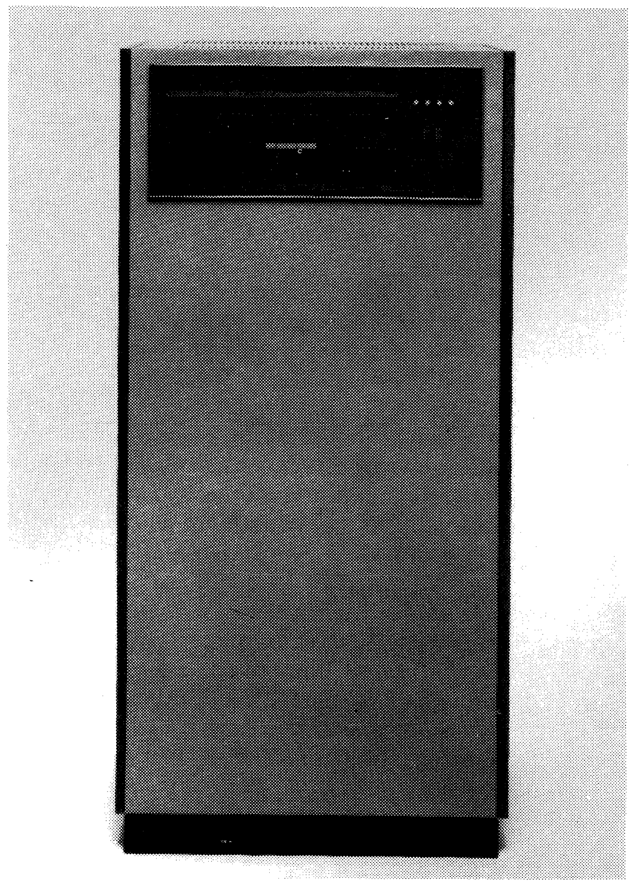
Communications Processor Functions

Because a communications processor is essentially a computer, it can be programmed to perform an almost limitless variety of functions. But in its role as controller of a data communications network, the specific functions generally programmed are those that relate to data and message control. The following functions are the most important ones offered with the more comprehensive communications processing systems. Some systems will not provide all these functions, as all are not required in specific installations.

1. *Line control.* This involves the periodic polling of terminals to determine readiness to transmit and receive data. Automatic call answering, acknowledgement, and dial-up can also be handled.

2. *Character and message assembly.* Bits are assembled (and disassembled) into parallel characters, and/or control characters are recognized to permit the assembly and disassembly of entire messages. Data can be handled at varying line speeds and in synchronous or asynchronous formats, with start-stop bits and synchronizing characters handled automatically.

3. *Code and protocol conversion.* The data transmission codes (such as Baudot, ASCII, etc.) and protocol-prescribed formats are converted into structures that are equivalent to the hosts native data code (such as EBCDIC) or conform to the formats of more efficient protocol procedures.



The Memorex 1270, depicted above, is a hard-wired communications controller, and as such, does not qualify as a true communications processor. However, since its announcement over a decade ago, the 1270 has proven so functional, so cost-effective, and so reliable that it significantly impacts the IBM 270X-emulation segment of today's communications processor market, and therefore deserves mention in this report.

4. *Data and message editing.* This is a general function that can include application-oriented reformatting, removal of spaces and zeros (and other kinds of data compression), and other data restructuring to permit more efficient data transmission and more efficient processing by the host computer.

5. *Error control.* Using both hardware and software techniques, the communications processor can detect and correct data transmission errors before they reach the host computer.

6. *Message buffering and queuing.* The communications processor can buffer several messages in its main memory before passing them to the host computer, with the intention of interrupting that computer as infrequently as possible. Also, if the host computer cannot process incoming messages as fast as they arrive into the system, the communications processor can queue these messages in its own auxiliary storage units, such as disks or magnetic tape units, and can transfer these messages to the host computer when processing time becomes available. Queue management can be arranged in several different ways, including a system of priorities.

7. *Message switching.* When the communications processor serves more than one host computer, it will analyze message headers and addresses and send each incoming message to the proper destination. This situation can occur when several computers share a data communications network while each remains dedicated to specific applications.

8. *Message answering.* Certain messages, such as simple inquiries, can be completely processed by the communications processor without any contact with the central data processing system. Since many communications processors permit attachment of on-line auxiliary storage units, these processors can store and access their own private data bases. Some systems also permit the communications processors to directly access the auxiliary storage subsystems and data files of the host computer.

9. *Message recording.* Vital inbound messages can be passed on to the host computer while being simultaneously recorded in the communications processor's auxiliary storage. Such message recording can assist in system restart operations in case the central system should malfunction and lose either its messages or the results of processing the messages. Also, it may be advisable in some systems to store a journal record of every message received during each processing period.

10. *Statistics recording.* The communications processor can keep a running record of all data communications traffic, including such statistics as total number of messages processed, number of messages delivered to each destination, number of line errors, average length of time in queue, number of busy signals, etc. These statistics can be dumped on demand or in the form of reports at the end of each processing cycle.

Other application-oriented functions can be programmed by the communications processor supplier, by the user, or by some combination of the two. It must be remembered, however, that the communications processor, like the host computer, has only a finite amount of processing power. The more functions that are added to it in order to relieve the host computer, the more likely it is to run out of power, especially in active, growing communications networks. A communications processor pushed beyond its capacity will result in lost messages and, ultimately, in system failure.

Advantages of Communications Processing

Communications processors are enjoying increased popularity in various parts of data communications systems because they are demonstrating themselves to be more and more effective on a price/performance basis. Factors that can contribute to this price/performance edge include the following:

1. *Flexibility.* Communications processors are designed to handle many line speeds and transmission characteristics in uniform or interchangeable circuitry and to support a wide variety of remote terminals from the mainframe and independent suppliers, regardless of their transmission speeds, line control conventions, synchronization techniques, and data codes. And since they can be modified at any time and at comparatively low cost by user or vendor, they are eminently well suited to handling key roles in data communications systems, which are typically characterized by bewildering variety and constant change. As advances in communication line facilities are made by the common carriers, and also by the independent companies, making available new, faster, and lower-cost transmission services, the advantages of this flexibility become eminently important in guarding against system obsolescence.

2. *Expandability.* Communications processors permit relatively easy growth of the data communications network, principally by adding line interface units and modifying the control programs.

3. *Distribution of labor.* Since these processors can be programmed to perform varying amounts of productive processing, often in conjunction with their own on-line peripheral devices, they can share portions of the overall processing load with other processors in the system—including the central processor. Peak loads can be more effectively handled and critical bottlenecks more likely avoided. In the case of a front-end processor, controlling the entire data communications subsystem will relieve the system's central processing unit on two counts: processing time and main memory space. Central control of data communications networks can consume 40 to 50 percent of the available

processing time in typical situations. And the resident software control routines can easily consume in excess of 50K bytes and frequently use up to 300K bytes or more of main memory space, depending on the functions performed. Efficient utilization of communications processors can provide almost full relief in both processing time and memory space overheads. (If the host processor is not overburdened, the need for a programmable unit may be harder to justify.)

4. *Fail-soft capability.* In data communications systems that include at least one other computer, programmable communications processors can provide some form of continued system operation when one or more of the other computers become inoperative. The degree and effectiveness of this fail-soft capability depend not only on the capabilities of the processor, but also, perhaps more importantly, on the skill displayed by the system architect in making provisions for redundant components and fall-back procedures.

5. *Independent processing.* When communications processors are not involved in their principal data communications tasks, they can often be used as stand-alone data processing systems—provided, of course, that their configuration includes some peripheral input/output devices. Simple media conversion tasks, such as card-to-tape and tape-to-print, can be valuable by-products from these otherwise communications-oriented processors, and localized time-sharing can yield added benefits. In off-line mode, the processor can also be adapted to serve specialized I/O devices, such as plotters and OCR devices, that the central system may not be able to handle.

Potential Problems

Communications processors deserve careful investigation because of the vast variety of equipment currently available. Such investigations should include as many probing questions as possible, because there are potentially serious pitfalls to be avoided.

One potential problem is the question of overloading the communications processor, with the resultant loss of data. Sophisticated data and message control programs will consume large quantities of the communications processor's computing and memory facilities, just as they do in a centrally-based communications system. A tendency toward overloading can easily negate any apparent advantages of expandability and growth potential.

Another serious question is that of software. The body of software required for terminal control, line control, and message control activities, not to mention application-oriented pre-processing, is unquestionably complex. It is also vital to the operation of these systems. The prospective user must determine whether or not the supplier is capable of supplying this software, at what level of completeness, with what assurance of bug-free stability, with what chances of interfacing smoothly with the central system software, and with how much installation assistance. Obviously, if the software doesn't work properly, the system is of little value. From another point of view, a system whose software works but performs very few and very basic functions may be inadequate for present or future needs.

Another consideration is that some communications processor hardware/software combinations may require far more time and effort to install and make operational than others, especially when the supplier of the communications processor equipment is different from that of the host computer system. Apart from the traditional problems (real or imagined) of divided vendor responsibility, there exists the very real problem of integrating two completely different sets of hardware and software.

A currently operational data communications installation which is considering replacing hard-wired communications controller(s) with a more sophisticated communications processor must carefully evaluate the problems of conversion. Beyond the usual problems of data integrity and the logistics of arranging the conversion process, the user may also be faced with the prospect of modifying either the central system control software or the body of application programs that use the communications network.

Evaluating a communications processing system on a cost/value basis is extremely complex and can be almost meaningless when performed in the abstract. Costs will vary with the size and diversity of the network being controlled, with the size and processing power of the communications processor, with the number of control and preprocessing functions incorporated (software is expensive, whether hidden in a "bundled" system price or not), and with the number of on-line peripheral devices.

Adding functions that will permit use of "foreign" terminals, relieve the central processor of intolerable overheads, and allowing independent and back-up processing may increase the costs but will also increase the value. In order to evaluate the cost of the communications processor in terms of the potential cost savings throughout the system, an effort must be made to associate specific dollar figures with the expected values to be derived from one data communications system versus another. In summary, it should be clear that costs and values of communications processing can be assessed only in terms of specific situations and specific systems.

Sources of Supply

One of the most interesting aspects of the story on communications processors is that computer users can now obtain them from literally dozens of vendors, with differing product implications depending on the source selected.

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Designers of the data communications system will probably first contact the supplier of their present or planned mainframe computer to investigate its offerings in the area of data communications. If communications processors are strongly promoted as the best (sometimes only) way in which to construct efficient, fully supported systems, the designers will usually go along with the recommendations of the mainframe supplier. The designers are comforted by the belief that their data communications subsystem will be fully supported and will interface efficiently with the central processing system. It is in this regard that developments such as IBM's SNA and DEC's DECnet increase in importance to systems designers.

But not all mainframe suppliers are equally advanced in their data communications product line, and not all offer a selection of communications processors supported with product-line software. Users not fully satisfied with the offerings of their mainframe supplier can investigate the wares of other promising suppliers, most of whom offer assurances that their communications processors can be "plug-compatible" with either the hard-wired or programmable communications controllers of the mainframe supplier, or at least with its data communications hardware and software interfaces.

The minicomputer manufacturers constitute one prominent group of suppliers who are actively pursuing the communications processor market with products that can either stand alone or interface smoothly with the mainframe equipment of other suppliers. Almost any currently marketed minicomputer is capable of serving as the fundamental building block of a communications processor, and many include communications hardware and specialized software packages to permit them to serve effectively as complete communications processing products.

A major source of integrated communications processing products is the independent systems houses, especially those that specialize in data communications systems. Companies such as these will generally provide complete hardware/software packages, including communications and central computer interfaces. In many cases they will accept full responsibility for the design and implementation of the entire data communications system. Such independent companies are generally well qualified in producing effective data communications systems, but prospective buyers of such systems must still consider the effects on the total system of dividing responsibility between at least two principal suppliers (communications and central system) and assure themselves that the products and systems of the several involved suppliers will indeed interface properly and function harmoniously.

Regardless of which type of supplier is selected, the buyer should show partiality to those vendors who will not only guarantee turnkey installation of their equipment but will also provide plans for future growth. If the user is faced with the formidable task of interfacing and integrating a variety of impressive but highly dissimilar communications and processing equipment, the proposed system may never get past the design stage.

Buying Guidance

The communications processing products have not matured to the point where their descriptive terminology is in any way standardized or consistent. As a result, prospective buyers must make every effort to determine exactly what they will be getting and what they will not. The sales brochures and technical manuals are often not sufficiently informative (and sometimes downright misleading).

For example, there are at present two distinctly different kinds of front-end processors. The first and more basic variety is designed to simply replace the functions and services of the central system's hard-wired controller. It is meant to be a plug-compatible replacement, requiring few, if any, changes to the central system's communications control software or the user's application programs. It does not necessarily relieve the central system of any software control overheads, but simply provides a more flexible interface to the communications network for accommodation of additional and varied lines and terminals in the future.

The most prevalent examples of this type of front-end processor are the many available units designed to replace or "emulate" the IBM 2701 Data Adapter Unit and the IBM 2702 and 2703 Transmission Control Units. These front-end processors function with the IBM System/360 or System/370 computer systems through the standard IBM BTAM, QTAM, TCAM, and VTAM communications control software.

The second and more powerful variety of front-end processor is designed to replace not only the functions and services of the hard-wired controller, but also most or all of the data communications control functions normally performed by the central system's processing unit and resident software. This variety of front-end processor, by freeing the central processing unit for productive work, provides valuable advantages not only in data communications flexibility, but also in systems throughput.

It is possible that a user may want to install the basic kind of front-end processor initially and then gradually add functions to it to relieve the central processing unit's communications overheads. However, the user must make sure that the selected front-end processor has enough processing and memory capacity to permit the gradual build-up of substantial message control routines, and that the various responsibilities of both the vendor and the user are clearly assigned.

In the case of systems performing line concentration, network node, and remote processing tasks, an equally wide range of capabilities is represented by current product offerings.

Another buyer's tip is to look for the word "turnkey." Turnkey installation of communications processors usually means that the supplier takes on full responsibility for hardware, software, and interfaces required to essentially "plug in" the product. From a user's point of view, this approach is highly desirable, since it can save money, time, and aggravation. But the user must still determine what product with what promised functions is being offered on the turnkey basis. It may still be a somewhat limited product.

A low list price can be totally misleading, since it may include only the basic processor hardware and an associated communications multiplexer. The cost and effort of establishing the proper interfaces and writing the all-important software can be dropped squarely on the buyer, who may have been trapped by an attractive low-price bid.

Since software development is such a critical question, the buyer should determine early in the proceedings exactly what software is provided with the basic system and at the basic price. If certain software is lacking, such as specific remote terminal handlers or message queuing routines, then implementation and integration responsibilities should be clearly fixed, and with firm price quotations.

The smart buyer will also ask the competing bidders for clear statements of service and support after installation. Since data communications subsystems can be complex and demanding in any environment, it must be considered an extremely valuable system feature if the prospective supplier of the communications processor offers to assume full operating and service responsibility for the externally controlled communications network that is directed by his product.

When considering a communications processor from a source other than the supplier of the central computer equipment, the buyer should insist on receiving concrete performance data, drawn from installed systems, to substantiate the supplier's claims. The buyer should beware if the supplier refuses to back up his claims with actual case studies. As further evidence of proven performance, the buyer should personally contact as many previous users as possible, probing not only for their degree of satisfaction, but also for the extent to which the installed systems reflect his own intended system design and functional objectives. However, even in highly specialized reference accounts, meaningful information can be derived regarding the supplier's competence and willingness to help, and the basic reliability of the hardware/software package.

When the proposed supplier is a major mainframe manufacturer, the buyer will also want evidence of proven performance. This evidence should apply to the overall performance of the total, integrated data processing system, and not just the communications subsystem. When the mainframe supplier offers a choice of several levels of processing capability (as several now do), then the buyer will again want specific, tangible performance data to justify selection of one over the other. Of course, the mainframe supplier can forcibly persuade adoption of one model over the other, even without offering convincing performance data, by simply indicating that the newer product will receive all future support and that the former one will be essentially dropped from the product line.

User Experience

Datapro is proud to present the first edition of our Network Users Survey. The survey is based on results received from questionnaires mailed to a cross-section of *Data Communications* magazine subscribers.

The extensiveness of the survey serves to broaden considerably the scope of data communications user responses that has been presented by Datapro in the past, in terms of both the number of responses and the variety of vendors and equipment models represented. This in turn creates for our subscribers a more informative picture of networking equipment usage patterns, as well as a more comprehensive table of user ratings. The new survey takes the place of our traditional practice of including a separate survey questionnaire in each of five supplements to cover the following subjects: facilities, modems, communication processors, line multiplexers, and testing equipment.

Survey Methodology

A questionnaire was designed and produced by Datapro and mailed by *Data Communications* personnel in November 1981 to approximately 10,000 addresses selected at random from a cross-section of *Data Communications'* U.S. end-user subscriber base.

The questionnaire contained 37 questions, and was divided into six basic parts. In the first part, users were asked to provide information concerning the general characteristics of their data communications networks. In each of the remaining five parts, the users were asked to specify within a given category the types of data communications equipment and services being used in their networks, and to provide usage information and equipment ratings on each type. The five categories of equipment/services included: data communications facilities, modems, communications/network processors, line multiplexers, and testing equipment. The questionnaire allowed the user to rate up to two vendor/model types within each category of equipment (three vendor/model types for the Modem category and three vendors for the Facilities category). The results of each of these five parts will be shown only in the Datapro report on that particular equipment category. The results of the Communications Processors questions are shown in this report.

When Datapro received the returns, they were audited by our senior level editors. All forms were carefully examined for validity before being sent for tabulation. The *Data Communications* labels were used for initial validation and identification. Responses to specific questionnaire sections or individual questions were disqualified

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TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS

Communication Processor Manufacturer and Model	Number of User Responses	Number of Units Installed	User Ratings*																			
			Overall Satisfaction					Ease of Installation					Throughput					Hardware Reliability				
			WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Action/Honeywell, all models	3	3	3.0	1	1	1	0	2.3	0	1	2	0	3.0	1	1	1	0	2.7	0	2	1	0
Amdahl 4705	5	8	3.4	2	3	0	0	3.2	2	2	1	0	3.6	3	2	0	0	3.4	2	3	0	0
Burroughs																						
SRI, all models	3	4	*	1	0	1	0	*	1	1	0	0	3.3	2	0	1	0	3.7	2	1	0	0
DCP	8	18	3.4	4	3	1	0	2.7	1	3	3	1	2.9	2	3	3	0	3.6	5	3	0	0
B874	5	7	3.0	1	3	1	0	3.4	2	3	0	0	3.2	2	2	1	0	3.4	3	1	1	0
Others & unspecified	13	33	3.4	5	8	0	0	2.9	3	6	4	0	3.3	6	5	2	0	3.0	2	9	2	0
Subtotals	29	62	3.3	11	14	3	0	2.9	7	13	7	1	3.2	12	10	7	0	3.3	12	14	3	0
CCI, all models	5	11	3.4	2	3	0	0	3.0	0	5	0	0	3.2	2	2	1	0	3.4	3	1	1	0
Control Data, all models	5	21	3.4	2	3	0	0	3.4	2	3	0	0	3.2	1	4	0	0	3.4	2	3	0	0
Codex 6000	10	223	3.4	6	2	2	0	3.2	4	4	2	0	3.4	6	2	2	0	3.4	4	6	0	0
Data General, all models	8	528	3.4	4	3	1	0	3.0	1	3	1	0	3.0	1	3	1	0	3.8	4	1	0	0
DCA, all models	5	14	2.4	0	2	3	0	1.4	0	0	2	1	2.4	1	0	4	0	2.8	0	4	1	0
DEC																						
PDP 11/34	4	17	3.5	2	2	0	0	2.8	1	1	2	0	2.8	1	1	2	0	3.3	2	1	1	0
PDP 11/40	3	12	3.3	1	2	0	0	3.0	1	1	1	0	2.3	0	1	2	0	3.0	1	1	1	0
PDP 11/70	5	7	3.6	4	0	1	0	3.6	3	2	0	0	3.0	1	3	1	0	3.4	3	1	1	0
Others & unspecified	8	71	3.1	1	7	0	0	3.0	1	5	1	0	3.4	3	4	0	0	3.0	1	6	1	0
Subtotals	20	107	3.4	8	11	1	0	3.1	6	9	4	0	3.0	5	9	5	0	3.2	7	9	4	0
GTE Telenet, all models	5	26	3.0	0	5	0	0	3.0	0	5	0	0	3.0	0	5	0	0	2.8	0	4	1	0
Harris, all models	3	11	3.7	2	1	0	0	3.7	2	1	0	0	3.0	0	3	0	0	3.3	2	0	1	0
Hewlett-Packard																						
3000	4	4	3.8	3	1	0	0	3.8	3	1	0	0	3.5	2	2	0	0	4.0	4	0	0	0
1000	6	15	3.3	3	2	1	0	3.5	3	3	0	0	3.3	2	4	0	0	3.3	3	2	1	0
Subtotals	10	19	3.5	6	3	1	0	3.6	6	4	0	0	3.4	4	6	0	0	3.6	7	2	1	0
Honeywell																						
Datanet 6661	3	16	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.7	2	1	0	0
355	4	20	2.8	1	2	0	1	2.3	0	2	1	1	2.3	0	2	1	1	2.8	1	2	0	1
6000	4	18	3.3	1	3	0	0	3.0	1	2	1	0	3.3	1	3	0	0	3.3	1	3	0	0
Level 6	3	24	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0
Other Datanets	13	43	3.1	1	12	0	0	2.8	1	9	3	0	2.9	2	8	3	0	2.9	1	10	2	0
Others & unspecified	7	364	3.0	1	5	1	0	2.7	1	4	1	1	2.7	1	3	3	0	2.4	0	3	4	0
Subtotals	34	485	3.1	7	25	1	1	2.9	5	21	6	2	2.9	6	20	7	1	2.9	6	21	6	1
IBM																						
3705	199	577	3.4	93	99	6	1	3.0	39	118	31	3	3.1	43	132	22	2	3.6	122	70	7	0
3704	30	35	3.1	6	22	2	0	2.7	2	17	9	1	2.9	6	16	6	2	3.2	9	19	2	0
Series/1	7	14	3.3	3	3	1	0	2.7	1	4	1	1	3.1	3	2	2	0	3.9	6	1	0	0
8100	3	8	3.7	2	1	0	0	3.7	2	1	0	0	3.0	0	3	0	0	3.3	1	2	0	0
S/34	3	3	2.7	0	2	1	0	3.3	1	2	0	0	2.3	0	2	0	1	3.0	1	1	1	0
Others & unspecified	5	21	3.4	2	3	0	0	3.5	2	2	0	0	3.3	1	3	0	0	3.5	2	2	0	0
Subtotals	247	658	3.4	106	130	10	1	3.0	47	144	41	5	3.1	53	158	30	5	3.5	141	95	10	0
Memorex 1270	20	40	3.3	8	10	2	0	3.1	6	8	5	0	3.2	6	12	2	0	3.4	9	10	1	0
Modcomp, all models	5	94	3.2	1	4	0	0	2.6	0	3	2	0	3.2	1	4	0	0	3.2	2	2	1	0
NCR																						
Comten 3650	15	27	3.3	6	8	1	0	2.9	5	4	5	1	3.5	7	8	0	0	3.4	8	6	0	1
Comten 3670	9	22	3.0	1	7	1	0	2.9	1	5	2	0	3.2	2	7	0	0	3.4	4	5	0	0
Comten 3690	24	94	3.3	7	16	1	0	3.0	6	11	6	0	3.5	11	13	0	0	3.2	6	16	2	0
621 and 721	3	7	3.0	0	3	0	0	2.7	0	2	1	0	3.3	1	2	0	0	2.7	0	2	1	0
Others & unspecified	11	24	2.9	1	9	0	1	2.8	2	7	0	2	3.0	2	6	2	0	2.9	3	5	2	1
Subtotals	62	174	3.2	15	43	3	1	2.9	14	29	14	3	3.3	23	36	2	0	3.2	21	34	5	2
Paradyne, all models	5	258	3.2	2	2	1	0	2.6	1	1	3	0	3.4	2	3	0	0	3.4	2	3	0	0
Periphonics TComm	4	11	3.0	0	4	0	0	2.3	0	2	1	1	3.3	1	3	0	0	3.5	2	2	0	0
Sperry Univac																						
V7x	11	254	3.1	2	8	1	0	2.7	0	9	1	1	2.7	2	4	5	0	3.1	2	8	1	0
Others & unspecified	10	13	2.7	1	7	0	2	2.3	1	3	4	2	2.4	1	5	1	3	2.9	2	6	1	1
Subtotals	21	267	2.9	3	15	1	2	2.5	1	12	5	3	2.6	3	9	6	3	3.0	4	14	2	1
Tandem, all models	6	17	3.2	1	5	0	0	3.3	2	4	0	0	3.0	1	4	1	0	3.2	1	5	0	0
All others	41	233	3.1	11	24	6	0	2.9	8	23	9	1	3.0	5	30	6	0	3.1	10	25	6	0
Grand Totals	553	3270	3.3	198	313	36	5	3.0	114	297	105	18	3.1	137	326	75	9	3.3	241	260	44	4

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighing the four ratings on a 4, 3, 2, 1 basis. The weighted average is considered invalid if fewer than three responses are received.

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TABLE 1. USERS' RATINGS OF COMMUNICATIONS PROCESSORS (Continued)

Communication Processor Manufacturer and Model	User Ratings* Promptness of Manufacturer's Maintenance					Quality of Manufacturer's Maintenance					Manufacturer's Software					Manufacturer's Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Action/Honeywell, all models	3.0	0	3	0	0	3.0	0	3	0	0	3.3	1	2	0	0	3.0	1	1	1	0
Amdahl 4705	3.8	4	1	0	0	3.8	4	1	0	0	*	0	1	1	0	3.2	2	2	1	0
Burroughs																				
SRI, all models	2.3	1	0	1	1	2.7	1	1	0	1	3.0	1	1	1	0	2.7	1	1	0	1
DCP	3.0	2	4	2	0	2.6	1	4	2	1	3.4	4	3	1	0	1.8	0	1	4	3
B874	2.8	1	3	0	1	3.0	1	3	1	0	3.0	2	1	2	0	2.6	0	4	0	1
Others & unspecified	2.9	4	6	1	2	2.9	2	7	4	0	3.4	7	4	2	0	2.6	2	6	3	2
Subtotals	2.9	8	13	4	4	2.8	5	15	7	2	3.3	14	9	6	0	2.4	3	12	7	7
CCI, all models	2.6	0	3	2	0	2.8	0	4	1	0	3.2	2	2	1	0	2.6	1	2	1	1
Control Data, all models	3.4	2	3	0	0	3.4	2	3	0	0	2.6	1	2	1	1	2.8	2	1	1	1
Codex 6000	3.1	4	3	3	0	3.3	4	5	1	0	3.1	5	1	4	0	3.1	2	7	1	0
Data General, all models	*	0	1	0	1	*	0	1	0	1	2.3	0	1	3	0	1.6	0	1	1	3
DCA, all models	1.8	0	0	4	1	1.5	0	0	2	2	2.6	0	3	2	0	2.0	1	0	2	2
DEC																				
PDP 11/34	2.8	0	3	1	0	2.8	0	3	1	0	2.7	0	2	1	0	2.7	0	2	1	0
PDP 11/40	2.0	0	1	1	1	2.3	0	1	2	0	*	0	1	1	0	2.0	0	1	0	1
PDP 11/70	3.0	2	1	2	0	2.8	2	1	1	1	2.4	1	2	0	2	2.2	0	1	4	0
Others & unspecified	3.0	0	8	0	0	3.0	1	6	1	0	2.6	2	3	1	2	2.4	0	4	3	1
Subtotals	2.8	2	13	4	1	2.8	3	11	5	1	2.6	3	8	3	4	2.3	0	8	8	2
GTE Telenet, all models	2.4	0	2	3	0	2.4	0	2	3	0	2.5	0	2	2	0	2.4	0	2	3	0
Harris, all models	3.3	2	0	1	0	3.3	2	0	1	0	3.0	0	3	0	0	3.0	1	1	1	0
Hewlett-Packard																				
3000	3.8	3	1	0	0	4.0	4	0	0	0	3.8	3	1	0	0	3.5	2	2	0	0
1000	3.0	2	3	0	1	3.2	2	3	1	0	3.0	2	2	2	0	2.7	1	3	1	1
Subtotals	3.3	5	4	0	1	3.5	6	3	1	0	3.3	5	3	2	0	3.0	3	5	1	1
Honeywell																				
Datanet 6661	3.7	2	1	0	0	3.7	2	1	0	0	3.0	0	3	0	0	3.3	1	2	0	0
355	2.8	1	2	0	1	2.5	0	3	0	1	2.5	0	3	0	1	2.5	1	1	1	1
6000	3.0	1	2	1	0	3.0	1	2	1	0	3.0	1	2	1	0	2.8	1	1	2	0
Level 6	3.3	1	2	0	0	2.3	0	1	2	0	*	0	0	2	0	*	0	1	1	0
Other Datanets	2.9	0	11	2	0	3.1	1	12	0	0	2.5	1	5	7	0	2.6	1	6	3	3
Other & unspecified	2.4	1	3	1	2	3.0	1	5	1	0	2.4	0	3	1	1	1.8	0	1	3	2
Subtotals	2.9	6	21	4	3	3.0	5	24	4	1	2.6	2	16	11	2	2.4	4	12	10	6
IBM																				
3705	3.4	92	95	12	0	3.4	84	99	15	0	2.9	36	119	37	6	3.0	45	108	41	4
3704	3.2	11	14	4	1	3.1	10	14	5	1	2.6	3	12	12	2	2.6	2	18	7	3
Series/1	3.3	4	1	2	0	3.4	3	4	0	0	1.5	0	0	3	3	2.0	0	1	5	1
8100	4.0	3	0	0	0	3.3	1	2	0	0	2.7	0	2	1	0	3.3	2	0	1	0
S/34	3.0	1	1	1	0	2.7	1	0	2	0	3.0	1	1	1	0	2.3	0	1	2	0
Others & unspecified	3.6	3	2	0	0	3.8	4	1	0	0	3.2	3	0	2	0	4.0	5	0	0	0
Subtotals	3.4	114	113	19	1	3.3	103	120	22	1	2.9	43	134	56	11	2.9	54	128	56	8
Memorex 1270	3.1	7	8	4	1	3.0	6	8	6	0	**	0	5	0	0	2.9	2	13	4	0
Modcomp, all models	*	0	0	1	0	*	0	0	1	0	*	0	0	0	0	1.7	0	1	0	2
NCR																				
Comten 3650	3.1	5	7	3	0	3.1	5	7	3	0	2.9	3	6	5	0	2.6	3	6	3	3
Comten 3670	2.9	1	6	2	0	2.8	1	6	1	1	2.8	0	8	0	1	2.6	1	4	3	1
Comten 3690	3.0	3	18	3	0	2.9	2	17	5	0	2.9	1	20	2	1	2.6	0	15	8	1
621 and 721	3.0	1	1	1	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	0	3	0	0
Others & unspecified	2.7	2	6	1	2	2.6	2	5	2	2	2.6	1	5	3	1	2.3	0	5	3	2
Subtotals	3.0	12	38	10	2	2.9	10	38	11	3	2.8	5	42	10	3	2.6	4	33	17	7
Paradyne, all models	2.2	1	1	1	2	2.8	1	2	2	0	3.0	1	3	1	0	3.0	2	1	2	0
Periphonics TComm	2.8	0	3	1	0	2.5	0	2	2	0	3.0	1	2	1	0	2.5	0	2	2	0
Sperry Univac																				
V7x	3.2	3	1	0	1	3.2	3	1	0	1	2.8	1	2	0	1	2.6	0	4	0	1
Others & unspecified	3.2	4	5	0	1	2.7	2	4	3	1	1.9	0	3	3	4	1.9	0	3	3	4
Subtotals	3.2	7	6	0	2	2.9	5	5	3	2	2.1	1	5	3	5	2.1	0	7	3	5
Tandem, all models	2.8	0	5	1	0	3.0	0	6	0	0	3.2	1	4	0	0	3.2	1	4	0	0
All others	2.7	6	17	14	2	2.7	7	14	13	3	2.7	6	16	14	2	2.5	5	16	11	6
Grand Totals	3.1	180	258	76	21	3.1	163	267	85	16	2.8	91	264	120	29	2.7	88	259	133	51

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighing the four ratings on a 4, 3, 2, 1 basis. The weighted average is considered invalid if fewer than three responses are received.
**Memorex 1270 Manufacturer's Software responses were judged invalid because the unit is not programmable.

whenever a vendor/model identity was omitted, user ratings were not assigned, a vested interest on the part of the respondent was judged to exist, or incomprehensible or unreasonable answers were given.

By the editorial cut-off of January 1, 1982, Datapro had processed 631 valid forms, which were then shipped to Mathematica Policy Research, Inc. for key entry and tabulation by computer. Summary information was prepared in the form of totals, percentages, or weighted averages, as appropriate for each question. Weighted averages were computed in a manner similar to most college grading systems: "Excellent" is weighted as 4, "Good" as 3, "Fair" as 2, and "Poor" as 1. The tallied numbers for each value were then multiplied by the corresponding weight, and the average taken by dividing the sum of the products by the total number of responses for that category.

Datapro suggests that the reader use the information presented with discretion. The individual equipment ratings are not presented to readers as the major consideration in making an acquisition decision. Rather, the ratings and other information should be used as guides to potential strengths and weaknesses that may call for further investigation in selecting the most suitable equipment for your needs.

The Results

The first part of the Network Survey consisted of ten questions that solicited information of the general characteristics of the users' networks. Taken together, the results provide a brief summary of the extent and complexity of these users' network configurations.

First, users were asked to indicate the number of sites that are linked by their networks, with the following results:

	Number of Responses	Percent of Responses
1 to 3 sites	139	23
4 to 10 sites	156	25
11 to 25 sites	93	15
26 to 50 sites	77	12
Over 50 sites	154	25
	619	100

These results present a fairly even spread of network sizes, with approximately half the users in the 1-to-10 site range, and the other half in the 10-and-over range. Note that no distinction is made here as to the type or intelligence of the devices located at any site.

The second question asked the number of computers participating as hosts. As you can see, nearly 60 percent of these users are operating in multiple-host environments:

	Number of Responses	Percent of Responses
1 host	245	41
2 to 4 hosts	274	45
5 to 10 hosts	46	8
Over 10 hosts	35	6
	600	100

This adds some degree of clarity to the responses to the Question 1, as well as developing a better picture of the level of sophistication of these users.

The users were also asked to indicate the number of end-user workstations (CRTs, teleprinters, etc.) that are in use on their networks:

	Number of Responses	Percent of Responses
1 to 10	53	9
11 to 25	67	11
26 to 100	147	25
101 to 500	185	31
Over 500	143	24
	595	100

When examined in conjunction with Questions 1 and 2, these results characterize the typical (median) respondent to the survey as having a network configuration consisting of approximately 10 to 20 sites, two or three hosts, and between 100 and 200 terminals (an average of 10 per site).

The users were requested to identify which vendors' systems are functioning as hosts. The following list summarizes their responses:

	Number of Responses	Percent of Responses
IBM	399	63
DEC	93	15
Burroughs	57	9
Amdahl	55	9
Honeywell	54	9
Univac	35	6
Control Data	24	4
National Advanced Systems	19	3
NCR	18	3
Magnuson	5	1
Other	102	16

As expected, IBM came out well ahead of all other vendors; however, DEC placed second with a surprisingly strong showing. Thirty-eight percent of the users are using more than one vendors' systems as hosts, indicating that the multiple-host environments represented in Question 2 are frequently multiple-vendor environments as well.

The same users were asked to identify which communications processor equipment they are using, with the following results:

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	Number of Responses	Percent of Responses
IBM	247	47
NCR	62	11
Honeywell	34	6
Burroughs	29	5
Sperry Univac	21	4
DEC	20	4
Memorex	20	4
Other	120	22

Apparently, at least 16 percent of all IBM mainframe users surveyed rely on non-IBM communications processor equipment. This may indicate that the IBM 3705 has reached its maturity. IBM customers are looking elsewhere for increased functions.

Communication processor users were then asked to specify what primary functions their equipment performed:

	Number of Responses	Percent of Responses
Front-end processor	343	54
Terminal controllers	137	22
Remote line concentrators	68	11
Message switching processors	45	7
Stand-alone network processors	44	7
Distributed processing node	38	6
Other	8	1

The total percent of responses is more than 100 because some users listed more than one primary function. These figures reflect the increased versatility communications processors now provide.

Another question asked the users to identify the overall network architecture with which their networks comply, with the following results:

	Number of Responses	Percent of Responses
IBM SNA	224	36
Digital DNA or DECnet	26	4
Burroughs BNA	19	3
Hewlett-Packard DSN	16	3
Honeywell DSE or DSA	14	2
Univac DCA	12	2
Other vendor-supported architecture	182	29
None or user-developed architecture	160	25

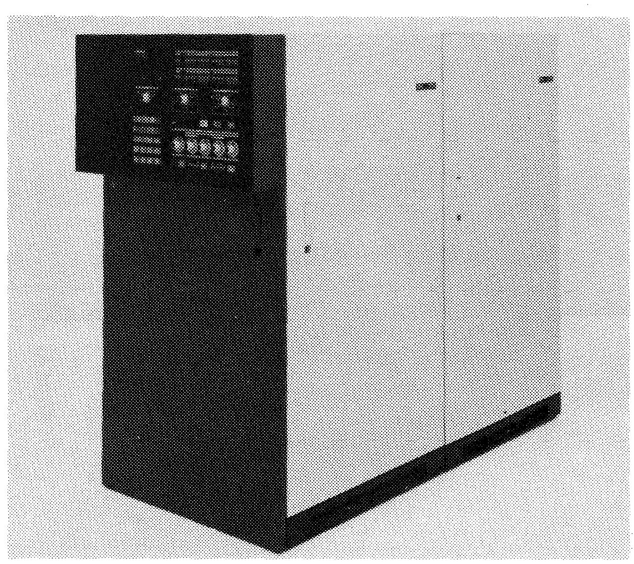
The number of responses totals 653, indicating that 22, or approximately four percent, of the respondents are using more than one of the listed architectures in their networks. The percent of users complying with IBM's SNA is somewhat higher than we had expected, indicating that the acceptance of that architecture is becoming more widespread, despite strong objections by some portions of the user community. However, the fact remains that about one-fourth of the respondents are not complying with any vendor-supported architectural scheme, either because their environments do not currently require it (but potentially may in the future) or because they have found other satisfactory alternatives.

Moreover, we assume that at least some of the "other vendor-supported architectures" respondents are IBM users operating in a pre-SNA, all-BSC environment, and should actually have been counted in the "none or user-developed architecture" tally, further increasing the number of users in this category.

The users were also asked to indicate the primary protocols supported by their networks:

	Number of Responses	Percent of Responses
Bisynchronous (including IBM BSC)	428	68
Asynchronous	377	60
IBM SDLC	203	32
X.25 packet level	40	6
ADCCP HDLC (including Univac UDLC and Burroughs BDLC)	33	5
Other	75	12

Eighty-three percent of these users responded that they are using more than one protocol in their network, with ASCII and bisynchronous the front-runners. The use of the IBM SDLC protocol by 32 percent of these users correlates with the 36 percent figure represented for IBM



The IBM 3705, shown above, has the largest installed base of any front-end processor, but is rapidly maturing. IBM is expected to announce a replacement unit in 1982.

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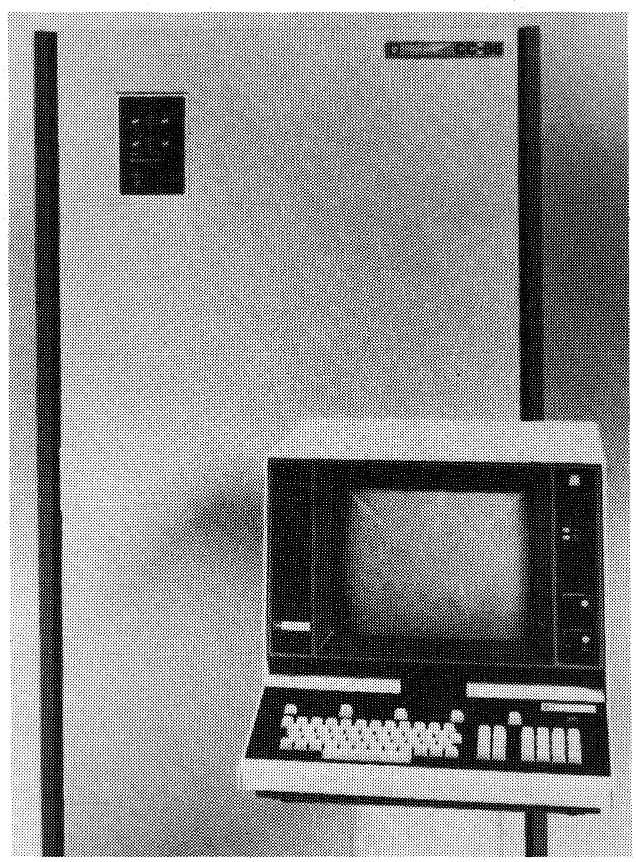
SNA compliance in the preceding question, but the high response for multiple protocol usage suggests that many of these users are still in various stages of migration to SNA.

Another question requested that the users indicate any commercial *local* networks which they operate. Only 14 percent of the users answered this question. A summary of these 81 responses is shown below:

	Number of Responses	Percent of Responses
ARC (Datapoint)	20	25
Ethernet	5	6
Hyperchannel	2	3
Other	54	66

Datapoint's Attached Resource Computer (ARC) network is well-established, with a total installed base of over 2,000 users. Local area networking is being strongly promoted by the industry, and new vendors are entering that market at a significant rate. We expect user acceptance of the local area network concept to be reflected in future editions of this survey.

The final question in the first part of the questionnaire provided a list of nine possible sources of networking problems, and asked the users to rank, in order of severity, any of these areas that they had experienced as problems in operating their networks. The users assigned a rank of 1 to the item representing the most severe problem, and 2 to the next most severe, etc. Any item that had not been a problem to the user was left blank.



Staving off the trend of attrition that has plagued independent front-end processor vendors, CCI has solved its financial difficulties with the help of CompuDyne. Its plan of reorganization should guarantee the continued production of the top of the line CCI 85, shown above, and other CCI product family members.

In order to show the information collected in the most meaningful way, we summarized the rankings on an indexed scale that weighted the rankings from 10 to 100, with 100 being the most severe problem. The rankings for each individual problem listed were tallied and assigned a weight: 100 was assigned to the responses tallied as the most severe problem (i.e., ranked by the users as "1"), a weight of 90 to those tallied as the next most severe, etc. The tallies of the blank answers were assigned a weight of 10. We then computed a weighted average for each problem by multiplying the weight times the number of tallied responses for each ranking, and then dividing the sum of the products by the total number of responses for that problem.

The results are shown below:

	Weighted Average*
Non-local communications lines	65.4
Terminals	53.5
Host software	48.6
Modems	48.3
Local loops	47.8
Host hardware	33.8
Front-end software	33.0
Front-end hardware	28.7
Multiplexers	22.0

*Based on a scale of 10 to 100, where 100 equals "Most severe problem" and 10 equals "No problem."

Not unexpectedly, the area of these users' networks that causes the most headaches is their communications lines. The least frequently experienced sources of problems are reportedly the high-end data communications equipment—front-end processors and multiplexers. Perhaps because the level of sophistication and the price-tag of these systems requires it, vendors are apparently spending more time on quality control and customer support on this type of equipment than the others, which may account for the resulting low numbers of problems reported.

It is also significant to note that only 69 of the 631 respondents, or 11 percent, chose not to answer this question. Although we have no way of knowing whether these users are indeed experiencing *no* problems, or whatever they simply skipped the question, the fact that so few fell into this category gives pretty good indication that encountering problems in operating networks is the status quo, and that very few users are fortunate enough to have none.

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▷The remaining parts of the questionnaire focused on specific categories of data communications devices and services. Users were asked to list the specific vendors and types of equipment/services they are using in their networks, and to provide user ratings based on their experiences with each. The Communications/Network Processor section of the questionnaire asked the user to provide the manufacturers and model numbers of each communications processor system in use, the number of systems installed, and ratings on eight specific categories of user experience: overall satisfaction, ease of installation, throughput, hardware reliability, promptness of manufacturer's maintenance, quality of manufacturer's maintenance, manufacturer's software, and manufacturer's technical support. A summary of the results of these questions is shown in Table 1.

The Datapro Research staff extends a sincere thanks to all for responding so enthusiastically to our 1982 Network Users Survey. Without your participation, it could not have been the terrific success it is, and we hope that this compendium of user experience will be of significant value to you. We look forward to hearing from you again.

Comparison Charts

The key functional characteristics of some 71 commercially available communications processors representing 39 manufacturers are presented in the accompanying comparison charts. Most of the information in the charts was supplied by the vendors during April 1982. The Datapro Research staff greatly appreciates their cooperation in the preparation of this survey.

All of the comparison chart entries are explained in the following paragraphs along with discussions of their significance to prospective buyers of communications processors.

Computer Systems Interfaced

The *manufacturers and models* listed show all computers which may be interfaced by the communications processor product shown. In the case of a front-end processor that interfaces with IBM mainframes, we generally list only current IBM computers, although the unit may also support a System/360 or other older systems. The word "compatibles" references IBM plug-compatible mainframe vendors. These vendors include Amdahl, Magnuson, NAS, Control Data, and others. Some vendors make custom interfaces while others use industry-standard connections. Both will be mentioned when applicable.

Functional Configurations

A *front-end processor* is a computer which has been programmed either by software or firmware for the purpose of handling communications activity between a host and its network. The front-end processor allows the host to devote more valuable machine cycles to other applications. The most significant application of communications processors, in terms of both frequency of use and level of complexity, is front-end processing.

The communications processor may replace a hard-wired communications controller as the interface between the central data processing system and the data communications network. The IBM 270X family and Memorex 1270 are examples of hard-wired controllers. (The Memorex 1270, unlike the IBM 270X, remains in active production; although this product is not a communications processor by our definition, we have included it in these charts due to its immense popularity in and influence on the current communications processor market).

The concept of front-end processing essentially involves off-loading or removing the data communications control function from the central processing unit and setting it up as an external, largely self-contained system. The front-end processor not only receives and transmits all data passing through the network, but also, and significantly, can be programmed to pre- and post-process this data in a variety of ways in order to relieve the system's central processing unit from time-consuming overhead activities related to message formatting and control. This decentralized approach to the distribution of processing labor permits both the communications and central processors to perform their primary functions in parallel and with little interference. Data is passed between the processors only when necessary and with as high a degree of efficiency as is possible in circuit design.

A front-end processor is by definition directly channel-attached to the host it is serving. This distinguishes the front-end processor from a processor which helps to perform similar off-loading responsibilities from a more remote location.

Some front-end processors may be directly channel-attached to more than one host. The *maximum number of hosts channel-attachable to the front-end* specifies the number of physical connections that may exist, and the *maximum number of active hosts supported simultaneously* represents the number of concurrent logical connections that a front-end is able to support. Some front-end processors that permit two or more direct channel-attachments allow only one channel to be active at a time; the other channel(s) act only as a back-up in emergency situations, or more frequently, during maintenance operations. Other front-end processors can maintain multiple active channel connections, either to one, or to more than one, host, so that multiple host applications or systems, each accessed by a dedicated channel, may be serviced simultaneously.

Many front-end processors feature the ability to provide *emulation* of IBM's communications systems. This allows the user to replace an aging IBM 270X communications controller or 370X communications processor with a more modern system, without requiring the user to rewrite software which was developed long ago on the older device. ▷

Communications Processors—Management Perspective and Equipment Specifications

A *remote line concentrator* is found at a remote location, and compresses several communications lines into a single high-speed line for transmission to the host. It differs slightly from the multiplex/demultiplex process by being more software intensive and providing software compatibility with host(s) it is serving. The *maximum number of hosts served by one concentrator* refers to the number of hosts that the communications processor can support concurrently in this remote configuration.

A *host-independent network processor* may reside anywhere in the network and typically performs a wide range of networking duties. Its function in the network is transparent to end-user devices, and thus it provides no software compatibility with any host. It may perform concentration, protocol conversion, and switching functions and, unlike a front-end processor or remote concentrator, generally makes no distinction between connections to terminals and connections to computer ports.

A *store-and-forward message switching processor* is similar to a network processor because it, too, is usually host-independent. Unlike the network processor, however, it performs no data manipulations. It simply receives strings of numerics and/or characters (messages), deciphers the address for whom the message is intended, and relays the unopened message to its destination point. It can also hold the message on a storage unit, such as disk or magnetic tape, for later delivery at a predetermined specified time or upon demand. Frequently, message switching functions are integrated into a more sophisticated system, which may operate in other applications besides message switching, and in fact, processors designed to provide *only* message switching of voice-grade lines were deemed not to meet the criteria for inclusion in this report.

A computer may be described as a *distributing processing node* when it not only performs communications processing functions but also has the ability to process off-line end-user applications (i.e., accounts receivable, payroll, etc.). It is usually located at a site remote from the host, and supports its own terminals, which can access local or host applications.

Many general-purpose minicomputers have refined this capability to an art form, combining intimate network involvement with attention to locally-initiated processes. Since the thrust of this report deals strictly with dedicated communications processor products, we do not focus great attention on general-purpose minicomputers that may be configured with communications processing applications. For a more expansive view of minicomputers that may operate this type of environment, please see our report C13-010-201 entitled "Communications Capabilities of Minicomputers and Small Business Computers" in Datapro Reports on Data Communications.

Many remote communications processors, because they are capable of supporting a network of terminals, can act as *terminal controllers*. By performing concentration and pre-processing tasks for transmission into the network, they act as a door through which the terminals they support may access the network. Note again that the role of terminal controller is generally one of several that may be played by a communications processor; for information on dedicated terminal controller products, we refer you to Sections C21 and C25 of Datapro Reports on Data Communications.

Most mainframe computer and minicomputer vendors have a definite approach by which their entire product line, from small to large systems, may be interconnected for communications. This *network architecture* is actually a philosophy that the vendor feels optimizes resources within a network. IBM's System Network Architecture (SNA) and Digital Equipment's DECnet represent two network architectures with approaches designed to meet the needs of their customers and installed base. Depending upon the types of products the computer vendor offers, the network architecture may be very simple, and easy for independent vendors to comply with, or highly structured, and very difficult to comply with. As we enter the mid-1980s, issues of standardization are hot, and the ability to comply with a computer vendor's network discipline may prove to be the great success or complete downfall of many companies providing communications processor products.

Most processors have a physical limit to the number of lines that they may support. However, the practical limits of *communications line capacity* usually varies depending upon line speed. Whether a line is operating at full- or half-duplex also has an *effect on line capacity*. For this reason, properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 9600 bps, and over 9600 bps. The number of low-speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium- and high-speed lines represent the outer limits of the throughput capabilities. On some systems, using full-duplex lines halves the line capacity, since two channels are required per line, and whether this effect occurs is also indicated.

Communications Features/Functions

One of the features of a communications processor is support of a variety of terminals throughout the network. The more *terminal protocols supported*, the more versatile the processor may be in providing network compatibility. Among the more common protocols supported are ASCII, IBM's BSC and SDLC, ANSI's ADCCP, ISO's HDLC, Burrough's BDLC, and Sperry Univac's UDLC. See Table 2 for a complete list of terminal protocols supported.

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TABLE 2. TERMINAL PROTOCOLS SUPPORTED

Manufacturer/ Product Name	ASCII/ async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocols*	X.25 Packet Level	Other Protocols Supported
Action/Honeywell Mercury Message Mgmt. Sys.	Yes	Yes	Yes	No	No	8A1, 83B3, 85A, SITA, ARINC, TWX, TELEX
Amdahl 4705	Yes	Yes	Yes	No	Yes	—
Amdahl Comm. Systems Div.						
3400 Series	Yes	Yes	Yes	Yes	Yes	IBM 2741
4410 Network Processor	Yes	Yes	Yes	Yes (HDLC)	Yes	—
Amnet Nucleus 6000	Yes	Yes	Yes	Yes	Yes	X.75, other PADs
Auscom 8911	Yes	Yes	Yes	Yes	Yes	RPQ
BBN Computer						
C-80	Yes	No	No	No	No	—
C/60	Yes	No	No	No	No	—
Braegen B40	No	Yes	Yes	No	No	—
Burroughs Corp.						
CP9558-1/CP9572	Yes	Yes	Yes	Yes	Yes	Most Burroughs protocols
CP3680/CP3680-01	Yes	Yes	No	No	No	Most Burroughs protocols
Cableshare						
LSI-X.25 Front-End	No	No	No	No	Telenet, Tymnet, Euronet	Uninet, Datapac, Infoswitch, PSS, Transpac, Datanet, Telepac, DATEX
LSI-X.25 Int. Concent.	No	No	No	No	Yes	Same as above
LSI-X.25 Host Port Concentrator	No	No	No	No	Yes	Same as above
Centennial Computer Corp. 2000/3000	Yes	Yes	No	No	Yes	Uniscope 100, 200, & 1004
Century Analysis OSI	Yes	Yes	No	No	No	—
Chi Comm. Processors	Yes	Yes	No	Yes (HDLC)	Telenet	Rem 1, NTR, Uniscope 100 & 200
Codex 6520	Yes	Yes	No	No	No	Telex, & IBM 2741, 2848, 2260
Commex						
DNP 4/6/16	Yes	Yes	Future	Yes (HDLC)	Yes	Various POS & custom protocols
CMC 4 & CMC 32	Yes	Yes	No	No	No	—
Computer Communications						
CC-6	Yes	Yes	No	No	No	Telex
CC-8	Yes	Yes	No	No	Telenet, Tymnet	Telex, 83B3
CC-80/85	Yes	Yes	No	No	Telenet, Tymnet	Telex, 83B3, PARS, SABRE, ARINC
Control Data 2551-1 & 2551-2	Yes	Yes	RPQ	Yes	Telenet, Tymnet, Datapac, Transpac	—
Datastream						
T5	Yes	Yes	No	No	No	—
T7	Yes	Yes	No	No	No	—
T8	Yes	No	Yes	Future	Future	—
DCA 355	Yes	No	No	Yes	Telenet	DDCMP-trunk only
GTE Telenet						
TP4000 Series	Yes	Yes	No	Yes	Telenet	—
TP2201/TP2202	Yes	No	No	No	Telenet	—
Honeywell Datanet 8	Yes	Yes	No	Yes (HDLC)	Telenet, Tymnet + 10 DDNs	VIP, PVE, RCI, LHDLC

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

TABLE 2. TERMINAL PROTOCOLS SUPPORTED (Continued)

Manufacturer/ Product Name	ASCII/ async./ TTY	IBM BSC	IBM SDLC	Other Bit-Oriented Protocol*	X.25 Packet Level	Other Protocols Supported
IBM						
3705-II (E1 thru L4)	Yes	Yes	Yes	No	Telenet	—
3705-80	Yes	Yes	Yes	No	Telenet	—
ICCI						
CA20 BSC	Yes	Yes	No	No	No	—
CA20 SNA	Yes	No	Yes	No	No	—
ICOT						
25X (253, 254, 257)	Yes	Yes	Yes	No	No	PARS, SITA, PI024, U400
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	—
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	No	—
Distributed Network Processor Series	Yes	Yes	RPQ	Yes	RPQ	RPQ
M/A-Com DCC						
CP9000 & MicroNode	No	No	No	No	No	—
Memorex						
1270	Yes	Yes	No	Via VAN	Telenet, Datapac, PSS, Tymnet, Transpac, DATEX-P	Sabre, Swift, SITA
Modcomp 3108 & 3109	Yes	Yes	Yes	Yes	Yes	—
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Yes	83B3
3690 (A5-E5, T3/U1)	Yes	Yes	Yes	Yes	Yes	83B3
721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
North American Philips						
MARC	Yes	No	Yes	Yes (HDLC)	Yes	83B3, Telex, & Cidin
Paradyne						
Pix/Pixnet	Yes	RPQ	No	No	No	Paradyne SDLC
Periphonics T-Comm 80	Yes	Yes	Yes	—	—	Voice response
Raytheon						
Raynet I, II, III, & IV	Yes	Yes	Yes	Yes	No	PARS, Univac
Sperry-Univac						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Scheduled certif. start, 3rd qtr. 1982	REM1, NTR
Starnet Data System, Protex Ind. Starnet II	Yes	No	No	No	No	—
Tandem Non-Stop II	Yes	Yes	Yes	Yes	Yes	Swift, Burroughs
Telefile EECP-X	Yes	Yes	No	No	No	—
Thomas Engineering						
MZ-80	Yes	Yes	Late 1982	No	No	Honeywell VIP
8770/20	Yes	Yes	No	No	No	Honeywell VIP
TRT Data Products, Norfield Comm.						
System 300	Yes	No	No	No	No	—
System 400	Yes	Yes	No	No	No	—
System 500	Yes	Yes	Yes	Yes	Yes	—
Westinghouse Canada						
W1655 ICC	Yes	No	No	No	No	PARS, Reservec II, Univac U100, P1024

*Other bit-oriented protocols include ADCCP, HDLC, BDLC, and UDLC.

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C-80	Yes	No	No	No	No	—
C/60	Yes	No	No	No	No	—
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Control Data						
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Datastream						
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3705-80	Yes	Yes	Yes	No	Telenet	—
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CA20 BSC	Yes	Yes	No	No	No	—
CA20 SNA	Yes	No	Yes	No	No	—
ICOT						
25X (253, 254, 257)	Yes	Yes	Yes	No	No	PARS, SITA, PI024, U400
251	Yes	No	No	No	Tymnet, Telenet, Uninet, PDNs	—
352	Yes	Yes	Yes	No	No	—
35X	No	Yes	No	No	No	Univac U400
Lemcom Systems						
CMC-4, CMC-8, & CMC-32	Yes	Yes	No	No	No	—
Distributed Network Processor Series	Yes	Yes	RPQ	Yes	RPQ	RPQ
M/A-Com DCC						
CP9000 & MicroNode	No	No	No	No	No	—
Memorex						
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Modcomp 3108 & 3109	Yes	Yes	Yes	Yes	Yes	—
NCR Comten						
3650 & 3670	Yes	Yes	Yes	Yes	Yes	83B3
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721-II	Yes	Yes	Yes	Yes	Yes	NCR BSC & in-house DLC
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Periphonics T-Comm 80	Yes	Yes	Yes	—	—	Voice response
Raytheon						
Raynet I, II, III, & IV	Yes	Yes	Yes	Yes	No	PARS, Univac
Sperry-Univac						
DCP/40 & DCP/20	Yes	Yes	No	Yes	Scheduled certif. start, 3rd qtr. 1982	REM1, NTR
Starnet Data System, Protex Ind. Starnet II	Yes	No	No	No	No	—
Tandem Non-Stop II	Yes	Yes	Yes	Yes	Yes	Swift, Burroughs
Telefile EECP-X	Yes	Yes	No	No	No	—
Thomas Engineering						
MZ-80	Yes	Yes	Late 1982	No	No	Honeywell VIP
8770/20	Yes	Yes	No	No	No	Honeywell VIP
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System 300	Yes	No	No	No	No	—
System 400	Yes	Yes	No	No	No	—
System 500	Yes	Yes	Yes	Yes	Yes	—
Westinghouse Canada						
W1655 ICC	Yes	No	No	No	No	PARS, Reservec II, Univac U100, P1024

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▷ The *X.25 Packet-level* protocol is now being supported by many communications processor vendors in the U.S. The support varies from a simple interface to a full "gateway" function, which generally includes packet assembly and disassembly, routing, and flow control for multiple terminal devices. Although utilized in some private packet-switching network, the X.25 support is generally used to gain access to public packet-switching networks, or Value-Added Networks (VAN), such as Tymnet and Telenet. Since the implementation of the X.25 protocol may vary, each of the public carriers have established a certification process by which a particular vendor's version of X.25 can be guaranteed to be compatible with their network. In the charts, you'll find a listing of those VANs on which the vendor's X.25 package is certified (e.g., IBM X.25 certified by GTE Telenet).

Other protocol possibilities allow the vendor to specify what other support they provide. A frequent response is Passenger Airline Reservation System (PARS), which is actually a combination application and protocol.

Many communications processors routinely perform *multiplexing/demultiplexing* operations. This process allows several communications lines to be compressed into one high-speed line. The data is then burst across the line and upon reaching its destination returned to its original state. This method is less sophisticated than concentrating, but an equally effective way to reduce line charges. Although intelligence resides at both ends, it is basically a hardware function and does not require software compatibility with the host.

An important function of many communications processors is the ability to allow a terminal to access multiple applications residing within one host, or to access more than one host. Some network processors that do not distinguish between terminals and host ports can make connections between any two termination points in the network. *Terminal-initiated applications switching* permits the terminal user to specify which application he/she wishes to access, with all addressing and routing performed transparently by the communications processor. Typically, a communications processor with this capability also provides some mechanism—passwords, configurational "class" codes, etc.—by which access authorization and restriction are controlled.

Communications processor-initiated dynamic line reconfiguration allows the user to define and activate a new line, or disable an existing line, from the communications processor console. The process takes place while the system is in an active state; no sysgen is required.

Another housekeeping function performed by some communications processors is *protocol* and *code conversion.* This feature allows normally incompatible devices and systems to "speak" to one another without any additional interfaces or user intervention. For example, less expensive ASCII terminals may be used to connect to an IBM 3270 application, with necessary conversions performed by the communications processor.

Every processor has some means of detection and *error control.* At the very least, there is typically a parity checking mechanism. Two of the more sophisticated algorithms frequently used are Longitudinal Redundancy Check (LRC) and Cyclical Redundancy Check (CRC).

Some communications processors have the very valuable built-in feature of *automatic transmission speed detection.* This function senses the speed of an incoming transmission and then automatically adjusts the channel interface to receive the call. Without automatic speed detection, each line must be configured for use at a specified speed; consequently, a user must dedicate one or more communications lines for every speed in use. With it, the same user may be able to make more efficient use of fewer lines, and residually, to reduce the number of busy signals on the network.

Some communications processors will *automatically disconnect an inactive dial-up terminal* if that terminal has been silent for a pre-programmed length of time. The automatic disconnection of a dormant terminal has saved many a user unnecessary line charges and non-productive occupation of a host port in situations where terminal operators leave their posts to take a coffee or lunch break without signing off.

System Characteristics

It should be kept in mind that a communications processor is in essence a mini- or microcomputer, specially programmed for communications-specific functions. As such, it shares many attributes with the more common general-purpose type of system.

Processor type specifies the manufacturer and model of the central processor used in the communications system. A vendor may build a processor or get it from another vendor. Motorola, Intel, and Zilog seem to be supplying the majority of processors currently being used. The processor supplies most of the intelligence and is central to the manipulation of data.

Main memory word size (length) is the number of bits that can be stored or retrieved from memory using a single machine cycle. We are currently in the midst of a rapidly-occurring technological revolution that involves development and mass production of microprocessors that support increasingly larger word lengths. As 32-bit microprocessors, such as the Motorola 68000, become readily available, older 8-bit and 16-bit chips are expected to be phased out. During this transition, you will find word lengths of eight, 16, and 32 bits represented in the chart entries.

In terms of operations, since a byte is eight bits, these microprocessors neatly accommodate 1-, 2-, and 4-byte processing. For example, a chip that has a 32-bit word length has the ability to process four bytes simultaneously. ▷

The longer word lengths permit greater precision, increased instructions, better performance, and more memory locations to be addressed.

Although 16- and 32-bit systems have the ability to process multiple bytes using a single machine cycle internally, all do not enjoy the same level of sophistication when passing data to external devices. Some vendors have retrofitted the data bus of their systems, which is the pathway by which data is transmitted between the processor and external devices, to accommodate the longer word length used by the processor, thus also maximizing the data transfer process. Others have not.

Main memory storage capacity is dependent on the number of memory locations that can be addressed by the processor. The entry shows the maximum amount of main storage available for each processor, expressed in thousands (K) or millions (M) of bytes.

Front-end processors transfer data across the channel to the host computer at very high-speeds. The *level of data transferred across an I/O channel* is indicative of the sophistication of the system. Less sophisticated communications processors, such as 270X emulators, transfer data one byte at a time. In order to pass the data more efficiently, higher level front-end processors package transmissions in multiple-byte blocks. Each block consists of a fixed number of bytes. Even more sophisticated systems can handle variable-length data transfers, and can transmit an entire file at a time to the host; only a few vendors are capable of performing this function.

The *type of data supported between memory and: communications lines, mass storage,* or *other peripherals* refers to the manner in which data is transferred to and from memory. Critical to this process is how much of a disturbance (interruption) the transfer causes in the central processor. Many of the microprocessors used today permit Direct Memory Access (DMA). DMA allows the external device to access the memory to perform read, write, and other memory functions without disturbing the microprocessor's registers or interrupting the microprocessor's processing cycle. Without DMA, an external communications line, peripheral, or other device must interrupt the microprocessor in order to access the memory. The interrupt must be recognized and the device's request processed, thus utilizing valuable machine time and cycles, and contributing to the performance deterioration of the microprocessor. To use an extreme example, this could turn out to be the bottleneck for an entire communications network.

Some communications processors support a variety of external peripheral devices. *I/O* refers to system-related input/output devices, such as a console CRT, printer, tape drive, or disk drive that may be utilized by the processor for system-level activities. Such activities might include system configuration and control, statistics gathering and reporting, and network monitoring. Peripheral devices such as disk drives may also be used as temporary *back-up* storage during an emergency or maintenance outage. The data stored can then be transferred back to the processor once the difficulty has been corrected. Many processors also allow *diagnostic peripherals* like line testers and various network control devices to connect directly to a systems interface established specifically for this purpose. Sometimes these devices may be mounted within the processor and thus be an integral part of the unit. More frequently, they are externally connected to the system via a designated "diagnostics port."

Most communications processors have a local console which is used to perform systems control functions. However, a growing number of processor vendors now offer *support for a remote console*. This feature permits a terminal at a remote site to access the systems operations of the communications processor via dial-up or leased-line facilities, diagnose a problem or make an adjustment, and then restart the system (sysgen) if necessary. Because the remote console has access to all systems functions and operations, several layers of security precautions are usually enforced to safeguard against unauthorized entrance. These may be a combination of hardware and software including a secure port, special firmware, and/or passwords.

Vendors find the remote console function to their liking because they can duplicate a problem, correct it, and advise the customer without leaving their own facility, thus saving on costly overhead associated with field engineering personnel. It's also good for the customer because it helps get the processor problem corrected a lot quicker than waiting for a service call.

Communications processors, like other computers, have *operating systems implemented in* firmware, software, or a combination. Firmware is program logic written and stored on a read-only integrated circuit residing inside the processor, and is generally not alterable by the user. Software, of course, is program logic loaded into the processor's main memory from an external source, such as a diskette or a host computer, and is easily modified by a programmer or updated by the vendor. Most operating systems implemented today utilize a combination of software and firmware.

The *Initial Program Load (IPL) method* employed may be internal self-loading initiated by the user simply flipping a switch or pushing a button to start-up the system, (figuratively, the system pulls itself up by its own bootstraps, aka "booting"). On some machines, all programs are stored in firmware, and the start-up process is completed by the bootstrap method. In other systems, botting only begins the process of bringing up the machine; the remaining program logic must be manually loaded from a diskette or other media, or downloaded from a host.

For functions not supported by the basic operating system, the communications processor vendor may offer *additional software support* in the form of preprogrammed packages, and/or support *user programmability*. Vendor-supplied software may include various

Communications Processors

development and mass production of microprocessors that support increasingly larger word lengths. As 32-bit microprocessors, such as the Motorola 68000, become readily available, older 8-bit and 16-bit chips are expected to be phased out. During this transition, you will find word lengths of eight, 16, and 32 bits represented in the chart entries.

In terms of operations, since a byte is eight bits, these microprocessors neatly accommodate 1-, 2-, and 4-byte processing. For example, a chip that has a 32-bit word length has the ability to process four bytes simultaneously.

The longer word lengths permit greater precision, increased instructions, better performance, and more memory locations to be addressed.

Although 16- and 32-bit systems have the ability to process multiple bytes using a single machine cycle internally, all do not enjoy the same level of sophistication when passing data to external devices. Some vendors have retrofitted the data bus of their systems, which is the pathway by which data is transmitted between the processor and external devices, to accommodate the longer word length used by the processor, thus also maximizing the data transfer process. Others have not.

Main memory storage capacity is dependent on the number of memory locations that can be addressed by the processor. The entry shows the maximum amount of main storage available for each processor, expressed in thousands (K) or millions (M) of bytes.

Front-end processors transfer data across the channel to the host computer at very high-speeds. The *level of data transferred across an I/O channel* is indicative of the sophistication of the system. Less sophisticated communications processors, such as 270X emulators, transfer data one-byte at a time. In order to pass the data more efficiently, higher level front-end processors package transmissions in multiple-byte blocks. Each block consists of a fixed number of bytes. Even more sophisticated systems can handle variable-length data transfers and can transmit an entire file at a time to the host; only a few vendors are capable of performing this function.

The *type of data supported between memory and communications lines, mass storage,* or *other peripherals* refers to the manner in which data is transferred to and from memory. Critical to this process is how much of a disturbance (interruption) the transfer causes in the central processor. Many of the microprocessors used today permit Direct Memory Access (DMA). DMA allows the external device to access the memory to perform read, write, and other memory functions without disturbing the microprocessor's registers or interrupting the microprocessor's processing cycle. Without DMA, an external communications line, peripheral, or other device must interrupt the microprocessor in order to access the memory. The interrupt must be recognized and the device's request processed, thus utilizing valuable machine time and cycles, and contributing to the performance deterioration of the microprocessor. To use an extreme example, this could turn out to be the bottleneck for an entire communications network.

Some communications processors support a variety of external peripheral devices. *I/O* refers to system-related input/output devices, such as a console CRT, printer, tape drive, or disk drive that may be utilized by the processor for system-level activities. Such activities might include system configuration and control, statistics gathering and reporting, and network monitoring. Peripheral devices such as disk drives may also be used as temporary *back-up* storage during an emergency or maintenance outage. The data stored can then be transferred back to the processor once the difficulty has been corrected. Many processors also allow *diagnostic peripherals* like line testers and various network control devices to connect directly to a systems interface established specifically for this purpose. Sometimes these devices may be mounted within the processor and thus be an integral part of the unit. More frequently, they are externally connected to the system via a designated "diagnostics port."

Most communications processors have a local console which is used to perform systems control functions. However, a growing number of processor vendors now offer *support for a remote console*. This feature permits a terminal at a remote site to access the systems operations of the communications processor via dial-up or leased-line facilities, diagnose a problem or make an adjustment, and then restart the system (sysgen) if necessary. Because the remote console has access to all systems functions and operations, several layers of security precautions are usually enforced to safeguard against unauthorized entrance. These may be a combination of hardware and software including a secure port, special firmware, and/or passwords.

Vendors find the remote console function to their liking because they can duplicate a problem, correct it, and advise the customer without leaving their own facility, thus saving on costly overhead associated with field engineering personnel. It's good for the customer because it helps get the processor problem corrected a lot quicker than waiting for a service call.

Communications processors, like other computers, have *operating systems implemented in* firmware, software, or a combination. Firmware is program logic written and stored on a read-only integrated circuit residing inside the processor, and is generally not alterable by the user. Software, of course, is program logic loaded into the processor's main memory from an external source, such as a diskette or a host computer, and is easily modified by a programmer or updated by the vendor. Most operating systems implemented today utilize a combination of software and firmware.

Initial Program Load (IPL) method employed may be internal self-loading initiated by the user simply flipping a switch or pushing a button to start-up the system, (figuratively, the system pulls itself up by its own

Communications Processors

bootstraps, aka "booting"). On some machines, all programs are stored in firmware, and the start-up process is completed by the bootstrap method. In other systems, booting only begins the process of bringing up the machine; the remaining program logic must be manually loaded from a diskette or other media, or downloaded from a host.

For functions not supported by the basic operating system, the communications processor vendor may offer *additional software support* in the form of preprogrammed packages, and/or support *user programmability*. Vendor-supplied software may include various utility programs for routine types of tasks, and programming language compilers or interpreters. Some operating software is parameter-based and permits the user to customize the system's functions and line configuration by selecting applicable parameters from various menus embedded in the operating system. Although this is not true programming, this method, depending on the extent of the menus, can offer great latitude in the formation of communications processing applications.

Some vendors offer *software separately priced*, while others "bundle" it into the total cost. Some vendors may only charge for optional software, such as utilities.

To judge the amount of user-created programs actually being written, we asked the vendors to *approximate the proportion of* their *currently installed systems supplied as turnkey systems*. A turnkey system is a system that becomes immediately operational without additional intervention on the part of the user. Since this type of system is up and running as soon as the "key is turned," it does not require the user to maintain costly on-site personnel in order to maintain hardware or software operations.

Pricing and Availability

We've shown the *purchase price, monthly maintenance*, and *monthly lease/rental* for a *minimum configuration, including all hardware components required for basic operation*. This basic system should be sufficiently functional to perform in applications considered entry-level for this system. The *maximum practical configuration* represents the largest fully configured system that the vendor considers practical to deliver. Because lease and maintenance contracts are not always available from vendors, prices for these items may not appear in a specific chart. In such cases, you might check with the vendor as to whether leases and maintenance are provided by a third party.

We asked if *maintenance is bundled with the lease/rental*. If it is, no additional charge for normal service is applied. However, bundling of service does preclude the option on the part of the user of seeking out a third party maintenance organization or performing "do it yourself" maintenance, unless that user wishes to pay twice for the same service.

The *date of first delivery* is not the announcement date of the product, but the date when the first system of this model was installed on a customer site. The *number of systems installed to date* may help you to discern the magnitude of the market, but does not always reveal the relative merits of a communications processor. Some recently announced products may have great attributes, but a modest installed base. Large installed bases may simply reflect effective marketing or an outdated, but once useful product. Please also refer to our user survey located earlier in this report for more telling data.

As we mentioned previously, a processor may be *serviced by* the vendor, a third party, or other means. Be advised that a vendor listed as performing service may, in reality, only provide factory service. In these cases, the user must mail in a faulty board or part to the vendor's factory for service or replacement. Other vendors may provide full on-site field service and/or a remote diagnostics capability.

When compiling a study of this sort, we sometimes come across a product whose basic characteristics are not completely covered by the designated categories we've delineated. The *comments* help to amplify preceding entries or to explain key elements of a product that may be overlooked in the formal chart entries.

Communications Processor Vendors

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the vendors whose communications products are shown in the comparison charts that follow.

Action/Honeywell, 4401 Beltwood Parkway South, Dallas, Texas 75234. Telephone (214) 386-3500.

Amdahl Communications Systems Division (formerly Tran Telecommunications), 2500 Walnut Avenue, Marina del Rey, California 90291. Telephone (213) 822-3202.

Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, California 94086. Telephone (408) 746-6000.

Amnet, Inc. (formerly ASI Teleprocessing, Inc.), 101 Morse Street, P.O. Box 412, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Auscom, Inc., 2007 Kramer Lane, Austin, Texas 78758. Telephone (512) 836-8080.

BBN Computer, 33 Moulton Street, Cambridge, Massachusetts 02238. Telephone (617) 497-2800.

BetaCom Corporation, 245 E. 6th Street, St. Paul, MN 55101. Telephone (612) 292-8188, (800) 238-2266.

Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4200.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Cableshare, Inc., 20 Enterprise Drive, P.O. Box 5880, London, Ontario, Canada N6A 4L6. Telephone (519) 686-2900.

Centennial Computer Products, Inc., 6100 Executive Boulevard, Rockville, Maryland 20852. Telephone (301) 984-9120.

Century Analysis, Inc., 114 Center Avenue, Pacheco, California 94553. Telephone (415) 680-7800.

utility programs for routine types of tasks, and programming language compilers or interpreters. Some operating software is parameter-based and permits the user to customize the system's functions and line configuration by selecting applicable parameters from various menus embedded in the operating system. Although this is not true programming, this method, depending on the extent of the menus, can offer great latitude in the formation of communications processing applications.

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Centennial Computer Products, Inc., 6100 Executive Boulevard, Rockville, Maryland 20852. Telephone (301) 984-9120.

Century Analysis, Inc., 114 Center Avenue, Pacheco, California 94553. Telephone (415) 680-7800.

Chi Corporation, 2111 Chagrin Boulevard, Beachwood, Ohio 44122. Telephone (216) 991-9000.

Codex Corporation, 20 Cabot Boulevard, Mansfield, Massachusetts 02048. Telephone (617) 364-2000.

Commex, Ltd., 141 Central Park Avenue South, Hartsdale, New York 10530. Telephone (914) 328-0600.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90717. Telephone (213) 320-9101.

Communications Processors—Management Perspective and Equipment Specifications

Comten, Inc.: see **NCR Comten, Inc.**

Control Data Corporation, 8100 34th Avenue South, Minneapolis, Minnesota 55420. Telephone (612) 853-8100.

Datastream Communications, Inc., 1115 Space Park Drive, Santa Clara, California 95050. Telephone (408) 727-2980.

Digital Communications Associates, Inc., 303 Research Drive/Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp.: see **MA/COM DCC Inc.**

GTE Telenet Communications Corporation, 8229 Boone Boulevard, Vienna, Virginia 22180. Telephone (703) 442-1000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 895-6000.

IBM Corporation, Information Systems Group, National Accounts Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

ICCI, 196 Broadway, Cambridge, Massachusetts 02139. Telephone (617) 864-3270.

ICOT Corporation, 830 Maude Avenue, Mountain View, California 94043. Telephone (800) 528-6050 x 1711 (U.S. except Arizona, Alaska, and Hawaii), (800) 352-0458 x 1711 (Arizona), (800) 528-0470 (Alaska and Hawaii).

Lemcom Systems, Inc., 2104 West Peoria Avenue, Phoenix, Arizona 85029. Telephone (602) 944-1543.

M/A-COM DCC, Inc., 11717 Exploration Lane, Germantown, Maryland 20874. Telephone (301) 428-5500.

Memorex Communications Group, 18922 Forge Drive, Cupertino, California 95014. Telephone (408) 996-9000.

Modular Computer Systems, Inc. (Modcomp), P.O. Box 6099, 1650 West McNab Road, Ft. Lauderdale, Florida 33310. Telephone (305) 974-1380.

NCR Corporation: see **NCR Comten, Inc.**

NCR Comten, Inc., 2700 Snelling Avenue North, St. Paul, Minnesota 55113. Telephone (612) 638-7777.

North American Philips Corporation, Communications Systems Division, 55 Knightsbridge Road, Piscataway, New Jersey 08854. Telephone (201) 457-0400.

Paradyne Corporation, 8550 Ulmerton Road, Largo, Florida 33541. Telephone (813) 536-4771.

Periphonics Corporation, 4000 Veterans Memorial Highway, Bohemia, New York 11716. Telephone (516) 467-0500.

Raytheon Data Systems Company, Minicomputer/Communications Operation, 360 Forbes Boulevard, Mansfield, Massachusetts 02048. Telephone (617) 339-7752.

Sperry Univac (Division of Sperry Corporation), P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.

Starnet Data Systems, Protex Industries, Inc., 1331 West Evans Avenue, Denver, Colorado 80223. Telephone (303) 935-3566.

Systems Research, Inc.: see **Burroughs Corp.**

Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 725-6000.

Telefile Computer Products, Inc., 17131 Daimler Street, Irvine, California 92714. Telephone (714) 554-6660.

Thomas Engineering Company, 1040 Oak Grove Road, Concord, California 94518. Telephone (415) 680-8640.

TRAN Telecommunications Corporation: see **Amdahl Communications Systems Division.**

TRT Data Products, Norfield Communications Division, 3 Depot Place, East Norwalk, Connecticut 06855. Telephone (203) 853-2777.

Westinghouse Canada, Incorporated, Electronic Systems Division, 777 Walker's Line, P.O. Box 5009, Burlington, Ontario, Canada L7R 4B3. Telephone (416) 528-8811.□

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Action/Honeywell Mercury Message Management System	Amdahl 4705	Amdahl Communications Systems Division 3400 Series	Amdahl Communications Systems Division 4410 Network Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	Amdahl 470, 580 and capatibles	Most major vendors	All X.25 equipped vendors
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	No
Max. no. of hosts channel-attachable to front-end	—	4	—	—
Max. no. of active hosts supported simultaneously	—	4	—	—
IBM emulation	—	270X, 3705 with NCP	—	—
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	1	Network—dependent	Network—dependent
Host-independent network processor	No	No	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network Architecture compliance	No	SNA	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	352	100	104
2000 to 9600 bps	128	352	100	104
Over 9600 bps	—	Application—dependent	Network—dependent	52
Highest line speed supported (bps)	19.2K	56K	19.2K	64K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	No	No	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	Yes
Protocol conversion	Yes	—	No	No
Code conversion	Yes	ASCII/EBCDIC	No	No
Error control	Yes	Yes	CRC	CRC
Automatic transmission speed detection	Yes	Comm-pro 50-1200 bps	50 to 9600 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	No
SYSTEM CHARACTERISTICS				
Processor	Data General Nova 3	Proprietary	CA 2/40	Proprietary
Main memory word size, bits	16	18	16	16
Main memory storage capacity, bytes	256K	512K	208K	64K
Level of data unit transferred across I/O channel	Byte	Byte or block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Both DMA & interrupt	Both DMA & interrupt	Interrupt
Mass storage	DMA	—	Both DMA & interrupt	—
Other peripherals	DMA	—	Both DMA & interrupt	—
I/O, back-up, and diagnostic peripherals supported	Disk, mag tape	Diskette	Diskette and self diagnostics	—
Support for remote console	Yes	No	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Combination of software and firmware	Combination of software and firmware
IPL method	Internal self-load	Download from host	From disk. & DP node	Load from diskette
Additional software supported	None	Comm-pro	—	—
User programmability	Yes, via user-selected parameters	Yes	Yes	Yes, via user-selected parameters
Software separately priced	None	Yes	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	All	5%	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	200,000	48,000	200,000	127,000
Monthly maintenance, $	1,000	440	2,000	1,600
Monthly lease/rental, $	Third party	1,400 (2 yr. lease)	—	Federal govt. only
Maximum practical configuration:				
Purchase price, $	500,000	300,000	5,000,000	300,000
Monthly maintenance, $	2,500	2,000	50,000	3,000
Monthly lease/rental, $	Third party	11,000 (2 yr. lease)	—	Federal govt. only
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	1971	November 1979	June 1982	1979
Number of systems installed to date	95	160	—	18
Serviced by	Honeywell	Amdahl	Amdahl	Amdahl
COMMENTS	Mercury replaces Telecontroller as Action's store-and-forward message switch system with front-end capability	Operates with IBM 3705 and 3705/comm-pro software, with up to 1.8 times the 3705 throughput capacity	Handles mix of asynch. and synch. traffic; used in multi-vendor environment; proprietary packet switching; supports satellite transmissions	Performs self-diagnostics; supports 1980 CCITT X.25 recommendation

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Amnet Nucleus 6000	Auscom 8911	BBN Computer C-80	BBN Computer C/60
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most major vendors	IBM 370, 30XX, 43XX, and compatibles	DEC-10 & 20, VAX, PDP-11, BBN C/70 & C/60	Unix—based mini-computers
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	No
Max. no. of hosts channel-attachable to front-end	—	2	—	—
Max. no. of active hosts supported simultaneously	—	2	—	—
IBM emulation	—	Any IBM controller	—	—
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	1024	2	8	—
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	No	Yes	Yes	Yes
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	Yes	Yes	No
Network Architecture compliance	OSI	Ethernet, DECnet, Cus.	1822/DOD	1822/DOD
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	1024	16	20	16
2000 to 9600 bps	1024	16	20	16
Over 9600 bps	512	16	20	16
Highest line speed supported (bps)	64K	1M	56K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes	No	No
Code conversion	Yes	Programmable	No	No
Error control	Yes	Programmable	Yes	Yes
Automatic transmission speed detection	Yes	No	50 to 19.2K bps	50 to 19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	Multi-microprocessor	DEC LSI-11	Proprietary	Proprietary
Main memory word size, bits	16	16	20	20
Main memory storage capacity, bytes	1M	256K	64K	2M
Level of data unit transferred across I/O channel	Byte and block	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Mass storage	DMA	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Other peripherals	DMA	Both DMA & interrupt	—	Both DMA & interrupt
I/O, back-up, and diagnostic peripherals supported	Console, printer, disk	CRT console, disk, disk., mag tape, printer	—	Mag tape and disk
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Software or firmware	Combination of software and firmware	Software
IPL method	Download from NMC	Load disk./tape/hst.	From host & self-load	Manual-load
Additional software supported	Program development utilities	Anything available for DEC LSI-11	None	Fortran 77, full screen editor, "C"
User programmability	Yes, on restricted basis	Yes, via user-created programs	Yes—via user-selectable parameters	Yes—via user-created programs
Software separately priced	Software options	All, except diagnostics	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	—	90%	100%	25%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	45,000	14,995	30,000	49,500
Monthly maintenance, $	—	—	450	495
Monthly lease/rental, $	—	—	—	—
Maximum practical configuration:				
Purchase price, $	200,000	Approx. 25,000	45,000	62,300
Monthly maintenance, $	—	—	675	623
Monthly lease/rental, $	—	—	—	—
			—	
Is maintenance bundled with lease/rental?	—	No	November 1979	—
Date of first delivery	1982	July 1980	200	March 1982
Number of systems installed to date	—	50	BBN	10
Serviced by	Amnet/third party	Auscom		BBN
COMMENTS	Supports 4 to 1024 ports	Designed as a programmable IBM channel interface or FEP by emulating standard IBM control unit; more hosts supported as front-end or concentrator with extended chassis	Adaptive routing; monitored & controlled by C/70 NOC	Unix minicomputer; runs file-transfer; virtual terminal; electronic mail

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	BBN Computer C/70	Braegen B40	Burroughs CP9558-1/CP9572	Burroughs CP3680/CP3680-01
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Unix—based mini-computers	IBM S/370, 303X, 43XX Series and compatibles	All Burroughs; IBM S/370, 30XX, 43XX, and compatibles	Burroughs B2000, B3000, and B4000 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	—	—	—	4
Max. no. of active hosts supported simultaneously	—	—	—	4
IBM emulation	—	3270/1403/2501	—	No
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	4	12	4
Host-independent network processor	Yes	No	Yes	No
Store-and-forward message switching processor	Yes	No	Yes	Yes
Distributed processing node	Yes	No	Yes	Yes
Terminal controller	No	Yes	Yes	Yes
Network Architecture compliance	1822/DOD	SNA	BNA, SNA	BNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	6	47	288 async., 72 sync.
2000 to 9600 bps	32	6	—	40
Over 9600 bps	32	6	—	40
Highest line speed supported (bps)	19.2K	56K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	—	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	No	—	—
Terminal-initiated applications switching	Yes	Yes	—	—
Comm. processor-initiated dynamic line reconfig.	Yes	No	—	—
Protocol conversion	No	No	—	Yes
Code conversion	No	No	ASCII/EBCDIC	Yes
Error control	Yes	CRC	—	—
Automatic transmission speed detection	50 to 19.2K bps	No	—	—
Automatic disconnect of inactive dial-up terminals	No	No	—	—
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Braegen	B920	—
Main memory word size, bits	20	16	16; multiprocessors	—
Main memory storage capacity, bytes	2M	256K	1.5M	—
Level of data unit transferred across I/O channel	Byte	Byte	Byte	—
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	DMA	DMA	Both DMA & interrupt
Mass storage	Both DMA & interrupt	—	DMA	DMA
Other peripherals	Both DMA & interrupt	DMA	—	—
I/O, back-up, and diagnostic peripherals supported	Mag. tape and disk.	FEP diskette	—	—
Support for remote console	Yes	Yes	—	—
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Combination of software and firmware	Combination software and firmware
IPL method	Manual-load	Manual from diskette	—	Download from host
Additional software supported	Fortran 77, "C", full screen editor	None	—	NDL, DCS
User programmability	Yes—via User-created programs	No	—	Yes, via user-selected parameters
Software separately priced	All	No	—	All
Approx. proportion of currently installed systems supplied as turnkey systems	25%	All	—	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	70,000	14,000	22,559 (9558-1)	Contact vendor
Monthly maintenance, $	700	—	75	—
Monthly lease/rental, $	—	300	729 (3 yr. lease)	—
Maximum practical configuration:				
Purchase price, $	150,000	200,000	29,401	—
Monthly maintenance, $	1,500	—	200	—
Monthly lease/rental, $	—	3,000	1,033 (3 yr. lease)	—
Is maintenance bundled with lease/rental?	—	No	Yes	—
Date of first delivery	January 1981	1981	October 1980	January 1978
Number of systems installed to date	50	Over 300	1,000	200
Serviced by	BBN	Braegen	Burroughs	Burroughs
COMMENTS	Unix minicomputer; runs file-transfer; virtual terminal; electronic mail	Concurrent support of local 3270, remote 3270, remote job entry, local job entry, screen editor, multiple hosts		Redundant system

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Cableshare LSI-X.25 Front-End Processor	Cableshare LSI-X.25 Intelligent Concentrator	Cableshare LSI-X.25 Host Port Concentrator	Centennial Computer 2000/3000
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	DEC PDP-11 and VAX computers	All async. terminals	All hosts supporting async. communications	Univac 1100 Series
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	32 async. channels	32 async. channels	16
Max. no. of active hosts supported simultaneously	1	32	32	15
IBM emulation	No	No	No	—
Remote line concentrator	No	Yes	Yes	No
Maximum no. of hosts served by one concentrator	1	32	32	—
Host-independent network processor	Yes	Yes	Yes	No
Store-and-forward message switching processor	No	No	No	Yes
Distributed processing node	No	No	No	No
Terminal controller	No	Yes	Yes	Yes
Network Architecture compliance	None	None	None	SNA, CSP
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	127	32	32	150
2000 to 9600 bps	127	32	32	150
Over 9600 bps	127	32	32	75
Highest line speed supported (bps)	19.2K	19.2K	19.2K	19.2K
Effect on line capacity, if all lines are full-duplex	Halved	Halved	Halved	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	No	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	No	Yes
Protocol conversion	Async./X.25	Async./X.25	Async./X.25	No
Code conversion	1	Baudot/ASCII	Baudot/ASCII	ASCII/EBCDIC
Error control	—	—	—	Yes; LRC and CRC
Automatic transmission speed detection	No	Yes 110-9600 bps	Yes, 110-9600 bps	Yes 50-19.2K lps
Automatic disconnect of inactive dial-up terminals	No	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23	LSI-11/2 or PDP-11/23	Proprietary
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	64K	64K	64K	32K (2000) 64K (3000)
Level of data unit transferred across I/O channel	Block	—	—	Byte
Type of data transfer supported between memory and:				
Communications lines	DMA	—	—	DMA
Mass storage	—	—	—	—
Other peripherals	—	—	—	—
I/O, back-up, and diagnostic peripherals supported	FEP console	Console	Console	Built-in self diagnostics
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Software	Software	Combination of software and firmware
IPL method	Download from host	Internal self-load	Internal self-load	From diskette or host
Additional software supported	None	None	None	Custom
User programmability	No	No	No	No
Software separately priced	—	—	—	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	100%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	13,450	4,335	4,335	150,000
Monthly maintenance, $	100	70	70	1,500
Monthly lease/rental, $	None	None	None	4,000
Maximum practical configuration:				
Purchase price, $	16,450	18,500	18,500	500,000
Monthly maintenance, $	125	100	100	3,000
Monthly lease/rental, $	—	—	—	13,500
Is maintenance bundled with lease/rental?	—	—	—	No
Date of first delivery	November 1978	March 1980	March 1980	1974 (2000) 1976 (3000)
Number of systems installed to date	75	125	25	50
Serviced by	Digital Equipment Corp.	Digital Equipment Corp.	Digital Equipment Corp.	Centennial Computer
COMMENTS		Formatted screen mode; DTE or DCE support	Formatted screen mode; DTE or DCE support	

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Century Analysis OSI (Office Systems Interface)	Chi Communications Processor	Codex 6520	Commex, LTD DNP 4/6/16
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	DEC PDP Series, NCR Century & Criterion	Univac 1100 Series	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	None	8	4	1 to 32, dep. on model
Max. no. of active hosts supported simultaneously	Multiple	8	2	1 to 32, dep. on model
IBM emulation	No	No	270X, 370X	270X, 370X EP
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	Multiple	Unlimited	—	1
Host-independent network processor	Yes	Yes	No	RPQ
Store-and-forward message switching processor	Yes	No	No	RPQ
Distributed processing node	Yes	No	No	RPQ
Terminal controller	Yes	Yes	No	No
Network Architecture compliance	Yes	No	No	Future
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	24	Over 1000	240	See Comments
2000 to 9600 bps	24	32	Config.—dependent	—
Over 9600 bps	24	6	Config.—dependent	—
Highest line speed supported (bps)	19.2K	50K	230.4K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	Half aggregate data rate
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	No	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes (3270, TTY, RJE)
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Yes; all protocols	ASCII/2741	RPQ
Code conversion	No	ASCII/excess 3/EBCDIC	ASCII/EBCDIC	RPQ
Error control	Yes	LRC, BCC, and CRC	LRC and CRC	RPQ
Automatic transmission speed detection	Yes	Yes 110-19.2K bps	Yes; 135 to 9600 bps	Yes; 110-19.2K bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	RPQ
SYSTEM CHARACTERISTICS				
Processor	CAI-124/108/224	Perkin-Elmer 3200	CCI 801	6809 and Signet. 8X300
Main memory word size, bits	16	32	16	8
Main memory storage capacity, bytes	1M	1M	64K	600K RAM; 512K bubble
Level of data unit transferred across I/O channel	Block	Byte	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	Comb. DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Mass storage	Both DMA & interrupt	Comb. DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Other peripherals	Both DMA & interrupt	Diagnostic	Both DMA & interrupt	Both DMA & interrupt
I/O, back-up, and diagnostic peripherals supported	FEP Console		FEP console	Multiple consoles—both local and remote
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination software and firmware	Software	Software
IPL method	Download from host	Host/self-load/disk.	From host or diskette	Load from bubble mem.
Additional software supported	A compiler & assembler	Simulator and other utilities	—	Network generator, trace, on-line and off-line diagnostics, etc.
User programmability	No	Yes, via user-selected parameters	—	Yes, via user-selected parameters
Software separately priced	No	X.25 only	—	None
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	10,950	60,000	Contact vendor	Contact vendor
Monthly maintenance, $	Software 25; h/w 150	700	—	—
Monthly lease/rental, $	—	—	—	—
Maximum practical configuration:				
Purchase price, $	Software 25; h/w 150	500,000	—	—
Monthly maintenance, $	—	—	—	—
Monthly lease/rental, $	—	—	—	—
Is maintenance bundled with lease/rental?	—	—	—	Yes
Date of first delivery	December 1981	1977	January 1980	June 1981
Number of systems installed to date	100	35	25	—
Serviced by	CAI	Chi Corporation	Codex	Commex, third party
COMMENTS	CAI implementation uses Motorola 68000	Dynamic routing; two async. screen editors; automatic terminal protocol detection		Modular, packet bus architecture; DNP 4 handles up to 13 lines plus console; DNP 6, up to 23 lines plus console; DPN 16, up to 83 lines plus console per cabinet (1300 lines max. per system)

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Commex, LTD CMC 4	Computer Communications CC-6	Computer Communications CC-8	Computer Communications CC-80/85
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, compatibles, and Nixdorf	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	1	2	4	7
Max. no. of active hosts supported simultaneously	1	2	4	7
IBM emulation	270X, 370X EP	270X/370X EP	270X/370X EP	270X/370X EP
Remote line concentrator	No	No	No	No
Maximum no. of hosts served by one concentrator	—	—	—	—
Host-independent network processor	RPQ	No	No	Yes
Store-and-forward message switching processor	RPQ	No	No	Yes
Distributed processing node	RPQ	No	No	No
Terminal controller	No	Yes	Yes	Yes
Network Architecture compliance	—	No	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4 to 32	32	240	1232
2000 to 9600 bps	4 to 32	32	120	120
Over 9600 bps	Up to 32	4	32	120
Highest line speed supported (bps)	56K	56K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	No	Yes	Yes	Yes
Terminal-initiated applications switching	No	No	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	RPQ	No	No	No
Code conversion	RPQ	Yes	Yes	Yes
Error control	RPQ	Yes; parity, LRC/CRC	Yes; parity, LCR/CRC	Yes; parity, LRC/CRC
Automatic transmission speed detection	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps	Yes; 110 to 1200 bps
Automatic disconnect of inactive dial-up terminals	RPQ	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	CCI 601	CCI 801	CCI 8001/8501
Main memory word size, bits	8	16	16	16
Main memory storage capacity, bytes	64K	64K	64K	256K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Mass storage	RPQ	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Other peripherals	RPQ	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
I/O, back-up, and diagnostic peripherals supported	Console support std., others RPQ	Control panel	FEP CRT console, diskette, printer	Disk (40-200 MB), mag tape, FEP CRT, printer
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software	Software	Software
IPL method	Full system diagnostics	Download from host	From host/diskette	From host/disk
Additional software supported		Assembler, utilities, diagnostics	Value-added options, assembler loader, utilities, diagnostics	Value-added options, custom software, assembler, loader, utilities
User programmability	Custom	Yes, via user parameters and programs	Yes, via user parameters and programs	Yes, via user parameters and programs
Software separately priced	None	None	Value-added options	Options and custom sys.
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	90%	95%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	13,500 to 34,770	24,990	39,840	91,050
Monthly maintenance, $	80 to 120	138	272	330
Monthly lease/rental, $	425 to 890 (3 yr. lease)	802 (3 yr.); 1048 (rental)	1224 (3 yr.); 1600 (rent.)	1,932 (3 yr. lease)
Maximum practical configuration:				
Purchase price, $	19,500 to 65,645	51,368	181,200	674,050
Monthly maintenance, $	80 to 275	405	1,593	3,344
Monthly lease/rental, $	545 to 1,950 (3 yr. lease)	1742 (3 yr.); 2263 (rent.)	5858 (3 yr.); 7635 (rent.)	17,523 (3 yr. lease)
Is maintenance bundled with lease/rental?	Yes	Yes	Yes	Yes
Date of first delivery	November 1977	November 1981	1976	1975
Number of systems installed to date	425	5	175	370
Serviced by	Commex, third party	Computer Comm.	Computer Comm.	Computer Comm.
COMMENTS				

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Control Data 2551-1	Control Data 2551-2	Datastream Communications T5	Datastream Communications T7
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	CDC 6000, Cyber 70, Cyber 170 Series	CDC 6000, Cyber 70, Cyber 170 Series	IBM 3270, 303X, 434X	IBM 3270, 303X, 434X
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	2	2	—	—
Max. no. of active hosts supported simultaneously	1	1	1	2
IBM emulation	No	No	—	—
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	8	8	1	2
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	Yes	Yes
Terminal controller	No	No	Yes	Yes
Network Architecture compliance	Yes	Yes	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	254	—	—
2000 to 9600 bps	32	254	—	—
Over 9600 bps	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	—	—
Highest line speed supported (bps)	56K	56K	—	—
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	No	No	Yes	Yes
Code conversion	Yes	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	Yes; 100 to 1200 bps	Yes; 100 to 1200 bps	50 to 1200 bps	50 to 1200 bps
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	CDC-2551-1	CDC 2551-2	Monolithic Z80	Monolithic Z80
Main memory word size, bits	16	16	8	8
Main memory storage capacity, bytes	256K	256K	48K	48K
Level of data unit transferred across I/O channel	Byte and control	Byte and control	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	Both DMA & interrupt	Interrupt	Interrupt
Mass storage	—	—	—	—
Other peripherals	Both DMA & interrupt	Both DMA & interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	Console, diskette	Console, diskette	Mag. tape	Mag. tape
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Software	Software
IPL method	Download from host	Download from host	Mag. tape	Mag. tape
Additional software supported	—	—	—	—
User programmability	Yes	Yes	Yes, via menu configurator	Yes, via menu configurator
Software separately priced	All	All	Some	Some
Approx. proportion of currently installed systems supplied as turnkey systems	98%	98%	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	53,000	63,755	6,250	9,950
Monthly maintenance, $	560	576	94	150
Monthly lease/rental, $	1,400 (3 yr. lease)	1,703 (3 yr. lease)	—	—
Maximum practical configuration:				
Purchase price, $	83,230	246,000	6,250	Same as above
Monthly maintenance, $	800	2,500	94	—
Monthly lease/rental, $	2,355 (3 yr. lease)	7,340 (3 yr. lease)	—	—
Is maintenance bundled with lease/rental?	No	No	No	No
Date of first delivery	June 1975	June 1975	April 1982	November 1980
Number of systems installed to date	Over 200	Over 400	5	450
Serviced by	Control Data Corp.	Control Data Corp.	Datastream Comm. Inc.	Datastream Comm. Inc.
COMMENTS			Tape-based system which supports 4 async. terminals and one BSC line to the host computer	Tape-based system which supports up to 2 BSC lines in 8 port, 12 port, & 16 port versions; field-upgradable to redundant and SNA

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Data Communications T8	Digital Communications Associates System 355	GTE Telenet TP4000 Series	GTE Telenet TP2201/TP2202
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM 3270, 303X, 434X	Most manufacturers	Most manufacturers	Most manufacturers
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	DECsystem-10	Local concentrator	Local concentrator
Max. no. of hosts channel-attachable to front-end	—	8	—	—
Max. no. of active hosts supported simultaneously	—	8	80	56 (2201); 80 (2202)
IBM emulation	—	No	—	—
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	—	Unrestricted	Multiple	—
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	Yes	No	No	No
Terminal controller	Yes	Yes	No	No
Network Architecture compliance	SNA	INA	No	X.25
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	—	124	50 to 80	35 to 80
2000 to 9600 bps	—	124	24 to 40	28 (2201); 40 (2202)
Over 9600 bps	—	44	12 to 16	—
Highest line speed supported (bps)	19.2K	19.2K	56K	—
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	Yes	Yes
Protocol conversion	Yes	Async./X.25	No	No
Code conversion	Yes	No	Yes	Yes
Error control	Yes	Yes-ARQ	Parity, LRC & CRC	Parity, CRC
Automatic transmission speed detection	No	110 to 2400 bps	110 to 2400 bps	110 to 2400 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 8086	DCA System 355—Z80A	MOS technology 6502A	MOS technology 6502A
Main memory word size, bits	16	8	8	8
Main memory storage capacity, bytes	128K	1,472K (64K per Z80A)	256K	128K
Level of data unit transferred across I/O channel	Byte	Byte	—	—
Type of data transfer supported between memory and:				
Communications lines	DMA	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Mass storage	—	Interrupt	—	—
Other peripherals	—	Interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	Mag. Tape	Dual cassette tape unit; all diagnostics built-in	GTE Telenet NCC	GTE Telenet NCC
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Software	Combination of software and firmware	Combination of software and firmware	Combination of software and firmware
IPL method	Mag. tape	Internal self-load	Downline load from NCC	Downline load from NCC
Additional software supported	—	Configuration tape generator	—	—
User programmability	Yes, via menu configurator	Yes; via user-selected parameters/programs	Yes, via user-selected parameters	Yes, via user parameters
Software separately priced	Some	Utilities only	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	5%	55%	5%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	10,950	12,000 and up	37,000-49,500	29,100 (2201); 38,800
Monthly maintenance, $	165	Contact vendor	215-300	155/195
Monthly lease/rental, $	—	Contact vendor	GTE Telenet tariff	GTE Telenet tariff
Maximum practical configuration:				
Purchase price, $	10,950	144,145	76,500-157,200	62,100 (2201); 99,500
Monthly maintenance, $	165	Contact vendor	495-995	365/600
Monthly lease/rental, $	—	Contact vendor	GTE Telenet tariff	GTE Telenet tariff
Is maintenance bundled with lease/rental?	No	Contact vendor	Yes	Yes
Date of first delivery	July 1982	October 1980	December 1979	September 1977
Number of systems installed to date	0	Over 200	650	250
Serviced by	Datastream Comm. Inc.	DCA, third party	GTE Telenet	GTE Telenet
COMMENTS	Tape-based system which emulates a 3274 (PU-2); comes in 8 port, 12 port, & 16 port versions; field-upgradeable to include SNA	Supports host selection, post contention, full line and modem control facilities; handles up to 44 high-speed trunk lines; symmetric multiprocessing; supports up to 23 Z80As	Multiple Microprocessor Line Card (LPU) redundancy and common logic redundancy are supported	Multiple microprocessor technology; may be configured with major component and line card redundancy

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	GTE Telenet TP3010	Honeywell Information Systems Datanet 8	IBM 3705-II Models E1 through L4	IBM 3705-80 Models M81 thru M83
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Most manufacturers	Honeywell DPS 8, DPS 66, and DPS 64	IBM S/370, 30XX, and 43XX	IBM S/370, 30XX, and 43XX
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Local concentrator	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	4	4	2
Max. no. of active hosts supported simultaneously	27	4	4	2
IBM emulation	—	Yes	270X/370X	270X/370X
Remote line concentrator	Yes	Yes	Yes	No
Maximum no. of hosts served by one concentrator	27	4	1	—
Host-independent network processor	Yes	Yes	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	No	Yes	No	No
Network Architecture compliance	X.25	Honeywell DSA (ISO)	SNA	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	21 to 27	128	352	16
2000 to 9600 bps	4 to 19	Load-dependent	352	16
Over 9600 bps	—	Load-dependent	32	—
Highest line speed supported (bps)	9600, (19.2K netline)	56K	230.4K	—
Effect on line capacity, if all lines are full-duplex	None	Load-dependent	Capacity halved	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	No
Terminal-initiated applications switching	Yes	Yes (by host program)	No	No
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	No
Protocol conversion	No	No	Yes	Yes
Code conversion	Yes	No	Yes	Yes
Error control	Parity, LRC and CRC	Yes	LRC and CRC	LRC and CRC
Automatic transmission speed detection	50 to 1200 bps	Yes; 110, 300, 1200 bps	Yes, via optional soft.	Yes, via optional soft.
Automatic disconnect of inactive dial-up terminals	Yes	Yes, optional, variable	No	No
SYSTEM CHARACTERISTICS				
Processor	Zilog Z80	Datanet 8 (Honeywell)	Proprietary	Proprietary
Main memory word size, bits	8	16	18	—
Main memory storage capacity, bytes	64K	1,536K	512K	246K
Level of data unit transferred across I/O channel	Byte, block	Byte	Block	Block
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	Async. bus	DMA	DMA
Mass storage	—	Async. bus	DMA	DMA
Other peripherals	Interrupt	Async. bus	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	GTE Telenet NCC, cassette tape, local con.	Console, diskette	—	—
Support for remote console	Yes	Yes	No	No
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software and firmware	Software	Software
IPL method	Manual or downline	Host, local, or VIP	Download from host	Download from host
Additional software supported	—	Additional on host for administration of control	NCCF, NPDA	NCCF, NPDA
User programmability	Yes, via user-created programs	Yes, via user-selected parameters	Yes	Yes
Software separately priced	All	All	Yes	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	80%	Software is customer installable	—	—
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	6,800	41,015	38,230 (E1)	36,600 (M81)
Monthly maintenance, $	65	248	159	203
Monthly lease/rental, $	—	1,281 (5 yr. lease)	1,385 (2 yr. lease)	1,270 (2 yr. lease)
Maximum practical configuration:				
Purchase price, $	12,690	119,868	107,040 (L4)	52,600 (M83)
Monthly maintenance, $	110	838	485	221
Monthly lease/rental, $	—	3,861 (5 yr. lease)	5,455 (2 yr. lease)	1,965 (2 yr. lease)
Is maintenance bundled with lease/rental?	—	Yes	Yes	Yes
Date of first delivery	January 1979	Latest model 3rd qtr.	August 1976	August 1981
Number of systems installed to date	1000	Early model over 500	50,000	—
Serviced by	GTE Telenet	Honeywell	IBM	IBM
COMMENTS	Redundant Communications Line Processor (CLP) with 64K memory is configurable			

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	ICCI CA20 BSC	ICCI CA20 SNA	ICOT 25X (253, 254-257)	ICOT 251
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX and compatibles	IBM S/370, 30XX, 43XX and compatibles	Most manufacturers via serial interface	Manufacturers supporting X.25 or Async. RS-232-C
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	No	No
Max. no. of hosts channel-attachable to front-end	—	—	—	—
Max. no. of active hosts supported simultaneously	—	—	—	—
IBM emulation	—	—	—	—
Remote line concentrator	No	No	Yes	No
Maximum no. of hosts served by one concentrator	—	—	18	—
Host-independent network processor	No	No	No	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	No	No	No
Terminal controller	Yes	Yes	No	Yes
Network Architecture compliance	BSC (bisync.)	SNA/SDLC	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	—	—	5 to 18	4 to 8
2000 to 9600 bps	10	10	5 to 18	4 to 8
Over 9600 bps	—	—	5 to 18	4 or 8
Highest line speed supported (bps)	19.2K syn., 9.6K asy.	19.2K syn., 9.6K asy.	19.2K	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	Async./3276 BSC	Async/3276 SNA	Yes	Async./X.25
Code conversion	ASCII/EBCDIC	ASCII/EBCDIC	ASCII/EBCDIC & ots.	No
Error control	CRC-16	CCITT	Yes, protocol conformant	Yes, defined by X.25
Automatic transmission speed detection	212-A modem compat.	212-A modem compat.	No	Yes, up to 1200 bps
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Zilog Z80A	Zilog Z80A	Intel 8085/8088	Zilog Z80
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	64K	64K	128K	24K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	—	—	—	—
Other peripherals	Interrupt	Interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	—	—	None	None
Support for remote console	Under development	Under development	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Firmware
IPL method	Internal self-load	Internal self-load	Internal self-load	Internal self-load
Additional software supported	None	None	—	—
User programmability	No	No	No	Yes, via user selected parameters
Software separately priced	No	No	No	No
Approx. proportion of currently installed systems supplied as turnkey systems	None	None	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	9,700	9,700	10,000	2,950
Monthly maintenance, $	60	60	985	—
Monthly lease/rental, $	1,000/3 month max.	1,000/3 months max.	—	—
Maximum practical configuration:				
Purchase price, $	9,700	9,700	50,000	4,200
Monthly maintenance, $	60	60	400	—
Monthly lease/rental, $	1,000/3 month max.	1,000/3 month max.	—	—
Is maintenance bundled with lease/rental?	Yes	Yes	—	No
Date of first delivery	March 1982	March 1982	June 1979	April 1982
Number of systems installed to date	25	25	—	32
Serviced by	ICCI	ICCI	ICOT	ICOT
COMMENTS	Second-generation product based on original CA12 technology, of which more than 400 units are currently installed	Second-generation product based on original CA12 technology, of which more than 400 units are currently installed	These three versions allow protocol/code conversion in multiple protocol environment	The primary function of ICOT 251 X.25 PAD is to allow async. ASCII terminals to access an X.25 network

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	ICOT 352	ICOT 35X	Lemcom Systems CMC-4	Lemcom Systems CMC-8
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM mainframes that support 3270 terminals	IBM mainframes supporting 3270s; Univac mainframes supporting UTS-400s	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	No	No	Yes	Yes
Max. no. of hosts channel-attachable to front-end	—	—	1	1
Max. no. of active hosts supported simultaneously	—	—	1	1
IBM emulation	—	—	270X	270X
Remote line concentrator	No	Yes	No	No
Maximum no. of hosts served by one concentrator	—	Up to 17	—	—
Host-independent network processor	No	No	No	No
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	Yes	No	No
Network Architecture compliance	No	No	—	—
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	2	5 to 18	4	8
2000 to 9600 bps	2	5 to 18	4	8
Over 9600 bps	—	—	3	6
Highest line speed supported (bps)	19.2K	19.2K	56K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	No	No	No	No
Terminal-initiated applications switching	Yes	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	No	No	No	No
Protocol conversion	Yes	Yes	RPQ	RPQ
Code conversion	Yes	Yes	RPQ	RPQ
Error control	Yes	Yes	LRC and CRC	LRC and CRC
Automatic transmission speed detection	Yes, 50 to 9600 bps	No	RPQ—300, 1200	RPQ—300, 1200
Automatic disconnect of inactive dial-up terminals	Yes	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Intel 8085/8088	Intel 8085/8088	Motorola 6800	Motorola 6800
Main memory word size, bits	8	8	8	8
Main memory storage capacity, bytes	64K	128K	40K	80K
Level of data unit transferred across I/O channel	Byte	Byte	Byte	Byte
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	—	—	—	—
Other peripherals	—	—	—	—
I/O, back-up, and diagnostic peripherals supported	Supervisory console	Logical console	FEP console	FEP console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Firmware	Firmware	Firmware
IPL method	Internal self-load	Internal self-load	Internal self-load	Internal self-load
Additional software supported	—	—	Problem determination aids	Problem determination aids
User programmability	User-configurable control tables	No	User-selected parameters	Yes, via user-selected parameters
Software separately priced	No	No	Utilities only	Utilities only
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	7,600	6,400	14,000	16,000
Monthly maintenance, $	85	70	Contact vendor	Contact vendor
Monthly lease/rental, $	—	—	Contact vendor	Contact vendor
Maximum practical configuration:				
Purchase price, $	9,850	38,000	20,000	30,000
Monthly maintenance, $	110	420	Contact vendor	Contact vendor
Monthly lease/rental, $	—	—	Contact vendor	Contact vendor
Is maintenance bundled with lease/rental?	—	—	Contact vendor	Contact vendor
Date of first delivery	March 1982	September 1981	March 1977	November 1980
Number of systems installed to date	25	25	300	20
Serviced by	ICOT	ICOT	Third party	Third party
COMMENTS	Allows ASCII terminals to emulate IBM 3270 using BSC or SDLC protocols	Enables IBM 3270 and Univac UTS-400 compatible terminals to emulate each other and operate in a IBM and Univac multi-host environment; three models are 353, 354S and 357S		

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Lemcom Systems CMC-32	Lemcom Systems Distributed Network Processor Series	M/A-COM DCC CP9000	M/A-COM DCC Micro-Node
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	IBM S/370, 30XX, 43XX, and compatibles	Most manufacturers via serial interface	Most manufacturers via serial interface
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	No
Max. no. of hosts channel-attachable to front-end	1	500	—	—
Max. no. of active hosts supported simultaneously	1	250	—	—
IBM emulation	270X	270X, 370X EP	—	—
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	250	No limit	No limit
Host-independent network processor	No	Yes	Yes	Yes
Store-and-forward message switching processor	No	RPQ	Yes	Yes
Distributed processing node	No	Yes	Yes	Yes
Terminal controller	No	RPQ	Yes	Yes
Network Architecture compliance	—	DMMA	No	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	32	6500	480	128
2000 to 9600 bps	32	1500	240 to 480	128
Over 9600 bps	24	250	60 to 120	128
Highest line speed supported (bps)	56K	56K	56K	56K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	No	Yes	No	No
Terminal-initiated applications switching	No	Yes	No	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	No	No
Protocol conversion	RPQ	RPQ	No	No
Code conversion	RPQ	RPQ	No	No
Error control	LRC and CRC	LRC and CRC	No	No
Automatic transmission speed detection	RPQ—300, 1200	110 to 19,200 bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	Motorola 6800	Motorola 6809	6502 and Z80	6502 and Z8000
Main memory word size, bits	8	8	8	8 and 16
Main memory storage capacity, bytes	320K	15M	4M bytes	64K
Level of data unit transferred across I/O channel	Byte	Byte and block	Byte	Byte and block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Both DMA & interrupt	Both DMA & interrupt	Both DMA & interrupt
Mass storage	—	Both DMA & interrupt	Interrupt	Interrupt
Other peripherals	—	Both DMA & interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	FEP console	FEP console and bubble memory	Diskette	Diskette
Support for remote console	Yes	;Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software	Software	Combination of software and firmware
IPL method	Internal self-load	Self-load from bubble	From host/diskette	From host/diskette
Additional software supported	Problem determination aids	Channel prog. simulator and prob. determin. aids	Assembler & LOGOS compilers & linker , system diagnostics	System diagnostics
User programmability	Yes, via user-selected parametes	Yes, via user-selected parameters	Yes—via user created programs	Yes—via user created programs
Software separately priced	Utilities only	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	None	25%	None	None
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	20,000	25,000	Approx. 20,000	Approx. 15,000
Monthly maintenance, $	Contact vendor	Contact vendor	—	—
Monthly lease/rental, $	Contact vendor	Contact vendor	—	—
Maximum practical configuration:				
Purchase price, $	60,000	500,000	Approx. 150,000	Approx. 100,000
Monthly maintenance, $	Contact vendor	Contact vendor	—	—
Monthly lease/rental, $	Contact vendor	Contact vendor	—	—
Is maintenance bundled with lease/rental?	Contact vendor	Contact vendor	No	No
Date of first delivery	March 1979	1981	1977	1980
Number of systems installed to date	90	5	Over 500	Approx. 50
Serviced by	Third party	Third party	M/A-COM DCC	M/A-COM DCC
COMMENTS		Distributed MPU FEP; up to 256 MPUs can be programmed to perform various comm. processing functions; supports manual and downline load	Communications features and functions programmable by user	Multi-processor designed for fail-safe operation; all components totally redundant; communication features and functions programmable by user

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Memorex Communications Group 1270 Terminal Control Unit	ModComp 3108 & 3109	NCR Comten 3650	NCR Comten 3670
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	Modcomp Classic 7845, 7855, 7875; IBM S/370; CDC; Cray	IBM S/370, 30XX, 43XX, and compatibles; custom	IBM S/370, 30XX, 43XX, and compatibles; custom
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	2	4	2	4
Max. no. of active hosts supported simultaneously	2	4	2	4
IBM emulation	270X, 370X EP	No	270X, 370X, ACF/NCP	270X, 370X, ACF/NCP
Remote line concentrator	No	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	—	User programmable	Unlimited	Unlimited
Host-independent network processor	No	Yes	No	Yes
Store-and-forward message switching processor	No	No	No	No
Distributed processing node	No	Yes	No	No
Terminal controller	Yes	Yes	No	No
Network Architecture compliance	VAN	Yes	SNA, CNA	SNA CNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	96	256	128	384
2000 to 9600 bps	70	256 to 166	128	384
Over 9600 bps	6	Application-dependent	32 to 128	96 to 284
Highest line speed supported (bps)	56K	250K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes for VAN	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	No	No	Yes	Yes
Protocol conversion	X.25/BSC/ASCII	No	Yes	Yes
Code conversion	ASCII/BCD	No	Yes	Yes
Error control	Yes	CRC	Yes	Yes
Automatic transmission speed detection	Yes 50 to 9600 bps	No	110 to 9600 bps	110 to 9600 bps
Automatic disconnect of inactive dial-up terminals	No	No	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	—	Modcomp 7845/55/75	Proprietary	Proprietary
Main memory word size, bits	—	16	32	32
Main memory storage capacity, bytes	—	4M	512K	512K
Level of data unit transferred across I/O channel	Byte	Block	Byte or block	Byte or block
Type of data transfer supported between memory and:				
Communications lines	Interrupt	Both DMA & interrupt	DMA	DMA
Mass storage	—	Both DMA & interrupt	DMA	DMA
Other peripherals	—	Both DMA & interrupt	DMA	DMA
I/O, back-up, and diagnostic peripherals supported	Console w/VANS	Mag. tape, diskette, disk	Diskette, cassette	Cassette
Support for remote console	No	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Firmware	Software	Software	Software
IPL method	Internal self-load	System, dependent	See comments	See comments
Additional software supported	—	Cobol, Pascal, Fortran	NDP, CLSS1, Codel 58	NDP, CLSS1, Codel 58
User programmability	No	Yes, via user-selected parameters	Yes, via user-sel. par. & user programs	Yes, via user-sel. par. & user programs
Software separately priced	No	Yes	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	All	None	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	14,900	Contact vendor	45,000	90,000
Monthly maintenance, $	126	—	199	270
Monthly lease/rental, $	543 mo. (3 yr. lease)	—	1,500 (2 yr. lease)	3,000 (2 yr. lease)
Maximum practical configuration:				
Purchase price, $	45,000	—	125,000	350,000
Monthly maintenance, $	250	—	631	2,000
Monthly lease/rental, $	1,450 (3 yr. lease)	—	4,150 (2 yr. lease)	11,600 (2 yr. lease)
Is maintenance bundled with lease/rental?	No	—	No	No
Date of first delivery	1970	—	March 1975	March 1972
Number of systems installed to date	2,100	—	1,200	400
Serviced by	Memorex	Modcomp	NCR Comten	NCR Comten
COMMENTS	Hard-wired data communications controller		Manual load from diskette and download from host	Manual load from diskette and download from host

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	NCR Comten 3690 Models A5-E5	NCR Comten 3690 Models T1/U1	NCR Comten 721-II	North America Philips Communications System Division MARC
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles; custom	IBM S/370, 30XX, 43XX; custom	NCR Century, Criterion, 8XX5 Systems	IBM S/370 and compatibles; Philips DS714
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	Yes	Yes
Max. no. of hosts channel-attachable to front-end	8	2	2	4
Max. no. of active hosts supported simultaneously	8	2	2	2
IBM emulation	270X/370X, ACF/NCP	270X, 370X, ACF/NCP	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	4
Host-independent network processor	Yes	Yes	Yes	Yes
Store-and-forward message switching processor	Yes	No	No	Yes
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Yes
Network Architecture compliance	SNA CNA	SNA/CNA	CNA	No
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	512	128	99	256
2000 to 9600 bps	512	128	52-99	12
Over 9600 bps	128 to 512	32 to 128	10 at 56K	9
Highest line speed supported (bps)	230.4K	230.4K	56K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	None	None
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	Yes
Terminal-initiated applications switching	Yes	Yes	No	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	No	Yes
Protocol conversion	Yes	Yes—Many	No	Yes; protocols supported
Code conversion	Yes	Yes	No	ASCII/EBCDIC
Error control	Yes	Yes	Yes	CRC
Automatic transmission speed detection	110 to 9600 bps	110 to 9600 bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	Yes	Yes
SYSTEM CHARACTERISTICS				
Processor	Proprietary	Proprietary	Proprietary	Up to 12 Z80Bs
Main memory word size, bits	32	32	16	8
Main memory storage capacity, bytes	4M	1M	512K	192K
Level of data unit transferred across I/O channel	Byte or block	Byte, block, or file	Byte and block	Byte or block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	DMA	Both DMA & interrupt
Mass storage	DMA	DMA	—	Both DMA & interrupt
Other peripherals	DMA	DMA	DMA	Both DMA & interrupt
I/O, back-up, and diagnostic peripherals supported	Diskette	Diskette	Cassette	No
Support for remote console	Yes	Yes	No	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of software or firmware	Software	Combination of software and firmware
IPL method	See comments	Load from host/disk.	Load from cassette	Host/diskette/cassette
Additional software supported	NDP, CLSS1, Codel 58	NDP, CLSS2, Codel 58	No	No
User programmability	Yes, via user-sel. par. & user programs	Yes, via user created programs	No	No
Software separately priced	All	All	All	—
Approx. proportion of currently installed systems supplied as turnkey systems	All	All	All	95%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	130,000	88,925	41,720	25,000
Monthly maintenance, $	672	445	209	—
Monthly lease/rental, $	4,300 (2 yr. lease)	2,327	1,205	None
Maximum practical configuration:				
Purchase price, $	550,000			
Monthly maintenance, $	3,365	108,500	100,400	200,000
Monthly lease/rental, $	18,000 (2 yr. lease)	545	502	—
		3,700	3,500	None
Is maintenance bundled with lease/rental?	No	Yes	Yes	—
Date of first delivery	June 1978	January 1980	1976	—
Number of systems installed to date	400	45	Approx. 1,200	150
Serviced by	NCR Comten	NCR Comten	NCR Comten	N. American Philips
COMMENTS	Manual load from diskette and download from host			Modular hardware and software designed for 100% redundancy

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Paradyne Pix/Pixnet	Periphonics T-COMM 80	Raytheon Data Systems Raynet I, II, III	Raytheon Data Systems Raynet IV
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/370, 30XX, 43XX, and compatibles	Most major manufacturers	IBM, Univac mainframes and compatibles	IBM, Univac mainframes and compatibles
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes; see comments	Yes	No	No
Max. no. of hosts channel-attachable to front-end	1	8 per processor	16	16
Max. no. of active hosts supported simultaneously	1	4 per processor	Interface-dependent	Interface-dependent
IBM emulation	—	—	No	No
Remote line concentrator	Yes	Yes	Yes	Yes
Maximum no. of hosts served by one concentrator	1	8	1 (R-I); 8 (R-II & R-III)	8
Host-independent network processor	1	Yes	Yes	Yes
Store-and-forward message switching processor	No	RPQ	No	Yes
Distributed processing node	Yes	Yes	No	No
Terminal controller	Yes	Yes	Yes	Yes
Network Architecture compliance	—	—	Yes	Yes
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	—	50	47	47
2000 to 9600 bps	Application-dependent	10 to 45	47	47
Over 9600 bps	3 full duplex	Up to 10	Varies	Varies
Highest line speed supported (bps)	56K	56K	56K	56K
Effect on line capacity, if all lines are full-duplex	Capacity havled	Capacity halved	None	Capacity halved
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	—	No	No	No
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	Yes
Protocol conversion	RPQ	Yes	Yes	Yes
Code conversion	RPQ	Yes	Yes	Yes
Error control	Yes	Yes	Yes	Yes
Automatic transmission speed detection	—	No	No	No
Automatic disconnect of inactive dial-up terminals	—	Yes	No	No
SYSTEM CHARACTERISTICS				
Processor	Proprietary	DEC PDP-11/34 or LSI-	RDS-7500	RDS-7500
Main memory word size, bits	16	16	16	16
Main memory storage capacity, bytes	128K	176K	256K	256K
Level of data unit transferred across I/O channel	Byte	Block	Block	Block
Type of data transfer supported between memory and:				
Communications lines	DMA, interrupt	Both DMA & interrupt	DMA	DMA
Mass storage	—	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA	Both DMA & interrupt	Both DMA & interrupt
I/O, back-up, and diagnostic peripherals supported	Mag. tape, remote console	Diskette, SMD, mag. tape	Console, cassette, printer	Console, cassette, printer
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination of software & firm. & hard.	Software	Combination of software and firmware	Combination of software and firmware
IPL method	Internal self-load	Host download/diskette	Host download & cass.	Host download & cass.
Additional software supported	Utilities	Vocabulary editor, appl. manager.	—	—
User programmability	—	Yes, via user-selected parameters	Yes; via user-selected parameters	Yes; via user selected parameters
Software separately priced	RPQ software only	All	All	All
Approx. proportion of currently installed systems supplied as turnkey systems	30%	All	All	All
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	Contact vendor	50,000	60,000	100,000
Monthly maintenance, $	—	—	—	—
Monthly lease/rental, $	—	—	—	—
Maximum practical configuration:				
Purchase price, $	—	—	700,000	40,000
Monthly maintenance, $	—	—	—	—
Monthly lease/rental, $	—	—	—	—
Is maintenance bundled with lease/rental?	—	—	No	No
Date of first delivery	April 1976	—	1978; 1980 (R-II & R-III)	1980
Number of systems installed to date	Over 1700	—	Over 100	Under 10
Serviced by	Paradyne	Periphonics Corporation	Raytheon Data Systems	Rayhteon Data Systems
COMMENTS	Pix permits remote peripherals to access host as if locally attached		Raynet I supports network control functions, redundancy option; Raynet II provides all Raynet I capabilities plus host selection; Raynet III provides all Raynet II capabilities plus protocol conversion	Raynet IV provides all Raynet III capabilities plus message switching; Raynet V provides all Raynet IV Capabilities plus node-to-node communications

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Sperry-Univac DCP/40 (Primary Mode)	Sperry-Univac DCP/20	Starnet Data System Protex Industries Starnet II	Tandem Non-Stop II
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Sperry-Univac Series 1100, Series 90	Sperry-Univac Series 1100, Series 90	Most computer systems via standard serial and parallel interfaces	—
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	Yes	No	Yes
Max. no. of hosts channel-attachable to front-end	16	4	—	4
Max. no. of active hosts supported simultaneously	16	3	—	10 or more
IBM emulation	No	No	—	Model 7
Remote line concentrator	Yes	Yes	No	Yes
Maximum no. of hosts served by one concentrator	No specific limit	No specific limit	—	10 or more
Host-independent network processor	Yes (initial host lead)	Yes (req. init. host load)	Yes	Yes
Store-and-forward message switching processor	Custom	Custom	No	Yes
Distributed processing node	No	No	No	Yes
Terminal controller	No	No	No	Yes
Network Architecture compliance	DCA	DCA	None	SNA
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	255 sync; 1023 async.	47 sync; 192 async.	16	1000
2000 to 9600 bps	255	47	16	300 to 400
Over 9600 bps	140	47	8	50 to 100
Highest line speed supported (bps)	64K	64K	19.2K	Up to 80K
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	75% to 50% of capacity
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	No	No	No	Yes
Terminal-initiated applications switching	Yes	Yes	Yes	Yes
Comm. processor-initiated dynamic line reconfig.	Yes	Yes	yes	Yes
Protocol conversion	No	No	Yes	Any protocols supported
Code conversion	Yes	Yes	ASCII/EBCDIC/Baudot	ASCII/EBCDIC/Baudot
Error control	Yes	Yes	No	LRC and CRC
Automatic transmission speed detection	Yes 110 to 19.2K bps	Yes 110 to 19.2 bps	No	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No	Yes
SYSTEM CHARACTERISTICS				
Processor	Sperry-Univac DCP/40	Sperry-Univac DCP/20	Intel 8085	Proprietary
Main memory word size, bits	16	16	8	16
Main memory storage capacity, bytes	2M	512K	96K	8M per processor
Level of data unit transferred across I/O channel	Block	Block	Byte	Block
Type of data transfer supported between memory and:				
Communications lines	DMA	DMA	—	DMA
Mass storage	DMA	DMA	—	DMA
Other peripherals	DMA	DMA	—	DMA
I/O, back-up, and diagnostic peripherals supported	Console, disk, mag. tape	Console, disk, diskette, mag. tape	—	Disk, mag. tape, & console
Support for remote console	Yes	Yes	Yes	Yes
Communications operating software:				
Operating system implemented in	Combination software and firmware	Combination software and firmware	Combination of software & firmware	Combination of software and firmware
IPL method	Host download & disk.	Host download & disk.	Internal self-load	Manual-load from disk
Additional software supported	File transfer	File transfer	None	Cobol, Fortran, Mumps computer, Database, TP monitors
User programmability	Yes, via user created programs	Yes, via user created programs	Yes, via user-selected parameters	Yes, via user-created programs
Software separately priced	All	All	Applications only	Yes
Approx. proportion of currently installed systems supplied as turnkey systems	10%	None	None	10%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	125,000	45,000	19,495 (16 channels)	200,000
Monthly maintenance, $	625	230	Approx. 100	1,000
Monthly lease/rental, $	2500-5 yr./3200-1 yr.	925-5 yr./1150-1 yr.	Third party	Third party
Maximum practical configuration:				
Purchase price, $	480,000	135,000	19,495	1,000,000
Monthly maintenance, $	2,500	700	Approx. 100	5,000
Monthly lease/rental, $	10,000-5 yr/12,500-1	2800-5 yr./3500-1 yr.	Third party	—
Is maintenance bundled with lease/rental?	No	No	—	—
Date of first delivery	September 1979	January 1982	February 1982	1976
Number of systems installed to date	500	25	5	3,000
Serviced by	Sperry-Univac	Sperry-Univac	Starnet Data or third party	Tandem
COMMENTS			As many as 256 Starnet II nodes may be daisy-chained; other features include automatic power failure restart and self-diagnostics for both hardware and firmware	Redundant processing provides 100% "up time"

Communications Processors—Management Perspective and Equipment Specification

SUPPLIER AND MODEL	Telefile Computer Products FECP-X	Thomas Engineering MZ-80	Thomas Engineering 8770/20	TRT Data Products Norfield Communications System 300
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Xerox Sigma 5-9 and Telefile T80 Series	IBM/370, 30XX, 43XX, Series 1; Honeywell—all models using VIP	IBM/370, 30XX, 43XX, Series 1; Honeywell—all models using VIP	Most major manufacturers
FUNCTIONAL CONFIGURATIONS				
Front-end processor	Yes	No	No	No
Max. no. of hosts channel-attachable to front-end	6	—	—	—
Max. no. of active hosts supported simultaneously	3	—	—	—
IBM emulation	None	—	—	—
Remote line concentrator	Yes	Yes	Yes	—
Maximum no. of hosts served by one concentrator	Network-dependent	1	1	—
Host-independent network processor	No	No	No	Yes
Store-and-forward message switching processor	Yes	No	No	Yes
Distributed processing node	Yes	Yes	Yes	Yes
Terminal controller	Yes	Yes	Yes	Yes
Network Architecture compliance	None	No	No	Yes
Communications line capacity:				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	256	32	32	32
2000 to 9600 bps	256	32	32	8
Over 9600 bps	—	32	32	—
Highest line speed supported (bps)	9600	19.2K bps	19.2K bps	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	70%
COMMUNICATIONS FEATURES/FUNCTIONS				
Multiplexing/demultiplexing:	Yes	Yes	Yes	No
Terminal-initiated applications switching	Yes	Yes	Yes	No
Comm. processor-initiated dynamic line reconfig.	Yes	No	No	No
Protocol conversion	No	Async/BSC; Async/VIP	Async/BSC; Async/VIP	Yes
Code conversion	ASCII/EBCDIC	ASCII/EBCDIC	ASCII/EBCDIC	Yes
Error control	No	Parity, LRC/CRC	Parity and LRC/CRC	Yes
Automatic transmission speed detection	Yes 110 to 9600 bps	50 to 200 bps	50 to 200 bps	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes (optional)	Yes (optional)	Yes
SYSTEM CHARACTERISTICS				
Processor	TCP-16	Zilog Z80B	Zilog Z80A	Data General 4X
Main memory word size, bits	16	8	8	16
Main memory storage capacity, bytes	128K	1M	90K	64K
Level of data unit transferred across I/O channel	Byte	Byte and block	Byte and block	—
Type of data transfer supported between memory and:				
Communications lines	Both DMA & interrupt	Interrupt (SDLC DMA)	Interrupt	—
Mass storage	—	Both DMA & interrupt	Interrupt	—
Other peripherals	—	Interrupt	—	—
I/O, back-up, and diagnostic peripherals supported	—	—	—	—
Support for remote console	Yes	—	—	Yes
Communications operating software:				
Operating system implemented in	Combination of software and firmware	Combination of firmware/software	Software	Software
IPL method	Download from host	Cassette/diskette/ROM	Load from diskette	Manual-loading diskette
Additional software supported	—	Program development system; CP/M—compatible packages	Program development system; CP/M—compatible packages	—
User programmability	—	Yes, via user-created programs	Yes, via user-created programs	No
Software separately priced	—	All	All	—
Approx. proportion of currently installed systems supplied as turnkey systems	25%	All	95%	75%
PRICING AND AVAILABILITY				
Minimum configuration, including all hardware components required for basic operation:				
Purchase price, $	35,000	4,620 for 4 lines	6,454 for 4 lines	50,000
Monthly maintenance, $	184	Third party	Third party	500
Monthly lease/rental, $	2,000 (rental)	Third party	Third party	Contact vendor
Maximum practical configuration:				
Purchase price, $	600,000	12,885-32 lines, 2 dsk.	13,230-32 lines, 2 dsk.	100,000
Monthly maintenance, $	1,700	Third party	Third party	1,000
Monthly lease/rental, $	25,000 (rental)	Third party	Third party	Contact vendor
Is maintenance bundled with lease/rental?	Yes	—	—	No
Date of first delivery	1976	December 1981	November 1978	1975
Number of systems installed to date	10	20	230	35
Serviced by	Telefile	General Electric	General Electric	Norfield
COMMENTS	Hardware and software compatible with all Xerox mainframes	System provides emulation of IBM 3277 and Honeywell VIP 7700 terminals using ASCII CRTs, as well as "pass-through" support of printers and other devices; line speeds are independently set, in any combination.	System provides emulation of IBM 3277 and Honeywell VIP 7700 terminals using ASCII CRTs, as well as support of printers and other devices; line speeds are independently set, in any combination	Custom systems available

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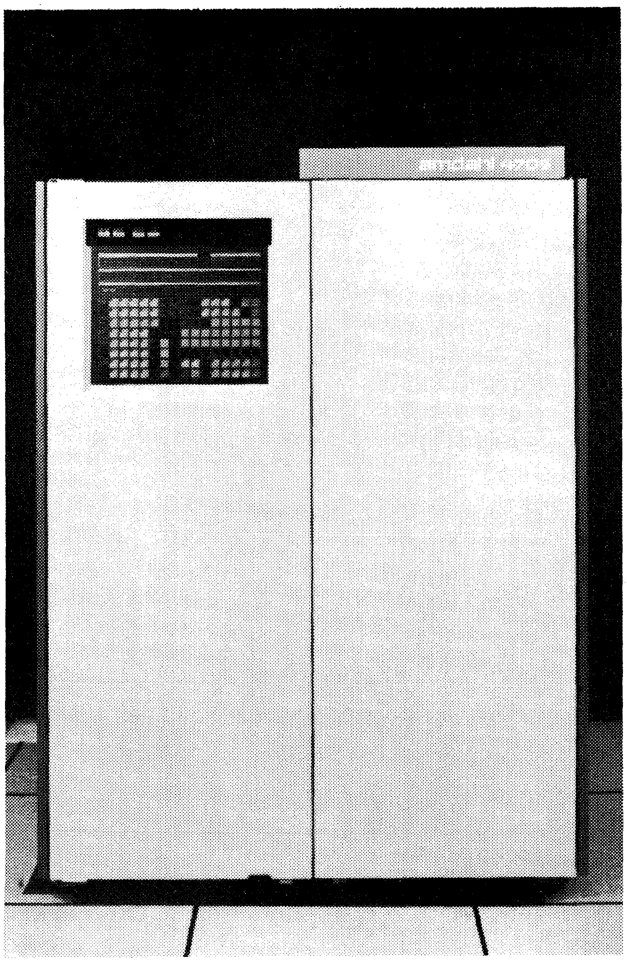
SUPPLIER AND MODEL	TRT Data Products Norfield Communications System 400	TRT Data Products Norfield Communications System 500	Westinghouse Canada Electronic Systems Division W1655 ICC
COMPUTER SYSTEMS INTERFACED			
Manufacturers and Models	Most major manufacturers	Most major manufacturers	IBM PARS, Univac Uniscope 100 & UTS20
FUNCTIONAL CONFIGURATIONS			
Front-end processor	No	No	No
Max. no. of hosts channel-attachable to front-end	—	—	—
Max. no. of active hosts supported simultaneously	—	—	—
IBM emulation	—	—	—
Remote line concentrator	—	—	Yes
Maximum no. of hosts served by one concentrator	—	—	4
Host-independent network processor	Yes	Yes	No
Store-and-forward message switching processor	Yes	Yes	Yes
Distributed processing node	Yes	Yes	No
Terminal controller	Yes	Yes	Yes
Network Architecture compliance	Yes	Yes	—
Communications line capacity:			
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:			
Up to 1800 bps	64	512	16
2000 to 9600 bps	16	32	16 to 4800; 8 to 9600
Over 9600 bps	12	24	—
Highest line speed supported (bps)	19.2K	56K	9600
Effect on line capacity, if all lines are full-duplex	70%	70%	Halved if over 4800
COMMUNICATIONS FEATURES/FUNCTIONS			
Multiplexing/demultiplexing:	No	Yes	No
Terminal-initiated applications switching	No	Yes	No
Comm. processor-initiated dynamic line reconfig.	No	Yes	No
Protocol conversion	Yes	Yes	IPARS/P1024; U100/
Code conversion	Yes	Yes	IPARS/P1024
Error control	Yes	Yes	Yes
Automatic transmission speed detection	Yes	Yes	No
Automatic disconnect of inactive dial-up terminals	Yes	Yes	No
SYSTEM CHARACTERISTICS			
Processor	Data General 4X	Perkin-Elmer 3230	Intel 8080 and 8085
Main memory word size, bits	16	32	8
Main memory storage capacity, bytes	256K	4M	32K
Level of data unit transferred across I/O channel	—	—	Block
Type of data transfer supported between memory and:			
Communications lines	—	—	Interrupt
Mass storage	—	—	—
Other peripherals	—	—	Interrupt
I/O, back-up, and diagnostic peripherals supported	—	—	—
Support for remote console	Yes	Yes	Yes
Communications operating software:			
Operating system implemented in	Software	Combination of software and firmware	Firmware
IPL method	Manual loading diskette	Manual loading diskette	Download, EPROMs
Additional software supported	—	—	—
User programmability	No	No	No
Software separately priced	—	—	None
Approx. proportion of currently installed systems supplied as turnkey systems	25%	None	All
PRICING AND AVAILABILITY			
Minimum configuration, including all hardware components required for basic operation:			
Purchase price, $	75,000	250,000	12,000
Monthly maintenance, $	600	500	—
Monthly lease/rental, $	Contact vendor	Contact vendor	Third party
Maximum practical configuration:			
Purchase price, $	300,000	1,000,000	20,000
Monthly maintenance, $	2,000	3,000	—
Monthly lease/rental, $	Contact vendor	Contact vendor	Third party
Is maintenance bundled with lease/rental?	No	No	No
Date of first delivery	1978	1982	September 1976
Number of systems installed to date	20	0	300
Serviced by	Norfield	Norfield	Third party
COMMENTS	Custom systems available	Custom systems available	Unit is modular, uses up to three microprocessors and is the basis for custom special systems

Communications Processors— Management Perspective and Equipment Specifications

A discussion of the products and trends of the highly active communications processor marketplace. Included in the report are comparison charts on 91 products currently offered by 42 different vendors, and user ratings from 192 users reporting on their experience with 377 installed communications processor systems.

An increasingly wide range of communications processing products is available on today's market. Most mainframe vendors have continued to enhance their existing communications processor product lines, and several new lines have been recently introduced, such as Burroughs' CP Series, Sperry Univac's DCP/40, and Amdahl's 4705. Rumors of IBM's replacement of its 3705 have become stronger in recent months, and several industry observers have speculated that its introduction could take place before the end of 1981. Users can now choose from a wide variety of communications systems that support increasingly sophisticated front-end processing, intelligent remote concentration, network processing, and other communications processing capabilities.

Enthusiastic promotion by minicomputer manufacturers, independent systems houses, and mainframe vendors accounts for the widespread support of both remote and local data communications processing. During the past several years, virtually every major computer manufacturer has announced its own network "architecture," a set of rules, and procedures that govern how its hardware and software products can be organized to create a network structure. And, of course, communications processors serve as key building blocks in the construction of these networks.



This year's most significant new entrant to the communications processor scene is Amdahl, which introduced its Model 4705 front-end processor in October 1980. As with other members of the Amdahl product line, the 4705 is designed to be software-compatible with its IBM counterpart, the 3705, but, according to Amdahl-tested benchmarks, provides a throughput capacity of up to 1.8 times that of the 3705 for a price that is generally about 10 to 15 percent lower than IBM's.

Several major developments have led to the dramatic increase in the use of communications processors, and to their continual development into machines with progressively higher capacity, capability, and compatibility.

The first major development was recognizing that the data communications functions must be segregated from other data processing functions. This resulted in modular communications software packages and communications interfaces that permit alteration of the communications environment without major surgery to the hardware and the software. It also permits the organization of communications processing functions, relative to other processing functions, along assembly-line principles. The assembly-line technique segments a job into discrete elements for exclusive execution by specialized persons or equipment; the assembly-line total output significantly exceeds the output of the same persons or equipment with each performing the total job. The development of specialized components to perform essential line handling functions resulted in the front-end processor, which freed the host processor of this time consuming task. A front-end/host configuration is able to handle a significantly greater data volume than a single processor with equivalent power that performs both the line handling and the data processing function.

The second major development was the introduction of the microprocessor. Now a standard item utilized in all types of electronic componentry, the microprocessor permits implementation of sophisticated processing functions at increasingly low cost. Complex communications processing tasks once handled by special-purpose hardwired controllers are now accomplished by inexpensive microcomputers that, when properly designed and programmed, are no more complicated to deal with than disk drives. And the fact that the costs of transmission ▷

Communications Processors—
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facilities have not decreased as rapidly as microprocessor-based processing justifies placement of communications processing equipment not only at the host site, but throughout the data communications network.

Intimately tied to the evolution of intelligence for *communications* processing equipment, is the parallel development of intelligence for remote *data* processing equipment. The assembly-line concept can be extended to all segments of a network, in which many small systems perform specific, specialized communications *and* data processing tasks independently of the host computer. This decentralized or distributed data processing has given rise to a new type of data processing module: the small processor or minicomputer which performs both data and communications processing. IBM's Information 8100 System and Sperry Univac's V77 family of minicomputers are two examples of processors which can serve either as independent processors, or as distributed systems which offer significant communications control capabilities.

A third, and often overlooked, influence on the development of communications processors is the effort on the part of most vendors towards standardization. This ongoing effort, along with hardware architectural improvements, is reducing the investment, inventory, and software support necessary to support a variety of different terminal and line disciplines, which are different for few justifiable reasons. Standardization, in addition to reducing costs to existing users, will continually increase the user base that can economically justify the use of electronic communications in their operations.

Recent Developments

The ground rules or network architectures announced by most of the large mainframe and minicomputer manufacturers have codified their communications standards. IBM's Systems Network Architecture, DEC's DECnet, Sperry Univac's Distributed Communications Architecture, and Honeywell's Distributed Systems Environment are examples of such architectures. Bit-oriented protocols are rapidly being adopted that improve the performance and error checking/recovery capabilities of data transmissions. Minor variations of the international HDLC or IBM's SDLC bit-oriented protocols are now supported by many suppliers of communications equipment.

Communications processor hardware and software architecture are continually being changed. Throughput capabilities are enhanced by using multiple microprocessors within the communications processor to perform specialized functions. Altering the microcode or stored logic (either directly by the user or indirectly by such features as IBM's Extended Facilities) has added a new dimension to throughput improvement techniques. Multiport memory access has facilitated warm-start back-up systems. Virtual operating systems are taken for granted and full-capability data base management systems are being given serious consideration by installations previously reluctant to accept the associated CPU overhead.

Definition and Applications

A *communications processor,* in the context of this report, is simply a digital computer that has been specifically programmed to perform one or more control and/or processing functions in a data communications network. As a self-contained system, it may or may not include the following components, depending on its specific application: communications lines multiplexer, line adapters, central computer system interface, and on-line peripheral devices. It always includes a specific set of user-modifiable software or interchangeable firmware modules, which can be used to implement particular customer requirements.

Communications processors do not represent a new system design concept. During the industry's second generation, in the early 1960's, such processors were offered by several of the major main-frame suppliers, including Control Data's 8090/8050, General Electric's DATA-NET-30, and IBM's 7740. Also, as early as March 1963, Collins Radio Company (now Rockwell-Collins) delivered its first Collins Data Control programmable communications system. In almost all such early uses, the systems were used primarily in message switching applications, acting simply as a message router and dispatcher in a data communications network.

The principal differences today lie in the diversity of application areas, the relatively low cost of such units, and, by consequence, the trend toward widespread usage. Listed below are some of the principal uses of communications processors in current data processing systems. It is important to note that many such units can be used in a variety of application areas, with specific sets of software and interface units for each application. The currently popular types of applications include:

- *Front-end processing.* The most significant application of communications processors, in terms of both frequency of use and level of complexity, is front-end processing. The communications processor replaces a hard-wired communications controller as the interface between the central data processing system and the data communications network. The concept of front-end processing essentially involves off-loading or removing the data communications control function from the central processing unit and setting it up as an external, largely self-contained system. The front-end processor not only receives and transmits all data passing through the network, but also, and significantly, can be programmed to pre- and post-process this data in a variety of ways in order to relieve the system's central processing unit from time-consuming overhead activities related to message formatting and control. This decentralized approach to the distribution of processing labor permits both the communications and central processors to perform their primary functions in parallel and with little interference. Data is passed between the processors only when necessary and with as high a degree of efficiency as is possible in circuit design.

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- A typical front-end processor might control a hundred or more communications lines of varying speeds and types attached to a large number of diverse remote terminals. The front-end processor would ideally assume all terminal, line, buffering, and message control functions, permitting the central processing unit and the user application programs to treat the communications network as just another high-speed, on-line peripheral device.

- Front-end processors can perform their functions in support of a wide variety of data processing applications. Additionally, the more sophisticated communications processors can be employed with software which permits them to be automatically reconfigured from a front-end mode of operation to that of a remote communications processor. This feature permits a single front end to switch automatically to a backup host in the event of a primary host failure, and also to perform communications processing for both local and remote hosts simultaneously.

- *Line concentration.* Communications processors sometimes fill the relatively simple role of communications line concentrators. Here the processor generally terminates a number of low-speed transmission lines and interfaces them to one or two higher-speed lines for more efficient and economical data transmission. Little, if any, processing of the transmitted data is performed. The programmable aspect of the processors is probably less used in this application than in any of the other currently popular uses. Hard-wired concentrators are generally equally effective, suffering by comparison only in their lack of flexibility.

- *Dedicated processing.* Many communication processors now have enough storage capacity and processing power to enable them to serve as the sole or principal computers in dedicated application systems of various types. In inquiry/response systems, for example, the processor receives inquiry messages from remote and/or locally connected terminals, processes the messages to determine the specific information required, retrieves the information from on-line random-access storage units, and sends it back to the inquiring terminals. In systems of this type, application-oriented processing is of equal importance with message receipt and transmission.

- *Message switching.* The message switching processor receives messages from remote terminals, analyzes them to determine their proper destination, performs any code conversions that may be necessary, and transmits them to other remote terminals. The sending and/or receiving remote terminals may themselves be computer systems. Most message switching systems are of the store-and-forward type, in which the processor stores the messages it receives on on-line auxiliary storage units, such as disks, drums, or magnetic tape. The length of time the messages are stored prior to transmission to other terminals or computers can range from a few seconds to an entire day or more, depending on the specific application needs and traffic volumes. The processor performs little, if any, processing on the messages; it acts principally as a traffic director.

Communications Processor Components

The essential components of every communications processing system are the following:

1. *Processor.* The processor element is a stored-program digital computer of almost any size. It must have its own main memory, but it may or may not use on-line peripheral devices. The processors should have excellent interrupt and/or direct memory access (DMA) handling and strong bit manipulation capabilities.

2. *Central processor interface.* When acting as a front-end, the communications processor must include the proper hardware interface to permit it to connect directly to a standard input/output channel of the central processing unit (or host computer). Such an interface should permit the host computer to communicate with the front-end processor as if it were a standard peripheral device control unit, requiring little, if any, operating system software modification. When acting as a remote processor, support for data communications line interfacing that connects the processor with the host computer(s) must be provided.

3. *Communications multiplexer.* This component provides a logically independent data channel into the communications processor's main memory for every transmission line being served. The multiplexer serves as the communications processor's functional interface with the data transmission lines. Control of incoming and outgoing data is coordinated between the multiplexer and the processor via interrupts or direct memory access (DMA).

4. *Line interface units.* These components are hardwired devices that link the multiplexer with the modems that terminate each communications line. Like the modems, the line interface units are specifically tailored to serve the speed transmission characteristics of the lines they terminate. The lines are, in turn, generally selected according to the transmission requirements of the remote terminal devices.

5. *Software/Firmware.* The communications processing hardware components become an integrated, functioning system only through the inclusion of stored-program logic (either firmware or software)—some generalized, and some highly specialized. The programs should include terminal control, line control, message control, and central system interface procedures. Depending on the supplier, the user may have to provide some portion of the software required to implement specific requirements.

Communications Processors— Management Perspective and Equipment Specifications

Communications Processor Functions

Because a communications processor is essentially a computer, it can be programmed to perform an almost limitless variety of functions. But in its role as controller of a data communications network, the specific functions generally programmed are those that relate to data and message control. The following functions are the most important ones offered with the more comprehensive communications processing systems. Some systems will not provide all these functions, as all are not required in specific installations.

1. *Line control.* This involves the periodic polling of terminals to determine readiness to transmit and receive data. Automatic call answering, acknowledgement, and dial-up can also be handled.

2. *Character and message assembly.* Bits are assembled (and disassembled) into parallel characters, and/or control characters are recognized to permit the assembly and disassembly of entire messages. Data can be handled at varying line speeds and in synchronous or asynchronous formats, with start-stop bits and synchronizing characters handled automatically.

3. *Data and protocol conversion.* The data transmission codes (such as Baudot, ASCII, etc.) and protocol-prescribed formats are converted into structures that are equivalent to the hosts native data code (such as EBCDIC) or conform to the formats of more efficient protocol procedures.

4. *Data and message editing.* This is a general function that can include application-oriented reformatting, removal of spaces and zeros (and other kinds of data compression), and other data restructuring to permit more efficient data transmission and more efficient processing by the host computer.

5. *Error control.* Using both hardware and software techniques, the communications processor can detect and correct data transmission errors before they reach the host computer.

6. *Message buffering and queuing.* The communications processor can buffer several messages in its main memory before passing them to the host computer, with the intention of interrupting that computer as infrequently as possible. Also, if the host computer cannot process incoming messages as fast as they arrive into the system, the communications processor can queue these messages in its own auxiliary storage units, such as disks, drums, or magnetic tape units, and can transfer these messages to the host computer when processing time becomes available. Queue management can be arranged in several different ways, including a system of priorities.

7. *Message switching.* When the communications processor serves more than one host computer, it will analyze message headers and addresses and send each incoming message to the proper destination. This situation can occur when several computers share a data communications network while each remains dedicated to specific applications.

8. *Message answering.* Certain messages, such as simple inquiries, can be completely processed by the communications processor without any contact with the central data processing system. Since many communications processors permit attachment of on-line auxiliary storage units, these processors can store and access their own private data bases. Some systems also permit the communications processors to directly access the auxiliary storage subsystems and data files of the host computer.

9. *Message recording.* Vital inbound messages can be passed on to the host computer while being simultaneously recorded in the communications processor's auxiliary storage. Such message recording can assist in system restart operations in case the central system should malfunction and lose either its messages or the results of processing the messages. Also, it may be advisable in some systems to store a journal record of every message received during each processing period.

10. *Statistics recording.* The communications processor can keep a running record of all data communications traffic, including such statistics as total number of messages processed, number of messages delivered to each destination, number of line errors, average length of time in queue, number of busy signals, etc. These statistics can be dumped on demand or in the form of reports at the end of each processing cycle.

Other application-oriented functions can be programmed by the communications processor supplier, by the user, or by some combination of the two. It must be remembered, however, that the communications processor, like the host computer, has only a finite amount of processing power. The more functions that are added to it in order to relieve the host computer, the more likely it is to run out of power, especially in active, growing communications networks. A communications processor pushed beyond its capacity will result in lost messages and, ultimately, in system failure.

Advantages of Communications Processing

Communications processors are enjoying increased popularity in various parts of data communications systems because they are demonstrating themselves to be more and more effective on a price/performance basis. Factors that can contribute to this price/performance edge include the following:

1. *Flexibility.* Communications processors are designed to handle many line speeds and transmission characteristics in uniform or interchangeable circuitry and to support a wide variety of remote terminals from

the mainframe and independent suppliers, regardless of their transmission speeds, line control conventions, synchronization techniques, and data codes. And since they can be modified at any time and at comparatively low cost by user or vendor, they are eminently well suited to handling key roles in data communications systems, which are typically characterized by bewildering variety and constant change. As advances in communication line facilities are made by the common carriers, and also by the independent companies, making available new, faster, and lower-cost transmission services, the advantages of this flexibility become eminently important in guarding against system obsolescence.

2. *Expandability.* Communications processors permit relatively easy growth of the data communications network, principally by adding line interface units and modifying the control programs.

3. *Distribution of labor.* Since these processors can be programmed to perform varying amounts of productive processing, often in conjunction with their own on-line peripheral devices, they can share portions of the overall processing load with other processors in the system—including the central processor. Peak loads can be more effectively handled and critical bottlenecks more likely avoided. In the case of a front-end processor, controlling the entire data communications subsystem will relieve the system's central processing unit on two counts: processing time and main memory space. Central control of data communications networks can consume 40 to 50 percent of the available processing time in typical situations. And the resident software control routines can easily consume in excess of 50K bytes and frequently use up to 300K bytes or more of main memory space, depending on the functions performed. Efficient utilization of communications processors can provide almost full relief in both processing time and memory space overheads. (If the host processor is not overburdened, the need for a programmable unit may be harder to justify.)

4. *Fail-soft capability.* In data communications systems that include at least one other computer, programmable communications processors can provide some form of continued system operation when one or more of the other computers become inoperative. The degree and effectiveness of this fail-soft capability depend not only on the capabilities of the processor, but also, perhaps more importantly, on the skill displayed by the system architect in his provisions for redundant components and fall-back procedures.

5. *Independent processing.* When communications processors are not involved in their principal data communications tasks, they can often be used as stand-alone data processing systems—provided, of course, that their configuration includes some peripheral input/output devices. Simple media conversion tasks, such as card-to-tape and tape-to-print, can be valuable by-products from these otherwise communications-oriented processors, and localized time-sharing can yield added benefits. In off-line mode, the processor can also be adapted to serve specialized I/O devices, such as plotters and OCR devices, that the central system may not be able to handle.

Potential Problems

Communications processors deserve careful investigation because of the vast variety of equipment currently available. Such investigations should include as many probing questions as possible, because there are potentially serious pitfalls to be avoided.

One potential problem is the question of overloading the communications processor, with the resultant loss of data. Sophisticated data and message control programs will consume large quantities of the communications processor's computing and memory facilities, just as they do in a centrally-based communications system. A tendency toward overloading can easily negate any apparent advantages of expandability and growth potential.

Another serious question is that of software. The body of software required for terminal control, line control, and message control activities, not to mention application-oriented pre-processing, is unquestionably complex. It is also vital to the operation of these systems. The prospective user must determine whether or not the supplier is capable of supplying this software, at what level of completeness, with what assurance of bug-free stability, with what chances of interfacing smoothly with the central system software, and with how much installation assistance. Obviously, if the software doesn't work properly, the system is of little value. From another point of view, a system whose software works but performs very few and very basic functions may be inadequate for present or future needs.

Another consideration is that some communications processor hardware/software combinations may require far more time and effort to install and make operational than others, especially when the supplier of the communications processor equipment is different from that of the host computer system. Apart from the traditional problems (real or imagined) of divided vendor responsibility, there exists the very real problem of integrating two completely different sets of hardware and software.

A currently operational data communications installation which is considering replacing hard-wired communications controller(s) with a more sophisticated communications processor must carefully evaluate the problems of conversion. Beyond the usual problems of data integrity and the logistics of arranging the conversion process, the user may also be faced with the prospect of modifying either his central system control software of his body of application programs that use the communications network.

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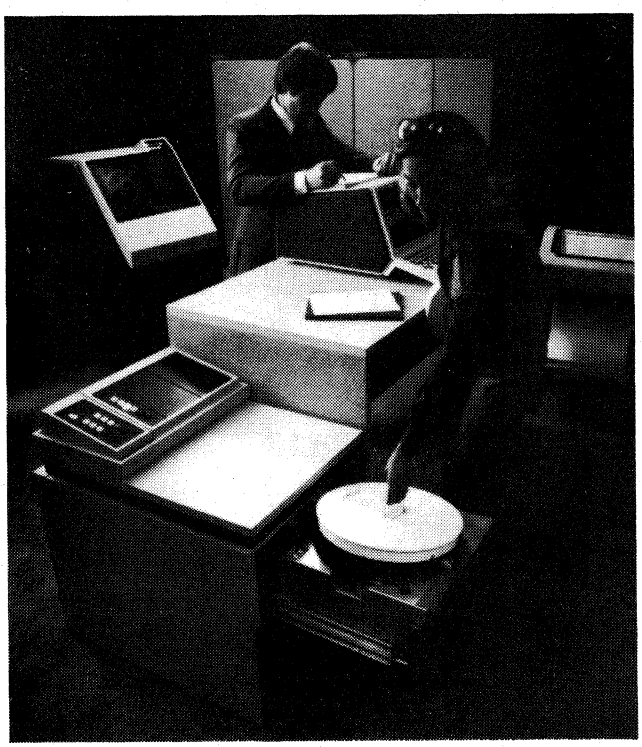
Evaluating a communications processing system on a cost/value basis is extremely complex and can be almost meaningless when performed in the abstract. Costs will vary with the size and diversity of the network being controlled, with the size and processing power of the communications processor, with the number of control and preprocessing functions incorporated (software is expensive, whether hidden in a "bundled" system price or not), and with the number of on-line peripheral devices.

Adding functions that will permit use of "foreign" terminals, relieves the central processor of intolerable overheads, and allowing independent and back-up processing may increase the costs but will also increase the value. In order to evaluate the cost of the communications processor in terms of the potential cost savings throughout the system, an effort must be made to associate specific dollar figures with the expected values to be derived from one data communications system versus another. In summary, it should be clear that costs and values of communications processing can be assessed only in terms of specific situations and specific systems.

Sources of Supply

One of the most interesting aspects of the story on communications processors is that computer users can now obtain them from literally dozens of vendors, with differing product implications depending on the source selected.



Sperry Univac's newest communications processor, the DCP/40, was released in June 1979 as a part of a major Series 1100 announcement. The DCP/40 is a multiprocessor-based system that can act as a front-end processor to a Sperry Univac 1100 Series or Series 90 mainframe, or as a remote intelligent concentrator or nodal processor in a Sperry Univac or multiple-vendor network.

Designers of the data communications system will probably first contact the supplier of their present or planned mainframe computer to investigate its offerings in the area of data communications. If communications processors are strongly promoted as the best (sometimes only) way in which to construct efficient, fully supported systems, the designers will usually go along with the recommendations of the mainframe supplier. The designers are comforted by the belief that their data communications subsystem will be fully supported and will interface efficiently with the central processing system. It is in this regard that developments such as IBM's SNA and DEC's DECnet increase in importance to systems designers.

But not all mainframe suppliers are equally advanced in their data communications product line, and not all offer a selection of communications processors supported with product-line software. Recent computer system announcements have, however, brought forth a number of such new products from the major manufacturers, as they both follow and "legitimize" the trend toward use of these processors.

Users not fully satisfied with the offerings of their mainframe supplier can investigate the wares of other promising suppliers, most of whom offer assurances that their communications processors can be "plug-compatible" with either the hard-wired or programmable communications controllers of the mainframe supplier, or at least with its data communications hardware and software interfaces.

The minicomputer manufacturers constitute one prominent group of suppliers who are actively pursuing the communications processor market with products that can either stand alone or interface smoothly with the mainframe equipment of other suppliers. Almost any currently marketed minicomputer is capable of serving as the fundamental building block of a communications processor, and many include communications hardware and specialized software packages to permit them to serve effectively as complete communications processing products.

A major source of integrated communications processing products is the independent systems houses, especially those that specialize in data communications systems. Companies such as these will generally provide complete hardware/software packages, including communications and central computer interfaces. In many cases they will accept full responsibility for the design and implementation of the entire data communications system. Such independent companies are generally well qualified in producing effective data communications systems, but prospective buyers of such systems must still consider the effects on the total system of dividing responsibility between at least two principal suppliers (communications and central system) and assure themselves that the products and systems of the several involved suppliers will indeed interface properly and function harmoniously.

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Regardless of which type of supplier is selected, the buyer should show partiality to those vendors who will not only guarantee turnkey installation of their equipment but will also provide plans for future growth. If the user is faced with the formidable task of interfacing and integrating a variety of impressive but highly dissimilar communications and processing equipment, the proposed system may never get past the design stage.

Buying Guidance

The communications processing products have not matured to the point where their descriptive terminology is in any way standardized or consistent. As a result, prospective buyers must make every effort to determine exactly what they will be getting and what they will not. The sales brochures and technical manuals are often not sufficiently informative (and sometimes downright misleading).

For example, there are at present two distinctly different kinds of front-end processors. The first and more basic variety is designed to simply replace the functions and services of the central system's hard-wired controller. It is meant to be a plug-compatible replacement, requiring few, if any, changes to the central system's communications control software or the user's application programs. It does not necessarily relieve the central system of any software control overheads, but simply provides a more flexible interface to the communications network for accommodation of additional and varied lines and terminals in the future.

The most prevalent examples of this type of front-end processor are the many available units designed to replace or "emulate" the IBM 2701 Data Adapter Unit and the IBM 2702 and 2703 Transmission Control Units. These front-end processors function with the IBM System/360 or System/370 computer systems through the standard IBM BTAM, QTAM, and TCAM communications control software.

The second and more powerful variety of front-end processor is designed to replace not only the functions and services of the hard-wired controller, but also most or all of the data communications control functions normally performed by the central system's processing unit and resident software. This variety of front-end processor, by freeing the central processing unit for productive work, provides valuable advantages not only in data communications flexibility, but also in systems throughput.

It is possible that a user may want to install the basic kind of front-end processor initially and then gradually add functions to it to relieve the central processing unit's communications overheads. However, the user must make sure that the selected front-end processor has enough processing and memory capacity to permit the gradual build-up of substantial message control routines, and that the various responsibilities of both the vendor and the user are clearly assigned.

In the case of systems performing line concentration, network node, and remote processing tasks, an equally wide range of capabilities is represented by current product offerings.

Another buyer's tip is to look for the word "turnkey." Turnkey installation of communications processors usually means that the supplier takes on full responsibility for hardware, software, and interfaces required to essentially "plug in" the product. From a user's point of view, this approach is highly desirable, since it can save money, time, and aggravation. But the user must still determine what product with what promised functions is being offered on the turnkey basis. It may still be a somewhat limited product.

A low list price can be totally misleading, since it may include only the basic processor hardware and an associated communications multiplexer. The cost and effort of establishing the proper interfaces and writing the all-important software can be dropped squarely on the buyer, who may have been trapped by an attractive low-price bid.

Since software development is such a critical question, the buyer should determine early in the proceedings exactly what software is provided with the basic system and at the basic price. If certain software is lacking, such as specific remote terminal handlers or message queuing routines, then implementation and integration responsibilities should be clearly fixed, and with firm price quotations.

The smart buyer will also ask the competing bidders for clear statements of service and support after installation. Since data communications subsystems can be complex and demanding in any environment, it must be considered an extremely valuable system feature if the prospective supplier of the communications processor offers to assume full operating and service responsibility for the externally controlled communications network that is directed by his product.

When considering a communications processor from a source other than the supplier of the central computer equipment, the buyer should insist on receiving concrete performance data, drawn from installed systems, to substantiate the supplier's claims. The buyer should beware if the supplier refuses to back up his claims with actual case studies. As further evidence of proven performance, the buyer should personally contact as many previous users as possible, probing not only for their degree of satisfaction, but also for the extent to which the installed systems reflect his own intended system design and functional objectives. However, even in highly specialized reference accounts, meaningful information can be derived regarding the supplier's competence and willingness to help, and the basic reliability of the hardware/software package.

When the proposed supplier is a major mainframe manufacturer, the buyer will also want evidence of proven

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USERS' RATINGS OF COMMUNICATIONS PROCESSORS

Processor	Number of User Responses	Number of Units Installed	Average No. of Lines per Unit	Average No. of Terminals per Unit	User Ratings* Overall Satisfaction					Ease of Installation					Throughput				
					WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Burroughs B 874	5	6	9	57	3.2	1	4	0	0	2.8	2	1	1	1	3.2	1	4	0	0
Burroughs, other models	3	3	57	63	4.0	3	0	0	0	4.0	3	0	0	0	3.7	2	1	0	0
Subtotals	8	9	27	59	3.5	4	4	0	0	3.3	5	1	1	1	3.4	3	5	0	0
CCI CC-8	4	7	37	202	3.3	2	1	1	0	2.5	1	1	1	1	3.3	1	3	0	0
CCI CC-80 & CC-40	6	18	89	633	3.3	2	4	0	0	2.5	1	3	0	2	3.6	3	2	0	0
Subtotals	10	25	68	460	3.3	4	5	1	0	2.5	2	4	1	3	3.4	4	5	0	0
DEC, all models	3	3	22	22	3.0	1	1	1	0	2.7	1	1	0	1	3.0	1	1	1	0
Honeywell Datanet 355	3	4	54	207	3.7	2	1	0	0	3.0	0	3	0	0	3.7	2	1	0	0
Honeywell Datanet 6632	3	4	32	96	2.3	0	2	0	1	3.0	1	1	1	0	2.3	0	2	0	1
Honeywell, other models	4	5	30	88	3.3	1	3	0	0	3.0	0	4	0	0	3.0	0	4	0	0
Subtotals	10	13	38	126	3.1	3	6	0	1	3.0	1	8	1	0	3.0	2	7	0	1
IBM 2701	3	3	3	3	3.0	1	1	1	0	2.7	1	0	2	0	3.0	1	1	1	0
IBM 3704	26	29	9	47	3.5	14	11	1	0	3.2	8	17	0	1	3.3	10	15	1	0
IBM 3705	92	114	45	365	3.5	49	38	4	0	3.1	25	51	13	2	3.4	46	39	4	2
Subtotals	121	146	36	288	3.5	64	50	6	0	3.1	34	68	15	3	3.4	57	55	6	2
Memorex 1270	17	25	25	79	3.6	11	6	0	0	3.2	6	9	2	0	3.4	6	10	0	0
Memorex 1380	3	3	100	122	3.0	1	1	1	0	2.0	0	1	1	1	3.7	2	1	0	0
Subtotals	20	28	36	85	3.6	12	7	1	0	3.1	6	10	3	1	3.4	8	11	0	0
NCR 3650	34	48	58	139	3.5	20	12	2	0	3.2	10	18	5	0	3.5	21	8	5	0
NCR 3670	21	38	170	408	2.9	9	8	4	0	3.1	4	14	2	0	3.6	9	11	0	0
NCR 3690	12	30	130	872	3.3	4	8	0	0	3.2	2	10	0	0	3.4	6	5	1	0
NCR, unspecified models	3	5	24	141	3.7	2	1	0	0	2.3	0	2	0	1	3.3	1	2	0	0
Subtotals	70	121	102	345	3.4	35	29	6	0	3.1	16	44	7	1	3.4	37	26	6	0
Periphonics T-Comm 7	3	3	15	1001	3.0	0	3	0	0	2.0	0	0	3	0	3.3	1	2	0	0
Sperry Univac, all models	5	11	61	224	3.0	2	2	0	1	2.8	2	0	3	0	2.8	1	2	2	0
All Others	12	18	28	98	3.1	3	7	2	0	2.8	3	3	6	0	3.2	5	5	1	1
TOTAL	262	377	54	276	3.4	128	114	17	2	3.0	70	139	40	10	3.4	119	119	16	4

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.

performance. This evidence should apply to the overall performance of the total, integrated data processing system, and not just the communications subsystem. When the mainframe supplier offers a choice of several levels of processing capability (as several now do), then the buyer will again want specific, tangible performance data to justify selection of one over the other. Of course, the mainframe supplier can forcibly persuade adoption of one model over the other, even without offering convincing performance data, by simply indicating that the newer product will receive all future support and that the former one will be essentially dropped from the product line.

Communications Processors from the User's Point of View

In the October 1980 supplements to both *DATAPRO 70* and *DATAPRO REPORTS ON DATA COMMUNICATIONS*, we published a Reader Survey Form on Communications Controllers/Processors.

By our editorial cut-off date of December 5, 1980, we had received a total of replies from 192 users. Since a number of these users provided ratings on more than one model of communications processor, 262 usable responses were generated, representing 377 communications processors. Both the number of responses from communications processor users and the number of processors represented were almost exactly the same as in our previous survey conducted in January 1980.

The content of these responses is tabulated in the accompanying table.

In an attempt to identify how communications processors were being used, we asked the users to check one or more usages in a list of five: front-end, stand alone or message switching node, remote concentrator, terminal controller, and other. The purpose was to determine the level of sophistication among users in the use of communications processors. The results are summarized below, but be sure to read the notes following the presentation.

Processor usage	Percent of Responses
Front-end	94%
Stand-alone or message switching node	3
Remote concentrator	3
Terminal controller	11
Other	4

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USERS' RATINGS OF COMMUNICATIONS PROCESSORS (Continued)

	User Ratings*																								
	Hardware Reliability					Promptness of Maintenance					Quality of Maintenance					Manufacturer's Software					Manufacturer's Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Burroughs B 874	3.6	3	2	0	0	3.2	1	4	0	0	3.0	1	3	1	0	3.4	2	3	0	0	2.2	0	1	4	0
Burroughs, other models	4.0	3	0	0	0	3.7	2	1	0	0	3.3	2	0	1	0	4.0	3	0	0	0	2.3	0	1	2	0
Subtotals	3.8	6	2	0	0	3.4	3	5	0	0	3.1	3	3	2	0	3.6	5	3	0	0	2.3	0	2	6	0
CCI CC-80 & CC-40	3.3	2	1	1	0	2.8	2	0	1	1	2.5	1	0	3	0	2.8	1	1	2	0	1.8	0	1	1	2
CCI CC-8	3.5	4	1	1	0	3.3	3	2	1	0	3.3	3	2	1	0	2.8	2	1	3	0	2.2	1	0	4	1
Subtotals	3.4	6	2	2	0	3.1	5	2	2	1	3.0	4	2	4	0	2.8	3	2	5	0	2.0	1	1	5	3
DEC, all models	3.7	2	1	0	0	2.7	1	0	2	0	3.3	3	2	1	0	2.8	2	1	3	0	2.2	1	0	4	1
Honeywell Datanet 355	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.0	0	3	0	0	3.0	0	3	0	0
Honeywell Datanet 6632	3.7	2	1	0	0	3.3	2	0	1	0	3.3	2	0	1	0	2.0	0	1	1	1	2.3	1	0	1	1
Honeywell, other models	3.0	0	4	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3.3	1	3	0	0	2.0	0	0	4	0
Subtotals	3.4	4	6	0	0	3.3	4	5	1	0	3.3	4	5	1	0	2.8	1	7	1	1	2.4	1	3	5	1
IBM 2701	3.0	1	1	1	0	2.7	1	1	0	1	2.7	1	1	0	1	2.7	1	1	0	1	2.3	1	0	1	1
IBM 3704	3.7	19	5	2	3	3.3	10	15	1	0	3.1	8	15	2	1	3.0	3	19	4	0	2.8	5	16	4	1
IBM 3705	3.7	68	21	2	0	3.5	46	39	4	1	3.4	41	49	1	1	3.3	28	40	21	1	3.0	20	47	16	3
Subtotals	3.7	88	27	5	0	3.4	57	55	5	2	3.3	50	65	3	3	3.0	32	60	25	2	3.0	26	63	21	5
Memorex 1270	3.6	10	7	0	0	3.8	5	8	3	0	3.1	2	13	1	0	2.7	2	3	0	2	2.6	2	7	3	2
Memorex 1380	3.3	1	2	0	0	2.3	0	1	2	0	2.7	0	2	1	0	2.7	0	2	1	0	3.0	0	3	0	0
Subtotals	3.6	11	9	0	0	3.0	5	9	5	0	3.0	2	15	2	0	2.7	2	5	1	2	2.7	2	10	3	2
NCR 3650	3.8	27	7	0	0	3.5	17	13	1	0	3.4	16	12	3	0	3.1	11	15	8	0	3.0	12	9	13	0
NCR 3670	3.5	12	7	2	0	3.3	7	12	1	0	3.0	4	13	2	1	2.9	2	15	4	0	2.7	5	7	7	2
NCR 3690	2.6	4	6	2	0	3.0	1	10	1	0	3.0	1	10	1	0	3.3	5	6	1	0	2.5	2	3	6	1
NCR, other models	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	2.7	0	2	1	0	2.7	0	2	1	0
Subtotals	3.6	45	21	4	0	3.3	26	37	3	0	3.2	22	37	6	1	3.1	18	38	14	0	2.8	19	21	27	3
Periphonics T-Comm 7	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	2.7	0	2	1	0	2.0	0	1	2	0
Sperry Univac, all models	3.2	3	1	0	1	3.4	3	1	1	0	3.2	2	2	1	0	2.5	1	1	1	1	2.8	1	2	2	0
All others	3.5	6	6	0	0	3.2	6	2	2	1	3.1	5	3	2	1	2.9	2	4	3	0	2.8	3	3	3	1
TOTAL	3.6	173	76	11	1	3.3	111	118	24	4	3.2	94	136	21	5	3.0	64	124	52	6	2.8	53	107	76	15

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.

Because the percentages total over 100 percent, it is obvious that some users reported more than one usage. In most cases, it appeared that multiple units were being used in different fashions. For example, one user of two processors might have indicated that one was employed as a front-end, while the other performed as a remote concentrator.

Within the category of front-end usage, we asked the users to indicate the type of control software being used, with these results:

Front-end Software	Percent of IBM Users	Percent of non-IBM Users
270X Emulation	63%	29%
NCP Mode	36	8
Other	9	45

Among the IBM users, two distinct patterns of usage were indicated. Those using the IBM 3704 as a front-end processor indicated that their usage was exclusively 270X emulation. Of the 3705 users, 57% were using 270X emulation software, 47% were using IBM's Network Control Program, and 12% were using other front-end processing software.

While it is apparent that many users are still not making use of the full power of front-end processors, it would appear that this percentage is dwindling. It is too early to determine the impact of distributed systems such as the IBM 8100, but Datapro believes that the increased integration of computer systems can only result in increased network and communications sophistication and efficiency.

We also asked these users whether their communications processors accessed more than one host computer. Of these users, 34% answered affirmatively and reported an average of 2.3 host computers per system.

When questioned as to which protocol(s) were being handled by their communications processors, these users indicated usage of the following line disciplines:

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Protocol	Percent of Users
Asynchronous	56%
Bisynchronous (including IBM BSC)	87
IBM SDLC	19
X.25 Packet-Level	1
Other	18

The host computer or computers were identified on virtually all 262 responses. A total of 300 computers were mentioned. The overall distribution of host computer models revealed the following pattern:

Host Computer Model	Percent of Users
IBM 370/115 through 370/148	13%
IBM 370/155 & Larger	27
IBM 303X	32
IBM 4341	3
Other IBM	6
Amdahl	13
Burroughs	3
National Advanced Systems	5
Honeywell	4
Univac	2
All others	5

The survey form also asked the users to identify areas of major difficulty. These users' assessments are summarized below:

Major difficulty	Percent of Responses Reporting
Communications processor software	27%
Host system software	14
Throughput	5
Communications lines	22
Modems	9
Terminals	8
System expansion (installing more lines)	18

Comparison Charts

A catalogue of commercially available communications processors along with the basic characteristics is presented on the following pages.

A prospective buyer can easily scan the charts to determine the scope of the options available for a given set of requirements. The proper use of the charts will produce a list of vendors and equipment that merit detailed study. It is only from a detailed study of the equipment that an advantageous price/performance selection can be made for a given systems requirement. It would be a misuse of the charts to eliminate a processor from consideration on the basis of comparing characteristics finely without checking to see if the architecture possesses a feature that overcomes a seemingly small disadvantage.

To have been included in the charts, a processor must have had appropriate hardware and software to function either as a front-end processor, as a remote concentrator, or as a free-standing communications processor. Processors designed to perform only message switching of voice grade lines were deemed not to meet the criteria for inclusion. All of the actively marketed equipment known to Datapro that satisfies the qualifying criteria is represented. Any omission is because the product is no longer marketed or is unknown to us.

The information presented on each communications processor in the accompanying charts serves not only to describe the basic characteristics of the equipment, but also assists in defining physical and throughput limitations. With one exception, all non-economic characteristics reduce themselves to one consideration: the throughput capabilities of the equipment relative to the specific systems requirements. The exception is where the physical attachment limitations are exceeded before the processing capabilities are fully used.

For example, the number of high speed communications lines that are physically attachable to a processor usually exceeds the throughput capabilities. For that reason, most vendors submitted a smaller value for the number of lines attachable at the higher speeds than the equipment could physically accommodate. The numbers more accurately describe the outer limits of the processor's throughput limitations than the physical limitations. All of the vendors were concerned that readers realize that the line mix and the resource mix could radically alter the number of lines that could be supported, physical port availability notwithstanding. Datapro was most impressed with the responsible attitude universally exhibited, and we are very optimistic that better ways of expressing throughput capabilities will develop through the combined efforts of the suppliers of communications processors and Datapro.

Some of the items indicated in the accompanying charts are self-evident; others offer information of a subtle nature. The following discussion highlights some of the subtleties.

Network Arrangements Supported

Most of the equipment listed herein, when operating as a front-end, is restricted to supporting the host computer systems of specific mainframe manufacturers. However, some vendors include in their product lines front ends that can be customized; such equipment is well represented in the charts. Not included is the myriad of older mainframes that have been fully written-off from an accounting standpoint and, therefore, can be offered at low enough prices to justify tailoring and dedicating the overqualified equipment to function as a front-end.

From a network arrangement standpoint, the number of direct connections a front-end can support to one host and the number of hosts a front-end can support become an important consideration, especially for fallback considerations. Usually, a small number represents a special direct connection. A high number indicates that the connection is via a regular communications line port and does not mean that the vendor is suggesting that so many connections to one or more host is a designed capability.

Communications Processors—
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When the number of pollable stations on one line is "1," the system, as standard, supports only point-to-point terminal arrangements. When the communications processor functions as a remote concentrator, the number of host/concentrator connections is also a consideration from a network standpoint. Again, the number of connections permitted is primarily an indication of whether a special interface or a regular communications line interface is used.

As the data communications industry continues to make strides towards standardization, the network architecture that a free-standing communications processor supports will take on more and more importance. (The architecture of a front-end must conform to the host's architecture.)

Since the prime purpose in burdening communications lines around the world with data is to either retrieve information or to add to the store of information, the nature of the data base system supported should not be overlooked. Actually it represents the "end" for which one selects a "(communications processor) means." The name of any data base system supported is listed for each communications processor. Of course, a buyer may be already committed to a file maintenance or data base system and not be interested in this type of support.

As would be expected, the tasks performed by each of the operating systems supplied with the hardware will vary. The name of the operating system is noted so that the reader will know what to look for in detailed reports on such software offerings.

Properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 9600 bps, and over 9600 bps. The number of low speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium and high speed lines represent the outer limits of the throughput capabilities. The effect of using full-duplex lines and an estimate of raw throughput capacity are also indicated.

The terminal protocols supported by the processors are listed. Even though the protocols supported are mostly dependent upon the marketing philosophy of the vendors, the large number of vendors supporting the standardized bit-oriented protocols is an indication of things to come.

Processor Characteristics

The communications processor's internal characteristics give a general "feeling" for the equipment's throughput capabilities. Hard-wired equipment and some programmable processors will receive a "No" to the question: "Is the processor microprogrammable by the manufacturer?" A "yes" means that the processor has firmware, or microcoded, stored logic. If the processor is programmable by the user, one can expect the capability for user implementation of specific system requirements not supported by vendor software, including applications-oriented functions. Main memory cycle time, main memory word size, and main memory storage capacity offer a very general "feel" for throughput speed possibilities. However, sophisticated internal architecture may enable the processor to be many times faster than another processor with the same cycle time and word size. That is another reason why we emphasize that a detailed analysis is necessary, once the initial selection is made from the charts.

The manner of data transfer between memory and communications lines, memory and mass storage, and memory and other supported peripherals becomes critical as volume requirements rise and/or response times are reduced. For high-speed, high-volume transmissions, Direct Memory Access transfers instead of character interrupt transfers become mandatory for reasonable throughput rates.

The "Turnkey systems" entry informs potential users whether or not the vendor is willing to provide a complete system, including all applications software.

Pricing and Availability

The prices depicted in the charts represent a range of typical configurations. The magnitude of the dollars gives a ball-park indication of the expansion capabilities of the equipment and should not be used to determine price/performance. Only a detailed price for a configuration satisfying specific requirements would give such an indication.

The absence of an entry for the monthly rental price indicates that the vendor offers his equipment on a purchase-only basis.

The charge for the processor's communications operating software is given, when separately priced.

The date of first delivery is the date of the first production delivery.

With 91 communications processors to choose from, there should be an offering for every need, whether the network is a fully distributed network or a classic master/slave network.

Suppliers

Listed below for your convenience in obtaining additional information are the full names and addresses of the 42 suppliers whose 91 products are summarized in the following charts.

Communications Processors—
Management Perspective and Equipment Specifications

Action Communications Systems, Inc., 4401 Beltwood Parkway South, Dallas, Texas 75234. Telephone (214) 386-3500.

Amdahl Corporation, 1250 E. Arques Avenue, Sunnyvale, California 94086. Telephone (408) 746-6000.

ASI Teleprocessing Inc., 101 Morse Street, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Austron Data Systems, Inc., 2007 Kramer Lane, Austin, Texas 78758. Telephone (512) 836-3523.

BBN Computer, 33 Moulton St., Cambridge, Massachusetts 02238. Telephone (617) 491-1065.

Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4200.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Cencom Systems, Inc., see **Centennial Computer Products.**

Centennial Computer Products (formerly CENCOM Systems, Inc.), 6100 Executive Boulevard, Rockville, Maryland 20852. Telephone (301) 984-9120.

Chi Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

Codex Corporation, 20 Cabot Blvd., Mansfield, Massachusetts 02048. Telephone (617) 364-2000.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

Comten, Inc.: see **NCR Comten, Inc.**

Control Data Corporation, 8100 34th Avenue South, P.O. Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Datastream Communications, Inc., 555 Ellis Street, Mountain View, California 94043. Telephone (415) 965-9911.

Digital Communications Associates, Inc., 303 Research Drive/ Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp., 11717 Exploration Lane, Germantown, Maryland 20767. Telephone (301) 428-5500.

DPF Incorporated, 141 Central Park Avenue South, Hartsdale, New York 10530. Telephone (914) 428-5000.

General Automation, 1055 S. East Street, Anaheim, California 92805. Telephone (714) 778-4800.

GTE Telenet Communications Corporation, 8229 Boone Boulevard, Vienna, Virginia 22180. Telephone (703) 442-1000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

ICOT Corporation (division of Microform Data Systems, Inc.), 830 Maude Avenue, Mountain View, California 94043. Telephone (800) 227-8068.

Industrial Computer Controls, Inc., 196 Broadway, Cambridge, Massachusetts 02139. Telephone (617) 864-0283.

Intelligent Terminals, Inc., One First Street, Los Altos, California 94022. Telephone (415) 948-7033.

ITT Courier Terminal Systems, Inc., 15 W. 14th Street, Tempe, Arizona 85281. Telephone (602) 894-7000.

Lemcom Systems, Inc., 2104 W. Peoria Ave., Phoenix, Arizona 85029. Telephone (602) 944-1543.

Memorex Corporation, Communications Group, 18922 Forge Drive, Cupertino, California 95014. Telephone (408) 996-9000.

Modular Computer Systems, Inc., 1650 W. McNab Road, Fort Lauderdale, Florida 33310. Telephone (305) 974-1380.

NCR Corporation, 1700 S. Patterson Blvd., Dayton, Ohio 45479. Telephone (513) 449-2000.

NCR Comten, Inc., 2700 Snelling Avenue North, St. Paul, Minnesota 55113. Telephone (612) 638-7777.

North American Philips Corporation, Communications Systems Division, 55 Knightsbridge Road, Piscataway, New Jersey 08854. Telephone (201) 457-0400.

Paradyne Corporation, 8550 Ulmerton Rd., Largo, Florida 33541. Telephone (813) 536-4771.

Periphonics Corporation, 75 Orville Drive, Bohemia, New York 11716. Telephone (516) 567-1000.

Raytheon Data Systems Company, Minicomputer/Communications Operation, 360 Forbes Boulevard, Mansfield, Massachusetts 02048. Telephone (617) 339-5731.

Rockwell International, Collins Communication Switching Systems Division, P.O. Box 10462, Dallas, Texas 75207. Telephone (214) 996-2336.

Sperry Univac (division of Sperry Rand Corporation), P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.

Systems Research, Inc., 2400 Science Parkway, P.O. Box 328, Okemos, Michigan 48864. Telephone (517) 349-0200.

Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 725-6000.

Telcon Industries, Inc., 1401 Northwest 69th Street, Fort Lauderdale, Florida 33309. Telephone (305) 971-2250.

Telefile Computer Products, Inc., 17131 Daimler St., Irvine, California 92714. Telephone (714) 557-6660.

TRAN Telecommunications Corporation, 2500 Walnut Avenue, Marina Del Rey, California 90291. Telephone (213) 822-3202.

TRT Data Products, Norfield Communications Division, 3 Depot Place, E. Norwalk, Connecticut 06855. Telephone (203) 853-2777.

Westinghouse Canada Incorporated, Electronic Systems Division, P.O. Box 5009, Burlington, Ontario, Canada L7R 4B3. Telephone (416) 528-8811.□

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Action Communications Systems TELECON-TROLLER	Amdahl 4705	ASI Teleprocessing Front End	ASI Teleprocessing Network Node	ASI Teleprocessing Store Data
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Most major vendors	Amdahl 470, 580 and compatibles	IBM, DEC, Burroughs	IBM, DEC, Burroughs	Stand-alone
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	No
Maximum no. of hosts supported simultaneously	16	4	—	—	—
Maximum no. of hosts channel-attachable to front-end	1	4	1	1	—
Maximum no. stations pollable per line or system	512 per system	Software-dep.	32 per line	32 per line	—
As a remote concentrator	Yes	Yes	No	Yes	No
Maximum no. of remote connections to one host	16	1	—	64	—
Maximum no. of hosts served by one concentrator	16	1	—	64	—
Maximum no. of stations pollable on one line	32	Device-dependent	—	32	—
As a free-standing communications processor	Yes	No	Yes	Yes	Yes
Network Architecture compliance	No	—	—	—	—
Full-capacity data base system	No	—	—	—	—
Operating system	Yes	—	ASI DOS	ASI DOS	RT-11
As a store-and-forward message switching processor	Yes	No	Yes	Yes	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	352	64	64	16
2000 to 9600 bps	64	352	64	64	16
Over 9600 bps	—	45+	64	64	16
Highest line speed supported, bits per second	9600	56K	56K	56K	9600
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None	None
Estimated processor throughput, chars./sec.	2500	See Comments	50K bytes	50K bytes	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	Yes	Yes	Yes	Yes
X.25—Packet level	No	No	No	No	No
Other	8A1, 83B3, SITA, ARINC, TWX, TELEX, Dial-in/out	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	No	No	No
Programmable by user	No	Yes	Yes	Yes	No
Main memory cycle time, usec.	0.6	0.145	1	1	1
Main memory word size, bits	16	18	16	16	16
Main memory storage capacity, words or bytes	65K words	512K bytes	256K bytes	256K bytes	256K bytes
Data transfer between memory and:					
Communications lines	Interrupt	Both	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	—	DMA	DMA	DMA
Other peripherals	DMA	—	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Mag. tape	Diskette	Disk, diskette	Disk, diskette	Disk, diskette, mag. tape
Communications operating software:					
Availability	Included in price	See Comments	Included in price	Included in price	Included in price
Generated by	Comm. processor	Host	Comm. processor	Comm. processor	Comm. processor
Additional software supported	None	See Comments	Assembler, utilities	Assembler, utilities	Assembler, utilities
Turnkey systems available	Yes	No	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$165,000 to $500,000	$50,000 to $350,000	$70,000 to $150,000	$50,000 to $100,000	$75,000 to $150,000
Monthly rental (2-yr. lease, including maint., range)	—	$1,800 to $13,000	—	—	—
Communications operating software—one-time charge	—	See Comments	—	—	—
Communications operating software—monthly charge	—	See Comments	—	—	—
Date of first delivery	1971	11/80	2/75	2/76	2/76
Number installed to date	87	—	20	10	10
Serviced by	Action or third party	Amdahl	ASI/IBM/DEC	ASI/IBM/DEC	ASI/DEC
COMMENTS	Telecontroller is a store-and-forward message switching system with front-end capability	Software-compatible with IBM 3705-II, with up to 1.8 times the 3705's throughput capacity; public domain software distributed and maint. by Amdahl	Packet switch application-transparent communications; full turnkey system	Packet switch application-transparent communications; full turnkey system	Multi-terminal interfacing for IBM, NCR, DTS, etc.; full turnkey system

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Austron 8500	Austron 8800	Austron 8911	BBN Computer Pluribus	BBN Computer C-30
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents	DEC-10, DEC-11 CDC 6000 Series, Honeywell Multi's, IBM S/360 & S/370	DEC-10, DEC-11, CDC 6000 Series, Honeywell Multi's, IBM S/360 & S/370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	1	2 or more	20	4
Maximum no. of hosts channel-attachable to front-end	1	1	2 or more	2	1
Maximum no. stations pollable per line or system	256	256	256	256	256
As a remote concentrator	No	No	No	Yes	Yes
Maximum no. of remote connections to one host	—	—	—	256	256
Maximum no. of hosts served by one concentrator	—	—	—	20	4
Maximum no. of stations pollable on one line	—	—	—	256	256
As a free-standing communications processor	No	No	Yes	Yes	Yes
Network Architecture compliance	—	—	X.25	ARPANET, X.25	ARPANET, X.25
Full-capacity data base system	—	—	—	—	—
Operating system	—	—	Stand-alone	—	UNIX
As a store-and-forward message switching processor	No	No	Yes	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	25	25	256	600	128
2000 to 9600 bps	16	16	256	400	128
Over 9600 bps	8	8	256	300	80
Highest line speed supported, bits per second	9600	9600	38.4K	230.4K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	1 million	1 million	1 million	110K	30K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	No	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	No	No
IBM SDLC	No	No	No	No	No
X.25—Packet level	No	No	Yes	Yes	Yes
Other	—	DEC DR11 16-bit parallel interface	Any protocol supported by LSI-11 module	IBM 2741	IBM 2741
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	See comments	Yes
Main memory cycle time, usec.	0.35	1.0	1.6	0.7	0.54
Main memory word size, bits	16	8	16	16	20
Main memory storage capacity, words or bytes	64K bytes	64K bytes	256K bytes	1024K bytes	1024K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA	Interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Diskette	Diskette	Disk, diskette, mag. tape	Disk, cassette	Disk, cassette
Communications operating software:					
Availability	Included in price	Included in price	Included in price	Separately priced	Separately priced
Generated by	Comm. processor	Cross compiler	Comm. processor	Comm. processor	Comm. processor
Additional software supported	Diagnostic and test routines	Diagnostic and test routines	Diagnostic and test routines	—	Bell Lab's 'C', FORTRAN 77, UNIX utilities
Turnkey systems available	Yes	Yes	Yes	Yes—for packet switch node systems	Yes—for packet switch node systems
PRICING AND AVAILABILITY					
Purchase price (system range)	\$50,000 to \$70,000	\$22,000 to \$30,000	\$3,000 to \$20,000	\$100,000 to \$300,000	\$25,000 to \$60,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	—
Communications operating software—one-time charge	—	—	—	—	\$5,000
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	12/75	2/80	7/80	9/75	11/79
Number installed to date	—	—	—	35	5
Serviced by	Austron	Austron	Austron, DEC	BBN	BBN
COMMENTS	Designed to emulate standard IBM device while driving non-standard remote or local peripherals, terminals, etc.	Designed for CPU-to-CPU interface. IBM side is programmable to emulate any standard IBM device	Provides direct channel interface between IBM CPU and communications lines, X.25 network, non-standard peripherals, other CPUs, etc. Unit is DEC LSI-11 based	Primarily marketed as a turnkey packet switch network node. User programming of the Pluribus system is not generally supported by BBN.	Multi-host front-end system; complete packet network system

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	BBN Computer C/70	Braegan Corp. B40 Computer	Burroughs B 874	Burroughs CP 9558 & CP 9572	Centennial Computer Products 1000/2000/3000 (formerly CENCOM)
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	—	IBM S/360 & S/370, 303X, 4300 Series and compatible systems	Burroughs	All Burroughs; IBM S/370, 303X, 4300 & compatibles	Univac 1100 Series, Univac 494 Series
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	No	Yes
Maximum no. of hosts supported simultaneously	—	8	2	—	8
Maximum no. of hosts channel-attachable to front-end	—	4	2	—	16
Maximum no. stations pollable per line or system	—	32	100	—	256
As a remote concentrator	No	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	6	32	12	192
Maximum no. of hosts served by one concentrator	—	6	32	12	8
Maximum no. of stations pollable on one line	—	32	100	—	256
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	DOD	Braegen/IBM	Burroughs BNA	Burr. BNA, IBM SNA	Avail. upon request
Full-capacity data base system	—	Braegen Editor	No	Yes	Not currently avail.
Operating system	UNIX	Braegen O.S.	MCS	CM TCS-1	ECES
As a store-and-forward message switching processor	Yes	—	—	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	—	6	32	12	128 to 256
2000 to 9600 bps	—	6	32	12	80 to 128
Over 9600 bps	64	6	4	12	60 to 80
Highest line speed supported, bits per second	19.2K	19.2K	19.2K	19.2K	56K
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	None	None
Estimated processor throughput, chars./sec.	—	—	—	—	50K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	No	Yes	Yes	Yes
IBM BSC	—	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	—	No	Yes	Yes	Yes
IBM SDLC	—	No	No	Yes	Avail. upon request
X.25—Packet level	Yes	No	—	Yes	Avail. upon request
Other	DOD/ARPANET	Braegan FDLC	—	—	HASP, 2780/3780, U1004, NTR, 3270
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	No	Yes	Yes	Yes
Main memory cycle time, usec.	.5	0.6	1	—	0.8
Main memory word size, bits	20	8	16	—	16 or 20
Main memory storage capacity, words or bytes	2MB	256K bytes	96K bytes	1.2 MB (CP 9558); 1.5 MB (CP 9572)	1M bytes
Data transfer between memory and:					
Communications lines	DMA	DMA, interrupt	DMA	—	DMA, interrupt
Mass Storage	DMA	DMA, interrupt	DMA	—	DMA
Other peripherals	Both	DMA, interrupt	Interrupt	—	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, tape	Diskette, disk	—	Diskette, disk mag. tape	Disk
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Comm. processor	Host	—	Comm. processor	Host & comm. proc.
Additional software supported	PEN, FORTRAN 77, YACC, LEX	Screen editor, 3270 emulator, remote job entry, local job entry	—	COBOL, RPG, CANDE, ODESY, GEMCOS, SYCOM, etc.	TIP, message switch, store & forward
Turnkey systems available	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$50,000 to $80,000	$14,000 to $120,000	$20,000 and up	$12,435 (CP 9572—$24,484) & up	$85,000 to $950,000
Monthly rental (2-yr. lease, including maint., range)	—	$300 to $3,000	$1,000 and up	$332 (CP 9572—$653) & up (5-yr.)	$2,000 and up
Communications operating software—one-time charge	—	—	$2,250	$145 (5-yr. plan)	—
Communications operating software—monthly charge	—	$45-$600	$200	$4,000	$250 to $800
Date of first delivery	1/81	1974	1977	4th qtr. 1980	8/74
Number installed to date	—	Over 200	—	—	48
Serviced by	BBN	Braegen Corp.	Burroughs	Burroughs	Centennial
COMMENTS	UNIX engine with network control software and electronic mail	Concurrent support of local 3270, remote 3270, remote job entry, local job entry, screen editor, multiple hosts	Based on 1979 information	Remote communications processors designed for use as network nodes or distributed processing systems; based on Burroughs B 900 architecture	Supports modular line handlers, variable speeds, standard Univac protocols plus most IBM protocols. Handles up to 8 CPUs through 1 CSI front-end; also supports host to host comm. thru front-end

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MANUFACTURER AND MODEL	Chi Corporation CCP	Chi Corporation CCP/RC	Codex 6520	Computer Communications CC-8	Computer Communications CC-8R
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Univac 1100 Series	Univac 1100 series	IBM 303X, 4300, S/360, S/370 & compatible systems	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	No
Maximum no. of hosts supported simultaneously	8	8	4	4	—
Maximum no. of hosts channel-attachable to front-end	8	8	4	4	—
Maximum no. stations pollable per line or system	Term.-depend.	Terminal-dep.	Device dependent	Unlimited	—
As a remote concentrator	Yes	Yes	No	No	Yes
Maximum no. of remote connections to one host	Unlimited	Unlimited	—	—	16
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	—	—	16
Maximum no. of stations pollable on one line	Term.-depend.	Terminal-dep.	—	—	Unlimited
As a free-standing communications processor	Yes	Yes	No	No	No
Network Architecture compliance	RADANET	X.25-Radenet	—	—	—
Full-capacity data base system	Not currently avail.	—	—	—	—
Operating system	CHIOPS	CHIOPS	—	—	—
As a store-and-forward message switching processor	Yes	Yes	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	100	100	240	240	64
2000 to 9600 bps	64	64	240	240	64
Over 9600 bps	32	32	Varies	240	64
Highest line speed supported, bits per second	50K	50K	230.4K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	25K	25K	Up to 200K	200K	200K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	IBM 3270	IBM 3270	No	No	No
IBM SDLC	No	Not currently	No	No	No
X.25—Packet level	Yes	Yes	No	Yes	Yes
Other	U1004, NTR, U100, U200, UTS 400	All Univac terminals	Dataspeed 40/4, PARS, others	—	SABRE, PARS
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.75	.75	0.3	0.3	0.3
Main memory word size, bits	32	32	16	16	16
Main memory storage capacity, words or bytes	1M bytes	1M	64K bytes	64K bytes	256K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	—	—	DMA, interrupt	DMA	DMA
Other peripherals	—	—	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Diskette, cassette	Diskette, cassette	Diskette, disk	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer
Communications operating software:					
Availability	Separately priced	Separately priced	Included in price	Included in price	Separately priced
Generated by	Host or comm. proc.	Host & comm. proc.	Host	Host	Host
Additional software supported	TIP, CMS, MAPPER	TIP, CMS, MAPPER	—	Utilities	Utilities
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$50,000 to $300,000	$50,000 to $300,000	$41,000 & up	$39,430 & up	$39,200 & up
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	$1,150 & up	$724 & up	$1,207 & up (3-yr.)
Communications operating software—one-time charge	Contact vendor	Contact vendor	—	—	$750
Communications operating software—monthly charge	Contact vendor	Contact vendor	—	—	$125
Date of first delivery	8/72	10/75	1/80	1976	1979
Number installed to date	45	10	—	121	7
Serviced by	CHI	CHI	Codex Corp.	CCI	CCI
COMMENTS	Supports auto baud & protocol detection; all Univac protocols & IBM multi-host & mixed vendor hosts; worldwide sales and support	Supports full range of network services incl. dynamic line reconfiguration, etc.	Multiplexed Network Interface (MNI) provides networking capabilities with Codex 6000 Series Intelligent Network Processors	Capabilities include auto-poll; auto baud rate select, auto-dump; auto-load etc.; terminal initiated host application selection; error control/correction	Low cost intelligent remote concentrator

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Computer Communications CC-80	Computer Communications CC-80RC	Computer Communications CC-85	Computer Communications CC-85AC	Computer Comunications CC-8000
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	No	Yes
Maximum no. of hosts supported simultaneously	7	—	7	—	7
Maximum no. of hosts channel-attachable to front-end	7	—	7	—	7
Maximum no. stations pollable per line or system	Unlimited	—	Unlimited	—	Unlimited
As a remote concentrator	No	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	—	32	—	32	32
Maximum no. of hosts served by one concentrator	—	32	—	32	32
Maximum no. of stations pollable on one line	—	Unlimited	—	Unlimited	Unlimited
As a free-standing communications processor	Yes	No	Yes	No	Yes
Network Architecture compliance	CCI; NCS	—	CCI; NCS	—	CCI; NCS
Full-capacity data base system	No	—	No	—	No
Operating system	CCI; NCS	—	CCI; NCS	—	CCI; NCS
As a store-and-forward message switching processor	No	No	No	No	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	1,232	240	1,232	240	240
2000 to 9600 bps	1,232	240	1,232	240	240
Over 9600 bps	1,232	240	1,232	240	240
Highest line speed supported, bits per second	230.4K	230.4K	230.4K	230.4K	50K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	200K	200K	400K	400K	5000
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	No	No	No	No
X.25—Packet level	Yes	Yes	Yes	Yes	Yes
Other	SABRE, PARS	SABRE, PARS	SABRE, PARS	SABRE, PARS	SABRE, PARS
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.3	0.3	0.15	0.15	0.3
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	512K bytes	512K bytes	512K bytes	512K bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	DMA	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Host	Host	Host	Host	Host
Additional software supported	Utilities	Utilities	Utilities	Utilities	Utilities
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$98,750 & up	$98,750 & up	$128,750 & up	$134,750 & up	$148,750 & up
Monthly rental (2-yr. lease, including maint., range)	$2,546 & up (3-yr.)	$2,546 & up (3-yr.)	$3,696 & up (3-yr.)	$3,835 & up (3-yr.)	$3,546 & up (3-yr.)
Communications operating software—one-time charge	$1,500	$1500	$1,500	$1,500	Varies
Communications operating software—monthly charge	$250	$250	$250	$250	Varies
Date of first delivery	1975	1979	1979	1980	1976
Number installed to date	294	9	23	4	26
Serviced by	CCI	CCI	CCI	CCI	CCI
COMMENTS	Network controller offering independent front-end processing and true networking in the emulation environment	High performance programmable remote concentrator	Distributed microprocessor architecture used to create a very high-speed independent front-end processor/network controller	Distributed microprocessor architecture, higher sustainable throughput for remote concentration	Custom message switching, multicomputer config., fractional redundancy, NLETS/NCIC interface

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Control Data Corp. 2551-1	Control Data Corp. 2551-2	Datastream Communications Inc. T7	Digital Communications Assoc. System 150 Network Processor	Digital Communications Assoc. System 250/10 Network Processor
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	CDC 6000, Cyber 70, Cyber 170, & Cyber 170 700 Series	CDC 6000, Cyber 70, Cyber 170 & Cyber 170 700 Series	IBM supporting 3270 drives	Most manufacturers	DEC
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	No	Yes
Maximum no. of hosts supported simultaneously	1	1	—	—	31
Maximum no. of hosts channel-attachable to front-end	2	2	—	—	6
Maximum no. stations pollable per line or system	Protocol-depend.	Protocol-depend.	—	—	—
As a remote concentrator	Yes	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	8	8	—	128	128
Maximum no. of hosts served by one concentrator	8	8	—	32	32
Maximum no. of stations pollable on one line	1 RC per trunk	1 RC per trunk	—	Varies	Varies
As a free-standing communications processor	No	No	Yes	Yes	Yes
Network Architecture compliance	—	—	—	INA	INA
Full-capacity data base system	—	—	—	—	—
Operating system	CCP	CCP	Spectral	Proprietary	Proprietary
As a store-and-forward message switching processor	No	No	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	254	—	128	128
2000 to 9600 bps	32	254	2	24	4
Over 9600 bps	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	—	—	—
Highest line speed supported, bits per second	56K	56K	9.6K	9600	9600
Effect on line capacity, if all lines are full-duplex	None	None	—	None	None
Estimated processor throughput, chars./sec.	20K	20K	—	4000	4000
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	No	No
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	No
IBM SDLC	Special	Special	Yes	No	No
X.25—Packet level	Yes	Yes	No	No	No
Other	Mode 4A, 4C HASP M-L	Mode 4A, 4C HASP M-L	No	IBM 2741/3767, 83B3	IBM 2741/3767, 83B3
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	No	Yes	Yes
Main memory cycle time, usec.	0.55	0.55	250 nanosec.	1.5	1.5
Main memory word size, bits	18	18	86K	12	12
Main memory storage capacity, words or bytes	262K bytes	262K bytes	64K bytes	32K words	32K words
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	Interrupt	Interrupt	Interrupt
Mass Storage	—	—	None	Interrupt	Interrupt
Other peripherals	—	—	—	Interrupt	Interrupt
Back-up and diagnostic peripherals supported	Cassette tape	Cassette tape	Magnetic tape	Diskette	Diskette
Communications operating software:					
Availability	Separately priced	Separately priced	Incl. in price	Included in price	Included in price
Generated by	Host	Host	Comm. processor	Comm. processor	Host
Additional software supported	PASCAL, Network Definition Lang.	PASCAL, Network Definition Lang.	—	DEC OS/8	DEC OS/8
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	\$49,000 to \$74,000	\$59,000 to \$190,000	\$9,350 to \$15,400	\$11,500 & up	\$20,000 & up
Monthly rental (2-yr. lease, including maint., range)	\$1,650 to \$2,300 (3-yr.)	\$2,000 to \$8,500 (3-yr.)	—	—	—
Communications operating software—one-time charge	\$3,940	\$3,940	—	—	—
Communications operating software—monthly charge	\$120 + \$570 OTC	\$120 + \$570 OTC	—	—	—
Date of first delivery	6/75	6/75	11/80	6/74	7/73
Number installed to date	Over 200	Over 400	20	75	40
Serviced by	Control Data Corp.	Control Data Corp.	DCI	DCA/DEC	DCA/DEC
COMMENTS	Demand-driven multiplexing; programmed in high-level lang.; extensive diagnostics	Demand-driven multiplexing; programmed in high-level lang.; extensive diagnostics; field-upgradable from 2551-1	Allows ASCII CRT terminals, operating in conversational (char.) mode, to appear to an IBM S/370 or compatible host as 3271-attached 3277 display stations; terminal attach. may be direct, or over leased or switched lines	Supports host selection, port contention; full line and modem control facilities	Supports host selection, port contention; full line and modem control facilities

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Digital Comm. Assoc. System 355 Master Network Processor	Digital Communications Corp. CP 9000	Digital Communications Corp. CM 9100	DPF Incorporated CMC 4	DPF Incorporated CMC 8
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Most manufacturers	Any computer system via serial data interfaces	Any computer system via serial data interfaces	IBM S/360, S/370, 30XX, 43XX; AS; Amdahl; Magnuson; CDC Omega, etc.	IBM S/360, S/370, 30XX 43XX; AS, Amdahl, Omega, Magnuson; CDC etc.
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	No	No	Yes	Yes
Maximum no. of hosts supported simultaneously	—	—	—	1	1
Maximum no. of hosts channel-attachable to front-end	—	—	—	1	1
Maximum no. stations pollable per line or system	—	—	—	4096	4096
As a remote concentrator	Yes	Yes	Yes	No	No
Maximum no. of remote connections to one host	124	Unrestricted	2 (1 back-up)	—	—
Maximum no. of hosts served by one concentrator	—	Unrestricted	1	—	—
Maximum no. of stations pollable on one line	Varies	Unrestricted	Unrestricted	—	—
As a free-standing communications processor	Yes	Yes	Yes	RPQ	RPQ
Network Architecture compliance	INA	Custom	Custom	—	—
Full-capacity data base system	—	No	No	—	—
Operating system	Proprietary	EX 9000	EX 9100	—	—
As a store-and-forward message switching processor	Yes	No	No	RPQ	RPQ
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	124	480	32	4	8
2000 to 9600 bps	124	480 to 240	16	4	8
Over 9600 bps	124	60	0	3	6
Highest line speed supported, bits per second	19.2K	56K	9.6K	56K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	400K bps	Up to 700K	Up to 3K	5.6K	11.2K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Future	Future
IBM SDLC	No	Yes	Special	Future	Future
X.25—Packet level	Yes	Yes	Special	Future	Future
Other	DDCMP-trunk only	Yes (custom)	Yes (custom)	IBM I, II, III; various POS & data collection terminals	IBM I, II, III; various PDS & data collection terminals
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	No	No
Main memory cycle time, usec.	.25	0.5	0.5	0.5	0.5
Main memory word size, bits	8	8	8	8	8
Main memory storage capacity, words or bytes	64K bytes	512K bytes	64K bytes	64K bytes	64K bytes per processor
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	Interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	Interrupt	DMA, interrupt	Interrupt	RPQ	RPQ
Other peripherals	Interrupt	Interrupt	—	RPQ	RPQ
Back-up and diagnostic peripherals supported	Card file	Diskette	—	RPQ	RPQ
Communications operating software:					
Availability	Incl. in price	Separately priced	Included in price	Included in price	Incl. in price
Generated by	Comm. processor	Host	Host	Comm. processor	Comm. processor
Additional software supported	—	LOGOS compiler, program debugger	Optional utilities	—	—
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$9,000 & up	Contact vendor	$1,800-$7,535	$13,500 to $19,500	$20,000 to $35,000
Monthly rental (2-yr. lease, including maint., range)	—	Contact vendor	Contact vendor	$460 to $520	$550 to $1,000
Communications operating software—one-time charge	—	Contact vendor	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	10/80	7/77	12/79	11/77	11/80
Number installed to date	—	Over 300	130	160	—
Serviced by	DCA	DCC	DCC	DPF, user, or 3rd pty.	DPF, user or third party
COMMENTS	Supports host selection, port contention, full line and modem control facilities; handles up to 62 high-speed trunk lines	Multi-microprocessor-based sys. (up to 62 mpu's); can be programmed to perform any comm. processing function; full on-line redundancy capability; compat. with CM 9100	Single-microprocessor-based sys.; available off-the-shelf as a concentrator/multiplexer; can be end-user programmed; compat. with CP 9000	Emulates IBM 2701 or 2705; replaces 370X; provides optional diagnostic console, BSC Pollamatic, BSC Broadcast, Auto-dial/Auto answer, custom protocols	Emulates IBM 2701 or 2703; replaces 370X; provides optional diagnostic console, BSC Pollamatic, BSC Broadcast, custom protocols

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	DPF Incorporated CMC 32	General Automation Solution Series 200 & 400	GTE Telenet TP 1000	GTE Telenet TP 2200	GTE Telenet TP 3010
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 30XX, 43XX; AS; Amdahl; Magnuson; CDC Omega; etc.	IBM S/360, S/370, 303X	Virtually all manufacturers	Virtually all manufacturers	Most manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	4 or more	7	64	27
Maximum no. of hosts channel-attachable to front-end	2	4 or more	None	None	1
Maximum no. stations pollable per line or system	4096	16	—	—	225
As a remote concentrator	No	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	256	7	64	27
Maximum no. of hosts served by one concentrator	—	256	7	64	27
Maximum no. of stations pollable on one line	—	—	—	—	225
As a free-standing communications processor	RPQ	Yes	Yes	Yes	Yes
Network Architecture compliance	—	Autonet	—	—	X.25
Full-capacity data base system	—	FMS	—	—	—
Operating system	—	CONTROL IV	TPOS	TPOS	—
As a store-and-forward message switching processor	RPQ	Yes	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	256	7	64	27
2000 to 9600 bps	32	96	—	64	27
Over 9600 bps	24	—	—	—	13
Highest line speed supported, bits per second	56K	2.4 MB/sec.	300	2400	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	44.8K	—	180	25.6K	4.8K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	No	No	Yes
ADCCP/HDLC (UDLC, BDLC)	Future	Yes	No	No	Yes
IBM SDLC	Future	Yes	No	No	No
X.25—Packet level	Future	Yes	No	No	Yes
Other	IBM I, II, III; various POS & data collection terminals	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	No	No	No	No	Yes
Main memory cycle time, usec.	0.5	0.24 to 0.72	0.5	0.5	450
Main memory word size, bits	8	16	8	8	8
Main memory storage capacity, words or bytes	64K bytes per proc. (8 processors max.)	2 megabytes	8K	64K	64K
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	Both
Mass Storage	RPQ	DMA, interrupt	—	—	—
Other peripherals	RPQ	DMA, interrupt	—	—	Interrupt
Back-up and diagnostic peripherals supported	RPQ	Disk, diskette, mag. tape	None	None	Mag tape, cassette, local TTY
Communications operating software:					
Availability	Included in price	Included	Included in price	Included in price	Included in price
Generated by	Comm. processor	—	—	—	Comm. processor
Additional software supported	—	Macro assembler, FORTRAN, COBOL, utilities	—	—	None
Turnkey systems available	Yes	Yes	No	No	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$34,770 to $65,645	$15,000 to $100,000	—	$24,100 to $62,000	$9,500-$12,500
Monthly rental (2-yr. lease, including maint., range)	$955 to $1,950	—	Telenet tariff	Telenet tariff	—
Communications operating software—one-time charge	—	—	—	—	Included
Communications operating software—monthly charge	—	—	—	—	$25-$50
Date of first delivery	2/79	9/76	9/77	9/77	5/79
Number installed to date	30	4500	228	217	178
Serviced by	DPF, user, or 3rd pty.	General Automation	GTE Telenet	GTE Telenet	GTE
COMMENTS	Emulates IBM 2701 or 2703; replaces 370X; provides optional diagnostic console, BSC Pollamatic, BSC Broadcast, Auto dial/Auto answer, custom protocols	The Solution Series includes the 200 Series micros and the 400 Series minis	Compatible with GTE Telenet public packet network	Compatible with GTE Telenet public packet network	X.25 network concentrator remote network control avail.; compatible w/GTE Telenet public data network and other X.25-based packet networks; formerly marketed as CTX 9101

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	GTE Telenet TP 4010	GTE Telenet TP 4020/ 4030	GTE Telenet TP 4040/ 4050	Honeywell DATANET 6661	Honeywell DATANET 8
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Virtually all manufacturers	Virtually all manufacturers	Virtually all manufacturers	Honeywell DPS, DPS-8	Honeywell DPS 8
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	64	256	256	1	2
Maximum no. of hosts channel-attachable to front-end	None	None	None	2	2
Maximum no. stations pollable per line or system	—	—	—	32	32
As a remote concentrator	Yes	Yes	Yes	No	No
Maximum no. of remote connections to one host	64	256	256	—	—
Maximum no. of hosts served by one concentrator	64	256	256	—	—
Maximum no. of stations pollable on one line	—	—	—	—	—
As a free-standing communications processor	Yes	Yes	Yes	No	No
Network Architecture compliance	—	—	—	—	—
Full-capacity data base system	—	—	—	—	—
Operating system	TPOS	TPOS	TPOS	—	—
As a store-and-forward message switching processor	No	No	No	Yes	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	256	256	96	128
2000 to 9600 bps	64	256	256	96	128
Over 9600 bps	—	—	136	96	128
Highest line speed supported, bits per second	2400	9600	56K	72K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	25.6K	128K	230.4K	—	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	Yes	Yes
IBM SDLC	No	No	No	No	No
X.25—Packet level	No	No	Yes	No	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	No	No	No	Yes	No
Main memory cycle time, usec.	0.5	0.5	0.5	0.44/0.55	0.44/0.55
Main memory word size, bits	8	8	8	18	16
Main memory storage capacity, words or bytes	128K	128K/256K	128K/256K	512K bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA	DMA
Mass Storage	—	—	—	DMA	DMA
Other peripherals	—	—	—	—	—
Back-up and diagnostic peripherals supported	None	None	None	Diskette (diagnostics only)	Diskette
Communications operating software:					
Availability	Included in price	Included in price	Included in price	See Comments	See Comments
Generated by	—	—	—	Host	Comm. processor
Additional software supported	—	—	—	Macro assembler	—
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$28,600 to $60,800	$32,600 to $181,000	$45,000 to $190,000	$51,046 to $272,620	$43,020 to $191,873
Monthly rental (2-yr. lease, including maint., range)	Telenet tariff	Telenet tariff	Telenet tariff	$2,055 to $10,470 (3-yr.)	$1,673 to $7,359 (3-yr.)
Communications operating software—one-time charge	Included	Included	Included	—	—
Communications operating software—monthly charge	$60-$100	$75-$150	$90-$175	$187 to $770	$632 to $1,783
Date of first delivery	8/78	12/79	12/79	4/80	1st qtr. 1981
Number installed to date	363 (4000 Series)	363 (4000 Series)	363 (4000 Series)	—	—
Serviced by	GTE	GTE	GTE	Honeywell	Honeywell
COMMENTS	Compatible with GTE Telenet public packet network and other X.25-based packet networks	Compatible with GTE Telenet public packet network and other X.25-based packet networks	Compatible with GTE Telenet public packet network and other X.25-based packet networks	GRTS-II & NPS software separately priced	DNS software separately priced

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	IBM-DPD 3704	IBM-DPD 3705-II	ICOT 257-15	ICOT 257-5	ICOT 257-1
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 303X, 43XX	IBM S/360, S/370, 303X, 43XX	Most manufacturers via serial line interface	Most manufacturers via serial line interface	Most manufacturers via serial line interface
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	No	No
Maximum no. of hosts supported simultaneously	1	4	—	—	—
Maximum no. of hosts channel-attachable to front-end	1	4	—	—	—
Maximum no. stations pollable per line or system	Device-depend.	Device-depend.	—	—	—
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	1	1	13	4	4
Maximum no. of hosts served by one concentrator	1	1	13	4	4
Maximum no. of stations pollable on one line	Device-depend.	Device-depend.	15	15	15
As a free-standing communications processor	No	No	Yes	Yes	Yes
Network Architecture compliance	—	—	Variable	Variable	Variable
Full-capacity data base system	—	—	No	No	No
Operating system	—	—	No	No	No
As a store-and-forward message switching processor	No	No	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	352	35	9	5
2000 to 9600 bps	32	352	13	4	5
Over 9600 bps	32	32	—	—	—
Highest line speed supported, bits per second	134.5K	230.4K	9.6K	9.6K	9.6K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None	None
Estimated processor throughput, chars./sec.	—	—	—	—	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	Yes	Yes
X.25—Packet level	No	No	Yes	Yes	Yes
Other	—	—	PARS, SITA, P1024, U100/200/400	PARS, SITA, P1024, U100/200/400	PARS, SITA, P1024, U100/200/400
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	No	No	No
Main memory cycle time, usec.	—	1.0	.805 usec	.805 usec	.805 usec
Main memory word size, bits	—	18	8	8	8
Main memory storage capacity, words or bytes	64K bytes	512K bytes	48K + 14K/line	48K + 14K/line	16K + 14K/line
Data transfer between memory and:					
Communications lines	Interrupt	DMA	Interrupt	Interrupt	Interrupt
Mass Storage	—	DMA	—	—	—
Other peripherals	—	DMA	—	—	—
Back-up and diagnostic peripherals supported	—	—	None	None	None
Communications operating software:					
Availability	Separately priced	Separately priced	Included	Included	Included
Generated by	Host	Host	—	—	—
Additional software supported	—	—	None	None	None
Turnkey systems available	Available	Available	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$22,100 to $24,455	$38,230 to $122,040	$10,000 to $30,000	$6,000 to $9,000	$3,900
Monthly rental (2-yr. lease, including maint., range)	$712 to $895	$1,205 to $4,785	—	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	Option-depend.	$132	—	—	—
Date of first delivery	5/73	8/76	1979	1980	1/81
Number installed to date	—	—	70	—	—
Serviced by	IBM	IBM	ICOT	ICOT	ICOT
COMMENTS		Prices shown are for basic controller only	Multimicroprocessor configuration provides for 1 processor per synchronous line, or 1 processor per up to 16 asynchronous lines	Multimicroprocessor configuration provides for 1 processor per synchronous line, or 1 processor per up to 16 asynchronous lines	Multimicroprocessor configuration provides for 1 processor per line

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Industrial Computer Controls, Inc. CA12	Intelligent Terminals, Inc. ADCAP 100-1	Intelligent Terminals, Inc. ADCAP 200-1	ITT Courier VTLC	Lemcom Systems, Inc. CMC-4
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM, Burroughs, asynchronous	Almost any mainframe except Burroughs	Almost any mainframe, except Burroughs	IBM S/360, S/370, 3000, 4300, & plug compatibles	IBM S/360, S/370, 303X, 4300, and compatible
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	No	Yes	Yes
Maximum no. of hosts supported simultaneously	8	—	—	1	1
Maximum no. of hosts channel-attachable to front-end	0	—	—	1	2
Maximum no. stations pollable per line or system	32	—	—	255	Unrestricted
As a remote concentrator	Yes	Yes	Yes	No	By RPQ
Maximum no. of remote connections to one host	29	Variable	Variable	—	—
Maximum no. of hosts served by one concentrator	8	1	2 per 8 input ports	—	—
Maximum no. of stations pollable on one line	32	4096	4096	—	—
As a free-standing communications processor	Yes	No	No	No	No
Network Architecture compliance	SNA	—	—	—	—
Full-capacity data base system	—	—	—	—	—
Operating system	—	—	—	—	—
As a store-and-forward message switching processor	No	Yes	Yes	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	15	4 per output chan.	8 per output chan.	4	4
2000 to 9600 bps	1 to 12	4 per output chan.	8 per output chan.	4	4
Over 9600 bps	2	4 per output chan.	8 per output chan.	4	3
Highest line speed supported, bits per second	19.2K	19.2K bps	56K bps	9.6K	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	None	—	None
Estimated processor throughput, chars./sec.	8K	38.4K	153.6K	—	7K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	No	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	No	Future
IBM SDLC	Yes	Yes	No	No	Future
X.25—Packet level	No	Yes	Yes	No	Future
Other	Yes	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	No	No	No	No	No
Main memory cycle time, usec.	.450	200 nanoseconds	200 nanoseconds	—	0.5
Main memory word size, bits	8	8	8	—	8
Main memory storage capacity, words or bytes	64K	64K words	48K words	—	40K
Data transfer between memory and:					
Communications lines	Both	DMA	DMA	—	Interrupt
Mass Storage	—	DMA	DMA	—	—
Other peripherals	—	DMA	DMA	—	—
Back-up and diagnostic peripherals supported	—	Internal diagnostics	Internal diagnostics	Diskette	Console
Communications operating software:					
Availability	Incl. in price	Included in price	Included in price	Included in price	—
Generated by	—	—	—	Comm. processor	—
Additional software supported	—	—	—	Message broadcast, line monitoring, error logging, & config. monitoring	—
Turnkey systems available	Yes	Yes	Yes	Yes; see Comments	—
PRICING AND AVAILABILITY					
Purchase price (system range)	$4,300-$15,000	$7,200 to $25,000	$5,700 to $25,000	$7,900 to $26,150	$14,000 to $20,000
Monthly rental (2-yr. lease, including maint., range)	—	$400	—	$383 to $1,050	Contact vendor
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1/79	11/79	7/81	7/76	3/77
Number installed to date	150	60	2	800	225
Serviced by	ICCI	Intelligent Terminals	Intelligent Terminals	ITT Courier	User/third party
COMMENTS	Extensive protocol conversion capabilities	A protocol converter that converts various protocols to X.25 network protocols; limited store-and-forward capabilities; expandable bandwidth via multiple processor architecture	A protocol converter that converts various protocols to X.25 network protocols; limited store-and-forward capabilities; expandable bandwidth via multiple processor architecture	A turnkey front-end processor system that can replace an IBM 370X in a network of 3270-type BSC terminal devices; the VTLC appears to the host as a 3272 controller and handles both remote and local terminal devices	Microprocessor-directed FEP. Compact and extremely flexible. Front-end polling, console support available. OEM discounts available. RPQ's available for a fee

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Lemcom Systems, Inc. CMC-8	Lemcom Systems, Inc. CMC-32	Memorex 1380	Modular Computer Systems Modcomp MCII/CP2	Modular Computer Systems Modcomp 3108
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 303X, 4300, and compatible	IBM S/360, S/370, 303X, 4300, and compatible	IBM S/360, S/370, 303X, 43XX, and compatibles	Modcomp MCII/26 & MCII/45	Modcomp Classic 7830
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	1	4	2	4
Maximum no. of hosts channel-attachable to front-end	2	2	8 (4 at a time)	2	4
Maximum no. stations pollable per line or system	Unrestricted	Unrestricted	Unrestricted	256	256
As a remote concentrator	By RPQ	By RPQ	By RPQ	Yes	Yes, with CPU
Maximum no. of remote connections to one host	—	—	Contact vendor	Applic.-dependent	Applic.-dependent
Maximum no. of hosts served by one concentrator	—	—	Contact vendor	Applic.-dependent	Applic.-dependent
Maximum no. of stations pollable on one line	—	—	Contact vendor	User-programmable	User-programmable
As a free-standing communications processor	No	No	No	Yes	Yes, with CPU
Network Architecture compliance	—	—	—	X.25	X.25
Full-capacity data base system	—	—	—	—	TSX, INFIN.
Operating system	—	—	—	MAX III/MAXNET III	MAX III/IV, MAXNET
As a store-and-forward message switching processor	No	No	No	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	8	32	112 to 216	256	256
2000 to 9600 bps	8	32	64	256 to 166	256 to 166
Over 9600 bps	6	24	40	Applic.-dependent	Applic.-dependent
Highest line speed supported, bits per second	56K	56K	230.4K	250K	250K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	14K	56K	—	200K	200K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Future	Future	No	No	Yes
IBM SDLC	Future	Future	No	No	Yes
X.25—Packet level	Future	Future	No	No	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	Limited	Yes
Programmable by user	No	No	Yes	No	No
Main memory cycle time, usec.	0.5	0.5	0.54	0.8-1.0	0.125
Main memory word size, bits	8	8	16	16	16/32
Main memory storage capacity, words or bytes	80K	320K	64K	128K bytes	2M bytes
Data transfer between memory and:					
Communications lines	Interrupt	Interrupt	DMA, interrupt	DMI	DMI, interrupt
Mass Storage	—	—	DMA	DMA	DMA, interrupt
Other peripherals	—	—	—	DMA	DMA, interrupt
Back-up and diagnostic peripherals supported	Console	Console	None	Disk, mag. tape, printers	Disk, mag. tape, printers
Communications operating software:					
Availability	—	—	Some separ. priced	Separately priced	Separately priced
Generated by	—	—	Host	Host	Host & comm. processor
Additional software supported	—	—	MASCOT and other host-resident utilities	Macro assembler, FORTRAN, utilities	See Comments
Turnkey systems available	—	—	No	No	No
PRICING AND AVAILABILITY					
Purchase price (system range)	\$16,000 to \$30,000	\$20,000 to \$60,000	Varies	\$27,000	\$30,850
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	Varies	—	—
Communications operating software—one-time charge	—	—	Contact vendor	—	—
Communications operating software—monthly charge	—	—	Contact vendor	—	—
Date of first delivery	11/80	3/79	1976	—	—
Number installed to date	3	30	150	—	—
Serviced by	User/third party	User/third party	Memorex	Modcomp	Modcomp
COMMENTS	Microprocessor-directed FEP. Compact and extremely flexible. Front-end polling, console support avail. OEM discounts, RPQ's available	Microprocessor-directed FEP. Compact and extremely flexible. Front-end polling console support available. OEM discounts available. RPQ's available for a fee	Custom software extensions are available for a fee, from Memorex Systems Engineering Services		Additional software supported includes FORTRAN IV, 77 CORAL 66, COBOL, PASCAL, & macro assembler utilities

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Modular Computer Systems Modcomp 3109	NCR 721-II	NCR Comten, Inc. COMTEN 3650	NCR Comten, Inc. COMTEN 3670	NCR Comten, Inc. COMTEN 3690
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Modcomp Classic 786X, 7870	NCR Century, Criterion, & 8XX5 Systems	IBM S/360, S/370, 3033, & 43XX; CDC Omega; Amdahl; custom	IBM S/360, S/370, 3033, & 43XX; CDC Omega; Amdahl; custom	IBM S/360, S/370, 3033, & 43XX: CDC Omega; Amdahl; custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	4	2	2	4	8
Maximum no. of hosts channel-attachable to front-end	4	2	2	4	8
Maximum no. stations pollable per line or system	256	Device-dependent	4096 per system	12,288 per system	16,384 per system
As a remote concentrator	Yes, with CPU	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Applic.-dependent	Unrestricted	15	15	15
Maximum no. of hosts served by one concentrator	Applic.-dependent	Unrestricted	Unlimited	Unlimited	Unlimited
Maximum no. of stations pollable on one line	User-programmable	Device-dependent	32	32	32
As a free-standing communications processor	Yes, with CPU	Yes	Yes	Yes	Yes
Network Architecture compliance	X.25	NCR/CNA	SNA, CNA	SNA, CNA	SNA, CNA
Full-capacity data base system	TSX, INFIN.	—	—	—	—
Operating system	MAX III/IV, MAXNET	TOX	See Comments	See Comments	See comments
As a store-and-forward message switching processor	Yes	No	No	No	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	256	99	128	384	512
2000 to 9600 bps	256 to 166	52 to 99	128	384	512
Over 9600 bps	Applic.-dependent	10 at 56K bps	32 to 128	96 to 384	128 to 512
Highest line speed supported, bits per second	250K	56K	230.4K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	200K	40K	100K (HASP)	100K (HASP)	300K (HASP)
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	Yes	Yes
X.25—Packet level	Yes	Yes	Yes,	Yes,	Yes,
Other	—	—	83B3	83B3	83B3
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	Yes
Programmable by user	No	No	Yes	Yes	Yes
Main memory cycle time, usec.	0.125	0.65	0.65	0.65	0.52
Main memory word size, bits	16/32	16	16 plus parity	16 plus parity	64 plus parity
Main memory storage capacity, words or bytes	4M bytes	256K bytes	512K bytes	512K bytes	4096K bytes
Data transfer between memory and:					
Communications lines	DMI, interrupt	DMA	DMA	DMA	DMA
Mass Storage	DMA, interrupt	—	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA	DMA	DMA	DMA
Back-up and diagnostic peripherals supported	Disk, mag. tape, printers	Cassette	Diskette, cassette	Cassette	Diskette
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Host & comm. processor	Host	Host/comm. proc.	Host/comm. proc.	Host/comm. proc.
Additional software supported	See Comments	—	NDP, CODEL Assembler	NDP, CODEL Assembler	NDP, CODEL Assembler
Turnkey systems available	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$46,310	$41,720 to $100,400	$45,000 to $125,000	$90,000 to $350,000	$130,000 to $550,000
Monthly rental (2-yr. lease, including maint., range)	—	$1,205 & up	$1,500 to $4,150	$3,000 to $11,600	$4,300 to $18,000
Communications operating software—one-time charge	—	$15,000	See comments	See comments	See comments
Communications operating software—monthly charge	—	$417 & up	See comments	See comments	See comments
Date of first delivery	—	1976	3/75	3/72	6/78
Number installed to date	—	—	Over 1100	Over 300	Over 400
Serviced by	Modcomp	NCR	NCR Comten	NCR Comten	NCR Comten
COMMENTS	Additional software supported includes FORTRAN IV, 77 CORAL 66, COBOL, PASCAL, & macro assembler utilities		Communications processor operating systems include EP, NCP, CNS, DSS, & ACF/NCP; all software is licensed on a monthly basis	Communications processor operating systems include EP, NCP, CNS, DSS, & ACF/NCP; all software is licensed on a monthly basis	Communications processor operating systems include EP, NCP, CNS, DSS, & CTAM; & ACF/NCP; all software is licensed on a monthly basis

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	North American Philips Corp., Comm. Sys. Div. MARK III Series	North American Philips Corp., Comm. Sys. Div. DSX 40	North American Philips Corp., Comm. Sys. Div. MARC	Paradyne PIX-II	Periphonics Corporation T-Comm 7
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/370, custom	Custom	Custom	IBM S/360, S/370, 4300, 303X, and compatibles	IBM, NCR, Burroughs, Honeywell, etc.
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	Yes; see comments	Yes
Maximum no. of hosts supported simultaneously	Applic.-dependent	—	See comments	1	8
Maximum no. of hosts channel-attachable to front-end	Applic.-dependent	—	See comments	1	4
Maximum no. stations pollable per line or system	Applic.-dependent	—	Applic.-dependent	64 (interrupt)	256/800
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Applic.-dependent	Applic.-dependent	Applic.-dependent	1	Host-dependent
Maximum no. of hosts served by one concentrator	Applic.-dependent	Applic.-dependent	Applic.-dependent	1	8
Maximum no. of stations pollable on one line	Applic.-dependent	Applic.-dependent	Applic.-dependent	25	256
As a free-standing communications processor	Yes	Yes	Yes	No	Yes
Network Architecture compliance	Philips	Philips	Philips	—	Peri-comm, SNA, etc.
Full-capacity data base system	Philips	Philips	Philips	—	No
Operating system	Philips	Philips	Philips	—	Peri-Comm
As a store-and-forward message switching processor	Yes	Yes	Yes	No	Yes—on RPQ basis
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	Applic.-dependent	Applic.-dependent	Applic.-dependent	—	50
2000 to 9600 bps	Applic.-dependent	Applic.-dependent	Applic.-dependent	Applic.-dependent	10 to 45
Over 9600 bps	Applic.-dependent	Applic.-dependent	Applic.-dependent	3 (full-duplex)	Up to 10
Highest line speed supported, bits per second	19.2K; higher by RPQ	19.2K; higher by RPQ	19.2K; higher by RPQ	56K	56K bytes
Effect on line capacity, if all lines are full-duplex	Capac. halved for voice & wideband	None	None	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	Applic.-dependent	Applic.-dependent	Applic.-dependent	14K	Processor-dependent
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	RPQ	RPQ	RPQ	RPQ	Yes
ADCCP/HDLC (UDLC, BDLC)	RPQ	RPQ	HDLC; RPQ others	No	Yes
IBM SDLC	RPQ	RPQ	RPQ	No	Yes
X.25—Packet level	RPQ	Yes	Yes	No	Yes
Other	RPQ	RPQ	RPQ	Paradyne version of SDLC	Audio Response (93 line max.)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	No
Programmable by user	Yes	Yes	Yes	No	No
Main memory cycle time, usec.	0.7	1.0	1.0	0.5	0.4 to 0.8
Main memory word size, bits	36	8	8	16	16
Main memory storage capacity, words or bytes	1M bytes	320K bytes	208K bytes x NP; see comments	128K bytes	176K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	DMA, interrupt	—	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, line printers, mag. tape	Disk, floppy disk, mag. tape	Disk, floppy disk, mag. tape	None	Remote console, diskette, mag. tape
Communications operating software:					
Availability	Included	Included	Included	Included in price	Included in price
Generated by	Host/comm. proc.	Host/comm. proc.	Host/comm. proc.	—	Host/comm. processor
Additional software supported	Special utilities	Special utilities	Special utilities	Special utilities	Data Collection (BANK-FROM-HOME)
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	Contact vendor	Contact vendor	Contact vendor	$80,000 & up
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	Contact vendor	Contact vendor	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1967	1979	1979	4/76	1971
Number installed to date	Over 90	30	Over 30	Over 1300	—
Serviced by	N. Am. Philips/CSD	N. Am. Philips/CSD	N. Am. Philips.CSD	Paradyne	Periphonics
COMMENTS	Virtually off-shelf for AFTN public switching and Telex applications; custom config. available	Also interfaces with VDU's & word processors; handles X.25 Level 3 (Philips Level 4)	Custom configs. include FAX, Teletex, peripheral controller; handles X.25 Level 3 (Philips Level 4); max. no. of host supported/attachable & main mem. storage capacity depends on no. of processors (NP) configured	PIX permits remote peripherals to access host as if locally attached; local PIX is byte-channel connected to host; remote PIX is input to local PIX	

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Periphonics Corporation DTC-II	Periphonics Corporation T-COMM 80 Multi-Processor	Raytheon Data Systems Raynet I, II & III	Raytheon Data Systems Raynet IV & V	Rockwell International Collins C-System
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM, NCR, Burroughs, Honeywell, etc.	IBM, NCR, Burroughs, Honeywell, Univac, DEC, etc.	IBM, Univac, and compatible CPUs	IBM, Univac, and compatible CPUs	IBM S/360, S/370, 303X; Univac 1100 and
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	No	Yes
Maximum no. of hosts supported simultaneously	8	8 x NP	—	—	Traffic-depend.
Maximum no. of hosts channel-attachable to front-end	4	4 x NP	—	—	8
Maximum no. stations pollable per line or system	256/800	800 x NP	—	—	Protocol-depend.
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Host-dependent	Host-dependent	Unlimited	Unlimited	Interface-depend.
Maximum no. of hosts served by one concentrator	8	8 x NP	1 (R-I); 8 (R-II & III)	8	Interface-depend.
Maximum no. of stations pollable on one line	256	256	No limit	No limit	Protocol-depend.
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	Peri-comm, SNA, etc.	Peri-comm, SNA, etc.	Yes	Yes	Most
Full-capacity data base system	No	No	No	Partial	No
Operating system	Peri-Comm	Peri-Comm	PCOS	PCOS	COS
As a store-and-forward message switching processor	Yes—on RPQ basis	Yes—on RPQ basis	No	Std. (R-IV); opt. (R-V)	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	25	50	47 per cpu	47	1024
2000 to 9600 bps	10 to 45	(10 to 45) x NP	47 per cpu	47	512
Over 9600 bps	Up to 10	Up to 10	Varies	Varies	256
Highest line speed supported, bits per second	56K	56K	56K	56K	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	Capacity halved	None
Estimated processor throughput, chars./sec.	Processor-dependent	Processor-dependent	Appl. dependent	Appl. dependent	50K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	Yes	Yes
X.25—Packet level	Yes	Yes	No	No	Yes
Other	Audio Response (25 line max.)	Audio Response (NP x 100 lines) max.	PARS, Univac	PARS, Univac	Yes, including most IBM
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	Yes	Yes	No
Programmable by user	No	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.4 to 0.8	0.4 to 0.8	0.7	0.7	0.9
Main memory word size, bits	16	16	16	16	32
Main memory storage capacity, words or bytes	128K bytes	320K bytes x NP	256K bytes per cpu	256K bytes per cpu	2M bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA, interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA
Back-up and diagnostic peripherals supported	Remote console, diskette, mag. tape	Remote console, diskette, mag. tape	Console, cassette, printer	Cassette, disk, console, mag. tape, printer	Disk, tape
Communications operating software:					
Availability	Included in price	Included in price	Separately priced	Separately priced	Included in price
Generated by	Host/comm. processor	Host/comm. processor	Comm. processor	Comm. processor	Comm. processor
Additional software supported	Data Collection (BANK-FROM-HOME)	All Periphonics plus other PDP-11, Data Collection (BANK-FROM-HOME)	Utilities, diagnostic and performance aids	Utilities, diagnostic and performance aids	Macro assembler, link editor, etc.
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$50,000 & up	$50,000 & up	$60,000 to $700,000	$100,000 to $400,000	$3,000,000 to $7,000,000
Monthly rental (2-yr. lease, including maint., range)	—	—	Contact vendor	Contact vendor	Contact vendor
Communications operating software—one-time charge	—	—	$2,000	$3,600	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	Fall 1977	Fall 1979	1978; 1980 (R-III)	1980(R-IV);1981(R-V)	3/74
Number installed to date	—	—	—	—	Over 20
Serviced by	Periphonics	Periphonics	Raytheon Data Systems	Raytheon Data Systems	Rockwell Int'l.
COMMENTS		Multi-Processor (MP) System. NP = number of processors; Peri-Comm provides for Multi-Processor, distributed functionality for large networks or stand-alone systems	Raynet I supports network control functions, redundancy option; Raynet II provides all Raynet I capabilities plus host selection; Raynet III provides all Raynet II capabilities plus protocol conversion	Raynet IV provides all Raynet III capabilities plus message switching; Raynet V provides all Raynet IV Capabilities plus node-to-node communications	

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Sperry Univac DCP/40 (Compatible Mode)	Sperry Univac DCP/40 (Primary Mode)	Systems Research Inc. SRI/DCS Model 300	Systems Research Inc. SRI/DCS Model 300R
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Univac Series 1100, Series 90	Univac Series 1100, Series 90	Burroughs medium systems (B2XXX, B3XXX, B4XXX)	Burroughs medium systems (B2XXX, B3XXX, B4XXX)
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	No
Maximum no. of hosts supported simultaneously	2	16	4	—
Maximum no. of hosts channel-attachable to front-end	2	16	4	—
Maximum no. stations pollable per line or system	Variable	Variable	Unlimited	—
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Variable	Variable	4	4
Maximum no. of hosts served by one concentrator	Variable	Variable	16	4
Maximum no. of stations pollable on one line	Variable	Variable	Unlimited	Unlimited
As a free-standing communications processor	Yes	Yes	No	No
Network Architecture compliance	DCA	DCA	—	—
Full-capacity data base system	No	No	—	—
Operating system	Telcon	Telcon	—	—
As a store-and-forward message switching processor	Custom	Custom	Yes	Yes
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	256	255	208	208
2000 to 9600 bps	128	255	40	40
Over 9600 bps	32	140	40	40
Highest line speed supported, bits per second	56K	64K	19.2	19.2
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	Variable	Variable	18K	18K
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No
IBM SDLC	No	No	No	No
X.25—Packet level	Contact vendor	Contact vendor	No	No
Other	Univac	Univac	Most Burroughs, IBM NCR, plus 20 others	—
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	Yes	No	No	No
Main memory cycle time, usec.	0.85	0.85	650 ns	650 ns
Main memory word size, bits	32	32	16	16
Main memory storage capacity, words or bytes	128K bytes	2M bytes	256K bytes	256K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	DMA	DMA, Interrupt	DMA, Interrupt
Mass Storage	DMA, interrupt	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA	None	None
Back-up and diagnostic peripherals supported	Disk, diskette, console	Disk, diskette, mag. tape, console	Yes	Yes
Communications operating software:				
Availability	Separately priced	Separately priced	Incl. in price	Incl. in price
Generated by	Host	Host	Host & comm. proc.	Host & comm. proc.
Additional software supported	Diagnostic debug aid, performance	Diagnostic debug aids, performance	Network management, forms, custom protocols, redundancy	—
Turnkey systems available	Contact vendor	Contact vendor	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$100,000 & up	$100,000 & up	$50,000 to $80,000	$40,000 to $60,000
Monthly rental (2-yr. lease, including maint., range)	$2,460 (5-yr.) & up	$2,200 (5-yr.) & up	Not offered	Not offered
Communications operating software—one-time charge	—	—	Included	Included
Communications operating software—monthly charge	$100	$130	Not offered	Not offered
Date of first delivery	1979	1980	3/78	1/80
Number installed to date	—	—	75	0
Serviced by	Sperry Univac	Sperry Univac	Hewlett-Packard, SRI	Hewlett-Packard, SRI
COMMENTS	Extensive network-oriented software; advanced multi-micro processor, LSI hardware	Extensive network-oriented software; advanced multi-micro processor, LSI hardware	May be chained together as network nodes via data comm. lines; data comm., network control, message queuing & forms handling are front-end resident	A comm. processor which interfaces to Burroughs medium systems hosts via data comm., rather than channel interfaces; same services as SRI/DCS model 300

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Systems Research Inc. MCS 3000 Model 300	Systems Research Inc. SRI/DCS Model 100	Tandem Computers, Inc. NonStop	Telcon Industries, Inc. Datamax Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Hewlett-Packard Series II, III, 23, 30, 44	Burroughs medium systems (B2XXX, B3XXX, B4XXX)	—	Universal; interfaces with any system
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	4	2	1024	8
Maximum no. of hosts channel-attachable to front-end	4	2	—	480
Maximum no. stations pollable per line or system	Unlimited	Unlimited	2561	Application-dependent
As a remote concentrator	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	4	—	1024	Unrestricted
Maximum no. of hosts served by one concentrator	16	—	1024	Unrestricted
Maximum no. of stations pollable on one line	Unlimited	—	256	Unrestricted
As a free-standing communications processor	No	No	Yes	Yes
Network Architecture compliance	—	—	Yes	Unrestricted
Full-capacity data base system	—	—	Encompass	—
Operating system	—	—	Guardian	Telcon
As a store-and-forward message switching processor	Yes	No	Yes	Yes, with floppies or bubble memory
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	208	208	2048	480
2000 to 9600 bps	40	40	2048	Up to 56
Over 9600 bps	40	40	2048	14
Highest line speed supported, bits per second	19.2	19.2	56K	256K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	Capacity halved	None
Estimated processor throughput, chars./sec.	18K	15K	—	—
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	Yes
IBM SDLC	No	No	Yes	Yes
X.25—Packet level	No	No	Yes	No
Other	Most Burroughs, IBM NCR, plus 20 others	—	3270, Burroughs, TI/Net	6-Level typesetter code, 83B3, 8A1, Infocom, bisync
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	No	No	Yes	Yes
Main memory cycle time, usec.	650 ns	650 ns	0.5 to 0.8	1.08
Main memory word size, bits	16	16	16	8
Main memory storage capacity, words or bytes	—	128K bytes	2M bytes	16K PROM, 32K RAM
Data transfer between memory and:				
Communications lines	DMA, Interrupt	DMA, Interrupt	DMA	Interrupt
Mass Storage	DMA	DMA	DMA	Interrupt
Other peripherals	None	None	DMA	Interrupt
Back-up and diagnostic peripherals supported	Yes	Yes	Disk, mag. tape, console	—
Communications operating software:				
Availability	Incl. in price	Incl. in price	Separately priced	Separately priced
Generated by	Host & comm. proc.	Host & comm. proc.	—	Comm. processor
Additional software supported	Network management, forms, custom protocols, redundancy	On-line network parameter generation	FORTRAN, COBOL, Pathway, Mumps, Enform, TAL	Alarm systems
Turnkey systems available	Yes	No	Optional	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$50,000 to $80,000	$38,750 to $60,000	$150,000 & up	$3,000 to $80,000
Monthly rental (2-yr. lease, including maint., range)	Not offered	Not offered	Contact vendor	$165 and up
Communications operating software—one-time charge	Included	Included	—	$1,500 and up
Communications operating software—monthly charge	Not offered	Not offered	—	—
Date of first delivery	1/78	1/79	May 1976	6/76
Number installed to date	30	8	—	4000
Serviced by	Hewlett-Packard/SRI	Hewlett-Packard/SRI	Tandem	General Electric
COMMENTS	May be chained together as network nodes via data comm. lines; data comm., network control, message queuing & forms handling are front-end resident	A front-end data comm. processor, supporting multiple protocols & dual host	A single Tandem system may contain 2 to 16 processors; up to 255 systems can be configured in a single network	Optional features include built-in 300, 1200, & 2400 bps modems, real-time mode operation, built-in video board for attachment of keyboard/display; capable of multiplexing 6 HDLC or SDLC lines; 56K bps line speed supported on all models

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Telefile Computer Products Inc. FECP-X	TRAN Telecommunications Corp. M3201A Single-Node Network Processor	TRAN Telecommunications Corp. M3201 Multi-Node	TRAN Telecommunications Corp. M3216 (XPRO) Attached Packet Processor
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Xerox Sigma 5-9 & Telefile T80 Series	Any with comm. interface (incl. Amdahl, IBM, CDC, HIS, Burroughs, etc.)	Any with comm. interfaces (incl. Amdahl, IBM, CDC, HIS, Burroughs, etc.)	Any with CCITT X.25 interface
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	No	No	No
Maximum no. of hosts supported simultaneously	6 or more	—	—	—
Maximum no. of hosts channel-attachable to front-end	6 or more	—	—	—
Maximum no. stations pollable per line or system	256	—	—	—
As a remote concentrator	Yes	Yes	Yes	No
Maximum no. of remote connections to one host	Software-dependent	1000	750	—
Maximum no. of hosts served by one concentrator	Software-dependent	Any (1,000)	Any (1,000)	—
Maximum no. of stations pollable on one line	Software-dependent	3270 polling thru PAD	3270 polling thru PAD	—
As a free-standing communications processor	Yes	Yes	Yes	Yes
Network Architecture compliance	—	Transparent	Transparent	X.25
Full-capacity data base system	—	No	No	No
Operating system	TCOS	DSOS	DSOS	EXEC
As a store-and-forward message switching processor	Yes	Opt. peripheral available	Opt. peripheral available	Yes
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	30 multiplexing trunks	30 multiplexing trunks	64
2000 to 9600 bps	128	—	—	64
Over 9600 bps	128	—	—	64
Highest line speed supported, bits per second	230.4K	115.2K	115.2K	64K
Effect on line capacity, if all lines are full-duplex	Normally none	None	None	None
Estimated processor throughput, chars./sec.	6K bytes	33K	33K	37.5K
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	No
IBM BSC	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	X.25 HDLC
IBM SDLC	No	Yes	Yes	No
X.25—Packet level	No	Yes (via XPRO)	Yes (via XPRO)	Yes
Other	—	—	—	—
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	Yes (not recommended)	No	No	No
Main memory cycle time, usec.	0.6 to 1.0	0.98	0.98	0.98
Main memory word size, bits	16	16	16	16
Main memory storage capacity, words or bytes	2M bytes	128K bytes	128K bytes	64K words
Data transfer between memory and:				
Communications lines	DMA, interrupt	—	—	—
Mass Storage	DMA	—	—	—
Other peripherals	DMA, interrupt	—	—	—
Back-up and diagnostic peripherals supported	Yes	Diskette, mag. tape	Diskette, mag. tape	Diskette, mag. tape
Communications operating software:				
Availability	Normally included	Separately priced	Separately priced	Separately priced
Generated by	Host	—	—	M3201
Additional software supported	FORTRAN, sort/merge, etc.	Dial-out, billing	Dial-out, billing	Billing
Turnkey systems available	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$60,000 & up	$125,000 to $250,000	$150,000 to $275,000	$50,000 & up
Monthly rental (2-yr. lease, including maint., range)	2½% to 3% per mo.	$7,000 to $14,000 and up	$7,000 to $14,000 and up	$2,750 & up
Communications operating software—one-time charge	—	$20,000 and up	$22,500 and up	—
Communications operating software—monthly charge	—	$800 and up	$1,000 and up	—
Date of first delivery	1978	1976	1979	1979
Number installed to date	6	20	30	10
Serviced by	Telefile	TRAN	TRAN	TRAN
COMMENTS		Hybrid sync./async. circuit and packet data switching system for large-scale single switching node networks; integrated diagnostics and network management capabilities	Hybrid sync./async. circuit and packet data switching system for large-scale multiple switching node networks; integrated diagnostics and network management capabilities	Requires M3201; three M3216s may be attached to one M3201

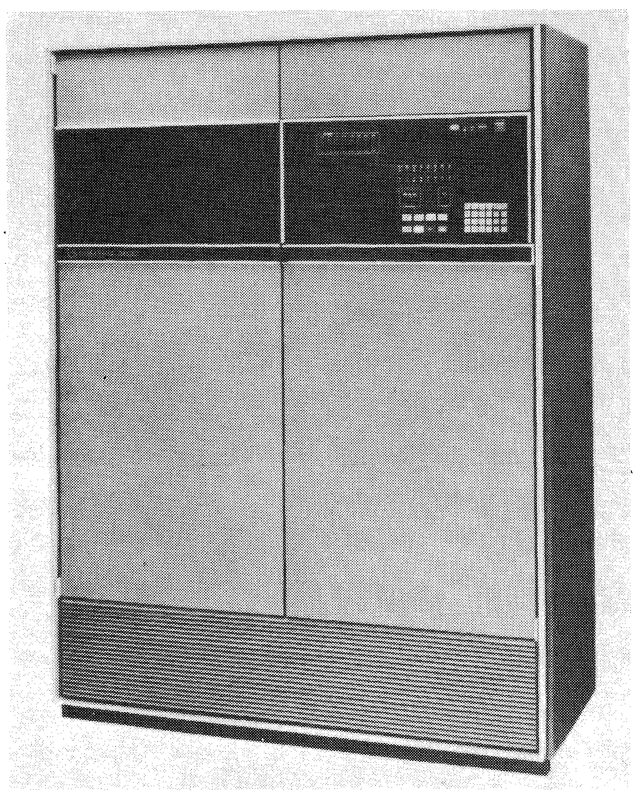
Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	TRT/Norfield AMMS	TRT/Norfield Series 300	TRT/Norfield Series 200	Westinghouse Canada Inc. Electronic Sys. W-1655-ICC
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM 303X, Univac, Honeywell, Burroughs	IBM 303X, Univac, Honeywell, Burroughs	Most major manufacturers	—
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	No	No	No	No
Maximum no. of hosts supported simultaneously	—	—	—	—
Maximum no. of hosts channel-attachable to front-end	—	—	—	—
Maximum no. stations pollable per line or system	—	—	—	—
As a remote concentrator	No	No	No	Yes
Maximum no. of remote connections to one host	—	—	—	16
Maximum no. of hosts served by one concentrator	—	—	—	4
Maximum no. of stations pollable on one line	—	—	—	Response-dependent
As a free-standing communications processor	Yes	Yes	Yes	No
Network Architecture compliance	Custom-supports all	Custom-supports all	Custom-supports all	—
Full-capacity data base system	—	—	—	—
Operating system	—	—	—	—
As a store-and-forward message switching processor	Yes	Yes	No	No
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	64	48	48	16
2000 to 9600 bps	16	16	16	16
Over 9600 bps	16	16	16	Future
Highest line speed supported, bits per second	50K	56K	19.2K	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	Capacity halved over 4800 bps
Estimated processor throughput, chars./sec.	50K	25K	25K	2400
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes
IBM SDLC	Yes	No	Yes	Future
X.25—Packet level	Yes	No	Yes	No
Other	83B, 8A1, 117B, OCR, 2260, 2780, 3270, & others	Telex, TWX, Free Wheeling Async. Infomaster, & others	Telex, Dataspeed 40/2 & 40/3, 2780, Free Wheeling Async., & others	RESERVEC 11, IPARS, U100/U200
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	No	No	No	No
Main memory cycle time, usec.	0.3	1.2	1.2	0.5
Main memory word size, bits	16	16	16	8
Main memory storage capacity, words or bytes	256K bytes	64K bytes	64K bytes	32K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	DMA, interrupt	—
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Back-up and diagnostic peripherals supported	Disk, mag. tape	Disk, mag. tape	Disk, mag. tape	—
Communications operating software:				
Availability	Included in price	Included in price	Included in price	Separately priced
Generated by	Comm. processor	Comm. processor	Comm. processor	Comm. processor
Additional software supported	Electronic mail	—	SMDR, CLM, CLR, OE, PO	To customer requirement
Turnkey systems available	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$95,000 to $500,000	$40,000 to $100,000	$30,000 to $300,000	$15,000 to $20,000
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	Contact vendor	—
Communications operating software—one-time charge	—	—	—	Contact vendor
Communications operating software—monthly charge	—	—	—	—
Date of first delivery	3/75	3/75	6/76	9/76
Number installed to date	30	8	2	200
Serviced by	TRT/Norfield/third party	TRT/Norfield/third party	TRT/Norfield/third party	User or third party
COMMENTS	Multi-node processor systems available. Norfield Communications is a division of TRT Data Products, a United Brands company; a manufacturer of message switching systems	Multi-node processor systems available. Norfield Communications is a division of TRT Data Products, a United Brands company; the series 300 is a low-end message switch	Norfield Communications is a division of TRT Data Products, a United Brands company; the Series 200 is a communications controller	Unit is modular, uses 3 micro-processors, and is the basis of custom-designed special systems

Communications Processors—Management Perspective and Equipment Specifications

As the concept of distributed data processing gains increased acceptance, the need for computer systems that are dedicated to the specialized tasks of data communications processing becomes increasingly important. Whether a particular network arrangement favors strong centralized processing or distributes processing power throughout the network, users can now choose from a wide variety of products that support increasingly sophisticated front-end processing, intelligent remote concentration, network processing, and other communications processing capabilities.

Enthusiastic promotion by minicomputer manufacturers, independent systems houses, and mainframe vendors accounts for the widespread support of both remote and local data communications processing. During the past several years, virtually every major computer manufacturer has announced its own network "architecture", a set of rules, procedures that governs how its hardware and software products can be organized to create a network structure. And, of course, communications processors serve as key building blocks in the construction of these networks.



The Model 3690 is Comten's top-of-the-line 3705 replacement. The 3690 supports up to 512 communications lines and up to eight channel attachments to IBM 360/370 and compatible hosts. Its basic 256K bytes of memory is expandable to over 4 megabytes and, unlike the 3705, peripherals such as disk and magnetic tape storage are supported.

A discussion of the characteristics, functions, and significance of modern programmable communications processors.

The report includes charts comparing 84 commercially available communications processor systems for 39 different vendors and an analysis of user experience from 245 users with over 400 communications processors or controllers installed.

Several major developments have led to the dramatic increase in the use of communications processors, and to their continual development into machines with progressively higher capacity, capability, and compatibility.

The first major development was recognizing that the data communications functions must be segregated from other data processing functions. This resulted in modular communications software packages and communications interfaces that permit alteration of the communications environment without major surgery to the hardware and the software. It also permits the organization of communications processing functions, relative to other processing functions, along assembly-line principles. The assembly-line technique segments a job into discrete elements for exclusive execution by specialized persons or equipment; the assembly-line total output significantly exceeds the output of the same persons or equipment with each performing the total job. The development of specialized components to perform essential line handling functions resulted in the front-end processor, which freed the host processor of this time consuming task. A front-end/host configuration is able to handle a significantly greater data volume than a single processor with equivalent power that performs both the line handling and the data processing function.

The second major development was the introduction of the microprocessor. Now a standard item utilized in all types of electronic componentry, the microprocessor permits implementation of sophisticated processing functions at increasingly low cost. And the fact that the costs of transmission facilities have not decreased as rapidly as microprocessor-based processing justifies placement of communications processing equipment not only at the host site, but throughout the data communications network.

Intimately tied to the evolution of intelligence for *communications* processing equipment, is the parallel development of intelligence for remote *data* processing equipment. The assembly-line concept can be extended to all segments of a network, in which many small systems perform specific, specialized communications *and* data processing ▷

Communications Processors— Management Perspective and Equipment Specifications

tasks independently of the host computer. This decentralized or distributed data processing has given rise to a new type of data processing module: the small processor or minicomputer which performs both data and communications processing. IBM's System 8100 and Sperry Univac's V77 family of minicomputers are two examples of processors which can serve either as independent processors, or as distributed systems which offer significant communications control capabilities.

A third, and often overlooked, influence on the development of communications processors is the effort on the part of most vendors towards standardization. This ongoing effort, along with hardware architectural improvements, is reducing the investment, inventory, and software support necessary to support a variety of different terminal and line disciplines, which are different for few justifiable reasons. Standardization, in addition to reducing costs to existing users, will continually increase the user base that can economically justify the use of electronic communications in their operations.

Recent Developments

The ground rules or network architectures announced by most of the large mainframe and minicomputer manufacturers have codified their communications standards. IBM's Systems Network Architecture, DEC's DECnet, Sperry Univac's Distributed Communications Architecture, and Honeywell's Distributed Systems Environment are examples of such architectures. Bit-oriented protocols are rapidly being adopted that improve the performance and error checking/recovery capabilities of data transmissions. Minor variations of the international HDLC or IBM's SDLC bit-oriented protocols are now supported by many suppliers of communications equipment.

Communications processor hardware and software architecture are continually being changed. Transistors have been replaced by multi-layered, electronically coupled, chip circuits. Throughput capabilities are enhanced by using multiple microprocessors within the communications processor to perform specialized functions. Altering the microcode or stored logic (either directly by the user or indirectly by such features as IBM's Extended Facilities) has added a new dimension to throughput improvement techniques. Multiport memory access has facilitated warm-start back-up systems. Virtual operating systems are taken for granted and full-capability data base management systems are being given serious consideration by installations previously reluctant to accept the associated CPU overhead.

While the communications processor manufacturers have been improving their hardware and software, the common and specialized carriers have not been idle. AT&T, in Chicago, is testing fiber optic cable in place of existing line cable. The significant volume of microwave voice and data transmissions has caused governmental concern about eavesdropping by foreign powers. ITT has committed itself to join Telenet, Tymnet, and Graphnet in offering a packet switching service that is characterized by charges for data transmission that are independent of distance. Certified equipment can be attached to phone lines without AT&T's DAA protective device. Voice-grade lines can be used to transmit at up to 9600 bits per second. The changes in the costs of communications lines and in their capabilities varies with individual situations and is sufficiently complex to defy summation.

Definition and Applications

A *communications processor,* in the context of this report, is simply a digital computer that has been specifically programmed to perform one or more control and/or processing functions in a data communications network. As a self-contained system, it may or may not include the following components, depending on its specific application: communications lines multiplexor, line adapters, central computer system interface, and on-line peripheral devices. It always includes a specific set of user-modifiable software or interchangeable firmware modules, which can be used to implement particular customer requirements.

Communications processors do not represent a new system design concept. During the industry's second generation, in the early 1960's, such processors were offered by several of the major main-frame suppliers, including Control Data's 8090/8050, General Electric's DATANET-30, and IBM's 7740. Also, as early as March 1963, Collins Radio Company (now Rockwell-Collins) delivered its first Collins Data Control programmable communications system. In almost all such early uses, the systems were used primarily in message switching applications, acting simply as a message router and dispatcher in a data communications network.

The principal differences today lie in the diversity of application areas, the relatively low cost of such units, and, by consequence, the trend toward widespread usage. Listed below are some of the principal uses of communications processors in current data processing systems. It is important to note that many such units can be used in a variety of application areas, with specific sets of software and interface units for each application. The currently popular types of applications include:

- *Front-end processing.* The most significant application of communications processors, in terms of both frequency of use and level of complexity, is front-end processing. The communications processor replaces a hard-wired communications controller as the interface between the central data processing system and the data communications network. The concept of front-end processing essentially involves off-loading or removing the data communications control function from the central processing unit and setting it up as an external, largely self-contained system. The front-end processor not only receives and transmits all data passing through the network, but also, and significantly, can be programmed to pre- and post-process this data in a variety of ways in order to relieve the system's central processing unit from time-consuming overhead activities related to message formatting and control. This decentralized approach to the distribution of processing labor permits both the communications and central processors to perform their primary functions in parallel and with little interference. Data is passed between the processors only when necessary and with as high a degree of efficiency as is possible in circuit design.

A typical front-end processor might control a hundred or more communications lines of varying speeds and types attached to a large number of diverse remote terminals. The front-end processor would ideally assume all terminal, line, buffering, and message control functions, permitting the central processing unit and the user application programs to treat the communications network as just another high-speed, on-line peripheral device.

Front-end processors can perform their functions in support of a wide variety of data processing applications. Additionally, the more sophisticated communications processors can be employed with software which permits them to be automatically reconfigured from a front-end mode of operation to that of a remote communications processor. This feature permits a single front end to switch automatically to a backup host in the event of a primary host failure, and also to perform communications processing for both local and remote hosts simultaneously.

- *Line concentration.* Communications processors sometimes fill the relatively simple role of communications line concentrators. Here the processor generally terminates a number of low-speed transmission lines and interfaces them to one or two higher-speed lines for more efficient and economical data transmission. Little, if any, processing of the transmitted data is performed. The programmable aspect of the processors is probably less used in this application than in any of the other currently popular uses. Hard-wired concentrators are generally equally effective, suffering by comparison only in their lack of flexibility.

- *Dedicated processing.* Many communication processors now have enough storage capacity and processing power to enable them to serve as the sole or principal computers in dedicated application systems of various types. In inquiry/response systems, for example, the processor receives inquiry messages from remote and/or locally connected terminals, processes the messages to determine the specific information required, retrieves the information from on-line random-access storage units, and sends it back to the inquiring terminals. In systems of this type, application-oriented processing is of equal importance with message receipt and transmission.

- *Message switching.* The message switching processor receives messages from remote terminals, analyzes them to determine their proper destination, performs any code conversions that may be necessary, and transmits them to other remote terminals. The sending and/or receiving remote terminals may themselves be computer systems. Most message switching systems are of the store-and-forward type, in which the processor stores the messages it receives on on-line auxiliary storage units, such as disks, drums, or magnetic tape. The length of time the messages are stored prior to transmission to other terminals or computers can range from a few seconds to an entire day or more, depending on the specific application needs and traffic volumes. The processor performs little, if any, processing on the messages; it acts principally as a traffic director.

Communications Processor Components

The essential components of every communications processing system are the following:

1. *Processor.* The processor element is a stored-program digital computer of almost any size. It must have its own main memory, but it may or may not use on-line peripheral devices. The processors should have excellent interrupt and/or direct memory access (DMA) handling and strong bit manipulation capabilities.

2. *Central processor interface.* When acting as a front-end, the communications processor must include the proper hardware interface to permit it to connect directly to a standard input/output channel of the central processing unit (or host computer). Such an interface should permit the host computer to communicate with the front-end processor as if it were a standard peripheral device control unit, requiring little, if any, operating system software modification. When acting as a remote processor, support for data communications line interfacing that connects the processor with the host computer(s) must be provided.

3. *Communications multiplexor.* This component provides a logically independent data channel into the communications processor's main memory for every transmission line being served. The multiplexor serves as the communications processor's functional interface with the data transmission lines. Control of incoming and outgoing data is coordinated between the multiplexor and the processor via interrupts or direct memory access (DMA).

4. *Line interface units.* These components are hardwired devices that link the multiplexor with the modems that terminate each communications line. Like the modems, the line interface units are specifically tailored to serve the speed transmission characteristics of the lines they terminate. The lines are, in turn, generally selected according to the transmission requirements of the remote terminal devices.

5. *Software/Firmware.* The communications processing hardware components become an integrated, func-

tioning system only through the inclusion of stored-program logic (either firmware or software)—some generalized, and some highly specialized. The programs should include terminal control, line control, message control, and central system interface procedures. Depending on the supplier, the user may have to provide some portion of the software required to implement specific requirements.

Communications Processor Functions

Because a communications processor is essentially a computer, it can be programmed to perform an almost limitless variety of functions. But in its role as controller of a data communications network, the specific functions generally programmed are those that relate to data and message control. The following functions are the most important ones offered with the more comprehensive communications processing systems. Some systems will not provide all these functions, as all are not required in specific installations.

1. *Line control.* This involves the periodic polling of terminals to determine readiness to transmit and receive data. Automatic call answering, acknowledgement, and dial-up can also be handled.

2. *Character and message assembly.* Bits are assembled (and disassembled) into parallel characters, and/or control characters are recognized to permit the assembly and disassembly of entire messages. Data can be handled at varying line speeds and in synchronous or asynchronous formats, with start-stop bits and synchronizing characters handled automatically.

3. *Data and protocol conversion.* The data transmission codes (such as Baudot, ASCII, etc.) and protocol-prescribed formats are converted into structures that are equivalent to the hosts native data code (such as EBCDIC) or conform to the formats of more efficient protocol procedures.

4. *Data and message editing.* This is a general function that can include application-oriented reformatting, removal of spaces and zeros (and other kinds of data compression), and other data restructuring to permit more efficient data transmission and more efficient processing by the host computer.

5. *Error control.* Using both hardware and software techniques, the communications processor can detect and correct data transmission errors before they reach the host computer.

6. *Message buffering and queuing.* The communications processor can buffer several messages in its main memory before passing them to the host computer, with the intention of interrupting that computer as infrequently as possible. Also, if the host computer cannot process incoming messages as fast as they arrive into the system, the communications processor can queue these messages in its own auxiliary storage units, such as disks, drums, or magnetic tape units, and can transfer these messages to the host computer when processing time becomes available. Queue management can be arranged in several different ways, including a system of priorities.

7. *Message switching.* When the communications processor serves more than one host computer, it will analyze message headers and addresses and send each incoming message to the proper destination. This situation can occur when several computers share a data communications network while each remains dedicated to specific applications.

8. *Message answering.* Certain messages, such as simple inquiries, can be completely processed by the communications processor without any contact with the central data processing system. Since many communications processors permit attachment of on-line auxiliary storage units, these processors can store and access their own private data bases. Some systems also permit the communications processors to directly access the auxiliary storage subsystems and data files of the host computer.

9. *Message recording.* Vital inbound messages can be passed on to the host computer while being simultaneously recorded in the communications processor's auxiliary storage. Such message recording can assist in system restart operations in case the central system should malfunction and lose either its messages or the results of processing the messages. Also, it may be advisable in some systems to store a journal record of every message received during each processing period.

10. *Statistics recording.* The communications processor can keep a running record of all data communications traffic, including such statistics as total number of messages processed, number of messages delivered to each destination, number of line errors, average length of time in queue, number of busy signals, etc. These statistics can be dumped on demand or in the form of reports at the end of each processing cycle.

Other application-oriented functions can be programmed by the communications processor supplier, by the user, or by some combination of the two. It must be remembered, however, that the communications processor, like the host computer, has only a finite amount of processing power. The more functions that are added to it in order to relieve the host computer, the more likely it is to run out of power, especially in active, growing communications networks. A communications processor pushed beyond its capacity will result in lost messages and, ultimately, in system failure.

Advantages of Communications Processing

Programmable communications processors are enjoying increased popularity in various parts of data communications systems because they are demonstrating themselves to be more effective on a price/performance basis than their predecessor hard-wired controllers. General advantages that contribute to this price/performance edge include the following:

1. *Price.* Through the economies afforded by integrated circuitry, modern communications processors can often be purchased for less money than specialized hard-wired controllers. Even when the cost of specific data communications software routines or firmware modules is added to the cost of the basic system, the net price of the microprocessor-based controller will often be substantially less than the hard-wired equivalent.

2. *Performance.* In spite of the lower cost, communications processors can frequently handle more and higher-speed data communications lines than hard-wired counterparts, with less host intervention or overhead.

3. *Flexibility.* These programmable processors are designed to handle many line speeds and transmission characteristics in uniform or interchangeable circuitry and to support a wide variety of remote terminals from the mainframe and independent suppliers, regardless of their transmission speeds, line control conventions, synchronization techniques, and data codes. And since they can be modified at any time and at comparatively low cost by user or vendor, they are eminently well suited to handling key roles in data communications systems, which are typically characterized by bewildering variety and constant change. As advances in communication line facilities are made by the common carriers, and also by the independent companies, making available new, faster, and lower-cost transmission services, the advantages of this flexibility become eminently important in guarding against system obsolescence.

4. *Expandability.* Communications processors permit relatively easy growth of the data communications network, principally by adding line interface units and modifying the control programs.

5. *Distribution of labor.* Since these processors can be programmed to perform varying amounts of productive processing, often in conjunction with their own on-line peripheral devices, they can share portions of the overall processing load with other processors in the system—including the central processor. Peak loads can be more effectively handled and critical bottlenecks more likely avoided. In the case of a front-end processor, controlling the entire data communications subsystem will relieve the system's central processing unit on two counts: processing time and main memory space. Central control of data communications networks can consume 40 to 50 percent of the available processing time in typical situations. And the resident software control routines can easily consume in excess of 50K bytes and frequently use up to 300K bytes or more of main memory space, depending on the functions performed. Efficient utilization of front-end processors can provide almost full relief in both processing time and memory space overheads. (If the host processor is not overburdened, the need for a programmable unit may be harder to justify.)

6. *Fail-soft capability.* In data communications systems that include at least one other computer, programmable communications processors can provide some form of continued system operation when one or more of the other computers become inoperative. The degree and effectiveness of this fail-soft capability depend not only on the capabilities of the programmable processor, but also, perhaps more importantly, on the skill displayed by the system architect in his provisions for redundant components and fall-back procedures.

7. *Independent processing.* When programmable communications processors are not involved in their principal data communications tasks, they can often be used as stand-alone data processing systems—provided, of course, that their configuration includes some peripheral input/output devices. Simple media conversion tasks, such as card-to-tape and tape-to-print, can be valuable by-products from these otherwise communications-oriented processors, and localized time-sharing can yield added benefits. In off-line mode, the processor can also be adapted to serve specialized I/O devices, such as plotters and OCR devices, that the central system may not be able to handle.

Potential Problems

Communications processors deserve careful investigation because of their many apparent advantages over hard-wired communications controllers. Such investigations should include as many probing questions as possible, because there are potentially serious pitfalls to be avoided.

One potential problem is the question of overloading the communications processor, with the resultant loss of data. Sophisticated data and message control programs will consume large quantities of the communications processor's computing and memory facilities, just as they do in a centrally-based communications system. A tendency toward overloading can easily negate any apparent advantages of expandability and growth potential.

Another serious question is that of software. The body of software required for terminal control, line control, and message control activities, not to mention application-oriented pre-processing, is unquestionably complex. It is also vital to the operation of these systems. The prospective user must determine whether or not the supplier is capable of supplying this software, at what level of completeness, with what assurance of bugfree stability, with what chances of interfacing smoothly with the central system software, and with how much installation assistance. Obviously, if the software doesn't work properly, the system is of little value. From another point of view, a system whose software works but performs very few and very basic functions may still offer little more than a typical hard-wired controller.

Another consideration is that the hardware/software combination that makes up a communications processor may require far more time and effort to install and make operational than a hard-wired controller, especially when the supplier of the communications processor equipment is different from that of the host computer system. Apart from the traditional problems (real or imagined) of divided vendor responsibility, there exists the very real problem of integrating two completely different sets of hardware and software.

A currently operational data communications installation which is considering replacing its hard-wired communications controller(s) with a communications processor must carefully evaluate the problems of conversion. Beyond the usual problems of data integrity and the logistics of arranging the conversion process, the user may also be faced with the prospect of modifying either his central system control software of his body of application programs that use the communications network.

Evaluating a communications processing system on a cost/value basis is extremely complex and can be almost meaningless when performed in the abstract. Costs will vary with the size and diversity of the network being controlled, with the size and processing power of the communications processor, with the number of control and preprocessing functions incorporated (software is expensive, whether hidden in a "bundled" system price or not), and with the number of on-line peripheral devices. Keeping costs to an absolute minimum will probably result in a system that is capable of little more than the hard-wired controller it is replacing. In this case, the cost differential is easily measured, but it will not likely be significant in either direction.

Adding functions that will permit use of "foreign" terminals, relieve the central processor of intolerable overheads, and allow independent and back-up processing may increase the costs as it increases the value. In order to evaluate the reasonableness of the cost of the communications processor and the potential cost savings throughout the system, an effort must be made to associate specific dollar figures with the expected values to be derived from re-orienting a host-controlled data communications system to an externally controlled one. In summary, it should be clear that costs and values of communications processing can be assessed only in terms of specific situations and specific systems.

Sources of Supply

One of the most interesting aspects of the story on programmable communications processors is that computer users can now obtain them from literally dozens of vendors, with differing product implications depending on the source selected.

Designers of the data communications system will probably first contact the supplier of their present or planned main-frame computer to investigate its offerings in the area of data communications. If communications processors are strongly promoted as the best (sometimes only) way in which to construct efficient, fully supported systems, the designers will usually go along with the recommendations of the main-frame supplier. The designers are comforted by the belief that their data communications subsystem will be fully supported and will interface efficiently with the central processing system. It is in this regard that developments such as IBM's SNA and DEC's DECnet increase in importance to systems designers.

But not all main-frame suppliers are equally advanced in their data communications product line, and not all offer a selection of programmable communications processors supported with product-line software. Recent computer system announcements have, however, brought forth a number of such new products from the major manufacturers, as they both follow and "legitimize" the trend toward use of these processors.

Users not fully satisfied with the offerings of their main-frame supplier can investigate the wares of other

The CC-85 from Computer Communications, Inc. is designed for controlling a high-volume data communications network of IBM and IBM-compatible mainframes. Peripherals include a microprocessor-controlled color CRT console that is used as a system supervisor, system monitor, or engineering console. The CC-85 can support up to seven channel-attachable host computers and up to 1232 communications lines of mixed speeds and protocols.

promising suppliers, most of whom offer assurances that their communications processors can be "plug-compatible" with either the hard-wired or programmable communications controllers of the mainframe supplier, or at least with its data communications hardware and software interfaces.

The minicomputer manufacturers constitute one prominent group of suppliers who are actively pursuing the communications processor market with products that can either stand alone or interface smoothly with the mainframe equipment of other suppliers. Almost any currently marketed minicomputer is capable of serving as the fundamental building block of a programmable communications processor, and many include communications hardware and specialized software packages to permit them to serve effectively as complete communications processing products.

A major source of integrated communications processing products is the independent systems houses, especially those that specialize in data communications systems. Companies such as these will generally provide complete hardware/software packages, including communications and central computer interfaces. In many cases they will accept full responsibility for the design and implementation of the entire data communications system. Such independent companies are generally well qualified in producing effective data communications systems, but prospective buyers of such systems must still consider the affects on the total system of dividing responsibility between at least two principal suppliers (communications and central system) and assure themselves that the products and systems of the several involved suppliers will indeed interface properly and function harmoniously.

Regardless of which type of supplier is selected, the buyer should show partiality to those vendors who will not only guarantee turnkey installation of their equipment but will also provide plans for future growth. If the user is faced with the formidable task of interfacing and integrating a variety of impressive but highly dissimilar communications and processing equipment, the proposed system may never get past the design stage.

Buying Guidance

The communications processing products have not matured to the point where their descriptive terminology is in any way standardized or consistent. As a result, prospective buyers must make every effort to determine exactly what they will be getting and what they will not. The sales brochures and technical manuals are often not sufficiently informative (and sometimes downright misleading).

For example, there are at present two distinctly different kinds of front-end processors. The first and more basic variety is designed to simply replace the functions and services of the central system's hard-wired controller. It is meant to be a plug-compatible replacement, requiring few, if any, changes to the central system's communications control software or the user's application programs. It does not necessarily relieve the central system of any software control overheads, but simply provides a more flexible interface to the communications network for accommodation of additional and varied lines and terminals in the future.

The most prevalent examples of this type of front-end processor are the many available units designed to replace or "emulate" the IBM 2701 Data Adapter Unit and the IBM 2702 and 2703 Transmission Control Units. These front-end processors function with the IBM System/360 or System/370 computer systems through the standard IBM BTAM, QTAM, and TCAM communications control software.

The second and more powerful variety of front-end processor is designed to replace not only the functions and services of the hard-wired controller, but also most or all of the data communications control functions normally performed by the central system's processing unit and resident software. This variety of front-end processor, by freeing the central processing unit for productive work, provides valuable advantages not only in data communications flexibility, but also in systems throughput.

It is possible that a user may want to install the basic kind of front-end processor initially and then gradually add functions to it to relieve the central processing unit's communications overheads. However, the user must make sure that the selected front-end processor has enough processing and memory capacity to permit the gradual build-up of substantial message control routines, and that the various responsibilities of both the vendor and the user are clearly assigned.

In the case of systems performing line concentration, network node, and remote processing tasks, an equally wide range of capabilities is represented by current product offerings.

Another buyer's tip is to look for the word "turnkey." Turnkey installation of front-end processors usually means that the supplier takes on full responsibility for hardware, software, and interfaces required to essentially "plug in" the product. From a user's point of view, this approach is highly desirable, since it can save money, time, and aggravation. But the user must still determine what product with what promised functions is being offered on the turnkey basis. It may still be a somewhat limited front-end product.

A low list price can be totally misleading, since it may include only the basic processor hardware and an associated communications multiplexor. The cost and effort of establishing the proper interfaces and writing the all-important software can be dropped squarely on the buyer, who may have been trapped by an attractive low-price bid.

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Since software development is such a critical question, the buyer should determine early in the proceedings exactly what software is provided with the basic front-end system and at the basic price. If certain software is lacking, such as specific remote terminal handlers or message queuing routines, then implementation and integration responsibilities should be clearly fixed, and with firm price quotations.

The smart buyer will also ask the competing bidders for clear statements of service and support after installation. Since data communications subsystems can be complex and demanding in any environment, it must be considered an extremely valuable system feature if the prospective supplier of the communications processor offers to assume full operating and service responsibility for the externally controlled communications network that is directed by his product.

When considering a communications processor from a source other than the supplier of the central computer equipment, the buyer should insist on receiving concrete performance data, drawn from installed systems, to substantiate the supplier's claims. The buyer should beware if the supplier refuses to back up his claims with actual case studies. As further evidence of proven performance, the buyer should personally contact as many previous users as possible, probing not only for their degree of satisfaction, but also for the extent to which the installed systems reflect his own intended system design and functional objectives. However, even in highly specialized reference accounts, meaningful information can be derived regarding the supplier's competence and willingness to help, and the basic reliability of the hardware/software package.

When the proposed supplier is a major mainframe manufacturer, the buyer will also want evidence of proven performance. This evidence should apply to the overall performance of the total, integrated data processing system, and not just the communications subsystem. However, when the main-frame supplier offers a choice of a front-end processor or a hard-wired controller (as several now do), then the buyer will again want specific, tangible performance data to justify selection of front-end processing. Of course, the mainframe supplier can forcibly persuade adoption of the communications processor concept, even without offering convincing performance data, by simply indicating that the newer product will receive all future support and that the former one will be essentially dropped from the product line.

Communications Processors from the User's Point of View

In the December 1979 supplements to both *DATAPRO 70* and *DATAPRO REPORTS ON DATA COMMUNICATIONS*, we published a Reader Survey Form on Communications Controllers/Processors. Although the subject of this report is communications processors, considerable feedback was received on popular hard-wired controllers, and summaries of the users' ratings with these products are also included to provide a frame of reference. However, hard-wired controllers were excluded from the usage patterns described in the text below.

By our editorial cut-off date of January 18, 1980, we had received a total of 245 usable replies representing 401 controllers and processors. Both the number of responses from communications processor users and the number of processors represented were almost exactly the same as in our previous survey conducted in 1979. However, the number of responses from users of hard-wired controllers decreased by more than 40 percent. We assume that this strong decline of responses from users of hard-wired controllers, which was also observed in last year's survey results, is a reflection of the dwindling of the user base for this inflexible type of equipment.

The content of these responses is tabulated in the accompanying table. The table is arranged into the two basic equipment groups: hard-wired controllers and front-end processors.

In an attempt to identify how communications processors were being used, we asked the users to check one or more usages in a list of five: front-end, stand alone or message switching node, remote concentrator, terminal controller, and other. The purpose was to determine the level of sophistication among users in the use of communications processors. The results are summarized below, but be sure to read the notes following the presentation.

Processor usage	Percent of Responses
Front-end	97%
Stand-alone or message switching node	3
Remote concentrator	8
Terminal controller	19
Other	3

Because the percentages total over 100 percent, it is obvious that some users reported more than one usage. In most cases, it appeared that multiple units were being used in different fashions. For example, one user of two processors might have indicated that one was employed as a front-end, while the other performed as a remote concentrator.

Within the category of front-end usage, we asked the users to indicate the type of control software being used, with these results:

Front-end Software	Percent of IBM Users	Percent of non-IBM Users
270X Emulation	67%	36%
NCP Mode	29	3
Other	4	61

Among the IBM users, two distinct patterns of usage were indicated. Those using the IBM 3704 as a front-end

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processor indicated that their usage was exclusively 270X emulation. Of the 3705 users, 57% were using 270X emulation software, 37% were using IBM's Network Control Program, and 6% were using other front-end processing software.

While it is apparent that many users are still not making use of the full power of front-end processors, it would appear that this percentage is dwindling. It is too early to determine the impact of distributed systems such as the IBM 8100, but Datapro believes that the increased integration of computer systems can only result in increased network and communications sophistication and efficiency.

We also asked these users whether their communications processors accessed more than one host computer. Of these users, 30% answered affirmatively and reported an average of 2.4 host computers per system.

When questioned as to which protocol(s) were being handled by their communications processors, these users indicated usage of the following line disciplines:

Protocol	Percent of Users
Asynchronous	55%
Bisynchronous (including IBM BSC)	83
IBM SDLC	20
X.25 Packet-Level	3
Other	5

The host computer or computers were identified on virtually all 211 responses. A total of 240 computers were mentioned. The overall distribution of host computer models revealed the following pattern:

Host Computer Model	Percent of Users
IBM 370/115 through 370/148	24%
IBM 370/155 & Larger	39
IBM 303X	24
Amdahl	12
Burroughs	3
Univac	1
All others	9

The survey form also asked the users to identify areas of major difficulty. These users' assessments are summarized below:

Major difficulty	Percent of Responses Reporting
Communications processor software	24%
Host system software	17
Throughput	5
Communications lines	21
Modems	9
Terminals	10
System expansion (installing more lines)	17

Comparison Charts

A catalogue of commercially available communications processors along with the basic characteristics is presented on the following pages.

A prospective buyer can easily scan the charts to determine the scope of the options available for a given set of requirements. The proper use of the charts will produce a list of vendors and equipment that merit detailed study. It is only from a detailed study of the equipment that an advantageous price/performance selection can be made for a given systems requirement. It would be a misuse of the charts to eliminate a processor from consideration on the basis of comparing characteristics finely without checking to see if the architecture possesses a feature that overcomes a seemingly small disadvantage.

To have been included in the charts, a processor must have had appropriate hardware and software to function either as a front-end processor, as a remote concentrator, or as a free-standing communications processor. Processors designed to perform only message switching of voice grade lines were deemed not to meet the criteria for inclusion.

All of the actively marketed equipment known to Datapro that satisfies the qualifying criteria is represented. Any omission is because the product is no longer marketed or is unknown to us.

The information presented on each communications processor in the accompanying charts serves not only to describe the basic characteristics of the equipment, but also assists in defining physical and throughput limitations. With one exception, all non-economic characteristics reduce themselves to one consideration: the throughput capabilities of the equipment relative to the specific systems requirements. The exception is where the physical attachment limitations are exceeded before the processing capabilities are fully used.

For example, the number of high speed communications lines that are physically attachable to a processor usually exceeds the throughput capabilities. For that reason, most vendors submitted a smaller value for the number of lines attachable at the higher speeds than the equipment could physically accommodate. The numbers more accurately describe the outer limits of the processor's throughput limitations than the physical limitations. All of the vendors were concerned that readers realize that the line mix and the resource mix could radically alter the number of lines that could be supported, physical port availability notwithstanding. Datapro was most impressed with the responsible attitude universally exhibited, and we are very optimistic that better ways of expressing throughput capabilities will develop between the combined efforts of the suppliers of communications processors and Datapro.

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USERS' RATINGS OF COMMUNICATIONS PROCESSORS/CONTROLLERS

Processor/Controller	Number of User Responses	Number of Units Installed	Average No. of Lines per Unit	Average No. of Terminals per Line	User Ratings* Overall Satisfaction					Ease of Installation					Throughput				
					WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Hard-Wired Controllers																			
IBM 270X	5	7	10.7	3.7	3.4	2	3	0	0	3.8	4	1	0	0	3.0	1	3	1	0
Memorex 1270	27	35	28.1	2.2	3.7	18	9	0	0	3.5	16	8	3	0	3.6	17	10	0	0
Sperry Univac, all	2	3	8.3	6.8	**	0	2	0	0	**	0	0	1	1	**	0	2	0	0
TOTALS	34	45	24.1	2.4	3.6	20	14	0	0	3.4	20	9	4	1	3.5	18	15	1	0
Front-End Processors																			
Burroughs B874	4	6	9.0	4.9	3.5	2	2	0	0	3.3	2	1	1	0	3.8	3	1	0	0
Burroughs DCP	3	6	39.8	3.5	4.0	3	0	0	0	3.7	2	1	0	0	3.3	1	2	0	0
Subtotals	7	12	24.4	3.8	3.7	5	2	0	0	3.4	4	2	1	0	3.6	4	3	0	0
CCI CC-8	4	13	15.4	2.6	3.0	1	2	1	0	3.0	1	2	1	0	3.3	1	3	0	0
Comten 3650	18	46	20.7	3.9	3.6	10	8	0	0	2.9	4	9	3	1	3.7	13	5	0	0
Comten 3670	11	30	69.7	1.9	3.6	6	4	0	0	3.2	3	7	1	0	3.7	7	3	0	0
Comten 3690	4	6	114.2	3.4	3.8	3	1	0	0	3.8	3	1	0	0	3.8	3	1	0	0
Subtotals	33	82	45.5	2.7	3.6	19	13	0	0	3.1	10	17	4	1	3.7	23	9	0	0
DEC, all	3	4	13.5	10.2	3.3	1	2	0	0	2.0	0	1	1	1	2.7	0	2	1	0
DPF, Inc. CMC	3	3	2.7	4.0	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0
Honeywell 66XX	5	6	34.7	2.0	3.2	1	4	0	0	3.3	1	3	0	0	3.0	1	3	1	0
IBM 3704	34	39	6.2	5.6	3.6	22	11	1	0	3.1	11	16	6	1	3.4	15	17	1	0
IBM 3705	92	151	21.6	5.6	3.4	44	45	2	1	3.0	21	52	19	0	3.2	31	52	8	1
IBM System 7	3	5	14.4	1.5	3.0	0	2	0	0	2.0	0	0	2	0	4.0	2	0	0	0
Subtotals	129	195	18.3	5.5	3.5	66	58	3	1	3.0	32	68	27	1	3.3	48	69	9	1
ITT Courier VTLC	4	4	1.0	8.0	3.0	1	2	1	0	3.5	2	2	0	0	3.5	2	2	0	0
Memorex 1380	4	4	62.8	4.2	2.5	0	2	2	0	2.5	0	3	0	1	3.3	1	3	0	0
Periphonics T-Comm 7	4	7	12.3	4.1	3.0	0	3	0	0	2.8	1	1	2	0	3.0	1	2	1	0
All Others	15	26	29.6	3.4	3.1	5	7	2	1	2.7	2	8	4	1	3.1	2	12	1	0
TOTALS	211	356	25.8	4.0	3.4	101	96	9	2	3.0	55	108	40	5	3.3	85	109	13	1

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.
**The Weighted Average is considered invalid if based on fewer than three responses.

Some of the items indicated in the accompanying charts are self-evident; others offer information of a subtle nature. The following discussion highlights some of the subtleties.

Network Arrangements Supported

Most of the equipment listed herein, when operating as a front-end, is restricted to supporting the host computer systems of specific mainframe manufacturers. However, some vendors include in their product lines front ends that can be customized; such equipment is well represented in the charts. Not included is the myriad of older mainframes that have been fully written-off from an accounting standpoint and, therefore, can be offered at low enough prices to justify tailoring and dedicating the overqualified equipment to function as a front-end.

From a network arrangement standpoint, the number of direct connections a front-end can support to one host and the number of hosts a front-end can support become an important consideration, especially for fallback considerations. Usually, a small number represents a special direct connection. A high number indicates that the connection is via a regular communications line port and does not mean that the vendor is suggesting that so many connections to one or more host is a designed capability.

When the number of pollable stations on one line is "1," the system, as standard, supports only point-to-point terminal arrangements. When the communications processor functions as a remote concentrator, the number of host/concentrator connections is also a consideration from a network standpoint. Again, the number of connections permitted is primarily an indication of whether a special interface or a regular communications line interface is used.

As the data communications industry continues to make strides towards standardization, the network architecture that a free-standing communications processor supports

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USERS' RATINGS OF COMMUNICATIONS PROCESSORS/CONTROLLERS (Continued)

Processor/Controller	User Ratings* Hardware Reliability					Promptness of Maintenance					Quality of Maintenance					Mfr.'s Software					Mfr.'s Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Hard-Wired Controllers																									
IBM 270X	3.6	3	2	0	0	3.2	1	4	0	0	3.6	3	2	0	0	3.0	0	5	0	0	3.4	3	1	1	0
Memorex 1270	3.7	19	8	0	0	3.4	15	8	2	1	3.3	13	10	2	1	1.7	0	0	2	1	3.1	8	11	4	1
Sperry Univac, all	**	0	1	1	0	**	1	1	0	0	**	1	1	0	0	**	0	0	1	1	**	0	1	1	0
TOTALS	3.6	22	11	1	0	3.4	17	13	2	1	3.4	17	13	2	1	2.3	0	5	3	2	3.1	11	13	6	1
Front-End Processors																									
Burroughs B874	3.8	3	1	0	0	3.0	1	2	1	0	3.0	1	2	1	0	3.3	2	1	1	0	2.0	0	1	2	1
Burroughs DCP	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	4.0	3	0	0	0	3.0	1	1	1	0
Subtotals	3.7	5	2	0	0	3.1	2	4	1	0	3.1	2	4	1	0	3.6	5	1	1	0	2.4	1	2	3	1
CCI CC-8	3.0	1	2	1	0	2.5	0	2	2	0	2.5	0	2	2	0	2.3	0	1	3	0	2.0	0	0	4	0
Comten 3650	3.6	11	6	1	0	3.3	7	10	1	0	3.2	6	10	2	0	2.9	3	11	4	0	2.3	1	6	9	2
Comten 3670	3.6	6	4	0	0	3.2	2	8	0	0	3.0	1	8	1	0	3.0	1	8	1	0	2.6	0	6	4	0
Comten 3690	3.5	2	2	0	0	3.5	2	2	0	0	3.5	2	2	0	0	3.0	0	4	0	0	3.0	1	2	1	0
Subtotals	3.6	19	12	1	0	3.3	11	20	1	0	3.2	9	20	3	0	3.0	4	23	5	0	2.5	2	14	14	2
DEC, all	3.0	1	1	1	0	2.7	0	2	1	0	2.3	0	1	2	0	1.5	0	0	1	1	1.3	0	0	1	2
DPF, Inc. CMC	3.7	2	1	0	0	2.7	1	0	2	0	2.7	1	0	2	0	3.0	0	1	0	0	3.3	1	2	0	0
Honeywell 66XX	3.6	3	2	0	0	2.8	1	3	0	1	2.8	1	3	0	1	3.0	1	3	1	0	2.8	1	2	2	0
IBM 3704	3.8	26	6	1	0	3.5	20	9	4	0	3.4	18	11	4	0	3.0	6	23	2	2	2.7	5	16	9	3
IBM 3705	3.7	63	29	0	0	3.3	42	33	17	0	3.3	42	36	12	1	2.9	12	58	18	2	2.9	19	45	24	4
IBM System 7	3.3	2	0	1	0	2.7	0	2	1	0	2.7	1	0	2	0	2.3	0	1	2	0	2.0	0	1	1	1
Subtotals	3.7	91	35	2	0	3.3	62	44	22	0	3.3	61	47	18	1	2.9	18	82	22	4	3.1	24	62	34	8
ITT Courier VTLC	2.3	0	2	1	1	2.5	0	2	2	0	2.8	0	3	1	0	3.5	1	1	0	0	1.7	0	1	0	2
Memorex 1380	3.0	0	4	0	0	2.5	0	2	2	0	2.8	0	3	1	0	2.0	0	1	2	1	2.5	0	3	0	1
Periphonics T-Comm 7	3.0	2	1	0	1	2.3	0	2	1	1	2.5	0	3	0	1	3.0	1	2	1	0	2.5	0	2	2	0
All Others	3.1	7	3	5	0	2.6	2	8	2	3	2.5	3	5	3	4	2.5	2	4	5	2	2.6	2	8	0	4
TOTALS	3.6	131	65	11	2	3.2	79	89	36	5	3.1	77	91	33	7	2.9	32	119	41	8	2.7	31	96	60	20

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.
**The Weighted Average is considered invalid if based on fewer than three responses.

will take on more and more importance. (The architecture of a front-end must conform to the host's architecture.) Underscoring this belief is the fact that two major mainframe manufacturers chose to list only their newest communications processor in the accompanying charts. In both cases, it is the only such item in their product lines that conforms to their new network architectures.

Since the prime purpose in burdening communications lines around the world with data is to either retrieve information or to add to the store of information, the nature of the data base system supported should not be overlooked. Actually it represents the "end" for which one selects a "(communications processor) means". The name of any data base system supported is listed for each communications processor. Of course, a buyer may be already committed to a file maintenance or data base system and not be interested in this type of support.

As would be expected, the tasks performed by each of the operating systems supplied with the hardware will vary. The name of the operating system is noted so that the reader will know what to look for in detailed reports on such software offerings.

Properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 9600 bps, and over 9600 bps. The number of low speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium and high speed lines represent the outer limits of the throughput capabilities. The effect of using full-duplex lines and an estimate of raw throughput capacity are also indicated.

The terminal protocols supported by the processors are listed. Even though the protocols supported are mostly dependent upon the marketing philosophy of the vendors, the large number of vendors supporting the standardized bit-oriented protocols is an indication of things to come.

Processor Characteristics

The communications processor's internal characteristics give a general "feeling" for the equipment's throughput capabilities. Hard-wired equipment and some programmable processors will receive a "No" to the question: "Is the processor microprogrammable by the manufacturer?" A "yes" means that the processor has firmware, or microcoded, stored logic. If the processor is programmable by the user, one can expect the capability for user implementation of specific system requirements not supported by vendor software, including applications-oriented functions. Main-memory cycle time, main memory word size, and main memory storage capacity offer a very general "feel" for throughput speed possibilities. However, sophisticated internal architecture may enable the processor to be many times faster than another processor with the same cycle time and word size. That is another reason why we emphasize that a detailed analysis is necessary, once the initial selection is made from the charts.

The manner of data transfer between memory and communications lines, memory and mass storage, and memory and other supported peripherals becomes critical as volume requirements rise and/or response times are reduced. For high-speed, high-volume transmissions, Direct Memory Access transfers instead of character interrupt transfers become mandatory for reasonable throughput rates.

The "Turnkey systems" entry informs potential users whether or not the vendor is willing to provide a complete system, including all applications software.

Pricing and Availability

The prices depicted in the charts represent a range of typical configurations. The magnitude of the dollars gives a ball-park indication of the expansion capabilities of the equipment and should not be used to determine price/performance. Only a detailed price for a configuration satisfying specific requirements would give such an indication.

The absence of an entry for the monthly rental price indicates that the vendor offers his equipment on a purchase-only basis.

The charge for the processor's communications operating software is given, when separately priced.

The date of first delivery is the date of the first production delivery.

With 84 communications processors to choose from, there should be an offering for every need, whether the network is a fully distributed network or a classic master/slave network.

Suppliers

Listed below for your convenience in obtaining additional information are the full names and addresses of the 39 suppliers whose 84 products are summarized in the following charts.

Action Communications Systems, Inc., 4401 Beltwood Parkway South, Dallas, Texas 75234. Telephone (214) 386-3500.

ASI Teleprocessing Inc., 101 Morse Street, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Austron Data Systems, Inc., 1915 Kramer Lane, Austin, Texas 78758. Telephone (512) 836-3523.

BBN Computer, 33 Moulton St., Cambridge, Massachusetts 02138. Telephone (617) 491-1850.

Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4200.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Cencom Systems, Inc., (formerly Omnus Computer Corporation), 4350 East West Highway, Suite 1103, Bethesda, Maryland 20014. Telephone (301) 652-2730.

Chi Computer Products Division of ECOTRAN-CHI Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

Codex Corporation, 20 Cabot Blvd., Mansfield, Massachusetts 02048. Telephone (617) 364-2000.

Computer Automation Inc., 2181 Dupont Drive, Irvine, California 92713. Telephone (714) 833-8830.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

Comten, Inc.: see **NCR Comten, Inc.**

Control Data Corporation, 8100 34th Avenue South, P.O. Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Digital Communications Associates, Inc., 135 Technology Park/Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp., 11717 Exploration Lane, Germantown, Maryland 20767. Telephone (301) 428-5500.

DPF Incorporated, 141 Central Park Avenue South, Hartsdale, New York 10530. Telephone (914) 428-5000.

Franklin Systems Corporation, 733 Lakefield Road, Westlake Village, California 91361. Telephone (805) 497-7755.

Communications Processors— Management Perspective and Equipment Specifications

General Automation, 1055 S. East Street, Anaheim, California 92805. Telephone (714) 778-4800.

GTE Telenet Communications Corporation, 8330 Old Courthouse Road, Vienna, Virginia 22180. Telephone (703) 827-9200.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

Intelligent Terminals, Inc., One First Street, Los Altos, California 94022. Telephone (415) 948-7033.

ITT Courier, 1515 W. 14th Street, Tempe, Arizona 85281. Telephone (602) 275-7555.

Lemcom Systems, Inc., 2104 W. Peoria Ave., Phoenix, Arizona 85029. Telephone (602) 944-1543.

Memorex Corporation, Communications Group, 18922 Forge Drive, Cupertino, California 95014. Telephone (408) 996-9000.

Modular Computer Systems, Inc., 1650 W. McNab Road, Fort Lauderdale, Florida 33310. Telephone (305) 974-1380.

NCR Corporation, 1700 S. Patterson Blvd., Dayton, Ohio 45479. Telephone (513) 449-2000.

NCR Comten, Inc., 1950 W. County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

Norfield Electronics, Inc.: See **TRT Data Products.**

North American Philips Corporation, Communications Systems Division, 55 Knightsbridge Road, Piscataway, New Jersey 08854. Telephone (201) 457-0400.

Paradyne Corporation, 8550 Ulmerton Rd., Largo, Florida 33541. Telephone (813) 536-4771.

Periphonics Corporation, 75 Orville Drive, Bohemia, New York 11716. Telephone (516) 567-1000.

Raytheon Data Systems, Minicomputer/Communications Division, 360 Forbes Boulevard, Mansfield, Massachusetts 02048. Telephone (617) 339-5731.

Rockwell International, Collins Communication Switching Systems Division, P.O. Box 10462, Dallas, Texas 75207. Telephone (214) 996-2336.

Sperry Univac (division of Sperry Rand Corporation), P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.

Tandem Computers, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 725-6000.

Telcon Industries, Inc., 1401 Northwest 69th Street, Fort Lauderdale, Florida 33309. Telephone (305) 971-2250.

Telefile Computer Products, Inc., 17131 Daimler St., Irvine, California 92714. Telephone (714) 557-6660.

Telenet Communications Corp., See **GTE Telenet Communications Corp.**

TRAN Telecommunications Corporation, 2500 Walnut Avenue, Marina Del Rey, California 90291. Telephone (213) 822-3202.

TRT Data Products, Norfield Communications Division, 3 Depot Place, E. Norwalk, Connecticut 06855. Telephone (203) 853-2777.

Westinghouse Canada Incorporated, Electronic Systems Division, P.O. Box 5009, Burlington, Ontario, Canada L7R 4B3. Telephone (416) 528-8811.□

Communications Processors—Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Action Communications Systems TELECON-TROLLER	ASI Teleprocessing Front End	ASI Teleprocessing Network Node	ASI Teleprocessing Store Data	Austron 8500
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Most major vendors	IBM, DEC, Burroughs	IBM, DEC, Burroughs	Stand-alone	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	No	Yes
Maximum no. of hosts supported simultaneously	16	—	—	—	1
Maximum no. of hosts channel-attachable to front-end	1	1	1	—	1
Maximum no. stations pollable per line or system	512 per system	32 per line	32 per line	—	256
As a remote concentrator	Yes	No	Yes	No	No
Maximum no. of remote connections to one host	16	—	64	—	—
Maximum no. of hosts served by one concentrator	16	—	64	—	—
Maximum no. of stations pollable on one line	32	—	32	—	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	No
Network Architecture compliance	No	—	—	—	—
Full-capacity data base system	No	—	—	—	—
Operating system	Yes	ASI DOS	ASI DOS	RT-11	—
As a store-and-forward message switching processor	Yes	Yes	Yes	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	64	64	16	25
2000 to 9600 bps	64	64	64	16	16
Over 9600 bps	—	64	64	16	8
Highest line speed supported, bits per second	9600	56K	56K	9600	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	2500	50K bytes	50K bytes	—	1 million
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	Yes	Yes	Yes	No
X.25—Packet level	No	No	No	No	No
Other	8A1, 83B3, SITA, ARINC, TWX, TELEX, Dial-in/out	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	No	No	Yes
Programmable by user	No	Yes	Yes	No	Yes
Main memory cycle time, usec.	0.6	1	1	1	0.35
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	65K words	256K bytes	256K bytes	256K bytes	64K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Mass Storage	DMA	DMA	DMA	DMA	DMA
Other peripherals	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Mag. tape	Disk, diskette	Disk, diskette	Disk, diskette, mag. tape	Diskette
Communications operating software:					
Availability	Included in price	Included in price	Included in price	Included in price	Included in price
Generated by	Comm. processor	Comm. processor	Comm. processor	Comm. processor	Comm. processor
Additional software supported	None	Assembler, utilities	Assembler, utilities	Assembler, utilities	Diagnostic and test routines
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$140,000 to $500,000	$70,000 to $150,000	$50,000 to $100,000	$75,000 to $150,000	$50,000 to $70,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1971	2/75	2/76	2/76	12/75
Number installed to date	83	20	10	10	—
Serviced by	Action or third party	ASI/IBM/DEC	ASI/IBM/DEC	ASI/DEC	Austron
COMMENTS	Telecontroller is a store-and-forward message switching system with front-end capability	Packet switch application-transparent communications; full turnkey system	Packet switch application-transparent communications; full turnkey system	Multi-terminal interfacing for IBM, NCR, DTS, etc.; full turnkey system	Designed to emulate standard IBM device while driving non-standard remote or local peripherals, terminals, etc.

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Austron 8800	Austron 8900	BBN Computer Pluribus	BBN Computer C-30	Braegan Corp. B40 Computer
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents	IBM S/360, S/370, 4300 Series, 303X, & channel-compat. equivalents	DEC-10, DEC-11 CDC 6000 Series, Honeywell Multi's, IBM S/360 & S/370	DEC-10, DEC-11, CDC 6000 Series, Honeywell Multi's, IBM S/360 & S/370	IBM S/360 & S/370, 303X, 4300 Series and compatible systems
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	2 or more	20	4	8
Maximum no. of hosts channel-attachable to front-end	1	2 or more	2	1	4
Maximum no. stations pollable per line or system	256	256	256	256	32
As a remote concentrator	No	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	—	256	256	6
Maximum no. of hosts served by one concentrator	—	—	20	4	6
Maximum no. of stations pollable on one line	—	—	256	256	32
As a free-standing communications processor	No	Yes	Yes	Yes	Yes
Network Architecture compliance	—	X.25	ARPANET, X.25	ARPANET, X.25	Braegen/IBM
Full-capacity data base system	—	—	—	—	Braegen Editor
Operating system	—	Stand-alone	—	UNIX	Braegen O.S.
As a store-and-forward message switching processor	No	Yes	Yes	Yes	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	25	256	600	128	6
2000 to 9600 bps	16	256	400	128	6
Over 9600 bps	8	256	300	80	6
Highest line speed supported, bits per second	9600	38.4K	230.4K	56K	19.2K
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	1 million	1 million	110K	30K	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	No
IBM BSC	No	No	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	No	No	No
IBM SDLC	No	No	No	No	No
X.25—Packet level	No	Yes	Yes	Yes	No
Other	DEC DR11 16-bit parallel interface	Any protocol supported by LSI-11 module	IBM 2741	IBM 2741	Braegan FDLC
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	See comments	Yes	No
Main memory cycle time, usec.	1.0	1.6	0.7	0.54	0.6
Main memory word size, bits	8	16	16	20	8
Main memory storage capacity, words or bytes	64K bytes	256K bytes	1024K bytes	1024K bytes	256K bytes
Data transfer between memory and:					
Communications lines	DMA	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Diskette	Disk, diskette, mag. tape	Disk, cassette	Disk, cassette	Diskette, disk
Communications operating software:					
Availability	Included in price	Included in price	Included in price	Separately priced	Separately priced
Generated by	Cross compiler	Comm. processor	Comm. processor	Comm. processor	Host
Additional software supported	Diagnostic and test routines	Diagnostic and test routines	—	Bell Lab's 'C', FORTRAN 77, UNIX utilities	Screen editor, 3270 emulator, remote job entry, local job entry
Turnkey systems available	Yes	Yes	Yes—for packet switch node systems	Yes—for packet switch node systems	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$22,000 to $30,000	$3,000 to $20,000	$100,000 to $300,000	$25,000 to $60,000	$14,000 to $120,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	$300 to $3,000
Communications operating software—one-time charge	—	—	—	$5,000	—
Communications operating software—monthly charge	—	—	—	—	$45-$600
Date of first delivery	2/80	7/80	9/75	11/79	1974
Number installed to date	—	—	35	5	Over 100
Serviced by	Austron	Austron, DEC	BBN	BBN	Braegen Corp.
COMMENTS	Designed for CPU-to-CPU interface. IBM side is programmable to emulate any standard IBM device	Provides direct channel interface between IBM CPU and communications lines, X.25 network, non-standard peripherals, other CPU's, etc. Unit is DEC LSI-11 based	Primarily marketed as a turnkey packet switch network node. User programming of the Pluribus system is not generally supported by BBN.	Multi-host front-end system; complete packet network system	Concurrent support of local 3270, remote 3270, remote job entry, local job entry, screen editor, multiple hosts

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Burroughs B 867	Burroughs B 874	Burroughs B 877	Cencom CSI 1000/2000/3000	Chi Computer Products CCP
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	All Burroughs, IBM S/360, S/370	Burroughs	All Burroughs, IBM S/360, S/370	Univac 1100 Series	Univac 1100 Series
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	No	Yes	Yes
Maximum no. of hosts supported simultaneously	—	2	—	8	8
Maximum no. of hosts channel-attachable to front-end	—	2	—	16	8
Maximum no. stations pollable per line or system	—	100	—	256	Term.-depend.
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	7	32	32	192	Unlimited
Maximum no. of hosts served by one concentrator	7	32	32	8	Unlimited
Maximum no. of stations pollable on one line	100	100	100	256	Term.-depend.
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	Burroughs BNA	Burroughs BNA	Burroughs BNA	Avail. upon request	RADANET
Full-capacity data base system	No	No	No	Not currently avail.	—
Operating system	MCP	MCS	MCP	ECES	CHIOPS
As a store-and-forward message switching processor	Yes	—	Yes	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	7	32	32	128 to 256	100
2000 to 9600 bps	7	32	32	80 to 128	64
Over 9600 bps	2	4	4	60 to 80	32
Highest line speed supported, bits per second	56K	19.2K	56K	100K	50K bytes
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	—	—	—	50K	25K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	No
IBM SDLC	Yes	No	Yes	Avail. upon request	No
X.25—Packet level	Yes	—	Yes	Avail. upon request	Yes
Other	—	—	—	U1004/NTR	No
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	1	1	1	0.8	0.75
Main memory word size, bits	16	16	16	16 or 20	32
Main memory storage capacity, words or bytes	114K bytes	96K bytes	147K bytes	1M bytes	1M bytes
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	DMA	DMA	DMA	—
Other peripherals	Interrupt	Interrupt	Interrupt	DMA, interrupt	—
Back-up and diagnostic peripherals supported	Disk, diskette, mag. tape	—	Disk, diskette, mag. tape	Disk	Diskette, cassette
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	—	—	—	Host & comm. proc.	Host
Additional software supported	COBOL, RPG, MPL, PSL, GEMCOS	—	COBOL, RPG, MPL, PSL, GEMCOS	TIP, message switch, store & forward	Yes
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$20,000 and up	$20,000 and up	$21,000 and up	$85,000 to $950,000	$50,000 to $300,000
Monthly rental (2-yr. lease, including maint., range)	$596 (5-yr.) and up	$1,000 and up	$564 (5-yr.) and up	$2,000 and up	Contact vendor
Communications operating software—one-time charge	$2,500	$2,250	$2,500	—	Contact vendor
Communications operating software—monthly charge	$72	$200	$72	$250 to $800	Contact vendor
Date of first delivery	8/77	1977	8/77	8/74	8/72
Number installed to date	—	—	—	38	30
Serviced by	Burroughs	Burroughs	Burroughs	Cencom	Third party
COMMENTS	Based on 1979 information	Based on 1979 information	Based on 1979 information	Supports modular line handlers, variable speeds, standard Univac protocols plus most IBM protocols. Handles up to 8 CPUs through 1 CSI front-end	

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Codex 6520	Computer Automation, Inc. SyFA System 1000	Computer Automation, Inc. Naked Mini LSI-2/3 & NM4	Computer Communications CC-8	Computer Communications CC-8R
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360 & S/370 & compatible systems	IBM S/360, S/370, & 303X; ICL; X.25-compatible	Application dependent	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	Yes	No
Maximum no. of hosts supported simultaneously	4	—	32	4	—
Maximum no. of hosts channel-attachable to front-end	4	—	32	4	—
Maximum no. stations pollable per line or system	Device dependent	—	128	Unlimited	—
As a remote concentrator	No	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	—	16	32	—	16
Maximum no. of hosts served by one concentrator	—	1	32	—	16
Maximum no. of stations pollable on one line	—	15	128	—	Unlimited
As a free-standing communications processor	No	Yes	No	No	No
Network Architecture compliance	—	SNA, X.25	—	—	—
Full-capacity data base system	—	SyClops	—	—	—
Operating system	—	SyClops	—	—	—
As a store-and-forward message switching processor	No	Yes	Yes	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	240	2	32	240	64
2000 to 9600 bps	240	2	32	240	64
Over 9600 bps	Varies	2	Application depend.	240	64
Highest line speed supported, bits per second	230.4K	19.2K	19.2K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	Up to 200K	—	600K	200K	200K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	No	No
IBM SDLC	No	Yes	Yes	No	No
X.25—Packet level	No	Yes	No	Yes	Yes
Other	Datasdpeed 40/4, PARS, others	—	—	—	SABRE, PARS
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.54	0.15	.55	0.3	0.3
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	64K bytes	128K to 304K bytes	64K bytes (LSI-2/3); 128K bytes (NM 4)	64K bytes	256K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Diskette, disk	Disk, tape	Disk, diskette, mag. tape	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer
Communications operating software:					
Availability	Included in price	Separately priced	Separately priced	Included in price	Separately priced
Generated by	Host	Comm. processor	—	Host	Host
Additional software supported	—	SyBOL; utilities to support business applications	—	Utilities	Utilities
Turnkey systems available	Yes	Yes, some application packages	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$41,000 to $200,000	$102,000 & up	$30,000 & up	$39,430 & up	$39,200 & up
Monthly rental (2-yr. lease, including maint., range)	$1,350 to $7,000	Via third party only	—	$724 & up	$1,207 & up (3-yr.)
Communications operating software—one-time charge	—	Contact vendor	Contact vendor	—	$750
Communications operating software—monthly charge		—		—	$125
Date of first delivery	1/80	5/76	1974; 1977 (NM4)	1976	1979
Number installed to date	—	350	—	85	3
Serviced by	Codex Corp.	Computer Automation	Various service companies	CCI	CCI
COMMENTS	Codex-enhanced version of Computer Communications, Inc.'s CC-8; Multiplexed Network Interface (MNI) provides networking capabilities with Codex 6000 Series Intelligent Network Processors	Multifunction interactive distributed network system		Capabilities include auto-poll; auto baud rate select, auto-dump; auto-load etc.; terminal initiated host application selection; error control/correction	Low cost intelligent remote concentrator

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Computer Communications CC-80	Computer Communications CC-80RC	Computer Communications CC-85	Computer Communications CC-85AC	Computer Comunications CC-8000
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles	IBM S/360, S/370, 303X, 434X; Itel; Amdahl; compatibles
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	No	Yes
Maximum no. of hosts supported simultaneously	7	—	7	—	7
Maximum no. of hosts channel-attachable to front-end	7	—	7	—	7
Maximum no. stations pollable per line or system	Unlimited	—	Unlimited	—	Unlimited
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	32	32	32	32	32
Maximum no. of hosts served by one concentrator	32	32	32	32	32
Maximum no. of stations pollable on one line	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
As a free-standing communications processor	Yes	No	Yes	Yes	Yes
Network Architecture compliance	CCI; NCS	—	CCI; NCS	CCI; NCS	CCI; NCS
Full-capacity data base system	No	—	No	No	No
Operating system	CCI; NCS	—	CCI; NCS	CCI; NCS	CCI; NCS
As a store-and-forward message switching processor	Yes	No	Yes	No	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	1,232	240	1,232	240	240
2000 to 9600 bps	1,232	240	1,232	240	240
Over 9600 bps	1,232	240	1,232	240	240
Highest line speed supported, bits per second	230.4K	230.4K	230.4K	230.4K	50K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	200K	200K	400K	400K	5000
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	No	No	No	No
X.25—Packet level	Yes	Yes	Yes	Yes	Yes
Other	SABRE, PARS	SABRE, PARS	SABRE, PARS	SABRE, PARS	SABRE, PARS
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.3	0.3	0.15	0.15	0.3
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	512K bytes	512K bytes	512K bytes	512K bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA	DMA	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, line printer
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Host	Host	Host	Host	Host
Additional software supported	Utilities	Utilities	Utilities	Utilities	Utilities
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$98,750 & up	$98,750 & up	$128,750 & up	$134,750 & up	$148,750 & up
Monthly rental (2-yr. lease, including maint., range)	$2,546 & up (3-yr.)	$2,546 & up (3-yr.)	$3,696 & up (3-yr.)	$3,835 & up (3-yr.)	$3,546 & up (3-yr.)
Communications operating software—one-time charge	$1,500	$1500	$1,500	$1,500	Varies
Communications operating software—monthly charge	$250	$250	$250	$250	Varies
Date of first delivery	1975	1979	1979	1980	1976
Number installed to date	285	5	20	1	20
Serviced by	CCI	CCI	CCI	CCI	CCI
COMMENTS	Network controller offering independent front-end processing and true networking in the emulation environment	High performance programmable remote concentrator	Distributed microprocessor architecture used to create a very high-speed independent front-end processor/ network controller	Distributed microprocessor architecture, higher sustainable throughput for remote concentration	Custom message switching, multicomputer config., fractional redundancy, NLETS/ NCIC interface

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Control Data Corp. 2551-1	Control Data Corp. 2551-2	Digital Communications Assoc. System 150 Network Processor	Digital Communications Assoc. System 250/10 Network Processor	Digital Communications Corp. CP 9000
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	CDC 6000, Cyber 70, Cyber 170, & Cyber 170 700 Series	CDC 6000, Cyber 70, Cyber 170 & Cyber 170 700 Series	Most manufacturers	DEC	Any computer system via serial data interfaces
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	Yes	No
Maximum no. of hosts supported simultaneously	1	1	—	31	—
Maximum no. of hosts channel-attachable to front-end	2	2	—	6	—
Maximum no. stations pollable per line or system	Protocol-depend.	Protocol-depend.	—	—	—
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	8	8	128	128	Unrestricted
Maximum no. of hosts served by one concentrator	8	8	32	32	Unrestricted
Maximum no. of stations pollable on one line	1 RC per trunk	1 RC per trunk	Varies	Varies	Unrestricted
As a free-standing communications processor	No	No	Yes	Yes	Yes
Network Architecture compliance	—	—	INA	INA	Custom
Full-capacity data base system	—	—	—	—	No
Operating system	CCP	CCP	Proprietary	Proprietary	EX 9000
As a store-and-forward message switching processor	No	No	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	254	128	128	480
2000 to 9600 bps	32	254	24	4	480 to 240
Over 9600 bps	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K	—	—	60
Highest line speed supported, bits per second	56K	56K	9600	9600	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	20K	20K	4000	4000	Up to 700K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	No	No	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	Yes
IBM SDLC	Special	Special	No	No	Yes
X.25—Packet level	Yes	Yes	No	No	Yes
Other	Mode 4A, 4C HASP M-L	Mode 4A, 4C HASP M-L	IBM 2741/3767, 83B3	IBM 2741/3767, 83B3	Yes (custom)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.55	0.55	1.5	1.5	0.5
Main memory word size, bits	18	18	12	12	8
Main memory storage capacity, words or bytes	262K bytes	262K bytes	32K words	32K words	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	Interrupt	Interrupt	DMA, interrupt
Mass Storage	—	—	Interrupt	Interrupt	DMA, interrupt
Other peripherals	—	—	Interrupt	Interrupt	Interrupt
Back-up and diagnostic peripherals supported	Cassette tape	Cassette tape	Diskette	Diskette	Diskette
Communications operating software:					
Availability	Separately priced	Separately priced	Included in price	Included in price	Separately priced
Generated by	Host	Host	Comm. processor	Host	Host
Additional software supported	PASCAL, Network Definition Lang.	PASCAL, Network Definition Lang.	DEC OS/8	DEC OS/8	LOGOS compiler, program debugger
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$49,000 to $74,000	$59,000 to $190,000	$11,500 & up	$20,000 & up	Contact vendor
Monthly rental (2-yr. lease, including maint., range)	$1,650 to $2,300 (3-yr.)	$2,000 to $8,500 (3-yr.)	—	—	Contact vendor
Communications operating software—one-time charge	$3,940	$3,940	—	—	Contact vendor
Communications operating software—monthly charge	$120 + $570 OTC	$120 + $570 OTC	—	—	—
Date of first delivery	6/75	6/75	6/74	7/73	7/77
Number installed to date	Over 200	Over 400	75	40	Over 300
Serviced by	Control Data Corp.	Control Data Corp.	DCA/DEC	DCA/DEC	DCC
COMMENTS	Demand-driven multiplexing; programmed in high-level lang.; extensive diagnostics	Demand-driven multiplexing; programmed in high-level lang.; extensive diagnostics; field-upgradable from 2551-1	Supports host selection, port contention; full line and modem control facilities	Supports host selection, port contention; full line and modem control facilities	Multi-microprocessor-based sys. (up to 62 mpu's); can be programmed to perform any comm. processing function; full on-line redundancy capability; compat. with CM 9100

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Digital Communications Corp. CM 9100	DPF Incorporated CMC 4	DPF Incorporated CMC 32	Franklin Systems Corp. ADS	Franklin Systems Corp. DMX
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Any computer system via serial data interfaces	IBM S/360, S/370, 30XX, 43XX; AS; Amdahl; Magnusson; CDC Omega, etc.	IBM S/360, S/370, 30XX, 43XX; AS; Amdahl; Magnusson; CDC Omega; etc.	Most manufacturers	Most manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	—	1	1	5	5
Maximum no. of hosts channel-attachable to front-end	—	1	2	5	5
Maximum no. stations pollable per line or system	—	4096	4096	5	5
As a remote concentrator	Yes	No	No	Yes	Yes
Maximum no. of remote connections to one host	2 (1 back-up)	—	—	5	5
Maximum no. of hosts served by one concentrator	1	—	—	5	5
Maximum no. of stations pollable on one line	Unrestricted	—	—	3	3
As a free-standing communications processor	No	RPQ	RPQ	Yes	Yes
Network Architecture compliance	—	—	—	—	—
Full-capacity data base system	—	—	—	—	—
Operating system	EX 9100	—	—	FSC	FSC
As a store-and-forward message switching processor	No	RPQ	RPQ	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	4	32	5	5
2000 to 9600 bps	16 to 4	4	32	5	5
Over 9600 bps	1	3	24	—	—
Highest line speed supported, bits per second	19.2K	56K	56K	9600	9600
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	Up to 8K	5.6K	44.8K	—	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Future	Future	Yes	Yes
IBM SDLC	No	Future	Future	Yes	Yes
X.25—Packet level	Yes	Future	Future	No	No
Other	Yes (custom)	IBM I, II, III; various POS & data collection terminals	IBM I, II, III; various POS & data collection terminals	TLX/TWX/IRC	TLX/TWX/IRC
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	No
Programmable by user	Yes	No	No	Yes	Yes
Main memory cycle time, usec.	0.5	0.5	0.5	0.25	0.25
Main memory word size, bits	8	8	8	8	8
Main memory storage capacity, words or bytes	64K bytes	64K bytes	64K bytes per proc. (8 processors max.)	48K bytes	48K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA, interrupt	Interrupt	Interrupt
Mass Storage	Interrupt	RPQ	RPQ	Disk-DMA	Disk-DMA
Other peripherals	—	RPQ	RPQ	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	—	RPQ	RPQ	Diskette	Diskette
Communications operating software:					
Availability	Included in price	Included in price	Included in price	Included in price	Included in price
Generated by	Host	Comm. processor	Comm. processor	—	—
Additional software supported	Optional utilities	—	—	BASIC, FORTRAN, word processing	BASIC, FORTRAN, word processing
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	$13,500 to $19,500	$34,770 to $65,645	$9,000 to $30,000	$19,500
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	$460 to $520	$955 to $1,950	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	12/79	11/77	2/79	5/79	3/80
Number installed to date	130	125	25	—	—
Serviced by	DCC	DPF, user, or 3rd pty.	DPF, user, or 3rd pty.	Franklin Systems	Franklin Systems
COMMENTS	Single-microprocessor-based sys.; available off-the-shelf as a concentrator/multiplexer; can be end-user programmed; compat. with CP 9000	Emulates IBM 2701 or 2705; replaces 370X; provides optional diagnostic console, BSC Pollamatic, BSC Broadcast, Auto-dial/Auto answer, custom protocols	Emulates IBM 2701 or 2703; replaces 370X; provides optional diagnostic console, BSC Pollamatic, BSC Broadcast, Auto dial/Auto answer, custom protocols	Priced as a turnkey system including CRT/keyboard, printer, 500K disk	Priced as a turnkey system including CRT/keyboard, printer, 1M disk

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Franklin Systems Corp. F-10	General Automation Solution Series 200 & 400	GTE Telenet TP 1000	GTE Telenet TP 2200	GTE Telenet TP 4000L
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Most manufacturers	IBM S/360, S/370, 303X	Virtually all manufacturers	Virtually all manufacturers	Virtually all manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	5	4 or more	7	64	64
Maximum no. of hosts channel-attachable to front-end	5	4 or more	None	None	None
Maximum no. stations pollable per line or system	5	16	—	—	—
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	10	256	7	64	64
Maximum no. of hosts served by one concentrator	5	256	7	64	64
Maximum no. of stations pollable on one line	3	—	—	—	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	—	Autonet	—	—	—
Full-capacity data base system	—	FMS	—	—	—
Operating system	FSC	CONTROL IV	TPOS	TPOS	TPOS
As a store-and-forward message switching processor	Yes	Yes	No	No	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	10	256	7	64	64
2000 to 9600 bps	10	96	—	64	64
Over 9600 bps	—	—	—	—	—
Highest line speed supported, bits per second	9600	2.4 MB/sec.	300	2400	2400
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	—	—	180	25.6K	25.6K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	No	No	No
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	No
IBM SDLC	Yes	Yes	No	No	No
X.25—Packet level	No	Yes	No	No	No
Other	TLX/TWX/IRC	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	Yes	Yes	Yes	Yes
Programmable by user	Yes	No	No	No	No
Main memory cycle time, usec.	0.25	0.24 to 0.72	0.5	0.5	0.5
Main memory word size, bits	8	16	8	8	8
Main memory storage capacity, words or bytes	48K bytes	2 megabytes	8K	64K	128K
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	Disk-DMA	DMA, interrupt	—	—	—
Other peripherals	DMA, interrupt	DMA, interrupt	—	—	—
Back-up and diagnostic peripherals supported	Diskette	Disk, diskette, mag. tape	None	None	None
Communications operating software:					
Availability	Included in price	Included	Included in price	Included in price	Included in price
Generated by	—	—	—	—	—
Additional software supported	BASIC, FORTRAN, word processing	Macro assembler, FORTRAN, COBOL, utilities	—	—	—
Turnkey systems available	Yes	Yes	No	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$28,000	$15,000 to $100,000	—	$24,100 to $62,000	$28,600 to $60,800
Monthly rental (2-yr. lease, including maint., range)	—	—	Telenet tariff	Telenet tariff	Telenet tariff
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	11/79	9/76	9/77	9/77	8/78
Number installed to date	—	4500	145	129	145 (4000 Series)
Serviced by	Franklin Systems	General Automation	GTE Telenet	GTE Telenet	GTE Telenet
COMMENTS	Priced as a turnkey system including CRT/keyboard, printer, 30M disk	The Solution Series includes the 200 Series micros and the 400 Series minis	Compatible with GTE Telenet public packet network	Compatible with GTE Telenet public packet network	Compatible with GTE Telenet public packet network

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	GTE Telenet TP 4000C	GTE Telenet TP 4000H & TP 4000S	Honeywell DATANET 355	Honeywell DATANET 6612/6624/6632	Honeywell DATANET 6641
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Virtually all manufacturers	Virtually all manufacturers	Honeywell Series 600, 6000	Honeywell Series 60, Level 66/68	Honeywell DPS, DPS-8
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	256	256	1	1	1
Maximum no. of hosts channel-attachable to front-end	None	None	2	2	2
Maximum no. stations pollable per line or system	—	—	32	32	32
As a remote concentrator	Yes	Yes	No	No	No
Maximum no. of remote connections to one host	256	256	—	—	—
Maximum no. of hosts served by one concentrator	256	256	—	—	—
Maximum no. of stations pollable on one line	—	—	—	—	—
As a free-standing communications processor	Yes	Yes	No	No	No
Network Architecture compliance	—	—	—	—	—
Full-capacity data base system	—	—	—	—	—
Operating system	TPOS	TPOS	—	—	—
As a store-and-forward message switching processor	No	No	Yes	Yes	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	256	256	96	8/32/96	8
2000 to 9600 bps	256	256	96	8/32/96	8
Over 9600 bps	—	136	96	8/32/96	8
Highest line speed supported, bits per second	9600	56K	50K	50K	72K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Estimated processor throughput, chars./sec.	128K	230.4K	—	—	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	Yes	Yes
IBM SDLC	No	No	No	No	No
X.25—Packet level	No	Yes	No	No	No
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	No
Programmable by user	No	No	Yes	Yes	Yes
Main memory cycle time, usec.	0.5	0.5	1.0	1.2	0.44/0.55
Main memory word size, bits	8	8	18	18	18
Main memory storage capacity, words or bytes	128K/256K	128K/256K	256K bytes	48/64/256K bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA
Mass Storage	—	—	DMA	DMA	DMA
Other peripherals	—	—	DMA	—	—
Back-up and diagnostic peripherals supported	None	None	Diskette (diagnostic only)	Diskette (diagnostic only)	Diskette (diagnostic only)
Communications operating software:					
Availability	Included in price	Included in price	See comments	See comments	See comments
Generated by	—	—	Host	Host	Host
Additional software supported	—	—	Macro assembler	Macro assembler	Macro assemblers
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$32,600 to $181,000	$34,600 to $189,200	$146,400 to $1,075,000	$46,800 to $888,400	$51,050 to $89,100
Monthly rental (2-yr. lease, including maint., range)	Telenet tariff	Telenet tariff	$3,638 to $30,395	$1,170 to $24,250	$1,500 to $2,600
Communications operating software—one-time charge	—	—	—	—	
Communications operating software—monthly charge	—	—	$170 (GRTS-II)	$170 (GRTS-II)	$170 to $780
Date of first delivery	—	—	11/70	7/74	10/77
Number installed to date	145 (4000 Series)	145 (4000 Series)	—	—	—
Serviced by	GTE Telenet	GTE Telenet	Honeywell	Honeywell	Honeywell
COMMENTS	Compatible with GTE Telenet public packet network	Compatible with GTE Telenet public packet network	GRTS, NPS software included in system price; GRTS-II software separately priced	GRTS, NPS software included in system price; GRTS-II software separately priced	GRTS-II & NPS software separately priced

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Honeywell DATANET 6651	Honeywell DATANET 6678	IBM-DPD 3704	IBM-DPD 3705-II	Intelligent Terminals, Inc. ADCAP 100-1
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Honeywell DPS, DPS-8	Honeywell Series 60, Level 66/68	IBM S/360, S/370, 303X, 43XX	IBM S/360, S/370, 303X, 43XX	IBM 370X & compatible
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	No
Maximum no. of hosts supported simultaneously	1	1	1	4	—
Maximum no. of hosts channel-attachable to front-end	2	2	1	4	—
Maximum no. stations pollable per line or system	32	32	Device-depend.	Device-depend.	—
As a remote concentrator	No	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	—	1	1	Variable
Maximum no. of hosts served by one concentrator	—	—	1	1	Unlimited
Maximum no. of stations pollable on one line	—	—	Device-depend.	Device-depend.	4096
As a free-standing communications processor	No	No	No	No	No
Network Architecture compliance	—	—	—	—	—
Full-capacity data base system	—	—	—	—	—
Operating system	—	—	—	—	—
As a store-and-forward message switching processor	Yes	Yes	No	No	Yes
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	96	96	32	352	—
2000 to 9600 bps	96	96	32	352	—
Over 9600 bps	96	96	32	32	—
Highest line speed supported, bits per second	72K	72K	134.5K	230.4K	—
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	Capacity halved	—
Estimated processor throughput, chars./sec.	—	—	—	—	38.4K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	Yes
IBM SDLC	No	No	Yes	Yes	Yes
X.25—Packet level	No	No	No	No	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	No	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes	No
Main memory cycle time, usec.	0.44/0.55	0.44/0.55	—	1.0	—
Main memory word size, bits	18	18	—	18	—
Main memory storage capacity, words or bytes	192K bytes	512K bytes	64K bytes	512K bytes	—
Data transfer between memory and:					
Communications lines	DMA	DMA	Interrupt	DMA	—
Mass Storage	DMA	DMA	—	DMA	—
Other peripherals	—	—	—	DMA	—
Back-up and diagnostic peripherals supported	Diskette (diagnostic only)	Diskette (diagnostic only)	—	—	—
Communications operating software:					
Availability	See comments	See comments	Separately priced	Separately priced	Included in price
Generated by	Host	Host	Host	Host	—
Additional software supported	Macro assembler	Macro assembler	—	—	—
Turnkey systems available	Yes	Yes	Available	Available	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$72,000 to $221,000	$191,460 to $280,600	$22,100 to $24,455	$40,800 to $122,040	$7,200 to $25,000
Monthly rental (2-yr. lease, including maint., range)	$2,105 to $6,200	$4,810 to $6,150	$679 to $856	$1,225 to $4,565	$350
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	$170 to $780	$170 (GRTS-II)	Option-depend.	$100	—
Date of first delivery	$10/77	10/77	5/73	8/76	11/79
Number installed to date	—	—	—	—	30
Serviced by	Honeywell	Honeywell	IBM	IBM	—
COMMENTS	CRTS-II & NPS software separately priced	GRTS, NPS software included in system price; GRTS-II software separately priced		Prices shown are for basic controller only	A protocol converter that converts various protocols to X.25 network protocols; limited store-and-forward capabilities; expandable bandwidth via multiple processor architecture

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	ITT Courier VTLC	Lemcom Systems, Inc. CMC-4	Lemcom Systems, Inc. CMC-32	Memorex 1380
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 3000, 4300, & plug compatibles	IBM S/360, S/370, 303X, 4300, and compatible	IBM S/360, S/370, 303X, 4300, and compatible	IBM S/360, S/370, 303X, 43XX, and compatibles
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	1	1	4
Maximum no. of hosts channel-attachable to front-end	1	2	2	8 (4 at a time)
Maximum no. stations pollable per line or system	255	Unrestricted	Unrestricted	Unrestricted
As a remote concentrator	No	No	No	By RPQ
Maximum no. of remote connections to one host	—	—	—	Contact vendor
Maximum no. of hosts served by one concentrator	—	—	—	Contact vendor
Maximum no. of stations pollable on one line	—	—	—	Contact vendor
As a free-standing communications processor	No	No	No	No
Network Architecture compliance	—	—	—	—
Full-capacity data base system	—	—	—	—
Operating system	—	—	—	—
As a store-and-forward message switching processor	No	No	No	No
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4	4	32	112 to 216
2000 to 9600 bps	4	4	32	64
Over 9600 bps	4	3	24	40
Highest line speed supported, bits per second	9600	56K	56K	230.4K
Effect on line capacity, if all lines are full-duplex	—	None	None	None
Estimated processor throughput, chars./sec.	—	7K	56K	—
Terminal protocols supported:				
ASCII, Async. (Teletype)	No	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No
IBM SDLC	No	No	No	No
X.25—Packet level	No	No	No	No
Other	—	—	—	—
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	No
Programmable by user	No	No	No	Yes
Main memory cycle time, usec.	—	0.5	0.5	0.54
Main memory word size, bits	—	8	8	16
Main memory storage capacity, words or bytes	—	40K	320K	64K
Data transfer between memory and:				
Communications lines	—	Interrupt	Interrupt	DMA, interrupt
Mass Storage	—	—	—	DMA
Other peripherals	—	—	—	—
Back-up and diagnostic peripherals supported	Diskette	None	None	None
Communications operating software:				
Availability	Included in price	—	—	Some separ. priced
Generated by	Comm. processor	—	—	Host
Additional software supported	Message broadcast, line monitoring, error logging, & config. monitoring	—	—	MASCOT and other host-resident utilities
Turnkey systems available	See comments	—	—	No
PRICING AND AVAILABILITY				
Purchase price (system range)	$7,900 to $26,150	$14,000 to $20,000	$20,000 to $60,000	$50,000 to $230,000
Monthly rental (2-yr. lease, including maint., range)	$370 to $1,150	Contact vendor	Contact vendor	$1,400 to $6,400
Communications operating software—one-time charge	—	—	—	Contact vendor
Communications operating software—monthly charge	—	—	—	Contact vendor
Date of first delivery	7/76	3/77	3/79	1976
Number installed to date	600	140	20	150
Serviced by	ITT Courier	User/third party	User/third party	Memorex
COMMENTS	A turnkey front-end processor system that can replace an IBM 370X in a network of 3270-type BSC terminal devices; the VTLC appears to the host as a 3272 controller and handles both remote and local terminal devices	Microprocessor-directed FEP. Compact and extremely flexible. Front-end polling, console support available. OEM discounts available. RPQ's available for a fee.	Microprocessor-directed FEP. Compact and extremely flexible. Front-end polling console support available. OEM discounts available. RPQ's available for a fee.	Custom software extensions are available for a fee, from Memorex Systems Engineering Services

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Modular Computer Systems Modcomp MCII/CP2	Modular Computer Systems Modcomp MCIV/35/CP-B	Modular Computer Systems Modcomp 3108	Modular Computer Systems Modcomp 3109	NCR 721-II
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Modcomp MCII/26 & MCII/45	Modcomp MCII/ 35-B	Modcomp Classic 7830	Modcomp Classic 786X, 7870	NCR Century, Criterion, & 8XX5 Systems
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	1	1	1	1	2
Maximum no. of hosts channel-attachable to front-end	1	1	1	1	2
Maximum no. stations pollable per line or system	256	256	256	256	Device-dependent
As a remote concentrator	Yes	Yes	Yes, with CPU	Yes, with CPU	Yes
Maximum no. of remote connections to one host	Applic.-dependent	Applic.-dependent	Applic.-dependent	Applic.-dependent	Unrestricted
Maximum no. of hosts served by one concentrator	Applic.-dependent	Applic.-dependent	Applic.-dependent	Applic.-dependent	Unrestricted
Maximum no. of stations pollable on one line	User-programmable	User-programmable	User-programmable	User-programmable	Device-dependent
As a free-standing communications processor	Yes	Yes	Yes, with CPU	Yes, with CPU	Yes
Network Architecture compliance	User-programmable	User-programmable	User-programmable	User-programmable	NCR/CNA
Full-capacity data base system	TOTAL, TXS, INFIN.	TOTAL, TXS, INFIN.	TOTAL, TXS, INFIN.	TOTAL, TXS, INFIN.	—
Operating system	MAX III/IV, MAXNET	MAX III/IV, MAXNET	MAX III/IV, MAXNET	MAX III/IV, MAXNET	TOX
As a store-and-forward message switching processor	Yes	Yes	Yes	Yes	No
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	256	256	256	256	253
2000 to 9600 bps	256 to 166	256 to 166	256 to 166	256 to 166	52 to 253
Over 9600 bps	Applic.-dependent	Applic.-dependent	Applic.-dependent	Applic.-dependent	10 at 56K bps
Highest line speed supported, bits per second	250K	250K	250K	250K	56K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	Capacity halved
Estimated processor throughput, chars./sec.	200K	200K	200K	200K	40K
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	User-programmable	User-programmable	User-programmable	User-programmable	Yes
IBM SDLC	User-programmable	User-programmable	User-programmable	User-programmable	Yes
X.25—Packet level	Yes	Yes	Yes	Yes	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Limited	Limited	Yes	Yes	Yes
Programmable by user	No	No	No	No	No
Main memory cycle time, usec.	0.8-1.0	0.6	0.125	0.125	0.65
Main memory word size, bits	16	16	16/32	16/32	16
Main memory storage capacity, words or bytes	128K bytes	1M bytes	2M bytes	4M bytes	256K bytes
Data transfer between memory and:					
Communications lines	DMI	DMI	DMI, interrupt	DMI, interrupt	DMA
Mass Storage	DMA	DMA	DMA, interrupt	DMA, interrupt	—
Other peripherals	DMA	DMA	DMA, interrupt	DMA, interrupt	DMA
Back-up and diagnostic peripherals supported	Disk, mag. tape, printers	Disk, mag. tape, printers	Disk, mag. tape, printers	Disk, mag. tape, printers	Cassette
Communications operating software:					
Availability	Separately priced	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Host	Host	Host	Host	Host
Additional software supported	Macro assembler, FORTRAN, utilities	Macro assembler, FORTRAN, utilities	Macro assembler, FORTRAN, utilities	Macro assembler, FORTRAN, utilities	—
Turnkey systems available	No	No	No	No	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$21,650	$55,400	$28,800	$43,300	$41,720 to $100,400
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	$1,205 & up
Communications operating software—one-time charge	—	—	—	—	$15,000
Communications operating software—monthly charge	—	—	—	—	$417 & up
Date of first delivery	—	—	—	—	1976
Number installed to date	—	—	—	—	—
Serviced by	Modcomp	Modcomp	Modcomp	Modcomp	NCR
COMMENTS					

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	NCR Comten, Inc. COMTEN 3650	NCR Comten, Inc. COMTEN 3670	NCR Comten, Inc. COMTEN 3690	North American Philips Corp., Comm. Sys. Div. MARK III Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM S/360, S/370, 3033, & 43XX; CDC Omega; Amdahl; custom	IBM S/360, S/370, 3033, & 43XX; CDC Omega; Amdahl; custom	IBM S/360, S/370, 3033, & 43XX: CDC Omega; Amdahl; custom	IBM S/370, custom
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	2	4	8	Applic.-dependent
Maximum no. of hosts channel-attachable to front-end	2	4	8	Applic.-dependent
Maximum no. stations pollable per line or system	4096 per system	12,288 per system	16,384 per system	Applic.-dependent
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	15	15	15	Applic.-dependent
Maximum no. of hosts served by one concentrator	Unlimited	Unlimited	Unlimited	Applic.-dependent
Maximum no. of stations pollable on one line	32	32	32	Applic.-dependent
As a free-standing communications processor	Yes	Yes	Yes	Yes
Network Architecture compliance	SNA, CNA	SNA, CNA	SNA, CNA	Philips
Full-capacity data base system	—	—	—	Philips
Operating system	EP, NCP, CNS, DSS	EP, NCP, CNS, DSS	See comments	Philips
As a store-and-forward message switching processor	No	No	Yes	Yes
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	384	512	Applic.-dependent
2000 to 9600 bps	128	384	512	Applic.-dependent
Over 9600 bps	32 to 128	96 to 384	128 to 512	Applic.-dependent
Highest line speed supported, bits per second	230.4K	230.4K	230.4K	19.2K; higher by RPQ
Effect on line capacity, if all lines are full-duplex	None	None	None	Capac. halved for voice & wideband
Estimated processor throughput, chars./sec.	100K (HASP)	100K (HASP)	300K (HASP)	Applic.-dependent
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	RPQ
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	RPQ
IBM SDLC	Yes	Yes	Yes	RPQ
X.25—Packet level	Yes, DATAPAK	Yes, DATAPAK	Yes, DATAPAK	RPQ
Other	83B3	83B3	83B3	RPQ
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	No	No	Yes	Yes
Programmable by user	Yes	Yes	Yes	Yes
Main memory cycle time, usec.	0.65	0.65	0.52	0.7
Main memory word size, bits	16 plus parity	16 plus parity	64 plus parity	36
Main memory storage capacity, words or bytes	512K bytes	512K bytes	4096K bytes	1M bytes
Data transfer between memory and:				
Communications lines	DMA	DMA	DMA	DMA, interrupt
Mass Storage	DMA	DMA	DMA	DMA, interrupt
Other peripherals	DMA	DMA	DMA	DMA, interrupt
Back-up and diagnostic peripherals supported	Diskette, cassette	Cassette	Diskette	Disk, line printers, mag. tape
Communications operating software:				
Availability	Separately priced	Separately priced	Separately priced	Included
Generated by	Host/comm. proc.	Host/comm. proc.	Host/comm. proc.	Host/comm. proc.
Additional software supported	NDP, CODEL Assembler	NDP, CODEL Assembler	NDP, CODEL Assembler	Special utilities
Turnkey systems available	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$45,000 to $125,000	$90,000 to $350,000	$130,000 to $550,000	Contact vendor
Monthly rental (2-yr. lease, including maint., range)	$1,500 to $4,150	$3,000 to $11,600	$4,300 to $18,000	Contact vendor
Communications operating software—one-time charge	See comments	See comments	See comments	—
Communications operating software—monthly charge	See comments	See comments	See comments	—
Date of first delivery	3/75	3/72	6/78	1967
Number installed to date	Over 800	Over 300	Over 200	Over 90
Serviced by	NCR Comten	NCR Comten	NCR Comten	N. Am. Philips/CSD
COMMENTS	All software except System Control Software is licensed on a monthly basis	All software except System Control Software is licensed on a monthly basis	Communications processor operating systems include EP, NCP, CNS, DSS, & CTAM; all software except System Control Software is licensed on a monthly basis	Virtually off-shelf for AFTN public switching and Telex applications; custom config. available

Communications Processors—
Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	North American Philips Corp., Comm. Sys. Div. DXS 40	North American Philips Corp., Comm. Sys. Div. MARC	Paradyne PIX-II	Periphonics Corporation T-Comm 7	Periphonics Corporation DTC-II
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Custom	Custom	IBM S/360, S/370, 303X, and compatibles	IBM, NCR, Burroughs, Honeywell, etc.	IBM, NCR, Burroughs, Honeywell, etc.
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes; see comments	Yes	Yes
Maximum no. of hosts supported simultaneously	—	See comments	1	8	8
Maximum no. of hosts channel-attachable to front-end	—	See comments	1	4	4
Maximum no. stations pollable per line or system	—	Applic.-dependent	64 (interrupt)	256/800	256/800
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Applic.-dependent	Applic.-dependent	1	Host-dependent	Host-dependent
Maximum no. of hosts served by one concentrator	Applic.-dependent	Applic.-dependent	1	8	8
Maximum no. of stations pollable on one line	Applic.-dependent	Applic.-dependent	25	256	256
As a free-standing communications processor	Yes	Yes	No	Yes	Yes
Network Architecture compliance	Philips	Philips	—	Pericomm, SNA, etc.	Pericomm, SNA, etc.
Full-capacity data base system	Philips	Philips	—	No	No
Operating system	Philips	Philips	—	Peri-Comm	Peri-Comm
As a store-and-forward message switching processor	Yes	Yes	No	Yes—on RPQ basis	Yes—on RPQ basis
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	Applic.-dependent	Applic.-dependent	—	50	25
2000 to 9600 bps	Applic.-dependent	Applic.-dependent	20	10 to 45	10 to 45
Over 9600 bps	Applic.-dependent	Applic.-dependent	3 (full-duplex)	Up to 10	Up to 10
Highest line speed supported, bits per second	19.2K; higher by RPQ	19.2K; higher by RPQ	56K	56K bytes	56K bytes
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	Applic.-dependent	Applic.-dependent	14K	Processor-dependent	Processor-dependent
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	RPQ	RPQ	RPQ	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	RPQ	HDLC; RPQ others	No	Yes	Yes
IBM SDLC	RPQ	RPQ	No	Yes	Yes
X.25—Packet level	Yes	Yes	No	Yes	Yes
Other	RPQ	RPQ	Paradyne version of SDLC	Audio Response (93 line max.)	Audio Response (25 line max.)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	No
Programmable by user	Yes	Yes	No	No	No
Main memory cycle time, usec.	1.0	1.0	0.5	0.4 to 0.8	0.4 to 0.8
Main memory word size, bits	8	8	16	16	16
Main memory storage capacity, words or bytes	320K bytes	208K bytes x NP; see comments	32K words	176K bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	—	DMA, interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	Interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, floppy disk, mag. tape	Disk, floppy disk, mag. tape	None	Remote console, diskette, mag. tape	Remote console, diskette, mag. tape
Communications operating software:					
Availability	Included	Included	Included in price	Included in price	Included in price
Generated by	Host/comm. proc.	Host/comm. proc.	—	Host/comm. processor	Host/comm. processor
Additional software supported	Special utilities	Special utilities	Special utilities	Data Collection (BANK-FROM-HOME)	Data Collection (BANK-FROM-HOME)
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	Contact vendor	$50,000 to $75,000	$80,000 & up	$50,000 & up
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	$1,000 and up	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1979	1979	4/76	1971	Fall 1977
Number installed to date	30	Over 30	1000	Over 250	25
Serviced by	N. Am. Philips/CSD	N. Am. Philips.CSD	Paradyne	Periphonics	Periphonics
COMMENTS	Also interfaces with VDU's & word processors; handles X.25 Level 3 (Philips Level 4)	Custom configs. include FAX, Teletex, peripheral controller; handles X.25 Level 3 (Philips Level 4); max. no. of host supported/attachable & main mem. storage capacity depends on no. of processors (NP) configured	PIX permits remote peripherals to access host as if locally attached; local PIX is byte-channel connected to host; remote PIX is input to local PIX		

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Periphonics Corporation T-COMM 80 Multi-Processor	Raytheon Data Systems Raynet I, II, & III	Raytheon Data Systems Raynet IV & V	Rockwell International Collins C-System	Sperry Univac DCP
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM, NCR, Burroughs, Honeywell, etc.	IBM, Univac	IBM, Univac	IBM S/360, S/370, 303X; Univac 1100 and 490 Series; Amdahl; etc.	Univac Series 1100, Series 90
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	No	Yes	Yes
Maximum no. of hosts supported simultaneously	8 x NP	—	—	Traffic-depend.	2
Maximum no. of hosts channel-attachable to front-end	4 x NP	—	—	8	2
Maximum no. stations pollable per line or system	(256/800) x NP	—	—	Protocol-depend.	Variable
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Host-dependent	22	12 (R-IV); 22 (R-V)	Interface-depend.	Variable
Maximum no. of hosts served by one concentrator	8 x NP	1 (R-I); 8 (R-II & III)	8	Interface-depend.	Variable
Maximum no. of stations pollable on one line	256	No limit	No limit	Protocol-depend.	Variable
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	Pericomm, SNA, etc.	Yes	Yes	Most	DCA
Full-capacity data base system	No	No	Partial	No	No
Operating system	Peri-Comm MP	PCOS	PCOS	COS	Telecom
As a store-and-forward message switching processor	Yes—on RPQ basis	No	Std. (R-IV); opt. (R-V)	Yes	Custom
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	50	87 per cpu	50 (R-IV); 87 (R-V)	1024	256
2000 to 9600 bps	(10 to 45) x NP	87 per cpu	50 (R-IV); 87 (R-V)	512	128
Over 9600 bps	Up to 10	87 per cpu	50 (R-IV); 87 (R-V)	256	32
Highest line speed supported, bits per second	56K bytes	56K	56K	56K	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	Capacity halved	None	Capacity halved
Estimated processor throughput, chars./sec.	Processor-dependent	Appl. dependent	Appl. dependent	50K	Variable
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	Yes	No
X.25—Packet level	Yes	No	No	Yes	Contact vendor
Other	Audio Response (NP x 25 lines) max.	PARS, Univac	PARS, Univac	Yes, including most IBM	Univac
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	Yes	Yes	No	No
Programmable by user	No	Yes	Yes	Yes	No
Main memory cycle time, usec.	0.4 to 0.8	0.7	0.7	0.9	0.92
Main memory word size, bits	16	16	16	32	16
Main memory storage capacity, words or bytes	320K bytes x NP	256K bytes per cpu	256K bytes per cpu	2M bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA	DMA	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	DMA	DMA	DMA	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA	DMA, interrupt
Back-up and diagnostic peripherals supported	Remote console, diskette, mag. tape	Cassette	Cassette, disk, mag. tape	Disk, tape	Disk, diskette, console
Communications operating software:					
Availability	Included in price	Separately priced	Separately priced	Included in price	Included
Generated by	Host/comm. processor	Comm. processor	Comm. processor	Comm. processor	Host
Additional software supported	All Periphonics plus other PDP-11	Utilities	Utilities	Macro assembler, link editor, etc.	Diagnostic debug aids, performance
Turnkey systems available	Yes	Yes	Yes	Yes	Contact vendor
PRICING AND AVAILABILITY					
Purchase price (system range)	$50,000 & up	$55,000 to $595,000	$60,000 to $575,000	$3,000,000 to $7,000,000	$100,000 & up
Monthly rental (2-yr. lease, including maint., range)	—	Contact vendor	Contact vendor	Contact vendor	$2,290 (5-yr.) & up
Communications operating software—one-time charge	—	$4,000	$4,000	—	—
Communications operating software—monthly charge	—	—	—	—	—
Data of first delivery	Fall 1979	1978; 1980 (R-III)	1980 (R-IV);1981(R-V)	3/74	1977
Number installed to date	—	—	—	Over 20	—
Serviced by	Periphonics	Raytheon Data Systems	Raytheon Data Systems	Rockwell Int'l.	Sperry Univac
COMMENTS	Multi-Processor (MP) System. NP + number of processors Peri-Comm MP provides for Multi-Processor, distributed functionality for large networks or stand-alone systems	Raynet I supports network control functions, redundancy option; Raynet II provides all Raynet I capabilities plus host selection; Raynet III provides all Raynet II capabilities plus protocol conversion	Raynet IV provides all Raynet III capabilities plus message switching; Raynet V provides all Raynet IV capabilities plus node-to-node communications		Extensive network-oriented software

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	North American Philips Corp., Comm. Sys. Div. DXS 40	North American Philips Corp., Comm. Sys. Div. MARC	Paradyne PIX-II	Periphonics Corporation T-Comm 7	Periphonics Corporation DTC-II
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Custom	Custom	IBM S/360, S/370, 303X, and compatibles	IBM, NCR, Burroughs, Honeywell, etc.	IBM, NCR, Burroughs, Honeywell, etc.
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes; see comments	Yes	Yes
Maximum no. of hosts supported simultaneously	—	See comments	1	8	8
Maximum no. of hosts channel-attachable to front-end	—	See comments	1	4	4
Maximum no. stations pollable per line or system	—	Applic.-dependent	64 (interrupt)	256/800	256/800
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Applic.-dependent	Applic.-dependent	1	Host-dependent	Host-dependent
Maximum no. of hosts served by one concentrator	Applic.-dependent	Applic.-dependent	1	8	8
Maximum no. of stations pollable on one line	Applic.-dependent	Applic.-dependent	25	256	256
As a free-standing communications processor	Yes	Yes	No	Yes	Yes
Network Architecture compliance	Philips	Philips	—	Pericomm, SNA, etc.	Pericomm, SNA, etc.
Full-capacity data base system	Philips	Philips	—	No	No
Operating system	Philips	Philips	—	Peri-Comm	Peri-Comm
As a store-and-forward message switching processor	Yes	Yes	No	Yes—on RPQ basis	Yes—on RPQ basis
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	Applic.-dependent	Applic.-dependent	—	50	25
2000 to 9600 bps	Applic.-dependent	Applic.-dependent	20	10 to 45	10 to 45
Over 9600 bps	Applic.-dependent	Applic.-dependent	3 (full-duplex)	Up to 10	Up to 10
Highest line speed supported, bits per second	19.2K; higher by RPQ	19.2K; higher by RPQ	56K	56K bytes	56K bytes
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	Capacity halved	Capacity halved
Estimated processor throughput, chars./sec.	Applic.-dependent	Applic.-dependent	14K	Processor-dependent	Processor-dependent
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	RPQ	RPQ	RPQ	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	RPQ	HDLC; RPQ others	No	Yes	Yes
IBM SDLC	RPQ	RPQ	No	Yes	Yes
X.25—Packet level	Yes	Yes	No	Yes	Yes
Other	RPQ	RPQ	Paradyne version of SDLC	Audio Response (93 line max.)	Audio Response (25 line max.)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	No
Programmable by user	Yes	Yes	No	No	No
Main memory cycle time, usec.	1.0	1.0	0.5	0.4 to 0.8	0.4 to 0.8
Main memory word size, bits	8	8	16	16	16
Main memory storage capacity, words or bytes	320K bytes	208K bytes x NP; see comments	32K words	176K bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	DMA, interrupt	—	DMA, interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	Interrupt	DMA, interrupt	DMA, interrupt
Back-up and diagnostic peripherals supported	Disk, floppy disk, mag. tape	Disk, floppy disk, mag. tape	None	Remote console, diskette, mag. tape	Remote console, diskette, mag. tape
Communications operating software:					
Availability	Included	Included	Included in price	Included in price	Included in price
Generated by	Host/comm. proc.	Host/comm. proc.	—	Host/comm. processor	Host/comm. processor
Additional software supported	Special utilities	Special utilities	Special utilities	Data Collection (BANK-FROM-HOME)	Data Collection (BANK-FROM-HOME)
Turnkey systems available	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	Contact vendor	$50,000 to $75,000	$80,000 & up	$50,000 & up
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	$1,000 and up	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1979	1979	4/76	1971	Fall 1977
Number installed to date	30	Over 30	1000	Over 250	25
Serviced by	N. Am. Philips/CSD	N. Am. Philips.CSD	Paradyne	Periphonics	Periphonics
COMMENTS	Also interfaces with VDU's & word processors; handles X.25 Level 3 (Philips Level 4)	Custom configs. include FAX, Teletex, peripheral controller; handles X.25 Level 3 (Philips Level 4); max. no. of host supported/attachable & main mem. storage capacity depends on no. of processors (NP) configured	PIX permits remote peripherals to access host as if locally attached; local PIX is byte-channel connected to host; remote PIX is input to local PIX		

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Periphonics Corporation T-COMM 80 Multi-Processor	Raytheon Raynet	Rockwell International Collins C-System	Sperry Univac DCP
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM, NCR, Burroughs, Honeywell, etc.	IBM, Univac	IBM S/360, S/370, 303X; Univac 1100 and 490 Series; Amdahl; etc.	Univac Series 1100, Series 90
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	8 x NP	Up to 8	Traffic-depend.	2
Maximum no. of hosts channel-attachable to front-end	4 x NP	Up to 8	8	2
Maximum no. stations pollable per line or system	(256/800) x NP	—	Protocol-depend.	Variable
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Host-dependent	Up to 8	Interface-depend.	Variable
Maximum no. of hosts served by one concentrator	8 x NP	Up to 8	Interface-depend.	Variable
Maximum no. of stations pollable on one line	256	—	Protocol-depend.	Variable
As a free-standing communications processor	Yes	Yes	Yes	Yes
Network Architecture compliance	Pericomm, SNA, etc.	—	Most	DCA
Full-capacity data base system	No	—	No	No
Operating system	Peri-Comm MP	COS	COS	Telecom
As a store-and-forward message switching processor	Yes—on RPQ basis	Yes	Yes	Custom
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	50	—	1024	256
2000 to 9600 bps	(10 to 45) x NP	62	512	128
Over 9600 bps	Up to 10	—	256	32
Highest line speed supported, bits per second	56K bytes	56K bytes	56K	56K
Effect on line capacity, if all lines are full-duplex	Capacity halved	—	None	Capacity halved
Estimated processor throughput, chars./sec.	Processor-dependent	100K per processor	50K	Variable
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	No
X.25—Packet level	Yes	—	Yes	Contact vendor
Other	Audio Response (NP x 25 lines) max.	PARS, Univac	Yes, including most IBM	Univac
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	No	Yes	No	No
Programmable by user	No	Not recommended	Yes	No
Main memory cycle time, usec.	0.4 to 0.8	—	0.9	0.92
Main memory word size, bits	16	—	32	16
Main memory storage capacity, words or bytes	320K bytes x NP	256K bytes	2M bytes	128K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	—	DMA, interrupt	DMA, interrupt
Mass Storage	DMA, interrupt	—	DMA	DMA, interrupt
Other peripherals	DMA, interrupt	—	DMA	DMA, interrupt
Back-up and diagnostic peripherals supported	Remote console, diskette, mag. tape	Disk, tape	Disk, tape	Disk, diskette, console
Communications operating software:				
Availability	Included in price	Included in price	Included in price	Included
Generated by	Host/comm. processor	—	Comm. processor	Host
Additional software supported	All Periphonics plus other PDP-11	—	Macro assembler, link editor, etc.	Diagnostic debug aids, performance
Turnkey systems available	Yes	Yes	Yes	Contact vendor
PRICING AND AVAILABILITY				
Purchase price (system range)	$50,000 & up	$60,000 to $400,000	$3,000,000 to $7,000,000	$100,000 & up
Monthly rental (2-yr. lease, including maint., range)	—	—	Contact vendor	$2,290 (5-yr.) & up
Communications operating software—one-time charge	—	—	—	—
Communications operating software—monthly charge	—	—	—	—
Date of first delivery	Fall 1979	03/79	3/74	1977
Number installed to date	—	—	Over 20	—
Serviced by	Periphonics	Raytheon Data Systems	Rockwell Int'l.	Sperry Univac
COMMENTS	Multi-Processor (MP) System. NP = number of processors Peri-Comm MP provides for Multi-Processor, distributed functionality for large networks or stand-alone systems	The product description shown above was derived by Datapro from Raytheon marketing literature, and was not reviewed by Raytheon personnel		Extensive network-oriented software

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Sperry Univac DCP/40 (Compatible Mode)	Sperry Univac DCP/40 (Primary Mode)	Tandem Computers, Inc. T16	Telcon Industries, Inc. Datamax Series
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Univac Series 1100, Series 90	Univac Series 1100, Series 90	—	Universal; interfaces with any system
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	Yes	Yes	Yes
Maximum no. of hosts supported simultaneously	2	8	1024	8
Maximum no. of hosts channel-attachable to front-end	2	8	—	480
Maximum no. stations pollable per line or system	Variable	Variable	2561	Application-dependent
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Variable	Variable	1024	Unrestricted
Maximum no. of hosts served by one concentrator	Variable	Variable	1024	Unrestricted
Maximum no. of stations pollable on one line	Variable	Variable	256	Unrestricted
As a free-standing communications processor	Yes	Yes	Yes	Yes
Network Architecture compliance	DCA	DCA	Yes	Unrestricted
Full-capacity data base system	No	No	Enscribe	—
Operating system	Telcon	Telcon	Guardian	Telcon
As a store-and-forward message switching processor	Custom	Custom	Yes	Yes, with floppies or bubble memory
Communications line capacity				
No of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	256	255	2048	480
2000 to 9600 bps	128	255	2048	Up to 56
Over 9600 bps	32	140	2048	14
Highest line speed supported, bits per second	56K	64K	80K	256K
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	Capacity halved	None
Estimated processor throughput, chars./sec.	Variable	Variable	—	—
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes
IBM SDLC	No	No	Yes	Yes
X.25—Packet level	Contact vendor	Contact vendor	Yes	No
Other	Univac	Univac	3270, Burroughs, TI/Net	6-Level typesetter code, 83B3, 8A1, Infocom, bisync.
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	No	No	Yes	Yes
Main memory cycle time, usec.	0.85	0.85	0.5 to 0.8	1.08
Main memory word size, bits	32	32	16	8
Main memory storage capacity, words or bytes	128K bytes	2M bytes	2M bytes	16K PROM, 32K RAM
Data transfer between memory and:				
Communications lines	DMA, interrupt	DMA	DMA	Interrupt
Mass Storage	DMA, interrupt	DMA	DMA	Interrupt
Other peripherals	DMA, interrupt	DMA	DMA	Interrupt
Back-up and diagnostic peripherals supported	Disk, diskette, console	Disk, diskette, mag. tape, console	Disk, mag. tape	—
Communications operating software:				
Availability	Separately priced	Separately priced	Separately priced	Separately priced
Generated by	Host	Host	—	Comm. processor
Additional software supported	Diagnostic debug aid, performance	Diagnostic debug aids, performance	FORTRAN, COBOL, Pathway Mumps, Enform, TAL	Alarm systems
Turnkey systems available	Contact vendor	Contact vendor	Optional	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$100,000 & up	$80,000 & up	$150,000 & up	$3,000 to $80,000
Monthly rental (2-yr. lease, including maint., range)	$2,460 (5-yr.) & up	$1,990 (5-yr.) & up	Contact vendor	$165 and up
Communications operating software—one-time charge	—	—	—	$1,500 and up
Communications operating software—monthly charge	$90	$115	—	—
Date of first delivery	1979	1980	May 1976	6/76
Number installed to date	—	—	—	4000
Serviced by	Sperry Univac	Sperry Univac	Tandem	General Electric
COMMENTS	Extensive network-oriented software; advanced multi-micro processor, LSI hardware	Extensive network-oriented software; advanced multi-micro processor, LSI hardware	A single Tandem system may contain 2 to 16 processors; up to 255 can be configured in a single network	Optional features include built-in 300, 1200, & 2400 bps modems, real-time mode operation, built-in video board for attachment of keyboard/display; capable of multi-plexing 6 HDLC or SDLC lines; 56K bps line speed supported on all models

Communications Processors— Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	Telefile Computer Products Inc. FECP-X	TRAN Telecommunications Corp. M300 Digital Circuit Switch	TRAN Telecommunications Corp. M3201A Single-Node Data Switch	TRAN Telecommunications Corp. M3201 Multi-Node Data Switch
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	Xerox Sigma 5-9 & Telefile T80 Series	IBM S/360, S/370, CDC 6600, H 6000, PDP-11, Univac, Xerox	IBM S/360, S/370, CDC 6600, H 6000, Univac, Xerox	IBM S/360, S/370, CDC 6600, H 6000, Univac, Xerox
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	No	No	No
Maximum no. of hosts supported simultaneously	6 or more	—	—	—
Maximum no. of hosts channel-attachable to front-end	6 or more	—	—	—
Maximum no. stations pollable per line or system	256	—	—	—
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Software-dependent	2048	1000	750
Maximum no. of hosts served by one concentrator	Software-dependent	32	Not applicable	Not applicable
Maximum no. of stations pollable on one line	Software-dependent	—	Not supported	Not supported
As a free-standing communications processor	Yes	No	No	No
Network Architecture compliance	—	Transparent	Transparent	Transparent
Full-capacity data base system	—	No	No	No
Operating system	TCOS	DSOS	DSOS	DSOS
As a store-and-forward message switching processor	Yes	No	Opt. peripheral available	Opt. peripheral available
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	550 @ 1200 bps	200	200
2000 to 9600 bps	128	—	150	150
Over 9600 bps	128	—	30	30
Highest line speed supported, bits per second	230.4K	72K	230.4K	230.4K
Effect on line capacity, if all lines are full-duplex	Normally none	None	None	None
Estimated processor throughput, chars./sec.	6K bytes	70K	33K	33K
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes
IBM SDLC	No	No	Yes	Yes
X.25—Packet level	No	No	Yes	Yes
Other	—	—	—	—
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	Yes (not recommended)	No	No	No
Main memory cycle time, usec.	0.6 to 1.0	0.98	0.98	0.98
Main memory word size, bits	16	16	16	16
Main memory storage capacity, words or bytes	2M bytes	32K bytes	112K bytes	128K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	—	—	—
Mass Storage	DMA	—	—	—
Other peripherals	DMA, interrupt	—	—	—
Back-up and diagnostic peripherals supported	Yes	None	Diskette, mag. tape	Diskette, mag. tape
Communications operating software:				
Availability	Normally included	Separately priced	Separately priced	Separately priced
Generated by	Host	—	—	—
Additional software supported	FORTRAN, sort/merge, etc.	Dial-out billing	Dial-out billing	Dial-out billing
Turnkey systems available	Yes	No	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	\$60,000 & up	\$60,000 to \$90,000	\$125,000 to \$250,000	\$150,000 to \$275,000
Monthly rental (2-yr. lease, including maint., range)	2½% to 3% per mo.	\$3,000 and up	\$7,000 to \$14,000 and up	\$7,000 to \$14,000 and up
Communications operating software—one-time charge	—	\$7,500	\$20,000	\$22,500
Communications operating software—monthly charge	—	\$450	\$800	\$1,000
Date of first delivery	1978	1973	1976	1979
Number installed to date	5	11	15	20
Serviced by	Telefile	TRAN	TRAN	TRAN
COMMENTS		For line concentration and digital circuit switching for async. terminals accessing multiple hosts	Sync./async. circuit data switching system with sophisticated integrated diagnostics and network management capabilities	Hybrid sync./async. circuit and packet data switching system for large-scale multiple switching node networks; sophisticated integrated diagnostics and network management capabilities

Communications Processors—Management Perspective and Equipment Specifications

MANUFACTURER AND MODEL	TRT/Norfield AMMS	TRT/Norfield Series 300	TRT/Norfield Series 200	Westinghouse Canada Inc. Electronic Sys. W-1655-ICC
COMPUTER SYSTEMS INTERFACED				
Manufacturers and Models	IBM 303X, Univac, Honeywell, Burroughs	IBM 303X, Univac, Honeywell, Burroughs	Most major manufacturers	—
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	Yes	No	No	No
Maximum no. of hosts supported simultaneously	4	—	—	—
Maximum no. of hosts channel-attachable to front-end	4	—	—	—
Maximum no. stations pollable per line or system	32	—	—	—
As a remote concentrator	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	256	64	64	16
Maximum no. of hosts served by one concentrator	256	64	—	4
Maximum no. of stations pollable on one line	1000	1000	1000	Response-dependent
As a free-standing communications processor	Yes	Yes	Yes	No
Network Architecture compliance	Norfield	Norfield	Norfield	—
Full-capacity data base system	Norfield	Norfield	Norfield	—
Operating system	Norfield	Norfield	Norfield	—
As a store-and-forward message switching processor	Yes	Yes	No	No
Communications line capacity				
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	128	128	64	16
2000 to 9600 bps	64	64	32	16
Over 9600 bps	32	32	16	Future
Highest line speed supported, bits per second	230.4K	56K	19.2K	9600
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	Capacity halved over 4800 bps
Estimated processor throughput, chars./sec.	50K	—	—	2400
Terminal protocols supported:				
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes
IBM BSC	Yes	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes
IBM SDLC	Yes	No	Yes	Future
X.25—Packet level	Yes	No	Yes	No
Other	83B, 8A1, 117B, OCR, 2260, 2780, 3270	Telex, TWX, Free Wheeling Async. Infomaster	Telex, Dataspeed 40/2 & 40/3, 2780, Free Wheeling Async.	RESERVEC 11, IPARS, U100/U200
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Programmable by user	No	No	No	No
Main memory cycle time, usec.	0.4	0.4	0.4	0.5
Main memory word size, bits	16	16	16	8
Main memory storage capacity, words or bytes	256K bytes	128K bytes	64K bytes	32K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Mass Storage	Interrupt	DMA, interrupt	DMA, interrupt	—
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Back-up and diagnostic peripherals supported	Disk, mag. tape	Disk, mag. tape	Disk, mag. tape	—
Communications operating software:				
Availability	Included in price	Included in price	Included in price	Separately priced
Generated by	Comm. processor	Comm. processor	—	Comm. processor
Additional software supported	Electronic mail	—	SMDR, CLM, CLR, OE, PO	To customer requirement
Turnkey systems available	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$95,000 to $500,000	$60,000 to $125,000	$40,000 to $75,000	$15,000 to $20,000
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	Contact vendor	—
Communications operating software—one-time charge	—	—	—	Contact vendor
Communications operating software—monthly charge	—	—	—	—
Date of first delivery	3/75	3/75	6/76	9/76
Number installed to date	40	40	6	200
Serviced by	TRT/Norfield	TRT/Norfield	TRT/Norfield	User or third party
COMMENTS	Multi-node processor systems available. Norfield Communications is a division of TRT Data Products, a United Brands company	Multi-node processor systems available. Norfield Communications is a division of TRT Data Products, a United Brands company	Norfield Communications is a division of TRT Data Products, a United Brands company	Unit is modular, uses 3 micro-processors, and is the basis of custom-designed special systems

Communications Processors—Basic Characteristics

A catalogue of the most commonly used communications processors along with their basic characteristics is presented on the following pages. Insomuch as an increasing number of minicomputer systems are being utilized as distributed processing modules within larger networks, a comprehensive section on commercially available minicomputers has been added to this tab. The minis included have widely varying communications capabilities which are available as either standard or optional features. The minicomputer section offers the system planner a full spectrum of processors which can be configured as remote data processing nodes, connected by communications links to a larger mainframe or network.

A prospective buyer can easily scan the charts to determine the scope of the options available for a given set of requirements. The proper use of the charts will produce a list of vendors and equipment that merit detailed study. It is only from a detailed study of the equipment that an advantageous price/performance selection can be made for a given systems requirement. It would be a misuse of the charts to eliminate a processor from consideration on the basis of comparing characteristics finely without checking to see if the architecture possesses a feature that overcomes a seemingly small disadvantage.

To have been included in the charts, a processor must have had appropriate hardware and software to function either as a front-end processor, as a remote concentrator, or as a freestanding communications processor.

A comparison of 89 communications processors from 36 vendors, whose names, addresses and telephone numbers are also provided.

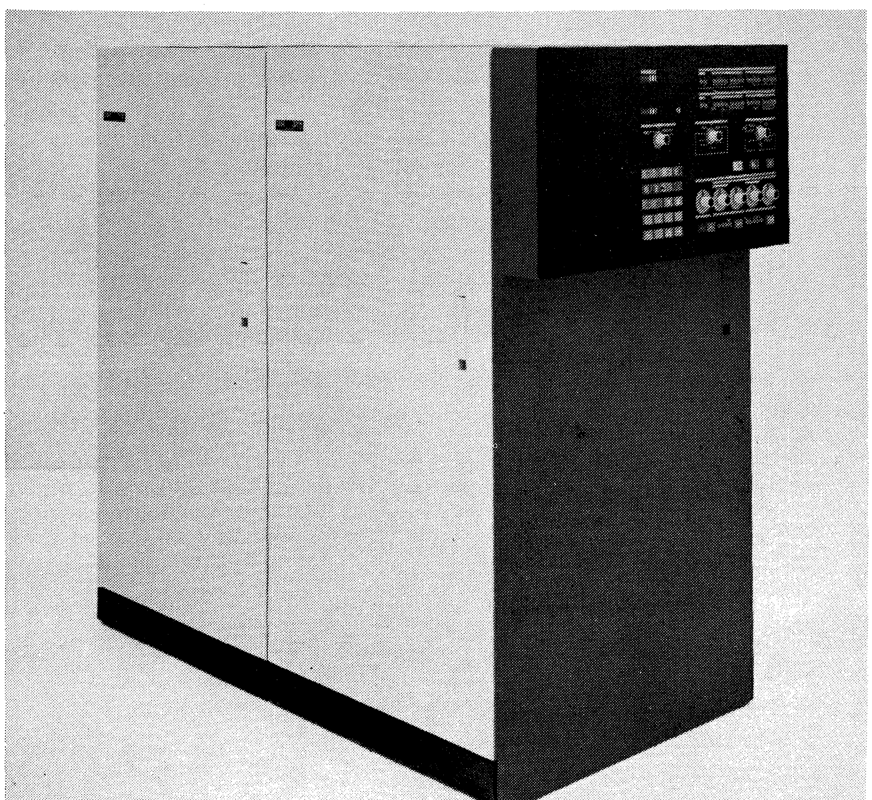
A discussion of the comparative characteristics of communications processors and an explanation of the accompanying charts is included.

For an in-depth analysis on the evolution and use of communications processors, a detailed look at front-end processors, and a presentation of users' ratings and usage patterns, see Report C09-013-101 behind the Management/System Guides tab in this volume.

All of the actively marketed equipment known to Datapro that satisfies the qualifying criteria is represented. Any omission is because the product is no longer marketed or is unknown to us.

Processors designed to perform only message switching of voice grade lines were deemed not to meet the criteria for inclusion. Equipment that vendors stated was no longer being actively marketed was also excluded.

The information presented on each communications processor in the accompanying charts serves not only to describe the basic characteristics of the equipment, but also assists in defining physical and throughput limita-



The IBM 3705 and its little brother, the 3704, are the standard of the industry. Together they accounted for two-thirds of the processor responses in our survey. However, if IBM was slow to move into the area of complex communications systems a few years ago, its customers have been slow to take advantage of the benefits of true front-end processing. Our survey indicated that few of the users were either the 3704 or the 3705 as independent processing units; the great majority were satisfied with emulating the 270X hardwired controllers.

Communications Processors—Basic Characteristics

tions. With one exception, all non-economic characteristics reduce themselves to one consideration: the throughput capabilities of the equipment relative to the specific systems requirements. The exception is where the physical attachment limitations are exceeded before the processing capabilities are fully used.

For example, the number of high speed communications lines that are physically attachable to a processor usually exceeds the throughput capabilities. For that reason, most vendors submitted a smaller value for the number of lines attachable at the higher speeds than the equipment could physically accommodate. The numbers more accurately describe the outer limits of the processor's throughput limitations than the physical limitations. All of the vendors were concerned that readers realize that the line mix and the resource mix could radically alter the number of lines that could be supported, physical port availability notwithstanding. Datapro was most impressed with the responsible attitude universally exhibited, and we are very optimistic that better ways of expressing throughput capabilities will develop between the combined efforts of the suppliers of communications processors and Datapro.

COMMENTS ON THE ENTRIES IN THE ACCOMPANYING CHARTS

Some of the items indicated in the accompanying charts are self-evident; others offer information of a subtle nature. The following discussion highlights some of the subtleties.

Network Arrangements Supported

Most of the equipment displayed herein, when operating as a front-end, is restricted to supporting the host computer systems of specific mainframe manufacturers. However, some vendors include in their product lines front ends that can be customized; such equipment is well represented in the charts. Not included is the myriad of older mainframes that have been fully written-off from an accounting standpoint and, therefore, can be offered at low enough prices to justify tailoring and dedicating the overqualified equipment to function as a front-end

Front a network arrangement standpoint, the number of direct connections a front-end can support to one host and the number of hosts a front-end can support become an important consideration, especially for fallback considerations. Usually, a small number represents a special direct connection. A high number indicates that the connection is via a regular communications line port and does not mean that the vendor is suggesting that so many connections to one or more host is a designed capability.

When the number of pollable stations on one line is "1," the system, as standard, supports only point-to-point terminal arrangements. When the communications processor functions as a remote concentrator, the number of host/concentrator connections is also a consideration from a network standpoint. Again, the number of connections permitted is primarily an indication of whether a special interface or a regular communications line interface is used.

As the data communications industry continues to make strides towards standardization, the network architecture that a free-standing communications processor supports will take on more and more importance. (The architecture of a front-end must conform to the host's architecture.) Underscoring this belief is the fact that two major mainframe manufacturers chose to list only their newest communications processor in the accompanying charts. In both cases, it is the only such item in their product lines that conforms to their new network architectures.

Since the prime purpose in burdening communications lines around the world with data is to either retrieve information or to add to the store of information, the nature of the data base system supported should not be overlooked. Actually it represents the "end" for which one selects a "(communications processor) means". The name of any data base system supported is listed for each communications processor. Of course, a buyer may be already committed to a file maintenance or data base system and not be interested in this type of support.

As would be expected, the tasks performed by each of the operating systems supplied with the hardware will vary. The name of the operating system is noted so that the reader will know what to look for in detailed reports on such software offerings.

Properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 96000 bps, and over 9600 bps. The number of low speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium and high speed lines represent the outer limits of the throughput capabilities. The effect is using full-duplex lines is also indicated.

The terminal protocols supported by the processors are listed. Even though the protocols supported are mostly dependent upon the marketing philosophy of the vendors, the large number of vendors supporting the standardized bit-oriented protocols is an indication of things to come.

Processor Characteristics

The communications processor's internal characteristics give a general "feeling" for the equipment's throughput capabilities. Hard wired equipment and some programmable processors will receive a "No" to the question: "Is the processor microprogrammable by the manufacturer?" A "yes" means that the processor has firmware, or micro-

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The 3690 shown at left is the latest system from the Comten, a company recently acquired by NCR. Based on new microprogrammable processor architecture, the 3690 is about five times as fast internally as the company's previous models and can service up to four times as many lines. To support the 3690 in the large scale environment it is intended for, Comten has developed the Data Switching System (DSS) software system, which will interface with IBM's SNA architecture. In addition to the now traditional functions of front-ending and remote concentration, DSS also supports data switching, which permits the distribution of processing tasks among nodes in a sophisticated network.

▷ coded stored logic. If the processor is microprogrammable by the user, one can expect the capability for increasing throughput by properly microcoding frequently-used, time-critical functions. If not properly done, the capability could adversely effect the installation. Main memory cycle time, main memory word size and main memory storage capacity offer a very general "feel" for throughput speed possibilities. However, sophisticated internal architecture may enable the processor to be many times faster than another processor to be many times faster than another processor with the same cycle time and word size. That is another reason why we emphasize that a detailed analysis is necessary, once the initial selection is made from the charts.

The manner of data transfer between memory and communications lines, memory and mass storage, and memory and other supported peripherals becomes critical as volume requirements rise and/or response times are reduced. For high speed, high volume transmissions, Direct Memory Access transfers instead of character interrupt transfers become mandatory for reasonable throughput rates.

The "Turnkey systems" entry informs potential users whether or not the vendor is willing to provide a complete system, incluing all applications software.

Pricing and Availability

The prices depicted in the charts represent a range of typical configurations. The magnitude of the dollars gives a ball-park indication of the expansion capabilities of the equipment and should not be used to determine price/performance. Only a detailed price for a configuration satisfying specific requirements would give such an indication.

The absence of an entry for the monthly rental price indicates that the vendor offers his equipment on a chase only basis.

The charge for the processor's communications operating software is given, when separately priced.

The date of first delivery is the date of the first production delivery.

With 89 communications processors to choose from, there should be an offering for every need, whether the network is a fully distributed network or a classic master/slave network.

Suppliers of Communications Processors

Listed below for your convience in obtaining additional information are the full names and addresses of the 36

Communications Processors—Basic Characteristics

suppliers whose 89 products are summarized in the following charts.

Action Communications Systems, Inc., 4401 Beltwood Parkway South, Dallas, Texas 75234. Telephone (214) 386-3500.

ASI Teleprocessing Inc. (formerly American Systems, Inc.), 101 Morse Street, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Austron, Inc., 1915 Kramer Lane, Austin, Texas 78758. Telephone (512) 386-3523.

Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4200.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Chi Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

Computer Automation, Inc., 2181 Dupont Drive, Irvine, California 92713. Telephone (714) 833-8830.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

Comten, 1950 W. County Road, B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

Control Data Corporation, 8100 34th Avenue South, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Data General Corporation, Route 9, Westboro, Massachusetts 01581. Telephone (617) 366-8911.

Digital Communications Associates, Inc., 135 Technology Park/Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp., 19 Firstfield Road, Gaithersburg, Maryland 20760. Telephone (301) 948-0850.

Digital Equipment Corporation, 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

Digital Systems Corp., 3 Main Street, Walkersville, Maryland 21793. Telephone (301) 845-4141.

Hewlett-Packard Company, 11000 Wolfe Road, Cupertino, California, 95014. Telephone (301) 257-7000.

Honeywell Information Systems, 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

IBM Corporation, General Systems Division, 5775 Glenridge Drive N.E., Atlanta, Georgia 30301. Telephone (404) 238-3000.

Memorex Corporation, Communications Group, 18922 Forge Drive, Cupertino, California 95014. Telephone (408) 996-9000.

Modular Computer Systems, 1650 W. McNab Road, Fort Lauderdale, Florida 33310. Telephone (305) 974-1380.

NCR Corporation, Main & K Streets, Dayton, Ohio 45479. Telephone (513) 449-2000.

NCR Corp., Data Pathing, Inc., 370 San Aleso Avenue, Sunnyvale, California 94086. Telephone (408) 734-0100.

Norfield Electronics, Inc. 3 Depot Place, East Norwalk, Connecticut 06855. Telephone (203) 853-2777.

North American Philips Corp., 91 McKee Drive, Mahwah, New Jersey 07430. Telephone (201) 529-3800.

Omnus Computer Corp., c/o Centennial Systems, 4350 East-West Highway, Suite 1103, Bethesda, Maryland 20014. Telephone (301) 656-4070.

Paradyne Corporation, 8550 Ulmerton Road, Largo, Florida 33540. Telephone (813) 536-4771.

Periphonics Corporation, 75 Orville Drive, Bohemia, New York 11716. Telephone (516) 567-1000.

Perkin-Elmer Corporation, Computer Systems Div., (formerly Interdata), 2 Crescent Place, Oceanport, New Jersey 07757. Telephone (201) 229-6800.

Rockwell-Collins, 1200 North Alma Road, Richardson, Texas 75081. Telephone (214) 996-5000.

Sperry Univac, PO Box 500, Blue Bell, Pennsylvania, 19422. Telephone (215) 542-4011.

Tandem Computers, Inc., 20605 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4800.

Telefile Computer Products Inc., 17131 Daimler Street, Irvine, California 92705. Telephone (714) 557-6660.

Telenet Communications Corp., 1050 17th Street N.W., Washington, DC 20036. Telephone (202) 637-7900.

Texas Instruments, Inc., PO Box 1444, Houston, Texas 77001. Telephone (713) 494-5115.

Westinghouse Canada Ltd., Electronic Systems Division, PO Box 5009, Burlington, Ontario, Canada. Telephone (416) 528-8811.□

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MANUFACTURER AND MODEL	Action Communications Systems TELE-CONTROLLER	ASI Teleprocessing Front-End Nucleus 4000	ASI Teleprocessing Network Node Nucleus 4010	ASI Teleprocessing Retail Teleprocessing Nucleus 4100	Austron 8500
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Most major vendors	IBM, NCR, DEC, Data General, Burroughs	IBM, NDR, DEC, Data General, Burroughs	IBM, NCR, DEC, Data General, Burr., or stand-alone	IBM System 360/370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	1	256	256	256	255
Maximum no. of hosts attachable to front-end	1	256	256	256	1
Maximum no. of stations pollable on one line	32	256	256	256	127
As a remote concentrator	Yes	Yes	Yes	Yes	No
Maximum no. of remote connections to one host	1	256	256	256	—
Maximum no. of hosts served by one concentrator	1	256	256	256	—
Maximum no. of stations pollable on one line	32	256	256	256	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	No
Network Architecture compliance	No	ASI-NCP	ASI-NCP	ASI-NCP	—
Full-capability data base system	No	—	—	—	—
Operating system	Included	ASI-DOS	ASI-DOS	ASI-DOS	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	128	128	128	25
2000 to 9600 bps	64	24 to 64	24 to 64	24 to 64	16
Over 9600 bps	—	4 to 24	4 to 24	4 to 24	8
Effect on-line capacity, if all lines are full-duplex	None	20% reduction	20% reduction	20% reduction	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	Yes	No
IBM SDLC	No	—	—	—	No
Other	TWX/Telex	NCR, Sweda, TI, MDS, TWX, others	NCR, Sweda, TI, MDS, TWX, others	NCR, Sweda, TI, MDS, TWX others	Various polling disciplines
PROCESSOR CHARACTERISTICS		(DEC PDP 11)	(DEC PDP 11)	(DEC PDP 11)	
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	No	Optional
Main memory cycle time, usec.	1.2/0.8	1	1	1	0.75
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	65K words	256K bytes	256K bytes	256K bytes	64K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	DMA	DMA	—
Other peripherals	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA interrupt
Communications operating software	Included	Bundled (licen.)	Bundled (licen.)	Bundled (licen.)	Included in price
Additional software supported	None	Support for various terminals & hosts	Support for various terminals & hosts	Support for various terminals & hosts	Diagnostic and test routines
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$90,000 to $250,000	$70,000 to $150,000	$50,000 to $130,000	$75,000 to $150,000	$30,000 to $80,000
Monthly rental (2-yr. lease, including maint., range)	—	$2,000	$1,500	$2,000	$1,100 to $3,000
Communications operating software—one-time charge	—	Bundled	Bundled	Bundled	—
Communications operating software—monthly charge	—	Bundled	Bundled	Bundled	—
Date of first delivery	1971	February 1975	February 1976	February 1976	1975
Number installed to date	78	NA	NA	NA	NA
Serviced by	Sorbus	ASI/DEC subcontract	ASI/DEC subcontract	ASI/DEC subcontract	Austron & third party
COMMENTS	TELECONTROLLER is a store and forward message switching system with front-end capability	Can serve as front-end to ASI Braille Translation or Text Editing System	Includes packet switching soft ware	Data Collection Polling System & Credit Authorization	Main market is emulating IBM local device interface to host for remote devices

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MANUFACTURER AND MODEL	Braegen Corp B40 Terminal Controller	Burroughs B 866	Burroughs B 874	Burroughs B 876	Chi Communications 732
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, 303X and compatible	All Burroughs, IBM System 360/370	Burroughs	All Burroughs, IBM System 360/370	UNIVAC 1100 Series
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	No	Yes
Maximum no. of direct connections to one host	7	—	2	—	8
Maximum no. of hosts attachable to front-end	7	—	2	—	8
Maximum no. of stations pollable on one line	32	—	100	—	Terminal dependent
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	16	7	32	32	Unlimited
Maximum no. of hosts served by one concentrator	16	7	32	32	Unlimited
Maximum no. of stations pollable on one line	32	100	100	100	Terminal depen.
As a free-standing communications processor	Yes	Yes	Yes	Yes	No
Network Architecture compliance	—	Burroughs BNA	Burroughs BNA	Burroughs BNA	—
Full-capability data base system	Braegen TSO	No	No	No	—
Operating system	Braegen OS	MCP	MCS	MCP	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds.					
Up to 1800 bps	16	7	32	32	100
2000 to 9600 bps	16	7	32	32	64
Over 9600 bps	16	2	4	4	32
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	No	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	Yes	Future
IBM SDLC	Yes	Yes	No	Yes	Future
Other	Braegen FDLC	—	—	—	REM1/UNIVAC
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.6	1	1	1	0.75
Main memory word size, bits	8	16	16	16	32
Main memory storage capacity, words or bytes	256K bytes	114K bytes	96K bytes	147K bytes	1M byte
Data transfer between memory and:	DMA, interrupt	DMA	DMA	DMA	DMA, interrupt
Communications lines	DMA, interrupt	DMA	DMA	DMA	Interrupt
Mass storage	DMA, interrupt	Interrupt	Interrupt	Interrupt	Interrupt
Other peripherals					
Communications operating software	Sep. priced	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Braegen TSO, 3270/3780 emul.	COBOL, RPG, MPL, PSL, GEMCOS	—	COBOL, RPG, MPL, PSL, GEMCOS	Yes
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$10,000 to $100,000	$33,000	$30,000 and up	$75,000	$50,000 to $300,000
Monthly rental (2-yr. lease, including maint., range)	$350 to $3,000	$1,000 up	$1,000 and up	$2,300 up	—
Communications operating software—one-time charge	—	—	$2,250	—	—
Communications operating software—monthly charge	$45 to $90	$25	$200	$25	—
Date of first delivery	1974	August 1977	1977	August 1977	August 1972
Number installed to date	70-80	NA	NA	NA	NA
Serviced by	Braegen Corp.	Burroughs	Burroughs	Burroughs	Chi Communications
COMMENTS		Network Definition Language is separately priced	Network Definition Language is separately priced	Network Definition Language is separately priced	

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MANUFACTURER AND MODEL	Computer Automation Inc. SyFA	Computer Automation Inc. LSI-2, 3, 4	Computer Communications Inc. CC-8	Computer Communications Inc. CC-80	Computer Communications Inc. CC-85
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370, ICL, or X.25-compatible	Application dependent	IBM 360/370 and compatible	IBM 360/370 and compatible	IBM 360/370 and compatible
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	32	4	7	7
Maximum no. of hosts attachable to front-end	—	32	4	7	7
Maximum no. of stations pollable on one line	—	128	Device dependent	Device dependent	Device dependent
As a remote concentrator	Yes	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	32	32	—	8	8
Maximum no. of hosts served by one concentrator	Applic. Depend.	32	—	105	105
Maximum no. of stations pollable on one line	Applic. Depend.	128	—	Device dependent	Device dependent
As a free-standing communications processor	Yes	No	No	No	No
Network Architecture compliance	SNA, X.25	—	—	—	—
Full-capability data base system	SyCLOPS	—	—	—	—
Operating system	SyCLOPS	—	—	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	34	32	240	864	1,112
2000 to 9600 bps	34	32	240	864	1,112
Over 9600 bps	Varies	Application dependent	Varies	Varies	Varies
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	No	Yes	Yes
IBM SDLC	Yes	Yes	No	Yes	Yes
Other	X.25	User writeable	Custom, X.25	Custom, X.25, SABRE	Custom, X.25 SABRE
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	Yes	No	No	No
Main memory cycle time, usec.	0.35	—	0.54	0.54	0.27
Main memory word size, bits	8	8	16	16	16
Main memory storage capacity, words or bytes	304K bytes	16K bytes	64K bytes	512K bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Communications operating software	Sep. priced	Sep. priced	Incl. in price	Incl. in price	Incl. in price
Additional software supported	SyBOL, SyMPLE, Panel Manager	—	—	Distributed Networking	Distributed Networking
Turnkey Systems	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$29,000 up	$30,000 and up	$40,000 to $200,000	$85,000 to $500,000	$120,000 to $600,000
Monthly rental (2-yr. lease, including maint., range)	—	—	$800 up (3 yr.)	$1,400 up (3 yr.)	$2,000 up (3 yr.)
Communications operating software—one-time charge	$2,000	Contact vendor	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	May 1976	Fall 1977	June 1975	May 1975	January 1979
Number installed to date	350	—	50	120	3
Serviced by	Computer Automation	Various service companies	CCI	CCI	CCI
COMMENTS	Multifunction interactive distributed network system		CC-8 Features enhanced 270X/370X emulation	CC-80 is independent front end and network controller/concentrator	CC-85 doubles throughput of CC-80 for front-ending and networking

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MANUFACTURER AND MODEL	Computer Communications Inc. CC-8000	COMTEN, Inc. COMTEN 20	COMTEN, Inc. COMTEN 476	COMTEN, Inc. COMTEN 3650 II	COMTEN, Inc. COMTEN 3670 II
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370 and compatible	Custom	IBM 360/370, custom	IBM 360/370, Amdahl, CDC Omega, Itel, custom	IBM 360/370, Amdahl, CDC Omega, Itel, custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	Yes	Yes
Maximum no. of direct connections to one host	7	—	4	2	4
Maximum no. of hosts attachable to front-end	7	—	4	2	4
Maximum no. of stations pollable on one line	Device dependent	—	4096	4096	4096
As a remote concentrator	No	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	—	2	—	2	4
Maximum no. of hosts served by one concentrator	—	Unlimited	—	Unlimited	Unlimited
Maximum no. of stations pollable on one line	—	4096	—	4096	4096
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	NCS	INFONET	CNA	SNA, CNA	SNA, CNA
Full-capability data base system	Included	Via INFONET	—	—	—
Operating system	NCS-MS	Proprietary	CTAM	DSS, COS	DSS, COS
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	240	128	240	128	384
2000 to 9600 bps	240	128	240	128	322
Over 9600 bps	Varies	64	80	80	80
Effect on line capacity, if all lines are full-duplex	None	No effect	No effect	No effect	No effect
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	Yes	Yes
IBM SDLC	No	No	Yes	Yes	Yes
Other	Custom, SABRE	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	No	No	No
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.54	0.75	0.75	0.65	0.65
Main memory word size, bits	16	16	32	16	16
Main memory storage capacity, words or bytes	512K bytes	128K bytes	512K bytes	512K bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA interrupt	DMA	DMA	DMA	DMA
Mass storage	DMA, interrupt	DMA	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA	DMA	DMA	DMA
Communications operating software	Incl. in price	NA	Included	Included	Included
Additional software supported	Message Switching	Full range via INFONET	CODEL	Data Switching System (DSS)	Data Switching System (DSS)
Turnkey Systems	Yes	No	Yes	Yes	Yes
PRICING AND AVAILABILITY Purchase price (system range)	$250,000 up	$60,000 up $120,000	$150,000 to $500,000	$40,000 to $120,000	$80,000 to $320,000
Monthly rental (2-yr. lease, including maint., range)	$6,000 up (3 yr.)	NA	NA	$1,000 to $3,000	$2,000 to $8,000
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	See Comments	See Comments
Date of first delivery	July 1976	March 1971	Sept. 1975	March 1975	March 1972
Number installed to date	15	Over 60	Over 60	Over 600	Over 300
Serviced by	CCI	Computer Sciences Corp.	COMTEN	COMTEN	COMTEN
COMMENTS	Message Switching software is custom and is separately priced			Software bundled except for DSS package	Software bundled except for DSS package
		In February 1979, COMTEN was acquired by NCR Corporation			

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MANUFACTURER AND MODEL	COMTEN, Inc. COMTEN 3690	Control Data Corp. CYBER 1000 (PMX)	Control Data Corp. CYBER 1000 (DNS)	Control Data Corp. 2551-1	Control Data Corp. 2551-2
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360, 370, ~~Amdahl~~, CDC Omega, Itel, custom	IBM 360/370, Univac 1108, Sigma 5	CDC CYBER, IBM 370, Univac 1100 Series	CDC 6000; CYBER 70, 170; 3000L Series	CDC 6000; CYBER 70,170 Series
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	8	1	1	2	2
Maximum no. of hosts attachable to front-end	8	2	4	2	2
Maximum no. of stations pollable on one line	4096	Protocol dependent	Protocol dependent	Protocol dependent	Protocol dependent
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	8	—	2	1	1
Maximum no. of hosts served by one concentrator	Unlimited	—	Unlimited	Up to 8	Up to 8
Maximum no. of stations pollable on one line	4096	—	Protocol dependent	Protocol dependent	Protocol dependent
As a free-standing communications processor	Yes	Yes	Yes	No	No
Network Architecture compliance	SNA, CNA	PMX	DNS	—	—
Full-capability data base system	—	No	No	—	—
Operating system	DSS, COS, CTAM	PMX	DNS	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	512	128	128	32	254
2000 to 9600 bps	512	128	128	32	254
Over 9600 bps	277	32	32	4 @ 19.2K; 2 @ 56K	4 @ 19.2K; 2 @ 56K
Effect on line capacity, if all lines are full-duplex	No effect	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes	Yes
IBM SDLC	Yes	No	No	No	No
Other	—	HASP M/L; Mode 4A, 4C; CDCCP	CDCCP, ISO 1745, ATT, CDT	HASP M/L; Mode 4A, 4C; X.25	HASP M/L; Mode 4A, 4C; X.25
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	No	Yes	Yes
Microprogrammable by user	No	No	No	Yes	Yes
Main memory cycle time, usec.	0.52	1.2	1.2	0.55	0.55
Main memory word size, bits	64	27	27	18	18
Main memory storage capacity, words or bytes	4096K bytes	768K bytes	768K bytes	262K bytes	262K bytes
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	DMA	—	—
Other peripherals	DMA	DMA	DMA	DMA, interrupt	DMA, interrupt
Communications operating software	Included	Sep. priced	Sep. priced	Sep. priced	Sep. priced
Additional software supported	Data Switching System (DSS)	FORTRAN IV, assembler, utilities	FORTRAN IV, assembler, utilities	PASCAL, cross-compilers, network products	PASCAL, cross-compilers, network products
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$120,000 to $500,000	$450,000 to $900,000	$250,000 to $550,000	$49,000 to $74,000	$59,000 to $190,000
Monthly rental (2-yr. lease, including maint., range)	$3,000 to $12,000	$13,500 to $24,500 (3 yr.)	$6,300 to $16,000 (3 yr.)	$1,650 to $2,300 (3 yr.)	$2,000 to $8,500 (3 yr.)
Communications operating software—one-time charge	—	$34,100	$27,520	$3,940	$3,940
Communications operating software—monthly charge	See Comments	$730+2,450 OTC	$590+1,960 OTC	$120+570 OTC	$120+570 OTC
Date of first delivery	June 1978	June 1973	October 1975	June 1975	June 1975
Number installed to date	Over 40	42	20	55	195
Serviced by	COMTEN	Control Data Corporation	Control Data Corporation	Control Data Corporation	Control Data Corporation
COMMENTS	Software bundled except for DSS package. See note on previous page	Protected Message Exchange (PMX) system includes multiprocessor interconnects, recovery, and load sharing	Distributed Network System (DNS) provides full network arcchitecture	Conforms with DNS network architecture	Features two processors; conforms with DNS network architecture

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Data General ECLIPSE S-130	Data General NOVA 4	Data General microNOVA	Data General DCU 50	Data General DCU 200
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, Data General, custom	IBM 360/370, Data General, custom	IBM 360/370, Data General, custom	Data General Nova, Eclipse	Data General Nova, Eclipse
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	Yes	Yes
Maximum no. of direct connections to one host	Multiple	Multiple	—	1	1
Maximum no. of hosts attachable to front-end	Multiple	Multiple	—	1	1
Maximum no. of stations pollable on one line	Device dependent	Device dependent	—	Device Dependent	Device Dependent
As a remote concentrator	Yes	Yes	Yes	No	No
Maximum no. of remote connections to one host	Multiple	Multiple	Multiple	—	—
Maximum no. of hosts served by one concentrator	Multiple	Multiple	Multiple	—	—
Maximum no. of stations pollable on one line	Device dependent	Device dependent	Device dependent	—	—
As a free-standing communications processor	Yes	Yes	Yes	No	No
Network Architecture compliance	Bisync/SDLC	Bisync/SDLC	Bisync	—	—
Full-capability data base system	INFOS	—	—	—	—
Operating system	AOS, RDOS	RDOS	DOS (diskette)	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	32	16	128	128
2000 to 9600 bps	32	16	4	64	64
Over 9600 bps	16	8	1	32	32
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	Yes	Yes
IBM SDLC	Yes	Yes	No	Yes	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	0.5-0.8	0.4	0.96	0.3	0.4
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	256K bytes	256K bytes	32K bytes	2K bytes	8K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	Interrupt	Interrupt	Interrupt
Mass storage	DMA	DMA	DMA	—	—
Other peripherals	DMA, interrupt	DMA, interrupt	Interrupt	—	—
Communications operating software	Incl. in price	Incl. in price	Sep. priced	Incl. in price	Incl. in price
Additional software supported	HASP Workstation, IBM 3270, 2780, 3780	HASP Workstation, IBM 3270, 2780, 3780	IBM 2780, 3780, 3270	IBM 2780, 3780, 3270, HASP	IBM 2780, 3780, 3270, HASP
Turnkey Systems	No	No	No	No	No
PRICING AND AVAILABILITY					
Purchase price (system range)	$11,500 to over $100,000	$2,500 to $50,000	$2,500 to $15,000	$3,000	$3,900
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	—
Communications operating software—one-time charge	—	—	Contact vendor	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	March 1975	1975	January 1977	September 1975	October 1978
Number installed to date	NA	NA	NA	NA	NA
Serviced by	Data General	Data General	Data General	Data General	Data General
COMMENTS					

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Digital Communications Assoc. 115 Network Processor	Digital Communications Assoc. 130 Network Processor	Digital Communications Assoc. 150 Network Processor	Digital Communications Assoc. 205/11 Host Interface	Digital Communications Assoc. 250/10 Network Processor
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Virtually all manufacturers	Virtually all manufacturers	Virtually all manufacturers	DEC	DEC
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	No	No	Yes	Yes
Maximum no. of direct connections to one host	—	—	—	128	128
Maximum no. of hosts attachable to front-end	—	—	—	1	3
Maximum no. of stations pollable on one line	—	—	—	—	—
As a remote concentrator	Yes	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	32	63	128	—	128
Maximum no. of hosts served by one concentrator	32	32	32	—	32
Maximum no. of stations pollable on one line	Varies	Varies	Varies	—	Varies
As a free-standing communications processor	Yes	No	Yes	No	Yes
Network Architecture compliance	INA	—	INA	—	INA
Full-capability data base system	—	—	—	—	—
Operating system	Proprietary	–	Proprietary	—	Proprietary
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	63 async	128	See comments	128
2000 to 9600 bps	12	24 async	24		24
Over 9600 bps	—	—	—		—
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	No	Yes	No	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	No	No	No	No
Other	IBM 2741/ 3767	IBM 2741/ 3767	IBM 2741/ 3767	—	IBM 2741/ 3767
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	Yes	Yes	No	Yes
Main memory cycle time, usec.	0.45	1.5	1.5	0.45	1.5
Main memory word size, bits	8	12	12	8	12
Main memory storage capacity, words or bytes	16K bytes	8K words	32K words	17K bytes	32K words
Data transfer between memory and:					
Communications lines	Interrupt	Interrupt	Interrupt	Interrupt	Interrupt
Mass storage	—	—	Interrupt	—	Interrupt
Other peripherals	—	Interrupt	Interrupt	DMA	Interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	—	—	DEC OS/8	—	DEC OS/8
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$1,900 to $8,100	$5,900 up	$9,900 up	$9,000	$17,900
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	August 1978	June 1975	June 1974	January 1979	July 1973
Number installed to date	100	—	—	—	—
Serviced by	DCA	DCA/DEC	DCA/DEC	DCA	DCA/DEC
COMMENTS	Full line and modem control facilities	Full line and modem control	Supports host selection, port contention. Full line and modem control facilities.	205 is a DEC UNIBUS adapter. Requires use with DCA 115 or 150 for line handling	Supports host selection, port contention. Full line and modem control facilities

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Digital Communications Corp. CP-9000	Digital Communications Corp. CM 9100	Digital Equipment Corp. PDP-11 with DECNET	Digital Systems Corp. Model 6101	Digital Systems Corp. Model 6116
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	DEC PDP-11 Series, Prime, HP 21 MX	DEC PDP-11 Series	DEC	IBM System/3 Model 8, 10, 12	IBM System/3, Burroughs B 1726, DSC Galaxy/5
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	No	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	—	Varies	1	16
Maximum no. of hosts attachable to front-end	—	—	Varies	1	1
Maximum no. of stations pollable on one line	—	—	Terminal dependent	10	32
As a remote concentrator	Yes	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	Unrestricted	2 (1 Backup)	Varies	—	Variable
Maximum no. of hosts served by one concentrator	Unrestricted	1	Varies	—	1
Maximum no. of stations pollable on one line	Unrestricted	Unrestricted	Terminal dependent	—	32
As a free-standing communications processor	Yes	No	Yes	No	No
Network Architecture compliance	Custom	—	DNA	—	—
Full-capability data base system	No	—	DMS-11	—	—
Operating system	EX-9000	—	Several support DECNET	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	480	32	Varies	1	15
2000 to 9600 bps	480	32	Varies	1 @ 2400 bps	15
Over 9600 bps	60	1	Varies	—	—
Effect on line capacity, if all lines are full-duplex	None	None	Varies	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	No	No	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	No
IBM SDLC	Yes	Yes	No	No	No
Other	X.25	—	DDCMP	No	No
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	Yes
Microprogrammable by user	Yes	Yes	No	No	Yes
Main memory cycle time, usec.	0.5	0.5	0.45/0.3	—	—
Main memory word size, bits	8	8	16	—	8
Main memory storage capacity, words or bytes	512K bytes	64K bytes	1024K words	—	32K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	Interrupt	DMA, interrupt	—	Interrupt
Mass storage	—	—	DMA, interrupt	—	—
Other peripherals	Interrupt	—	DMA, interrupt	—	--
Communications operating software	Sep. priced	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	LOGOS, Debugger, Assembler	Optional Utilities	—	Special Utility Packages	—
Turnkey Systems	Yes	Yes	No	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	Contact vendor	$32,000 to $125,000	$3,950	$10,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	$150	$325
Communications operating software—one-time charge	Contact vendor	Contact vendor	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	July 1977	August 1979	February 1972	March 1973	April 1977
Number installed to date	Over 150	NA	NA	60	4
Serviced by	DCC	DCC	DEC	Digital Systems	Digital Systems
COMMENTS	Network functions tailored to customer. Supports packet switching. Compatible with CM-9100	Single microprocessor-based configuration. Compatible with CP-9000			

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Digital Systems Corp. Model 1300	Hewlett-Packard HP 1000	Honeywell DATANET 6678	Honeywell DATANET 6632	Honeywell DATANET 6624
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, S/3	Hewlett-Packard M-, E-, and F-series	Honeywell Series 60 Level 66/68	Honeywell Series 60 Level 66/68	Honeywell Series 60 Level 66/68
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	Yes	Yes	Yes
Maximum no. of direct connections to one host	90	—	4	4	4
Maximum no. of hosts attachable to front-end	4	—	1	1	1
Maximum no. of stations pollable on one line	32	—	32	32	32
As a remote concentrator	Yes	No	No	No	No
Maximum no. of remote connections to one host	Variable	—	—	—	—
Maximum no. of hosts served by one concentrator	4	—	—	—	—
Maximum no. of stations pollable on one line	32	—	—	—	—
As a free-standing communications processor	Yes	Yes	No	No	No
Network Architecture compliance	No	DSN	—	—	—
Full-capability data base system	Yes	IMAGE/1000	—	—	—
Operating system	Real time	RTE II, IV, MII, MIII	—	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				380 @ 110 bps 198 @ 300 bps	56 @ 110 bps 49 @ 300 bps
Up to 1800 bps	90	Traffic depen.	96	96	32
2000 to 9600 bps	90	Traffic depen.	96	96	32
Over 9600 bps	—	Traffic depen.	96	96	32
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	Yes	Yes	Yes
IBM SDLC	Yes	No	No	No	No
Other	No	HP 2645A	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	No
Microprogrammable by user	Yes	Yes	No	No	No
Main memory cycle time, usec.	—	0.35/0.595	0.4/0.55	1.2	1.2
Main memory word size, bits	12	16	18	18	18
Main memory storage capacity, words or bytes	64K to 1M byte	2M bytes	512K bytes	256K bytes	64K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA	DMA	DMA
Mass storage	Interrupt	DMA, interrupt	DMA	DMA	DMA
Other peripherals	Interrupt	Interrupt	—	—	—
Communications operating software	Sep. priced	DS/1000 sep. pr.	Incl. in price	Incl. in price	Incl. in price
Additional software supported	RPG II, BASIC, DBMS	FORTRAN IV, HP 1000 Assembler, Basic, DATACAP/1000	Macro assembler	Macro assembler	Macro assembler
Turnkey Systems	Yes	No	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price (system range)	\$38,000 to \$75,000	\$21,000 to \$46,000	\$190,870 to \$366,471	\$124,874 to \$888,394	\$81,780 to \$102,620
Monthly rental (2-yr. lease, including maint., range)	—	—	\$4,711 to \$9,502	\$2,893 \$24,248	\$1,896 to \$2,418
Communications operating software—one-time charge	\$4,000	\$2,500	—	—	—
Communications operating software—monthly charge	\$100	—	—	—	—
Date of first delivery	October 1976	August 1973	October 1977	September 1974	July 1974
Number installed to date	20	1260	NA	NA	NA
Serviced by	Digital Systems, General Electric	Hewlett-Packard	Honeywell	Honeywell	Honeywell
COMMENTS		Distributed Systems Communications package permits resource sharing on network. User-definable network topology	Operating software is Network Processing Supervisor, GRTS, GRT II, and MCS	Operating software is Network Processing Supervisor, GRTS, GRT II, and MCS	Operating software is Network Processing Supervisor, GRTS, GRTS II, and MCS. Functionally upgradeable to 6632

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Honeywell DATANET 6616	Honeywell DATANET 355	IBM-DPD 3705-II	IBM-DPD 3704	IBM-DPD 270X
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	Honeywell Series 60 Level 66	Honeywell Series 6000, 600	IBM System/ 360, 370	IBM System/ 360, 370	IBM System/ 360, 370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Partial
Maximum no. of direct connections to one host	4	4	4	1	1
Maximum no. of hosts attachable to front-end	1	1	4	1	1
Maximum no. of stations pollable on one line	32	32	Device dependent	Device dependent	Device dependent
As a remote concentrator	No	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	—	1	1	—
Maximum no. of hosts served by one concentrator	—	—	1	1	—
Maximum no. of stations pollable on one line	—	—	Device dependent	Device dependent	—
As a free-standing communications processor	No	No	No	No	No
Network Architecture compliance	—	—	—	—	—
Full-capability data base system	—	—	—	—	—
Operating system	—	—	—	—	—
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	8	96	352	32	176
2000 to 9600 bps	8	96	352	32	24
Over 9600 bps	8	96	32	32	—
Effect on line capacity, if all lines are full-duplex	None	None	Capacity halved	Capacity halved	NA
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	No
IBM SDLC	No	No	Yes	Yes	No
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	Yes	No	No
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	1.2	1.0	1.0	—	—
Main memory word size, bits	18	18	18	—	—
Main memory storage capacity, words or bytes	48K bytes	256K bytes	512K bytes	64K bytes	—
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA	Interrupt	Interrupt
Mass storage	DMA	DMA	DMA	—	—
Other peripherals	—	DMA	DMA	—	—
Communications operating software	Incl. price	Incl. in price	Sep. priced	Sep. priced	—
Additional software supported	Macro assembler	Macro assembler	—	—	—
Turnkey Systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price (system range)	$46,800 to $78,800	$146,400 to $1.075M	$40,000 to $137,000	$22,100 to $27,350	$12,400 to $84,200
Monthly rental (2-yr. lease, including maint., range)	$1,166 $2,018	$3,638 to $30,595	$1,300 to $4,000	$750 to $2,500	$308 to $1,800
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	$100	Option depen.	—
Date of first delivery	Sept. 1976	November 1970	August 1976	May 1973	1965
Number installed to date	NA	NA	NA	NA	NA
Serviced by	Honeywell	Honeywell	IBM	IBM	IBM
COMMENTS	Operating software is General Remote Terminal System (GRTS, GRTS II). Functionally upgradeable to 6624 or 6632	Operating software is Network Processing Supervisor. GRTS, GRTS II and MCS			

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	IBM-GSD Series 1	MEMOREX 1270	MEMOREX 1380	Modular Computer Systems Modcomp II/CP2	Modular Computer Systems Modcomp IV/CP
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM System/370	IBM 360/370, 303X and compatible	IBM 360/370, 303X and compatible	IBM 360/370; CDC 3000/ 6000, CYBER; custom	IBM 360/370; CDC 3000/ 6000, CYBER; custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	Varies	2	4	4	4
Maximum no. of hosts attachable to front-end	Varies	2	8 (4 at a time)	4	4
Maximum no. of stations pollable on one line	Device dependent	Unrestricted	Unrestricted	Device dependent	Device dependent
As a remote concentrator	Yes	No	No	Yes	Yes
Maximum no. of remote connections to one host	Unrestricted	—	—	64	64
Maximum no. of hosts served by one concentrator	Unrestricted	—	—	Applic. depend.	Applic. depend.
Maximum no. of stations pollable on one line	Unrestricted	—	—	Device dependent	Device dependent
As a free-standing communications processor	Yes	No	No	Yes	Yes
Network Architecture compliance	SNA	—	—	—	MAXNET
Full-capability data base system	—	—	—	Future	TOTAL
Operating system	RTPS	—	—	MAXCOM, MAX III	MAX IV
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	96	96	112 to 216	256	256
2000 to 9600 bps	48	37 to 96	64	100-256	100-256
Over 9600 bps	24	36	40	12-48	12-48
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	Planned	Yes	Yes
IBM SDLC	Yes	No	Planned	Yes	Yes
Other	—	SABRE, SITA	—	CDC UT-200, 3270, 3780, Univac 1004	CDC UT-200, 3270, 3780, Univac 1004, HASP workstation
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	See Comments	No	Limited	Limited
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.66-0.88	NA	0.54	0.8-1.0	0.6
Main memory word size, bits	16	NA	16	16	16
Main memory storage capacity, words or bytes	256K bytes	NA	64K	128K bytes	1M byte
Data transfer between memory and:					
Communications lines	DMA	NA	DMA, interrupt	DMA	DMA
Mass storage	DMA	NA	DMA	DMA	DMA
Other peripherals	DMA	NA	NA	DMA	DMA
Communications operating software	Sep. priced	NA	Incl. in price	Incl. in price	Incl. in price
Additional software supported	PL/1, FORTRAN	MASCOT (host-resident diagnostic system)	MASCOT and other host resident utilities	Macro assembler, FORTRAN utilities	Macro assembler, FORTRAN, utilities
Turnkey Systems	No	No	No	No	No
PRICING AND AVAILABILITY					
Purchase price (system range)	$20,000 to $60,000	$28,000 to $130,000	$50,000 to $230,000	$30,500 up	$53,750 up
Monthly rental (2-yr. lease, including maint., range)	—	$750 to $3,500	$1,400 to $6,400	—	—
Communications operating software—one-time charge	$1,200 or	NA	—	—	—
Communications operating software—monthly charge	$20	NA	—	—	—
Date of first delivery	November 1976	1971	1976	March 1973	December 1975
Number installed to date	NA	1800	150	Over 400	Over 200
Serviced by	IBM	Memorex	Memorex	Modular Computer Systems	Modular Computer Systems
COMMENTS	Exact number of medium and high speed lines supported is dependent on message size. Can emulate 3272 controller when host-connected	Available with the 1270 is an intelligent line adapter with ROM-based microprogram	Custom software extensions are available, for a fee, from Memorex Systems Engineering Services		32 bit internal bus and 4 port memory is standard

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Modular Computer Systems Modcomp CLASSIC Series	NCR 621	NCR 721	NCR Data Pathing Systems System 15	NCR Data Pathing Systems System 150
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370, CDC 3000/6000, CYBER, custom	NCR Century and Criterion Series	NCR Century and Criterion Series	Computers of most major manufacturers	Computers of most major manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Partial	Yes	Yes	Yes
Maximum no. of direct connections to one host	4	1	2	1	1
Maximum no. of hosts attachable to front-end	4	2	2	1	1
Maximum no. of stations pollable on one line	Device dependent	Device dependent	Device dependent	10	15
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	64	—	Varies	1	1
Maximum no. of hosts served by one concentrator	Applic. depend.	—	Varies	1	1
Maximum no. of stations pollable on one line	Device dependent	—	Device dependent	10	15
As a free-standing communications processor	Yes	No	Yes	Yes	Yes
Network Architecture compliance	MAXNET	—	NCR DNA	—	Various
Full-capability data base system	TOTAL	—	—	DAF, BDM, RDM	DAF, BDM, RDM
Operating system	MAX IV	—	TOX	DCOS 6	DCOS 6
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	256	254	253	23	31
2000 to 9600 bps	100-256	160	52-253	23	31
Over 9600 bps	12-48	Device dependent	10 @ 56K	—	—
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	Capacity halved	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	No	No
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Future	Yes	No	No
IBM SDLC	Yes	Future	Yes	No	No
Other	CDC UT-200, 3270, 3780, Univac 1004, HASP workstation	NCR DLC	NCR DLC	DPI (BSC)	DPI (BSC)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	Yes	No	No
Microprogrammable by user	No	No	Limited	No	No
Main memory cycle time, usec.	0.125	—	1.2	1.0	1.0
Main memory word size, bits	16/32	—	16	16	16
Main memory storage capacity, words or bytes	2M bytes	—	256K bytes	512K bytes	640K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	Interrupt	DMA	DMA, interrupt	DMA, interrupt
Mass storage	DMA, interrupt	—	DMA	DMA	DMA
Other peripherals	DMA, interrupt	—	DMA	DMA	DMA
Communications operating software	Incl. in price	Incl. in price	Sep. priced	Incl. in price	Incl. in price
Additional software supported	Macro Assembler, FORTRAN, utilities	—	—	Optional or user-programmed, custom tailored	Complete range, plus application package
Turnkey Systems	No	Available	Available	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$30,000 to $130,000	$1,200 and up	$50,000 to $125,000	$28,000 up	$105,000 and up
Monthly rental (2-yr. lease, including maint., range)	—	$200 and up	$1,650 to $4,500	$1,300 (1 yr.)	$2,200
Communications operating software—one-time charge	—	—	$32,500	—	—
Communications operating software—monthly charge	—	—	$150	—	—
Date of first delivery	June 1978	1969	1976	1978	1973
Number installed to date	150	NA	Over 50	1	200
Serviced by	Modular Computer Systems	NCR	NCR	NCR Data Pathing Systems	NCR Data Pathing Systems
COMMENTS		In February 1979, NCR acquired COMTEN, Inc.			

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Norfield Communications DCS 400	Norfield Communications CON/EM Series 10	North American Philips Mark III	North American Philips DS 714/81	North American Philips DS 7
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, Univac, Comten	Most major vendors	Custom	IBM System/ 370, custom	Custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes-RPQ	Yes	Yes
Maximum no. of direct connections to one host	64	8	Unrestricted	Appl. dependent	Appl. dependent
Maximum no. of hosts attachable to front-end	64	8	Unrestricted	Appl. dependent	Appl. dependent
Maximum no. of stations pollable on one line	32	20	Unrestricted	Appl. dependent	Appl. dependent
As a remote concentrator	Yes	Yes	Yes-RPQ	Yes	Yes
Maximum no. of remote connections to one host	64	8	Appl. dependent	Appl. dependent	Appl. dependent
Maximum no. of hosts served by one concentrator	64	8	Appl. dependent	Appl. dependent	Appl. dependent
Maximum no. of stations pollable on one line	32	20	Appl. dependent	Appl. dependent	Appl. dependent
As a free-standing communications processor	Yes	Yes	Yes	Yes	RPQ
Network Architecture compliance	Norfield	No	Philips	Philips	—
Full-capability data base system	Norfield	No	Philips	Philips	—
Operating system	Norfield	Micro (Norfield)	Philips	DACOS	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128	8	Appl. dependent	Appl. dependent	30-64
2000 to 9600 bps	64	8	Appl. dependent	Appl. dependent	8-30
Over 9600 bps	32	—	Appl. dependent	Appl. dependent	8
Effect on line capacity, if all lines are full-duplex	Capacity halved	None	Halved for voice, wide band	Halved for voice, wide band	Halved for voice, wide band
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	RPQ	RPQ	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	RPQ	RPQ	Yes
IBM SDLC	No	Yes	RPQ	RPQ	RPQ
Other	Telex, TWX	Telex, Data Speed 40/2, 40/3	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	Yes	Yes	Yes	No
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.96	0.5	2.0	0.7	1.0
Main memory word size, bits	16	16	36	36	16
Main memory storage capacity, words or bytes	128K bytes	16K bytes	1M byte	4M bytes*	32K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	Programmed
Mass storage	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA
Other peripherals	Interrupt	—	DMA, interrupt	DMA, interrupt	DMA
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Custom designed	—	Special utilities	Special utilities	Special utilities
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$60,000 to $125,000	$1,500 to $7,500	Contact vendor	Contact vendor	Contact vendor
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	March 1975	June 1976	1967	1976	1974
Number installed to date	36	Over 200	Over 80	Over 10	40
Serviced by	Norfield Electronics	Norfield	North American Philips-CSD	North American Philips-CSD	North American Philips-CSD
COMMENTS	Multi-node processor systems avail. Division of Norfield Elec. Inc	Front-end to any communications device; intelligent protocol, speed and code conversion	Generally, installed in custom-tailored configurations	*Up to four processors may be configured together to achieve max main memory. Each has ten times throughput of Mark III	Main application is as multiplexer for Mark III and DS/714 host systems

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Omnus Computer Corporation Omnus-1/CU	Paradyne PIX-II	Periphonics Corporation T-COMM 7	Periphonics Corporation DTC	Perkin-Elmer Interdata 8/32
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Univac 1100 series, 494; others available	IBM 360/370, 303X, and compatible	IBM, NCR, Burroughs, Honeywell	IBM, NCR, Burroughs, Honeywell	IBM 360/370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes; see comm.	Yes	Yes	Yes
Maximum no. of direct connections to one host	8	1	4	4	1
Maximum no. of hosts attachable to front-end	16	1	8	8	2
Maximum no. of stations pollable on one line	256	64 (interrupt)	50	50	—
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	192	1	Variable	Variable	1
Maximum no. of hosts served by one concentrator	192	1	8	2	2
Maximum no. of stations pollable on one line	256	25	50	25	—
As a free-standing communications processor	Yes	No	Yes	Yes	Yes
Network Architecture compliance	Available	—	Yes	Yes	—
Full-capability data base system	Available	—	No	No	—
Operating system	ECES	—	PERI-COMM	PERI-COMM	OS/32MT, ITAM
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	120 (per CPU)	—	45	20	255
2000 to 9600 bps	20-80 (per CPU)	20	10-45	5-20	255
Over 9600 bps	40 (per CPU)	3 (full-duplex)	Special quote	—	40
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	Capacity halved	Halved	Capacity halved
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	RPQ	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes	Yes
IBM SDLC	Available	No	Yes	Yes	Yes
Other	All Univac, IBM 2741, 2780	Paradyne Version SDLC	Audio response (93 line max.)	Audio Response (20 line max.)	Interdata Synchronous Mode
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	Yes
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	0.8	0.5	0.8	0.9	0.75
Main memory word size, bits	16 or 20	16	16	16	32
Main memory storage capacity, words or bytes	1M byte	32K words	2M bytes	56K words	1M bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Mass storage	DMA	—	DMA, interrupt	DMA, interrupt	DMA
Other peripherals	DMA, interrupt	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Sep. priced
Additional software supported	TIP, message switch, store & forward	Special utilities	Data collection, (BANK-FROM-HOME)	—	—
Turnkey Systems	Yes	Yes	Yes	Yes	Available
PRICING AND AVAILABILITY					
Purchase price (system range)	$125,000 to $950,000	$50,000 to $75,000	$70,000 and up	$50,000 and up	$50,000 to $500,000
Monthly rental (2-yr. lease, including maint., range)	$3,500 up	$1,000 up	—	—	—
Communications operating software—one-time charge	—	—	—	—	$7,500
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	August 1974	April 1976	1971	Fall 1977	July 1975
Number installed to date	7	600	Over 200	—	NA
Serviced by	Omnus	Paradyne	Periphonics	Periphonics	Perkin-Elmer
COMMENTS	Line capacities shown are for simultaneously active lines per CPU (8 CPU's max.). Omnus-1/CU is a replacement for Univac C/SP, DCP, and CTMC	PIX permits remote peripherals to access host as if locally attached. Local PIX is byte-channel connected to host. Remote PIX's input to local PIX			Supports RJE applications & Interdata processor-to-processor communications

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Perkin-Elmer Interdata 7/32	Perkin-Elmer Interdata 6/16	Rockwell-Collins C-System	Rockwell-Collins C-900	Sperry Univac Distributed Communications Processor
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370	IBM 360/370	IBM 360/370, Univac 1100 & 490 Series, custom	IBM 360/370, DEC, custom	Univac Series 1100, Series 90
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	1	1	2	Variable	2
Maximum no. of hosts attachable to front-end	2	2	16	Variable	2
Maximum no. of stations pollable on one line	—	—	Variable	Variable	AT&T dependent
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	1	1	Interface depen.	Interface depen.	No limit
Maximum no. of hosts served by one concentrator	2	2	Interface depen.	Interface depen.	No limit
Maximum no. of stations pollable on one line	—	—	Interface depen.	Interface depen.	AT&T dependent
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	—	—	Most	Most	DCA
Full-capability data base system	—	—	Limited	Limited	TELCON (TOT.)
Operating system	OS/32 MT, ITAM	OS/16 MT, ITAM	Comm. & general	Comm. & general	TELCON
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	255	128	1024	256	256
2000 to 9600 bps	255	128	256	20	96
Over 9600 bps	40	20	128	10	32
Effect on line capacity, if all lines are full-duplex	Capacity halved	Capacity halved	None	None	Capacity halved
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	Yes
IBM SDLC	Yes	Yes	Yes	Yes	Yes
Other	Interdata Synchronous Mode	Interdata Synchronous Mode	—	—	REM-1, Uniscope NTR
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	Yes
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.75	1.0	0.9	0.9	0.92
Main memory word size, bits	32	16	32	16	16
Main memory storage capacity, words or bytes	1M bytes	64K bytes	262K bytes	256K bytes	128K bytes
Data transfer between memory and:					
Communications lines	Interrupt	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	DMA	DMA	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA	DMA, interrupt	DMA, interrupt
Communications operating software	Sep. priced	Sep. priced	Incl. in price	Incl. in price	Incl. in price
Additional software supported	—	—	Editor Assembler, Link Editor, etc.	Editor Assembler, Link Editor, etc.	NETGEN-DCP, host-cross assembler, loader, sysgen
Turnkey Systems	Available	Available	Yes	Yes	Optional
PRICING AND AVAILABILITY					
Purchase price (system range)	$15,000 to $1.5M	$2,000 to $25,000	$1M to $2.5M	$350,000 to $950,000	$100,000 to $300,000
Monthly rental (2-yr. lease, including maint., range)	—	—	Contact vendor	Contact vendor	$2,500 to $5,705
Communications operating software—one-time charge	$7,500	$7,500	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	July 1974	Spring 1976	March 1974	January 1975	October 1977
Number installed to date	NA	NA	Over 20	Over 10	NA
Serviced by	Perkin-Elmer	Perkin-Elmer	Rockwell-Collins	Rockwell-Collins	Sperry Univac, Customer Engrg.
COMMENTS	See 8/32	See 8/32			Communications line capacity is dependent on line mix

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Sperry Univac V77-200	Sperry Univac V77-400	Sperry Univac V77-600	Sperry Univac V77-800	Tandem Computers Inc. T16/212, 243, 244
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, Univac, CDC	IBM 360/370, Univac, CDC	IBM 360/370, Univac, CDC	IBM 360/370, Univac, CDC	IBM 360/370, 303X, Burroughs, Xerox Sigma
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Limited to other V77 models	Limited to other V77 models	Limited to other V77 models	Limited to other V77 models	Yes
Maximum no. of direct connections to one host					1024
Maximum no. of hosts attachable to front-end					1024
Maximum no. of stations pollable on one line					256
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Varies	Varies	Varies	Varies	1024
Maximum no. of hosts served by one concentrator	Varies	Varies	Varies	Varies	1024
Maximum no. of stations pollable on one line	Device depen.	Device depen.	Device depen.	Device depen.	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	Univac DCA	Univac DCA	Univac DCA	Univac DCA	Yes
Full-capability data base system	—	PRONTO/TOT.	PRONTO/TOT.	PRONTO/TOTAL	ENSCRIBE
Operating system	VORTEX/VTAM	VORTEX II/ VTAM	VORTEX II/ Summit	VORTEX II/ Summit	GUARDIAN
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	8	8	256	256	2048
2000 to 9600 bps	8	8	256	256	2048
Over 9600 bps	1	—	—	—	2048
Effect on line capacity, if all lines are full-duplex	None	None	None	None	Capacity halved
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Ues	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Planned	Planned	Planned	Planned	Yes
IBM SDLC	Planned	Planned	Planned	Planned	Yes
Other	—	—	—	—	Burroughs Bisync, Ti/NET
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	Yes	Yes	Yes	No
Main memory cycle time, usec.	0.660	0.660	0.660	0.6	0.8/0.5
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	64K bytes	556K bytes	1M bytes	2M bytes	1M words
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA
Mass storage	DMA	DMA	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA
Communications operating software	Sep. priced	Sep. priced	Sep. priced	Sep. priced	Incl. in price
Additional software supported	FORTRAN, RPG-II	COBOL, FORTRAN, RPG-II	COBOL, FORTRAN, RPG-II	COBOL, FORTRAN, RPG-II Special utilities	TAL, COBOL, sort, editor, entry, FORTRAN
Turnkey Systems	No	No	No	No	Optional
PRICING AND AVAILABILITY					
Purchase price (system range)	$35,000 to $60,000	$45,000 to $150,000	$55,000 $300,000	$75,000 to $300,000	$150,000 up
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	Contact vendor
Communications operating software—one-time charge	$3,500	$14,500	$14,500	$14,500	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	December 1976	December 1976	December 1976	July 1979	May 1976
Number installed to date	NA	NA	NA	NA	109
Serviced by	Sperry Univac Minicomp. Opn.	Sperry Univac Minicomp. Opn.	Sperry Univac Minicomp. Opn.	Sperry Univac Minicomp. Opn.	Tandem
COMMENTS	System will emulate popular remote batch terminals such as IBM HASP, CDC 200 UT, and Univac 1004	PRONTO operates either as a stand-alone transaction system or as a distributed data processing/ transaction system, emulating IBM 3270 protocol to an IBM 370		V77 family front-end capability is with multi-processor, shared memory configurations	A single Tandem system may configure up to 16 processors; up to 255 systems can be configured in a single network

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Telefile Computer Products, Inc. FECP-X	TELENET TP 1000	TELENET TP 2200	TELENET TP 4000	Texas Instruments DXS
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Xerox Sigma 5-9	Virtually all manufacturers	Virtually all manufacturers	Virtually all manufacturers	Other network DXS's, and IBM 370X front-ends
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	1	3 or 7	64	272	4
Maximum no. of hosts attachable to front-end	2	3 or 7	64	272	4
Maximum no. of stations pollable on one line	256	—	—	—	16
As a remote concentrator	Yes	Yes	No	Yes	Yes
Maximum no. of remote connections to one host	Soft. dependent	3	—	288	4
Maximum no. of hosts served by one concentrator	Soft. dependent	3	—	288	1
Maximum no. of stations pollable on one line	Soft. dependent	—	—	—	16
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	No	—	—	—	Future (SN2)
Full-capability data base system	No	—	—	—	TINDX
Operating system	TCOS	TPOS	TPOS	TPOS	DXS
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128	4 or 8	72	788	60
2000 to 9600 bps	128	—	36	144	44
Over 9600 bps	128	—	9	36	16
Effect on line capacity, if all lines are full-duplex	Normally none	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	No
IBM BSC	Yes	No	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	No	Yes	No
IBM SDLC	No	No	No	RPQ	Future
Other	—	—	X.25	X.25	DXS Protocol, 2260
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	No	Option
Main memory cycle time, usec.	0.6 to 1.0	0.4	0.4	0.4	0.75
Main memory word size, bits	16	9	9	9	16
Main memory storage capacity, words or bytes	1M bytes	8K bytes	128K bytes	256K bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	—	—	—	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Communications operating software	Normally incl.	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	FORTRAN, sort/merge, etc.	—	—	Optional, RPQ	COBOL, Transaction Language, assembler
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$60,000 and up	$9,500	$20,000 to $275,000	$25,000 to $350,000	$28,000 and up
Monthly rental (2-yr. lease, including maint., range)	—	$500	$1,000 to $13,700	$1,200 to $17,500	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1978	September 1977	September 1977	August 1978	1972
Number installed to date	—	98	71	20	1400
Serviced by	Telefile	Telenet	Telenet	Telenet	Texas Instruments
COMMENTS		Compatible with Telenet Public Data Network.	Compatible with Telenet Public Data Network. Optional hardware redundancy available	Compatible with Telenet Public Data Network. Optional hardware redundancy available	Distributed system with multiple 960B processors, 914A CRT's and 4M bytes mass storage

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Texas Instruments 700 TPS	TRAN Telecommunications Corp. M3200 PACUIT Data Switch	TRAN Telecommunications Corp. M3000 Digital Circuit Switch	Westinghouse Canada Ltd., Electronic Sys. W-1655-1CC
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	TI 700 Series terminals	IBM 360/370, CDC 6600, H 6000, Univac, Xerox	IBM 360/370, CDC 6600, H 6000, PDP 11, Univac, Xerox	—
NETWORK ARRANGEMENTS SUPPORTED				
As a front-end	No	No	No	No
Maximum no. of direct connections to one host	—	—	—	—
Maximum no. of hosts attachable to front-end	—	—	—	—
Maximum no. of stations pollable on one line	—	—	—	—
As a remote concentrator	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	Unlimited	2048	8 (+8 back-up)
Maximum no. of hosts served by one concentrator	—	Up to 128	Up to 32	4
Maximum no. of stations pollable on one line	—	—	—	Response dependent
As a free-standing communications processor	Yes	No	No	No
Network Architecture compliance	—	—	—	—
Full-capability data base system	—	—	—	—
Operating system	PAM/D	—	—	—
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:				
Up to 1800 bps	4	200	550 @ 1200 bps	16
2000 to 9600 bps	4	150	—	16
Over 9600 bps	4	30	—	Future
Effect on line capacity, if all lines are full-duplex	—	None	None	Capacity halved over 4800 bps
Terminal protocols supported:				
ASCII, Async. (Teletype)	No	Yes	Yes	Yes
IBM BSC	No	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	No	Yes
IBM SDLC	No	Yes	No	Future
Other	TI 742	CCITT X.25	—	RESERVEC II, SITA/1024/1040
PROCESSOR CHARACTERISTICS				
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes
Microprogrammable by user	Option	Yes	No	No
Main memory cycle time, usec.	0.75	0.98	0.98	0.5
Main memory word size, bits	16	16	16	8
Main memory storage capacity, words or bytes	48K bytes	320K bytes	32K bytes	32K bytes
Data transfer between memory and:				
Communications lines	DMA, interrupt	—	—	Interrupt
Mass storage	DMA	—	—	—
Other peripherals	DMA, interrupt	—	—	Interrupt
Communications operating software	Incl. in price	Sep. priced	Sep. priced	Sep. priced
Additional software supported	Available	Dial-out resource message	Dial-out resource message	To customer requirement
Turnkey Systems	Yes	No	No	Yes
PRICING AND AVAILABILITY				
Purchase price (system range)	$28,425	$150,000 up	$75,000 to $500,000	$15,000 to $20,000
Monthly rental (2-yr. lease, including maint., range)	$755	$6,500 up	$3,000 up	—
Communications operating software—one-time charge	—	$17,500	$5,000	Contact vendor
Communications operating software—monthly charge	—	$750	$250	—
Date of first delivery	1976	1976	1973	Sept. 1976
Number installed to date	NA	35	11	100
Serviced by	Texas Instruments	TRAN Telecommunications Corp.	TRAN Telecommunications Corp.	User or third party
COMMENTS	Primarily a terminal polling system for TI 700 series terminals	Hybrid circuit-packet data switch system for large-scale multiple switching-node networks	For line concentration and digital switch for async terminals; accessing multiple hosts	Unit is modular, uses 3 microprocessors, and is the basis of custom designed special systems

Communications Processors—Basic Characteristics

A catalogue of the most commonly used communications processors along with their basic characteristics are presented on the following pages.

A prospective buyer can easily scan the charts to determine the scope of the options available for a given set of requirements. The proper use of the charts will produce a list of vendors and equipment that merit detailed study. It is only from a detailed study of the equipment that an advantageous price/performance selection can be made for a given systems requirement. It would be a misuse of the charts to eliminate a processor from consideration on the basis of comparing characteristics finely without checking to see if the architecture possesses a feature that overcomes a seemingly small disadvantage.

To have been included in the charts, a processor must have had appropriate hardware and software to function either as a front-end processor, as a remote concentrator, or as a freestanding communications processor.

All of the actively marketed equipment known to Datapro that satisfies the qualifying criteria is represented, with the exception of one vendor. The one vendor declined to supply enough meaningful information to merit inclusion. Any other omission is because the product is no longer marketed or is unknown to us.

Processors designed to perform only message switching of voice grade lines were deemed not to meet the criteria for inclusion. Equipment that vendors stated was no longer being actively marketed was also excluded.

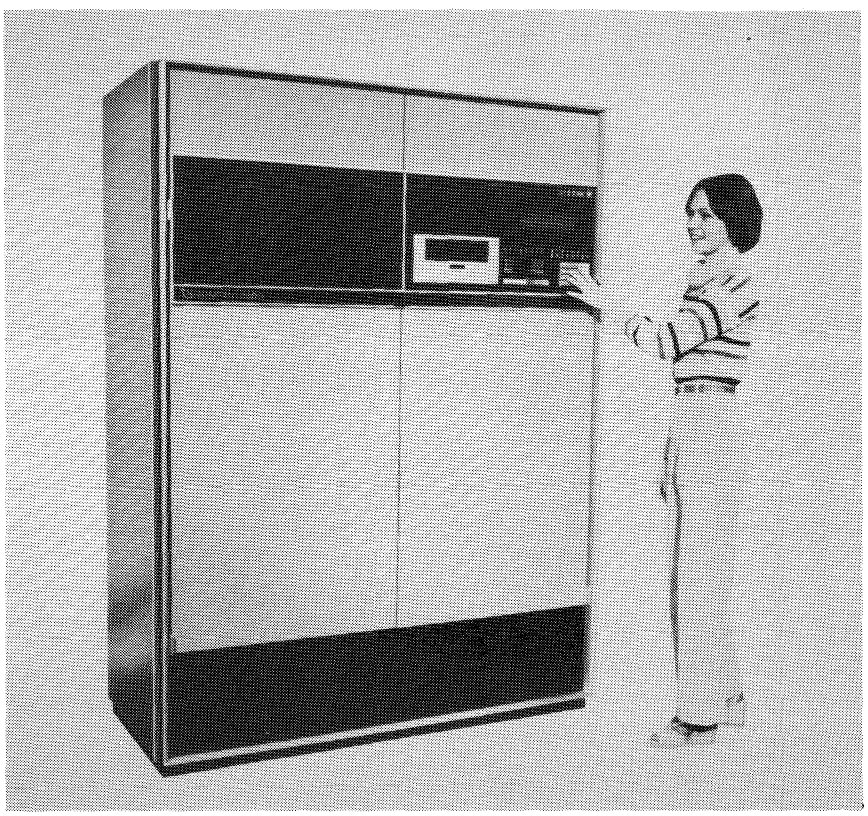
A total of 90 communications processors offered by 42 vendors are displayed in this report.

Subtleties of the basic characteristics of communications processors and how to use the accompanying charts are discussed.

For a perspective on the evolution and use of communications processors; a detailed look at front-end processors; and a presentation of users' ratings and usage patterns, see Report C09-013-101 behind the Management/System Guides tab in this volume.

The information presented on each communications processor in the accompanying charts serves not only to describe the basic characteristics of the equipment, but also assists in defining physical and throughput limitations. With one exception, all non-economic characteristics reduce themselves to one consideration: the throughput capabilities of the equipment relative to the specific systems requirements. The exception is where the physical attachment limitations are exceeded before the processing capabilities are fully used.

For example, the number of high speed communications lines that are physically attachable to a processor usually ▷



The 3690 shown at left is the latest system from the Comten, the leading independent supplier of communications processors. Based on new microprogrammable processor architecture, the 3690 is about five times as fast internally as the company's previous models and can service up to four times as many lines. To support the 3690 in the large scale environment it is intended for, Comten has developed the Data Switching System (DSS) software system, which will interface with IBM's SNA architecture. In addition to the now traditional functions of front-ending and remote concentration, DSS also supports data switching, which permits the distribution of processing tasks among nodes in a sophisticated network.

Communications Processors—Basic Characteristics

exceeds the throughput capabilities. For that reason, most vendors submitted a smaller value for the number of lines attachable at the higher speeds than the equipment could physically accommodate. The numbers more accurately describe the outer limits of the processor's throughput limitations than the physical limitations. All of the vendors were concerned that readers realize that the line mix and the resource mix could radically alter the number of lines that could be supported, physical port availability notwithstanding. Datapro was most impressed with the responsible attitude universally exhibited, and we are very optimistic that better ways of expressing throughput capabilities will develop between the combined efforts of the suppliers of communications processors and Datapro.

COMMENTS ON THE ENTRIES IN THE ACCOMPANYING CHARTS

Some of the items indicated in the accompanying charts are self-evident; others offer information of a subtle nature. The following discussion highlights some of the subtleties.

Network Arrangements Supported

Most of the equipment displayed herein, when operating as a front-end, is restricted to supporting the host computer systems of specific mainframe manufacturers. However, some vendors include in their product lines front ends that can be customized; such equipment is well represented in the charts. Not included is the myriad of older mainframes that have been fully written-off from an accounting standpoint and, therefore, can be offered at low enough prices to justify tailoring and dedicating the overqualified equipment to function as a front-end.

From a network arrangement standpoint, the number of direct connections a front-end can support to one host and the number of hosts a front-end can support become an important consideration, especially for fall-back considerations. Usually, a small number represents a special direct connection. A high number indicates that the connection is via a regular communications line port and does not mean that the vendor is suggesting that so many connections to one or more host is a designed capability.

When the number of pollable stations on one line is "1," the system, as standard, supports only point-to-point terminal arrangements. When the communications processor functions as a remote concentrator, the number of host/concentrator connections is also a consideration from a network standpoint. Again, the number of connections permitted is primarily an indication of whether a special interface or a regular communications line interface is used.

As the data communications industry continues to make strides towards standardization, the network architecture that a free-standing communications processor supports will take on more and more importance. (The architecture of a front-end must conform to the host's architecture.) Underscoring this belief, is the fact that two major mainframe manufacturers chose to list only their newest communications processor in the accompanying charts. In both cases, it is the only such item in their product lines that conforms to their new network architectures.

Since the prime purpose in burdening communications lines around the world with data is to either retreive information or to add to the store of information, the nature of the data base system supported should not be overlooked. Actually it represents the "end" for which one selects a "(communications processor) means". The name of any data base system supported is listed for each communications processor. Of course, a buyer may be already committed to a file maintenance or data base system and not be interested in this type of support.

As would be expected, the tasks performed by each of the operating systems supplied with the hardware will vary. The name of the operating system is noted so that the reader will know what to look for in detailed reports on such software offerings.

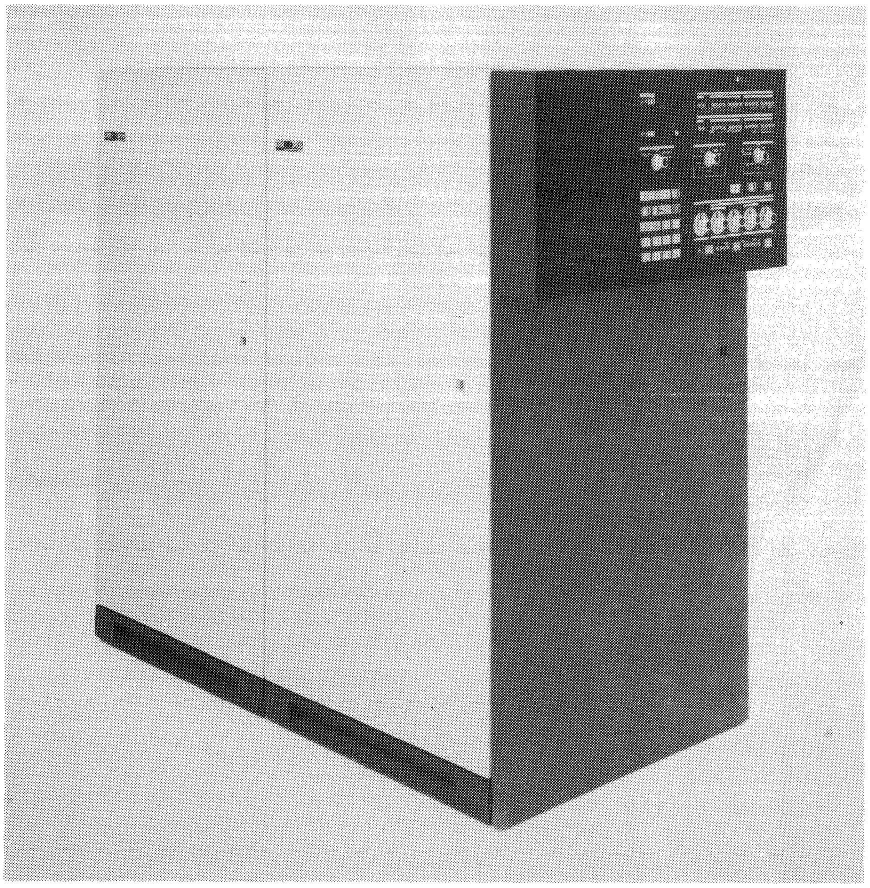
Properly depicting communications line capacity is the most difficult and the most controversial entry in the accompanying charts. It would be very easy to utilize a full page to describe the line capacity capabilities of just one processor. As a reasonable alternative, Datapro decided to show the number of half-duplex lines that can be physically attached to the processor presuming all lines were operating within a given speed range. Three ranges were chosen to represent low, medium, and high line speeds. The ranges chosen were: up to 1800 bps, 2000 to 96000 bps, and over 9600 bps. The number of low speed lines usually represents the physical and throughput limitation for asynchronous lines. Generally, the medium and high speed lines represent the outer limits of the throughput capabilities. The effect is using full-duplex lines is also indicated.

The terminal protocols supported by the processors are listed. Even though the protocols supported are mostly dependent upon the marketing philosophy of the vendors, the large number of vendors supporting the standardized bit-oriented protocols is an indication of things to come.

Processor Characteristics

The communications processor's internal characteristics give a general "feeling" for the equipment's throughput capabilities. Hard wired equipment will receive a "No" to the question: "Is the processor microprogrammable by the manufacturer?" A "yes" means that the processor has stored logic. If the processor is microprogrammable by the user, one can expect the capability for increasing throughput by properly microcoding frequently-used, time-critical functions. If not properly done, the capability could adversely effect the installation. Main memory

Communications Processors—Basic Characteristics



The IBM 3705 and its little brother, the 3704, are the standard of the industry. Together they accounted for two-thirds of the processor responses in our survey. However, if IBM was slow to move into the area of complex communications systems a few years ago, its customers have been slow to take advantage of the benefits of true front-end processing. Our survey indicated that few of the users were using either the 3704 or the 3705 as independent processing units; the great majority were satisfied with emulating the 270X hardwired controllers.

cycle time, main memory word size, and main memory storage capacity offer a very general "feel" for throughput speed possibilities. However, sophisticated internal architecture may enable the processor to be many times faster than another processor with the same cycle time and word size. That is another reason why we emphasize that a detailed analysis is necessary, once the initial selection is made from the charts.

The manner of data transfer between memory and communications lines, memory and mass storage, and memory and other supported peripherals becomes critical as volume requirements rise and/or response times are reduced. For high speed, high volume transmissions, Direct Memory Access transfers instead of character interrupt transfers become mandatory for reasonable throughput rates.

The "Turnkey systems" entry informs potential users whether or not the vendor is willing to provide a complete system, including all applications software.

Pricing and Availability

The prices depicted in the charts represent a range of typical configurations. The magnitude of the dollars gives a ball-park indication of the expansion capabilities of the equipment and should not be used to determine price/performance. Only a detailed price for a configuration satisfying specific requirements would give such an indication.

The absence of an entry for the monthly rental price indicates that the vendor offers his equipment on a purchase only basis.

The charge for the processor's communications operating software is given, when separately priced.

The date of first delivery is the date of the first production delivery.

With 90 communications processors to choose from, there should be an offering for every need, whether the network is a fully distributed network or a classic master/slave network.

Suppliers of Communications Processors

Listed below for your convenience in obtaining additional information are the full names and addresses of the 42 suppliers whose 90 products are summarized in the following charts.

Action Communications Systems, Inc., 10300 N. Central Expressway, Dallas, Texas 75231. Telephone (214) 750-3000.

ASI Teleprocessing Inc. (formerly American Systems, Inc.), 123 Water Street, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Austron, Inc., 1915 Kramer Lane, Austin, Texas 78758. Telephone (512) 836-3523.

Communications Processors—Basic Characteristics

Burroughs Corporation, Second Avenue at Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Chi Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

Collins Communication Switching Systems, Rockwell International, P.O. Box 10462, Dallas, Texas 75207. Telephone (214) 690-5000.

Computer Automation Inc., 18651 Von Karman Avenue, Irvine, California 92664. Telephone (714) 833-8830.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

Computer Transmission Corporation (Tran), 2352 Utah Avenue, El Segundo, California 90245. Telephone (213) 973-2222.

Comten, 1950 W. County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

Control Data Corporation, 8100 34th Avenue South, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Data General Corporation, Route 9, Westboro, Massachusetts 01581. Telephone (617) 8911.

Data Pathing Inc., 370 San Aleso Avenue, Sunnyvale, California 94086. Telephone (408) 734-0100.

Digital Communications Associates, Inc., 135 Technology Park/Atlanta, Norcross, Georgia 30092. Telephone (404) 448-1400.

Digital Communications Corp., 19 Firstfield Road, Faithersburg, Maryland 20760. (301) 948-0850.

Digital Equipment Corporation, 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

Digital Systems Corp., 3 Main Street, Walkersville, Maryland 21793. Telephone (301) 898-5184.

GSC Data Systems, Inc. (formerly Wells TP Sciences, Inc.), 99 West Sheffield Avenue, Englewood, New Jersey 07631. Telephone (201) 569-7711.

Harris Corp., Data Communications Division, 11262 Indian Trail, P.O. Box 44076, Dallas, Texas 75234. Telephone (214) 620-4400.

Hewlett-Packard Company, 11000 Wolfe Road, Cupertino, California 95014. Telephone (408) 257-7000.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

IBM Corporation, General Systems Division, 5775 Glenridge Drive N.E., Atlanta, Georgia 30301. Telephone (404) 256-7000.

Intercomputer Corporation, 2201 East University Drive, Phoenix, Arizona 85034. Telephone (602) 279-3561.

Interdata, Inc., 2 Crescent Place, Oceanport, New Jersey 07757. Telephone (201) 229-4040.

Memorex Corporation, San Tomas at Central Expressway, Santa Clara, California 95052. Telephone (408) 987-1000.

MICOM Systems, Inc., 9551 Irondale Ave., Chatsworth, California 91311. Telephone (213) 882-6890.

Modular Computer Systems, 1650 W. McNab Road, Fort Lauderdale, Florida 33309. Telephone (305) 974-1380.

Norfield Electronics, Inc., 3 Depot Place, East Norwalk, Connecticut 06855. Telephone (203) 853-2777.

North American Philips Communications Corp., 91 McKee Drive, Mahwah, New Jersey 07430. Telephone (201) 529-3800.

NCR Corp., Main and K Streets, Dayton, Ohio 45479. Telephone (513) 449-2000.

Omnus Computer Corporation, 6110 Executive Blvd., Rockville, Maryland 20852. Telephone (301) 881-4550.

Paradyne Corporation, 8550 Ulmerton Rd., Largo, Florida 33540. Telephone (813) 536-4771.

Periphonics Corporation, 75 Orville Drive, Bohemia, New York 11716. Telephone (516) 567-1000.

Sperry Univac (division of Sperry Rand Corporation), P.O. Box 500, Blue Bell, Pennsylvania 19422. Telephone (215) 542-4011.

Tandem Computers, Inc., 20605 Valley Green Drive, Cupertino, California 95014. Telephone (408) 255-4800.

Telenet Communications Corp., 1050 17th Street N.W., Washington, D.C. 20036. Telephone (202) 637-7900.

Telefile Computer Products Incorporated, 17131 Daimler St., Irvine, California 92705. Telephone (714) 557-6660.

Texas Instruments, Inc., P.O. Box 1444, Houston, Texas 77001. Telephone (713) 494-5115.

Varian Data Machines, 2722 Michelson Drive, Irvine, California 92806. Telephone (714) 833-2400.

Western Union Information Systems, Inc., 82 McKee Drive, Mahwah, New Jersey 07430. Telephone (201) 529-4600.

Westinghouse Canada Ltd., Electronic Systems Division, P.O. Box 5009, Burlington, Ontario, Canada. Telephone (416) 528-8811.□

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Action Communications Systems TELE-CONTROLLER	ASI Teleprocessing Front-End Nucleus 4000	ASI Teleprocessing Network Node Nucleus 4010	ASI Teleprocessing Retail Teleprocessing Nucleus 4100	Austron 8500
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	—	IBM, NCR, DEC, Data General, Burroughs	IBM, NDR, DEC, Data General, Burroughs	IBM, NCR, DEC, Data General, Burr., or stand-alone	IBM System 360/370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	1	256	256	256	255
Maximum no. of hosts attachable to front-end	1	256	256	256	1
Maximum no. of stations pollable on one line	32	256	256	256	127
As a remote concentrator	Yes	Yes	Yes	Yes	No
Maximum no. of remote connections to one host	1	256	256	256	—
Maximum no. of hosts served by one concentrator	1	256	256	256	—
Maximum no. of stations pollable on one line	32	256	256	256	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	No
Network Architecture compliance	No	ASI-NCP	ASI-NCP	ASI-NCP	—
Full-capability data base system	No	—	—	—	—
Operating system	Included	ASI-DOS	ASI-DOS	ASI-DOS	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	128	128	128	25
2000 to 9600 bps	64	24 to 64	24 to 64	24 to 64	16
Over 9600 bps	—	4 to 24	4 to 24	4 to 24	8
Effect on line capacity, if all lines are full-duplex	None	20% reduction	20% reduction	20% reduction	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	Yes	Yes	Yes	No
IBM SDLC	No	—	—	—	No
Other	TWX/Telex	NCR, Sweda, TI, MDS, TWX, others	NCR, Sweda, TI, MDS, TWX, others	NCR, Sweda, TI, MDS, TWX, others	Various polling disciplines
PROCESSOR CHARACTERISTICS		(DEC PDP 11)	(DEC PDP 11)	(DEC PDP 11)	
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	No	Optional
Main memory cycle time, usec.	1.2/0.8	1	1	1	0.75
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	65K words	256K bytes	256K bytes	256K bytes	64K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	DMA	DMA	—
Other peripherals	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Communications operating software	Included	Bundled (licen.)	Bundled (licen.)	Bundled (licen.)	Included in price
Additional software supported	None	Support for various terminals & hosts	Support for various terminals & hosts	Support for various terminals & hosts	Diagnostic and test routines
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	\$90,000 to \$250,000	\$70,000 to \$150,000	\$50,000 to \$130,000	\$75,000 to \$150,000	\$30,000 to \$80,000
Monthly rental (2-yr. lease, including maint., range)	—	\$2,000	\$1,500	\$2,000	\$1,100 to \$3,000
Communications operating software—one-time charge	—	Bundled	Bundled	Bundled	—
Communications operating software—monthly charge	—	Bundled	Bundled	Bundled	—
Date of first delivery	1971	February 1975	February 1976	February 1976	1975
Number installed to date	78	Over 12	8	4	NA
Serviced by	Sorbus	ASI/DEC subcontract	ASI/DEC subcontract	ASI/DEC subcontract	Austron & third party
COMMENTS	TELECONTROLLER is a store and forward message switching system with front-end capability	Can serve as front-end to ASI Braille Translation or Text Editing System	Includes packet switching software	Data Collection Polling System & Credit Authorization	Main market is emulating IBM local device interface to host for remote devices

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Burroughs B/876	Burroughs B/866	Chi Communications 732	Collins Comm. Switching (Rockwell Int'l.) C-System	Collins Comm. Switching (Rockwell Int'l.) C-900
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	All Burroughs, IBM System 360/370	All Burroughs, IBM System 360/370	UNIVAC 1100 Series	IBM 360/370, Univac 1100 & 490 Series, custom	IBM 360/370, DEC, custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	No	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	—	8	2	Variable
Maximum no. of hosts attachable to front-end	—	—	8	16	Variable
Maximum no. of stations pollable on one line	—	—	Terminal dependent	Variable	Variable
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	32	7	Unlimited	Interface depen.	Interface depen.
Maximum no. of hosts served by one concentrator	32	7	Unlimited	Interface depen.	Interface depen.
Maximum no. of stations pollable on one line	100	100	Terminal depen.	Interface depen.	Interface depen.
As a free-standing communications processor	Yes	Yes	No	Yes	Yes
Network Architecture compliance	Burroughs	Burroughs	—	Most	Most
Full-capability data base system	No	No	—	Limited	Limited
Operating system	MCP	MCP	—	Comm. & general	Comm. & general
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	7	100	1024	256
2000 to 9600 bps	32	7	64	256	20
Over 9600 bps	4	2	32	128	10
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Future	Yes	Yes
IBM SDLC	Yes	Yes	Future	Yes	Yes
Other	—	—	REM1	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	No
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	1	1	0.75	0.9	0.9
Main memory word size, bits	16	16	32	32	16
Main memory storage capacity, words or bytes	147K bytes	114K bytes	1M byte	262K bytes	256K bytes
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	Interrupt	DMA	DMA
Other peripherals	Interrupt	Interrupt	Interrupt	DMA	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	COBOL, RPG, MPL, PSL, GEMCOS	COBOL, RPG, MPL, PSL, GEMCOS	—	Editor Assembler, Link Editor, etc.	Editor Assembler, Link Editor, etc.
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$75,000	$33,000	$50,000 to $300,000	$1M to $2.5M	$350,000 to $950,000
Monthly rental (2-yr. lease, including maint., range)	$2,300 up	$1,000 up	—	Contact vendor	Contact vendor
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	$25	$25	—	—	—
Date of first delivery	August 1977	August 1977	August 1977	March 1974	January 1975
Number installed to date	NA	NA	9	Over 20	Over 10
Serviced by	Burroughs	Burroughs	Chi Communications	Collins Comm. Switching	Collins Comm. Switching
COMMENTS	Network Definition Language is separately priced	Network Definition Language is separately priced			

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	COMTEN, Inc. COMTEN 20	COMTEN, Inc. COMTEN 476	COMTEN, Inc. COMTEN 3650 II	COMTEN, Inc. COMTEN 3670 II	COMTEN, Inc. COMTEN 3690
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Custom	IBM 360/370, custom	IBM 360/370, Amdahl, CDC Omega, Itel, custom	IBM 360/370, Amdahl, CDC Omega, Itel, custom	IBM 360,370, Amdahl, CDC Omega, Itel, custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	4	2	4	8
Maximum no. of hosts attachable to front-end	—	4	2	4	8
Maximum no. of stations pollable on one line	—	4096	4096	4096	4096
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	2	—	2	4	8
Maximum no. of hosts served by one concentrator	Unlimited	—	Unlimited	Unlimited	Unlimited
Maximum no. of stations pollable on one line	4096	—	4096	4096	4096
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	INFONET	CNA	SNA, CNA	SNA, CNA	SNA, CNA
Full-capability data base system	Via INFONET	—	—	—	—
Operating system	Proprietary	CTAM	DSS, COS	DSS, COS	DSS, COS
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128	240	128	384	512
2000 to 9600 bps	128	240	128	322	512
Over 9600 bps	64	80	80	80	277
Effect on line capacity, if all lines are full-duplex	No effect	No effect	No effect	No effect	No effect
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	Yes	Yes
IBM SDLC	No	Yes	Yes	Yes	Yes
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	No	No	Yes
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.75	0.75	0.65	0.65	0.65
Main memory word size, bits	16	32	16	16	64
Main memory storage capacity, words or bytes	128K bytes	512K bytes	256K bytes	512K bytes	1024K bytes
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA	DMA	DMA
Mass storage	DMA	DMA	DMA	DMA	DMA
Other peripherals	DMA	DMA	DMA	DMA	DMA
Communications operating software	NA	Included	Included	Included	Included
Additional software supported	Full range via INFONET	CODEL	Data Switching System (DSS)	Data Switching System (DSS)	Data Switching System (DSS)
Turnkey Systems	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$60,000 to $120,000	$100,000 to $350,000	$40,000 to $120,000	$80,000 to $320,000	$100,000 to $500,000
Monthly rental (2-yr. lease, including maint., range)	NA	NA	$1,000 to $3,000	$2,000 to $8,000	$2,500 to $12,000
Communications operating software—one-time charge	NA	—	—	—	—
Communications operating software—monthly charge	NA	—	$300-$500	$300-$500	$300-$500
Date of first delivery	March 1971	Sept. 1975	March 1975	March 1972	4Q 1977
Number installed to date	Over 60	Over 60	Over 200	Over 200	—
Serviced by	Computer Sciences Corp.	COMTEN	COMTEN	COMTEN	COMTEN
COMMENTS					

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Computer Automation Inc. LSI-2, 3, 4	Computer Communications Inc. CC-80	Computer Communications Inc. CC-8	Computer Communications Inc. CC-8000	Computer Transmission M3200 PACUIT Data Switch
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Application dependent	IBM 360/370, custom	IBM 360/370, custom	IBM 360/370, custom	IBM 360/370, CDC 6600, H 6000, Univac, Xerox
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	No
Maximum no. of direct connections to one host	32	11	7	11	—
Maximum no. of hosts attachable to front-end	32	11	7	11	—
Maximum no. of stations pollable on one line	128	Device dependent	Device dependent	Device dependent	—
As a remote concentrator	Yes	Yes	No	No	Yes
Maximum no. of remote connections to one host	32	11	—	—	Unlimited
Maximum no. of hosts served by one concentrator	32	11	—	—	Up to 64
Maximum no. of stations pollable on one line	128	Device dependent	—	—	—
As a free-standing communications processor	No	No	No	Yes	No
Network Architecture compliance	—	—	—	NCS	—
Full-capability data base system	—	—	—	Included	—
Operating system	—	—	—	NCS-MS	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	32	240	240	240	200
2000 to 9600 bps	32	240	240	240	150
Over 9600 bps	Application dependent	Varies	Varies	Varies	30
Effect on line capacity, if all lines are full-duplex	None	Up to 88	Up to 88	Up to 88	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	No
IBM SDLC	Yes	Yes	Yes	Yes	Yes
Other	User writeable	Custom	Custom	Custom	CCITT X.25
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	—	0.36	0.36	0.36	0.98
Main memory word size, bits	8	16	16	16	16
Main memory storage capacity, words or bytes	16K bytes	40M bytes	40M bytes	40M bytes	512K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA interrupt	—
Mass storage	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	—
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	—
Communications operating software	Sep. priced	Incl. in price	Incl. in price	Incl. in price	Sep. priced
Additional software supported	—	Distributed Networking	—	Message Switching	—
Turnkey Systems	Yes	Yes	Yes	Yes	No
PRICING AND AVAILABILITY					
Purchase price (system range)	$3,000 and up	$85,000 to $500,000	$60,000 to $200,000	$250,000 up	$150,000 to $1M
Monthly rental (2-yr. lease, including maint., range)	—	$1,400 up (3 yr.)	$1,100 up (3 yr.)	$6,000 up	—
Communications operating software—one-time charge	Contact vendor	—	—	—	$17,500
Communications operating software—monthly charge	—	—	—	—	$600
Date of first delivery	Fall 1977	May 1974	June 1974	October 1974	1976
Number installed to date	—	100	35	10	NA
Serviced by	Various service companies	CCI	CCI	CCI	Computer Transmission
COMMENTS			CC-8 is 270X, 370X emulator only (no message switching)	Message Switching software is custom and is separately priced	Hybrid circuit-packet data switch system for large-scale multiple switching-node networks

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Computer Transmission M3000 Digital Circuit Switch	Control Data Corp. CYBER 1000 (PMX)	Control Data Corp. CYBER 1000 (DNS)	Control Data Corp. 2550-2	Control Data Corp. 2552-1
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, CDC 6600, PDP-11, H 6000, Univac, Xerox	IBM 360/370, Univac 1108, Sigma 5	CDC CYBER, IBM 370, Univac 1100 Series	CDC 6000; CYBER 70, 170; 3000L Series	CDC 6000; CYBER 70, 170 Series
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	1	1	2	2
Maximum no. of hosts attachable to front-end	—	2	4	2	2
Maximum no. of stations pollable on one line	—	Protocol dependent	Protocol dependent	Protocol dependent	Protocol dependent
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	Unlimited	—	2	1	1
Maximum no. of hosts served by one concentrator	Up to 32	—	Unlimited	Up to 16	Up to 16
Maximum no. of stations pollable on one line	—	—	Protocol dependent	Protocol dependent	Protocol dependent
As a free-standing communications processor	No	Yes	Yes	No	No
Network Architecture compliance	—	PMX	DNS	—	—
Full-capability data base system	—	No	No	—	—
Operating system	—	PMX	DNS	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	550 @ 1200 bps	128	128	128	254
2000 to 9600 bps	—	128	128	128	254
Over 9600 bps	—	32	32	128 @ 19.2K; 2 @ 40.8K	254 @ 19.2K, 2 @ 40.8K
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	Yes	Yes
IBM SDLC	No	No	No	No	No
Other	Correspondence, EBCDIC	HASP M/L; Mode 4A, 4C; CDCCP	CDCCP, ISO 1745, ATT, CDT	HASP M/L; Mode 4A, 4C; CDCCP	HASP M/L; Mode 4A, 4C; CDCCP
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	No	Yes	Yes
Microprogrammable by user	No	No	No	Yes	Yes
Main memory cycle time, usec.	0.98	1.2	1.2	0.55	0.55
Main memory word size, bits	16	27	27	18	18
Main memory storage capacity, words or bytes	32K bytes	768K bytes	768K bytes	262K bytes	512K bytes
Data transfer between memory and:					
Communications lines	—	DMA	DMA	DMA, interrupt	DMA, interrupt
Mass storage	—	DMA	DMA	—	—
Other peripherals	—	DMA	DMA	DMA, interrupt	DMA, interrupt
Communications operating software	Incl. in price	Sep. priced	Sep. priced	Sep. priced	Sep. priced
Additional software supported	—	FORTRAN IV, assembler, utilities	FORTRAN IV, assembler, utilities	PASCAL, cross-compilers, network products	PASCAL, cross-compilers, network products
Turnkey Systems	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$75,000 to $500,000	$450,000 to $900,000	$250,000 to $550,000	$59,300 to $152,800	$89,200 to $227,000
Monthly rental (2-yr. lease, including maint., range)	—	$13,500 to $24,500 (3 yr.)	$6,300 to $16,000 (3 yr.)	$2,054 to $5,500 (3 yr.)	$2,900 to $9,800 (3 yr.)
Communications operating software—one-time charge	—	$34,100	$27,520	$3,940	$3,940
Communications operating software—monthly charge	—	$730+2,450 OTC	$590+1,960 OTC	$120 + 570 OTC	$120 + 570 OTC
Date of first delivery	1973	June 1973	October 1975	June 1975	August 1977
Number installed to date	NA	42	20	122	2
Serviced by	Computer Transmission	Control Data Corporation	Control Data Corporation	Control Data Corporation	Control Data Corporation
COMMENTS	Used as a line concentrator and digital switch for async. terminals to access multiple computers	Protected Message Exchange (PMX) system inlcudes multiprocessor interconnects, recovery, and load sharing	Distributed Network System (DNS) provides full network architecture	Conforms with DNS network architecture	Features two processors; conforms with DNS network architecture

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Data General ECLIPSE S-130	Data General NOVA 3	Data General microNOVA	Data Pathing Inc. 2000 Series	Data Pathing Inc. 150 Series
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370, Data General, custom	IBM 360/370, Data General, custom	IBM 360/370, Data General, custom	IBM 360/370, custom	Computers of most major manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	Yes	Yes
Maximum no. of direct connections to one host	Multiple	Multiple	—	1	3
Maximum no. of hosts attachable to front-end	Multiple	Multiple	—	1	3
Maximum no. of stations pollable on one line	Device dependent	Device dependent	—	15	16
As a remote concentrator	Yes	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	Multiple	Multiple	Multiple	—	3
Maximum no. of hosts served by one concentrator	Multiple	Multiple	Multiple	—	3
Maximum no. of stations pollable on one line	Device dependent	Device dependent	Device dependent	—	16
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	Bisync/SDLC	Bisync/SDLC	Bisync/SDLC	DPI	Various
Full-capability data base system	INFOS	—	—	—	DAF & DDM
Operating system	AOS, RDOS	RDOS	DOS (diskette)	DCOS	DCOS 6
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128	64	32	—	31
2000 to 9600 bps	64	32	4	6	31
Over 9600 bps	16	8	1	—	—
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	No	No
IBM BSC	Yes	Yes	Yes	No	No
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	No
IBM SDLC	Yes	Yes	No	No	No
Other	—	—	—	DPI	DPI (BSC)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	No
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	0.5-0.8	0.7	0.96	8	1
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	256K bytes	128K bytes	32K bytes	16K bytes	640K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	Interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	Interrupt	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	Interrupt	DMA	DMA
Communications operating software	Incl. in price	Incl. in price	Sep. priced	Incl. in price	Incl. in price
Additional software supported	HASP Workstation, IBM 3270, 2780, 3780	HASP Workstation, IBM 3270, 2780, 3780	IBM 2780, 3780, 3270	Complete range, plus application packages	Complete range, plus application package
Turnkey Systems	No	No	No	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$11,500 to over $100,000	$5,000 to $75,000	$2,500 to $15,000	$24,000	$105,000 and up
Monthly rental (2-yr. lease, including maint., range)	—	—	—	$812 to $900	$2,200
Communications operating software—one-time charge	—	—	Contact vendor	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	March 1975	1975	January 1977	1967	1973
Number installed to date	NA	NA	NA	90	200
Serviced by	Data General	Data General	Data General	Data Pathing Inc.	Data Pathing Inc.
COMMENTS					

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Digital Communications Associates, Inc. SMART/ MUX-HX	Digital Communications Associates, Inc. SMART/ MUX-RX	Digital Communications Associates, Inc. MICRO/ MUX	Digital Communications Corp. CP-9000	Digital Communications Corp. CM 9108
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	DECsystem 10, IBM 360/370, Amdahl 470	—	—	DEC, Prime, Tempus	DEC, Prime, Tempus
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Partial support	No	No	No	No
Maximum no. of direct connections to one host	1	—	—	—	—
Maximum no. of hosts attachable to front-end	Unlimited	—	—	—	—
Maximum no. of stations pollable on one line	1024	—	—	—	—
As a remote concentrator	No	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	Any line	Any line	Unlimited	Unlimited
Maximum no. of hosts served by one concentrator	—	Any line	Any line	Unlimited	Unlimited
Maximum no. of stations pollable on one line	—	63/1024	63	Unlimited	Unlimited
As a free-standing communications processor	No	No	No	Yes	Yes
Network Architecture compliance	—	—	—	See Comments	See Comments
Full-capability data base system	—	—	—	See Comments	See Comments
Operating system	—	—	—	See Comments	See Comments
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128 async.	63/128 async.	62 async.	480 async.	8
2000 to 9600 bps	24 async.	24 async.	24 async.	480async.,240sync	—
Over 9600 bps	—	—	—	60 sync.	—
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	No	No	Yes (1-78)	No
Other	DDCMP	DDCMP	DDCMP	X.25 (1-78)	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	Yes	Yes	Yes	Yes	No
Main memory cycle time, usec.	1.5	1.5	2.0	0.5	0.5
Main memory word size, bits	12	12	8	8	8
Main memory storage capacity, words or bytes	32K words	8K/32K words	16K bytes	524K bytes	8K bytes
Data transfer between memory and:					
Communications lines	Interrupt (FIFO)	Interrupt	Interrupt	DMA, interrupt	Interrupt
Mass storage	None	None	None	—	—
Other peripherals	Interrupt	Interrupt	Interrupt	—	—
Communications operating software	Incl. in price.	Incl. in price	Incl. in price	Sep. priced	Sep. priced
Additional software supported	OS/8	—	—	Cross Assembler/loader, simulator debugger	Cross Assembler/loader, simulator debugger
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$22,000 to $63,000	$7,000 to $47,000	$8,500 to $24,600	Contact vendor	Contact vendor
Monthly rental (2-yr. lease, including maint., range)	$852 to $2,724	$295 to $2,169	$300 to $1,098	—	—
	—	—	—	—	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	July 1973	June 1974	3rd Q 1977	2nd Q 1977	2nd Q 1977
Date of first delivery	NA	NA	NA	4	1
Number installed to date	DEC	DEC	DCA	Digital Communications Corp.	Digital Communications Corp.
Serviced by					
COMMENTS	Host-end statistical multiplexor; host demultiplexes character stream	Node concentrators for multiple SMART/ MUXs; remote-end statistical multiplexor	Remote-end statistical multiplexor	Network software is tailored for customer; supports packet switching network	Network software is tailored for customer; supports packet switching network

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Digital Equipment Corp. PDP-11 with DECNET	Digital Systems Corp. Model 6101	Digital Systems Corp. Model 6116	Digital Systems Corp. Model 1300	GSC Data Systems Inc. T578 Systems
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	DEC	IBM System/3 Model 8, 10, 12	IBM System/3, Burroughs B 1726, DSC Galaxy/5	IBM 360/370, S/3	All major manufacturers
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	Varies	1	16	90	4
Maximum no. of hosts attachable to front-end	Varies	1	1	4	4
Maximum no. of stations pollable on one line	Terminal dependent	10	32	32	Unlimited
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	Varies	—	Variable	Variable	256
Maximum no. of hosts served by one concentrator	Varies	—	1	4	48
Maximum no. of stations pollable on one line	Terminal dependent	—	32	32	Unlimited
As a free-standing communications processor	Yes	No	No	Yes	Yes
Network Architecture compliance	DNA	—	—	No	Various
Full-capability data base system	DMS-11	—	—	Avail. fall 1977	GSC
Operating system	Several support DECNET	—	—	Real time	GSC
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	Varies	1	15	90	256
2000 to 9600 bps	Varies	1 @ 2400 bps	15	90	256
Over 9600 bps	Varies	—	—	—	—
Effect on line capacity, if all lines are full-duplex	Varies	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	No	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	Future
IBM SDLC	No	No	No	Yes	Future
Other	DDCMP	No	No	No	X.25
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	Yes	Yes	Yes
Microprogrammable by user	No	No	Yes	Yes	No
Main memory cycle time, usec.	0.45/0.3	—	—	—	0.96
Main memory word size, bits	16	—	8	12	16
Main memory storage capacity, words or bytes	1024K words	—	32K bytes	64 to 1M byte	128K words
Data transfer between memory and:					
Communications lines	DMA, interrupt	—	Interrupt	Interrupt	DMA
Mass storage	DMA, interrupt	—	—	Interrupt	DMA, interrupt
Other peripherals	DMA, interrupt	—	—	Interrupt	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Sep. priced	Incl. in price
Additional software supported	—	Special Utility Packages	—	RPG II, BASIC, DBMS	—
Turnkey Systems	No	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$32,000 to $125,000	$3,950	$10,000	$38,000 to $75,000	$60,000 to $500,000
Monthly rental (2-yr. lease, including maint., range)	—	$150	$325	—	$1,500 to $1,400
Communications operating software—one-time charge	—	—	—	$4,000	—
Communications operating software—monthly charge	—	—	—	$100	—
Date of first delivery	February 1972	March 1973	April 1977	October 1976	December 1969
Number installed to date	NA	60	4	10	NA
Serviced by	DEC	Digital Systems	Digital Systems	Digital Systems, General Electric	GSC
COMMENTS					

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Harris Corp. 4705	Harris Corp. CC-65	Hewlett-Packard HP 1000	Honeywell DATANET 6678	Honeywell DATANET 6632
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM 360/370	IBM 360/370; CDC 6000/7000, Cyber 170; Univac 1100 Series	Hewlett-Packard 21MX, 2100 Series	Honeywell Series 60 Level 66/68	Honeywell Series 60 Level 66/68
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	No	Yes	Yes
Maximum no. of direct connections to one host	1	3	—	4	4
Maximum no. of hosts attachable to front-end	2	3	—	1	1
Maximum no. of stations pollable on one line	Unlimited	1	—	32	32
As a remote concentrator	No	No	No	No	No
Maximum no. of remote connections to one host	—	—	—	—	—
Maximum no. of hosts served by one concentrator	—	—	—	—	—
Maximum no. of stations pollable on one line	—	—	—	—	—
As a free-standing communications processor	No	No	Yes	No	No
Network Architecture compliance	—	—	DSN	—	—
Full-capability data base system	—	—	IMAGE/1000	—	—
Operating system	—	—	RTE II, III	—	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					380 @ 110 bps 198 @ 300 bps
Up to 1800 bps	38-152	26	Traffic depen.	96	96
2000 to 9600 bps	76	26	Traffic depen.	96	96
Over 9600 bps	—	26	Traffic depen.	96	96
Effect on line capacity, if all lines are full-duplex	None	Varies	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	No	Yes	Yes	Yes
IBM BSC	Yes	Late 1977	No	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	Yes	Yes
IBM SDLC	No	No	No	No	No
Other	—	UT-200, Univac 1004, COPE Mode	HP 2645A	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	No	Yes	No	No
Microprogrammable by user	No	No	Yes	No	No
Main memory cycle time, usec.	1	1.5	0.35/0.595	0.4/0.55	1.2
Main memory word size, bits	16	12	16	18	18
Main memory storage capacity, words or bytes	128K bytes	296K words	2M bytes	512K bytes	256K bytes
Data transfer between memory and:					
Communications lines	Interrupt	DMA	DMA, interrupt	DMA	DMA
Mass storage	—	—	DMA, interrupt	DMA	DMA
Other peripherals	—	DMA	Interrupt	—	—
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Cross-assembler	Cross-assembler	FORTRAN IV, ALGOL, 21 mx assembler	Macro assembler	Macro assembler
Turnkey Systems	Yes	Yes	No	Available	Available
PRICING AND AVAILABILITY					
Purchase price (system range)	$40,000 to $140,000	$150,000 to $400,000	$21,000 to $62,000	$192,000 to $358,500	$128,474 to $5.98M
Monthly rental (2-yr. lease, including maint., range)	$1,000 to $3,500	$3,000 to $10,000	$820 to $2,450 (3 yr.)	$4,356 to $8,000	$2,519 to $12,000
Communications operating software—one-time charge	—	—	$3,500	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1970	1968	August 1973	October 1977	September 1974
Number installed to date	NA	NA	NA	NA	NA
Serviced by	Harris	Harris	Hewlett-Packard	Honeywell	Honeywell
COMMENTS		Also supports IBM HASP Multi-leaving	Distributed Systems Communications package permits resource sharing on network	Operating software is Network Processing Supervisor, GRTS	Operating software is Network Processing Supervisor, GRTS

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Honeywell DATANET 6624	Honeywell DATANET 6616	Honeywell DATANET 355	Honeywell Remote Network Processor DATANET 707	Honeywell Remote Network Processor Series 60/6-06
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Honeywell Series 60 Level 66/68	Honeywell Series 60 Level 66	Honeywell Series 6000, 600	Honeywell Series 60 Level 66, Series 6000	Honeywell Series 60 Level 66, Series 6000
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	No	No
Maximum no. of direct connections to one host	4	4	4	—	—
Maximum no. of hosts attachable to front-end	1	1	1	—	—
Maximum no. of stations pollable on one line	32	32	32	—	—
As a remote concentrator	No	No	No	Yes	Yes
Maximum no. of remote connections to one host	—	—	—	6	6
Maximum no. of hosts served by one concentrator	—	—	—	1	1
Maximum no. of stations pollable on one line	—	—	—	32	32
As a free-standing communications processor	No	No	No	Yes	Yes
Network Architecture compliance	—	—	—	DSE	DSE
Full-capability data base system	—	—	—	—	—
Operating system	—	—	—	OS/700	OS/700
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	96	8	96	128	128
2000 to 9600 bps	96	8	96	64	64
Over 9600 bps	96	8	96	8	8
Effect on line capacity, if all lines are full-duplex	None	None	None	None	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	Yes
IBM SDLC	No	No	No	No	No
Other	—	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	No	No	No	Yes
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	1.2	1.2	1.0	0.75	1.0
Main memory word size, bits	18	18	18	16	16
Main memory storage capacity, words or bytes	64K bytes	48K bytes	64K bytes	64K words	64K words
Data transfer between memory and:					
Communications lines	DMA	DMA	DMA	DMA, interrupt	DMA, interrupt
Mass storage	DMA	DMA	DMA	DMA, interrupt	DMA, interrupt
Other peripherals	—	—	DMA	DMA, interrupt	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Macro assembler	Macro assembler	Macro assembler	FORTRAN, assembler	FORTRAN, assembler
Turnkey Systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price (system range)	\$85,380 to \$168,000	\$50,000 to \$62,000	\$118,320 to \$800,000	\$20,000 to \$150,000	\$15,000 to \$100,000
Monthly rental (2-yr. lease, including maint., range)	\$1,676 to \$3,507	—	—	\$700 to \$3,600	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	July 1974	Sept. 1976	November 1970	June 1974	October 1976
Number installed to date	NA	NA	NA	NA	NA
Serviced by	Honeywell	Honeywell	Honeywell	Honeywell	Honeywell
COMMENTS	Operating software is Network Processing Supervisor, GRTS. Supports up to 380 lines at 110 bps and up to 198 lines at 300 bps	Operating software is General Remote Terminal System (GRTS)	Operating software is Network Processing Supervisor, GRTS. Supports up to 408 lines at 110 bps and up to 198 lines 300 bps		

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Honeywell Remote Network Processor DATANET 700	IBM-DPD 3705-II	IBM-DPD 3704	IBM-DPD 270X	IBM-GSD Series 1
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Honeywell Series 6000, Level 66 Series	IBM System/ 360, 370	IBM System/ 360, 370	IBM System/ 360, 370	—
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Partial	No
Maximum no. of direct connections to one host	—	4	1	1	—
Maximum no. of hosts attachable to front-end	—	4	1	1	—
Maximum no. of stations pollable on one line	—	Device dependent	Device dependent	Device dependent	—
As a remote concentrator	Yes	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	4	1	1	—	96
Maximum no. of hosts served by one concentrator	1	1	1	—	48
Maximum no. of stations pollable on one line	32	Device dependent	Device dependent	—	Unlimited
As a free-standing communications processor	Yes	No	No	No	Yes
Network Architecture compliance	No	—	—	—	SNA
Full-capability data base system	DBM	—	—	—	—
Operating system	OS/700	—	—	—	RTPS
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	64	352	32	176	96
2000 to 9600 bps	64	352	32	24	48
Over 9600 bps	2	32	32	—	24
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	Capacity halved	NA	Capacity halved
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	No	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	No	No	No	No	No
IBM SDLC	No	Yes	Yes	No	Yes
Other	VIP, MMI	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	No	No	Yes
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	0.775	1.0	—	—	0.66-0.88
Main memory word size, bits	16	18	—	—	16
Main memory storage capacity, words or bytes	64K words	256K bytes	64K bytes	—	128K bytes
Data transfer between memory and:					
Communications lines	DMA	DMA	Interrupt	Interrupt	DMA
Mass storage	DMA	DMA	—	—	DMA
Other peripherals	DMA	DMA	—	—	DMA
Communications operating software	Incl. in price	Sep. priced	Sep. priced	—	Sep. priced
Additional software supported	FORTRAN, DAF, host resident cross compiler	—	—	—	PL/1, FORTRAN
Turnkey Systems	Available	Available	Available	Available	No
PRICING AND AVAILABILITY					
Purchase price (system range)	\$21,000 to \$120,000	\$40,000 to \$150,000	\$26,000 to \$50,000	\$12,400 to \$84,200	\$20,000 to \$60,000
Monthly rental (2-yr. lease, including maint., range)	\$717 to \$5,200	\$1,300 to \$4,000	\$750 to \$2,500	\$308 to \$1,800	—
Communications operating software—one-time charge	None	—	—	—	\$1,200 or
Communications operating software—monthly charge	None	\$100	Option depen.	—	\$20
Date of first delivery	January 1975	August 1976	May 1973	1965	November 1976
Number installed to date	150	NA	NA	NA	NA
Serviced by	Honeywell	IBM	IBM	IBM	IBM
COMMENTS	Currently supports multilevel remote job entry; application programs are available				Exact number of medium and high speed lines supported is dependent on message size

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Intercomputer Corp. Intercomputer 1370N	Interdata 8/32	Interdata 7/32	Interdata 6/16	MEMOREX 1270
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370	IBM 360/370	IBM 360/370	IBM 360/370	IBM 360/22-195, 370/135 and up
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	2	1	1	1	1
Maximum no. of hosts attachable to front-end	2	2	2	2	2
Maximum no. of stations pollable on one line	Unlimited	—	—	—	1
As a remote concentrator	No	Yes	Yes	Yes	No
Maximum no. of remote connections to one host	—	1	1	1	—
Maximum no. of hosts served by one concentrator	—	2	2	2	—
Maximum no. of stations pollable on one line	—	—	—	—	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	No
Network Architecture compliance	—	—	—	—	—
Full-capability data base system	—	—	—	—	—
Operating system	Included	OS/32MT, ITAM	OS/32 MT, ITAM	OS/16 MT, ITAM	—
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	250	255	255	128	96
2000 to 9600 bps	24 to 48	255	255	128	37 to 96
Over 9600 bps	2 to 8	40	40	20	36
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	Capacity halved	Capacity halved	NA
Terminal protocols supported:	Yes	Yes	Yes	Yes	Yes
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	No
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	Yes	Yes	No
IBM SDLC	Yes	Yes	Yes	Yes	No
Other	—	Interdata Synchronous Mode	Interdata Synchronous Mode	Interdata Synchronous Mode	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	No
Microprogrammable by user	Yes	No	No	No	No
Main memory cycle time, usec.	1	0.75	0.75	1.0	NA
Main memory word size, bits	18	32	32	16	NA
Main memory storage capacity, words or bytes	128K words	1M bytes	1M bytes	64K bytes	NA
Data transfer between memory and:					
Communications lines	DMA, interrupt	Interrupt	Interrupt	Interrupt	NA
Mass storage	—	DMA	DMA	DMA	NA
Other peripherals	Interrupt,	DMA, interrupt	DMA, interrupt	DMA, interrupt	NA
Communications operating software	Incl. in price	Sep. priced	Sep. priced	Sep. priced	None
Additional software supported	—	—	—	—	MASCOT (host-resident diagnostic system)
Turnkey Systems	Yes	Available	Available	Available	No
PRICING AND AVAILABILITY					
Purchase price (system range)	$6,000 to $100,000	$50,000 to $500,000	$15,000 to $1.5M	$2,000 to $25,000	$28,000 to $130,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	$600 to $6,000
Communications operating software—one-time charge	—	$7,500	$7,500	$7,500	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1970	July 1975	July 1974	Spring 1976	NA
Number installed to date	50	NA	NA	NA	NA
Serviced by	Telex	Interdata	Interdata	Interdata	Memorex
COMMENTS		Supports RJE applications & Interdata processor-to-processor communications	See 8/32	See 8/32	

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	MEMOREX 1380	MICOM Systems Inc. MICOM 40 Series	MICOM Systems Inc. MICOM 20 Series	Modular Computer Systems Modcomp II/2	Modular Computer Systems Modcomp II/CP2
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/22-195, 370/135 and up	Any RS-232 interface	Any RS-232 interface	IBM 360/370; CDC 3000/6000, CYBER; custom	IBM 360/370; CDC 3000/6000, CYBER; custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	No	No	No	Yes
Maximum no. of direct connections to one host	1	—	—	—	4
Maximum no. of hosts attachable to front-end	8 (4 at a time)	—	—	—	4
Maximum no. of stations pollable on one line	32	—	—	—	Device dependent
As a remote concentrator	No	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	—	30	8	64	4
Maximum no. of hosts served by one concentrator	—	1	1	1	4
Maximum no. of stations pollable on one line	—	Any number	Any number	Device dependent	Device dependent
As a free-standing communications processor	No	Yes	Yes	Yes	Yes
Network Architecture compliance	—	As required	As required	—	—
Full-capability data base system	—	—	—	—	Future
Operating system	—	—	—	MAXCOM, MAX II/3	MAXCOM, MAX II/3
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	112 to 216	Up to 30	Up to 8	48	256
2000 to 9600 bps	64	4 to 6	4 to 6	12-36	100-256
Over 9600 bps	40	—	—	2-6	12-48
Effect on line capacity, if all lines are full-duplex	NA	Capacity halved	Capacity halved	Capacity halved	None
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Planned	Optional	Optional	Future	Future
IBM SDLC	Planned	Optional	Optional	Future	Future
Other	—	Custom	Custom	CDC UT-200	CDC UT-200, 3270, 3780, Univac 1004
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	No	Limited
Microprogrammable by user	Yes	Yes	Yes	No	No
Main memory cycle time, usec.	0.54	0.5	0.5	0.6	0.8-1.0
Main memory word size, bits	16	8	8	16	16
Main memory storage capacity, words or bytes	64K-512K bytes	65K bytes	65K bytes	48K bytes	128K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt	DMA
Mass storage	DMA	Custom	Custom	DMA	DMA
Other peripherals	NA	Custom	Custom	DMA	DMA
Communications operating software	Incl. in price	Sep. priced	Sep. priced	Incl. in price	Incl. in price
Additional software supported	MASCOT and other host-resident utilities	—	—	—	Macro assembler, FORTRAN, utilities
Turnkey Systems	No	Yes	Yes	No	No
PRICING AND AVAILABILITY					
Purchase price (system range)	$40,000 to $280,000	$2,000 to $6,000	$1,000 to $3,000	$6,000 to $50,000	$30,000 up
Monthly rental (2-yr. lease, including maint., range)	$1,120 to $8,000	—	—	—	—
Communications operating software—one-time charge	—	Typically $10K	Typically $10K	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	NA	4th Q 1975	2nd Q 1977	Sept. 1976	March 1973
Number installed to date	60	120	60	Over 10	Over 100
Serviced by	Memorex	MICOM	MICOM	Modular Computer Systems	Modular Computer Systems
COMMENTS	Custom software extensions are available, for a fee, from Memorex Systems Engineering Services	Designed for concentrator and message switch applications for up to 30 channels	Designed to be terminal controller and eight-channel concentrator	Dedicated, programmable CPU for communications applications	

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Modular Computer Systems Modcomp IV/CP	NCR 621	NCR 754	Norfield Electronics Inc. DCS 400	North American Philips DS 714/70
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	IBM 360/370; CDC 3000/ 6000, CYBER; custom	NCR Century and Criterion Series	NCR Century and Criterion Series	IBM 360/370, Univac	Custom
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Partial	No	Yes	Yes
Maximum no. of direct connections to one host	4	1	—	64	Appl. dependent
Maximum no. of hosts attachable to front-end	4	2	—	64	Appl. dependent
Maximum no. of stations pollable on one line	Device dependent	Device dependent	—	32	Appl. dependent
As a remote concentrator	Yes	No	Yes	Yes	Yes
Maximum no. of remote connections to one host	4	—	29	64	Appl. dependent
Maximum no. of hosts served by one concentrator	4	—	29	64	Appl. dependent
Maximum no. of stations pollable on one line	Device dependent	—	Terminal dependent	32	Appl. dependent
As a free-standing communications processor	Yes	No	No	Yes	Yes
Network Architecture compliance	—	—	—	Norfield	Philips
Full-capability data base system	Future	—	—	Norfield	Philips
Operating system	MAX IV	—	—	Norfield	Philips
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	256	254	29	128	Appl. dependent
2000 to 9600 bps	100-256	160	6	64	Appl. dependent
Over 9600 bps	12-48	Device dependent	1	32	Appl. dependent
Effect on line capacity, if all lines are full-duplex	None	Capacity halved	None	Capacity halved	Halved for voice, wide band
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	RPQ
ADCCP/HDLC (UDLC, BDLC)	Future	Future	No	No	RPQ
IBM SDLC	Future	Future	No	No	RPQ
Other	CDC UT-200, 3270, 3280, Univac 1004	—	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Limited	No	Yes	No	Yes
Microprogrammable by user	No	No	No	No	Yes
Main memory cycle time, usec.	0.6	—	1.2	0.96	2.0
Main memory word size, bits	16	—	16	16	36
Main memory storage capacity, words or bytes	1M byte	—	32K words	128K bytes	1M byte
Data transfer between memory and:					
Communications lines	DMA	Interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	—	—	Interrupt	DMA, interrupt
Other peripherals	DMA	—	—	Interrupt	DMA, interrupt
Communications operating software	Incl. in price	Sep. priced	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Macro assembler, FORTRAN, utilities	—	—	—	Special utilities
Turnkey Systems	No	Available	Available	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$48,500 up	$1,200 and up	$16,500 and up	$35,000 to $100,000	Contact vendor
Monthly rental (2-yr. lease, including maint., range)	—	$200 and up	$611 (1 yr.)	—	Contact vendor
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	$60 and up	—	—	—
Date of first delivery	December 1975	1969	November 1973	March 1975	1967
Number installed to date	Over 50	NA	NA	30	80
Serviced by	Modular Computer Systems	NCR	NCR	Norfield Electronics	North American Philips
COMMENTS	32 bit internal bus and 4 port memory is standard				

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	North American Philips DS 714/81	North American Philips DS 7	Omnus Computer Corporation Omnus-1/CU	Paradyne PIX-II	Periphonics Corporation T-COMM 7
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Custom	Custom	Univac 1100 series, 494; others available	IBM 360/370	IBM, NCR, Burroughs, Honeywell
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	To other PIX-II	Yes
Maximum no. of direct connections to one host	Appl. dependent	Appl. dependent	8	10	4
Maximum no. of hosts attachable to front-end	Appl. dependent	Appl. dependent	16	1	8
Maximum no. of stations pollable on one line	Appl. dependent	Appl. dependent	256	26 (interrupt)	50
As a remote concentrator	Yes	Yes	Yes	No	Yes
Maximum no. of remote connections to one host	Appl. dependent	Appl. dependent	192	—	Variable
Maximum no. of hosts served by one concentrator	Appl. dependent	Appl. dependent	192	—	8
Maximum no. of stations pollable on one line	Appl. dependent	Appl. dependent	256	—	50
As a free-standing communications processor	Yes	Yes	Yes	No	Yes
Network Architecture compliance	Philips	Philips	Available	—	No
Full-capability data base system	Philips	Philips	Available	—	No
Operating system	DACOS	Philips	ECES	—	PERI-COMM
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	Appl. dependent	Appl. dependent	120 (per CPU)	—	45
2000 to 9600 bps	Appl. dependent	Appl. dependent	20-80 (per CPU)	20	10-45
Over 9600 bps	Appl. dependent	Appl. dependent	40 (per CPU)	3 (full-duplex)	Special quote
Effect on line capacity, if all lines are full-duplex	Halved for voice, wide band	Halved for voice, wide band	None	Capacity halved	Capacity halved
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	No	Yes
IBM BSC	RPQ	RPQ	Yes	No	Yes
ADCCP/HDLC (UDLC, BDLC)	RPQ	RPQ	Yes	No	Yes
IBM SDLC	RPQ	RPQ	Available	No	Yes
Other	—	—	All Univac, IBM 2741, 2780	Paradyne Version SDLC	Audio response (93 line max.)
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	No
Microprogrammable by user	Yes	Yes	Yes	No	No
Main memory cycle time, usec.	0.7	1.0	0.8	0.5	0.8
Main memory word size, bits	36	16	16 or 20	16	16
Main memory storage capacity, words or bytes	3M byte	32K bytes	1M byte	32K words	2M bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA, interrupt	DMA, interrupt	DMA	—	DMA, interrupt
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	Special utilities	Special utilities	TIP, message switch, store & forward	—	Data collection, (BANK-FROM-HOME)
Turnkey Systems	Yes	Yes	Yes	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	Contact vendor	Contact vendor	$125,000 to $950,000	$50,000 to $75,000	$80,000 and up
Monthly rental (2-yr. lease, including maint., range)	Contact vendor	Contact vendor	$3,500 up	$2,200	—
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1976	1974	August 1974	April 1976	1971
Number installed to date	2	35	7	80	Over 200
Serviced by	North American Philips	North American Philips	Omnus	Paradyne	Periphonics
COMMENTS			Line capacities shown are for simultaneously active lines per CPU (8 CPU's max.). Omnus-1/CU is a replacement for Univac C/SP, DCP, and CTMC		

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Periphonics Corporation DTC	Sperry Univac Distributed Communications Processor (DCP)	Tandem Computers Inc. T16/240	Tandem Computers Inc. T16/212, 243, 244	Telefile Computer Products, Inc. FECP-I
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	IBM, NCR, Burroughs, Honeywell	Univac Series 1100, Series 90	IBM, Xerox Sigma, Burroughs	IBM, Xerox Sigma, Burroughs	IBM 360/370
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	Yes	Yes	Yes	Yes
Maximum no. of direct connections to one host	—	2	32	1024	1
Maximum no. of hosts attachable to front-end	—	2	32	1024	2
Maximum no. of stations pollable on one line	—	AT&T dependent	256	256	Host dependent
As a remote concentrator	Yes	Yes	Yes	Yes	Yes
Maximum no. of remote connections to one host	Variable	No limit	32	1024	Software depen.
Maximum no. of hosts served by one concentrator	2	No limit	32	1024	Software depen.
Maximum no. of stations pollable on one line	25	AT&T dependent	—	—	Software depen.
As a free-standing communications processor	No	Yes	Yes	Yes	Yes
Network Architecture compliance	—	DCA	—	—	No
Full-capability data base system	—	TELCON (TOT.)	ENSCRIBE	ENSCRIBE	No
Operating system	—	TELCON	GUARDIAN	GUARDIAN	TCOS
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	20	256	256	2048	128
2000 to 9600 bps	5-20	96	256	2048	48
Over 9600 bps	—	32	256	2048	32
Effect on line capacity, if all lines are full-duplex	Halved	Capacity halved	Capacity halved	Capacity halved	Normally none
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	Yes	Yes
ADCCP/HDLC (UDLC, BDLC)	Yes	Yes	No	No	Yes
IBM SDLC	Yes	Yes	No	No	Yes
Other	Audio Response (20 line max.)	REM-1, Uniscope NTR	—	—	—
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	No	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	No	No
Main memory cycle time, usec.	0.9	0.92	0.5	0.8/0.5	0.6 to 1.0
Main memory word size, bits	16	16	16	16	16
Main memory storage capacity, words or bytes	56K words	128K bytes	160K words	224K/256K words	1M words
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA, interrupt
Mass storage	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA	DMA	DMA, interrupt
Communications operating software	Incl. in price	Incl. in price	Incl. in price	Incl. in price	Normally incl.
Additional software supported	—	NETGEN-DCP, host-cross assembler, loader, sysgen	TAL, COBOL, sort, editor, entry	TAL, COBOL, sort, editor, entry	FORTRAN, sort/merge, etc.
Turnkey Systems	Yes	Optional	No	No	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$50,000 and up	$40,668 to $200,000	Contact vendor	Contact vendor	$48,000 and up
Monthly rental (2-yr. lease, including maint., range)	—	$1,204 to $5,705	—	—	$1,775 and up
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	Fall 1977	October 1977	April 1977	May 1976	1971
Number installed to date	—	NA	5	30	NA
Serviced by	Periphonics	Sperry Univac, Customer Engrg.	Tandem	Tandem	Telefile
COMMENTS		Communications line capacity is dependent on line mix	All Tandem processors have multiprocessor architecture for for fault-tolerant operation		

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Telefile Computer Products, Inc. FECP-X	TELENET TP 1000	TELENET TP 2000	Texas Instruments DXS	Texas Instruments 700 TPS
COMPUTER SYSTEMS INTERFACED					
Manufacturers and Models	Xerox Sigma 5-9	Virtually all manufacturers	Virtually all manufacturers	Other network DXS's, and IBM 370X front-ends	—
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	Yes	Yes	Yes	Yes	No
Maximum no. of direct connections to one host	1	3	32	4	—
Maximum no. of hosts attachable to front-end	2	3	32	4	—
Maximum no. of stations pollable on one line	256	—	—	16	—
As a remote concentrator	Yes	Yes	No	Yes	No
Maximum no. of remote connections to one host	Soft. dependent	3	—	4	—
Maximum no. of hosts served by one concentrator	Soft. dependent	3	—	1	—
Maximum no. of stations pollable on one line	Soft. dependent	—	—	16	—
As a free-standing communications processor	Yes	Yes	Yes	Yes	Yes
Network Architecture compliance	No	—	—	Future (SN2)	—
Full-capability data base system	No	—	—	TINDX	—
Operating system	TCOS	—	—	DXS	PAM/D
Communications line capacity					
No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	128	4	36	60	4
2000 to 9600 bps	48	—	36	44	4
Over 9600 bps	32	—	—	16	4
Effect on line capacity, if all lines are full-duplex	Normally none	None	None	None	—
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	No	No
IBM BSC	Yes	No	No	Yes	No
ADCCP/HDLC (UDLC, BDLC)	Yes	No	Yes	No	No
IBM SDLC	Yes	No	No	Future	No
Other	—	—	X.25	DXS Protocol, 2260	T.I. 742
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Yes	Yes
Microprogrammable by user	No	No	No	Option	Option
Main memory cycle time, usec.	0.6 to 1.0	0.4	0.4	0.75	0.75
Main memory word size, bits	16	9	9	16	16
Main memory storage capacity, words or bytes	1M words	8K bytes	64K bytes	128K bytes	48K bytes
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt
Mass storage	DMA	—	—	DMA	DMA
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA interrupt
Communications operating software	Normally incl.	Incl. in price	Incl. in price	Incl. in price	Incl. in price
Additional software supported	FORTRAN, sort/merge, etc.	—	—	COBOL, Transaction Language, assembler	Available
Turnkey Systems	Yes	—	—	Yes	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$60,000 and up	$6,000	$23,000 to $35,000	$32,300 and up	$28,425
Monthly rental (2-yr. lease, including maint., range)	$2,630 and up	$200	$770 to $1,170	Contact vendor	$755
Communications operating software—one-time charge	—	—	—	—	—
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	1976	Sept. 1977	Sept. 1977	1972	1976
Number installed to date	NA	—	—	420	NA
Serviced by	Telefile	Telenet	Telenet	Texas Instruments	Texas Instruments
COMMENTS		Compatible with Telenet network	Compatible with Telenet network	Distributed system with multiple 960B processors, 914A CRT's, and 4M bytes mass storage	Discounts are available

Communications Processors—Basic Characteristics

MANUFACTURER AND MODEL	Varian V77-200	Varian V77-400	Varian V77-600	Western Union Information Systems C2100	Westinghouse Canada Ltd., Electronic Sys. W-1655-1CC
COMPUTER SYSTEMS INTERFACED Manufacturers and Models	—	—	—	Univac 1100, 490 Series, 48	—
NETWORK ARRANGEMENTS SUPPORTED					
As a front-end	No	No	No	Yes	No
Maximum no. of direct connections to one host	—	—	—	256	—
Maximum no. of hosts attachable to front-end	—	—	—	1	—
Maximum no. of stations pollable on one line	—	—	—	Unlimited	—
As a remote concentrator	No	No	No	Yes	Yes
Maximum no. of remote connections to one host	—	—	—	280	8 (+8 back-up)
Maximum no. of hosts served by one concentrator	—	—	—	1	4
Maximum no. of stations pollable on one line	—	—	—	Unlimited	Response dependent
As a free-standing communications processor	Yes	Yes	Yes	No	No
Network Architecture compliance	Planned	Planned	Planned	—	—
Full-capability data base system	—	PRONTO/TOT.	PRONTO/TOT.	—	—
Operating system	VORTEX/VTAM	VORTEX II/ VTAM	VORTEX II/ VTAM	—	—
Communications line capacity No. of half-duplex lines physically attachable to processor if all are operated at the listed speeds:					
Up to 1800 bps	1	12	12	536	16
2000 to 9600 bps	1	12	12	270	16
Over 9600 bps	1	—	—	64	Future
Effect on line capacity, if all lines are full-duplex	None	None	None	None	Capacity halved over 4800 bps
Terminal protocols supported:					
ASCII, Async. (Teletype)	Yes	Yes	Yes	Yes	Yes
IBM BSC	Yes	Yes	Yes	No	Yes
ADCCP/HDLC (UDLC, BDLC)	Planned	Planned	Planned	Yes	Yes
IBM SDLC	Planned	Planned	Planned	Yes	Future
Other	—	—	—	—	RESERVEC II, SITA/024C-1024
PROCESSOR CHARACTERISTICS					
Microprogrammable by manufacturer	Yes	Yes	Yes	Partial	Yes
Microprogrammable by user	No	Yes	Yes	No	No
Main memory cycle time, usec.	0.660	0.660	0.660	0.9	0.5
Main memory word size, bits	16	16	16	18	8
Main memory storage capacity, words or bytes	32K words	1M words	1M words	16K words	8K bytes (per processor)
Data transfer between memory and:					
Communications lines	DMA, interrupt	DMA, interrupt	DMA, interrupt	DMA, interrupt	Interrupt
Mass storage	DMA	DMA	DMA	—	—
Other peripherals	DMA, interrupt	DMA, interrupt	DMA, interrupt	—	Interrupt
Communications operating software	Sep. priced	Sep. priced	Sep. priced	Incl. in price	To cust. require.
Additional software supported	FORTRAN, RPG-II	COBOL, FORTRAN, RPG-II	COBOL, FORTRAN, RPG-II	—	To customer requirement
Turnkey Systems	No	No	No	Available	Yes
PRICING AND AVAILABILITY					
Purchase price (system range)	$35,000 to $60,000	$45,000 to $150,000	$55,000 to $300,000	$88,300 to $250,000	$15,000 to $20,000
Monthly rental (2-yr. lease, including maint., range)	—	—	—	—	—
Communications operating software—one-time charge	$3,500	$14,500	$14,500	—	Contact vendor
Communications operating software—monthly charge	—	—	—	—	—
Date of first delivery	December 1976	December 1976	December 1976	October 1973	Sept. 1976
Number installed to date	NA	NA	NA	—	80
Serviced by	Varian	Varian	Varian	Univac	User or third party
COMMENTS	System will emulate popular remote batch terminals such as IBM HASP, CDC 200 UT, and Univac 1004	PRONTO operates either as a stand-alone transaction system or as a distributed data processing/ transaction system, emulating IBM 3270 protocol to an IBM 370		Remote line adapter, RLA 2100, multiplexes up to 20 lines	Unit is modular, uses 3 microprocessors, and is the basis of custom designed special systems

Communications Processors - Basic Characteristics and Equipment Specifications

A discussion of the basic characteristics of communications processors and a presentation of the specifications of 84 processors from 37 vendors.

For a perspective, including the basic justifications for communications processors; a detailed look at front-end processors; and a presentation of users' ratings and usage patterns, see Report C09-013-101 behind the Management/System Guides tab in this volume.

The prospective buyer of a communications processor can learn a good deal about the various suppliers of this equipment and the specifications and prices of their wares by scanning the following pages of comparison charts. These charts present the principal characteristics of today's commercially available communications processors.

The information in the charts was supplied and/or verified by the vendors during the months of November 1975 through January 1976. Their cooperation is acknowledged and greatly appreciated. *The omission of the products of any specific company from the charts means that the company either failed to respond to our repeated information requests, was unknown to us, or has discontinued its communications processor product line.*

Subject matter for the charts includes processors with such uses as front-end processing, message switching, data collection, line concentration, etc. Processors used strictly as controllers in remote batch terminals are not included, because these products are generally limited to one type of line or terminal and are covered in the appropriate sections of this service. Minicomputers and their suppliers are only included when the manufacturer offers an integrated communications product, rather than a bare minicomputer, for sale to end users.

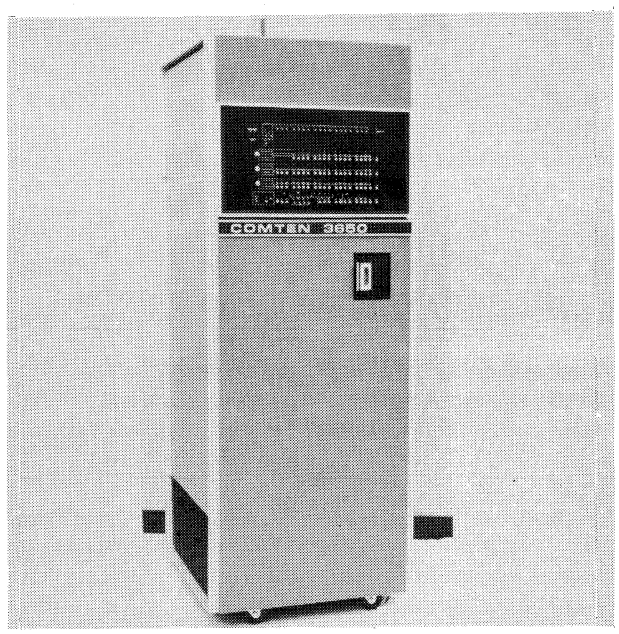
With two exceptions, hard-wired communications controllers are not covered in these charts on programmable communications processors. The two exceptions are the IBM 270X hard-wired controllers and their Memorex equivalents. It seems only fitting that these products be included for comparative purposes, since they triggered much of the interest in communications processors by the average EDP user.

The chart entries and their significance to prospective users of programmable communications processors are explained in the following paragraphs.

Computer system interface. Those programmable communications processors that provide specific hardware interfaces to central main-frame computer systems are generally used primarily as front-end processors. This entry lists the interfaces available, if any. If none is available, the processor is probably used as the heart of a message switching or data collection system, as will be specified later on in the entry called Supported Applications. The computer system interface generally enables the front-end processor to connect directly to an I/O channel of the central computer system, appearing as a standard I/O device controller to the channel.

Host computer communications software. This entry defines the communications processor's compatibility with the host computer's existing communications software. In some cases, the existing software must be altered to accommodate the vendor's product, while in other cases the host computer's communications software must be completely replaced. Where alterations to or replacement of the existing software is required, the entries specify whether or not the vendor provides the alterations or replacement software. If he does not, it is the user's responsibility to furnish the software. In some cases, the vendor provides both alterations and replacement software for his product, depending on the user's application.

In some cases, entries show that the existing mainframe software is "used as is" and also "altered" and/or "replaced." This seeming anomaly results from vendor support of multiple applications. It also occurs when the vendor expands the main-frame maker's software to support enhancements provided by the vendor's



Comten is one of the leading independent vendors of communications processors. Founded in 1967, the company was a pioneer in unloading communications functions from the host computer mainframe long before IBM blessed the concept with the introduction of the 3705. The Comten 3650 above can be configured to emulate 270X or 370X equipment or as a free-standing communications processor for remote concentration, message switching, networking, etc.

Communications Processors — Basic Characteristics

Until March 1972, communications functions in IBM computer systems were handled by the hard-wired 270X series controllers, which placed the communications processing burden squarely upon the central processor. Then IBM announced the 3705 Communications Controller (above), a minicomputer-based front-end processor that can handle up to 352 lines. In November 1975, IBM introduced an enhanced version, the 3705-II, that features significant improvements in performance and reductions in cost. Because of problems in the development of the sophisticated Network Control Program software for the 3705, most installations are currently using the unit strictly to emulate the earlier 270X controllers and thereby missing many of the promised benefits of front-end processing.

product. The complete account on compatibility with mainframe software is a critical factor in the procurement of a communications processor. A clear understanding between the user and the vendor must be established prior to signing the contract to avoid unpleasant surprises on both sides during installation. The difference between the meanings of the terms "plug compatible" and "functionally compatible," for example, becomes exceedingly important in considering who has to do what.

Supported applications. This entry lists the key application areas for which each programmable processor has been designed. If a given processor is listed as serving one particular application area, such as message switching, it is likely that it can be adapted to other uses with the addition of some hardware interface units and specialized software packages. Specific entries are included to pinpoint the devices capable of directly replacing IBM 270X controllers or 3705 processors with or without NCP.

Communications lines configuration. This entry summarizes the communications line handling capacity of each processor. The total number of half-duplex lines that can be directly connected is listed, together with the total number of lines that can be simultaneously active (i.e., transmitting data). The latter number may be less than the maximum number of lines that can be connected.

In separate entries are listed the maximum number of narrow-band, voice-band, and broad-band lines that can be connected. These figures are at best meant to serve as general guidelines, since a specifically tailored processor system may be able to handle considerably fewer lines than the listed maximums (depending, for example, on the relative activities of the three types of lines and also on the amount of processor time dedicated to pre- or post-processing of the data being transmitted).

Because full-duplex operation requires twice the number of data paths, some systems accommodate only half the number of lines when full-duplex operation is introduced. Other systems are not affected and accommodate the same number of lines for either half- or full-duplex operation.

Processor and memory. This entry includes the basic performance specifications of the programmable processor and its main memory unit. The length of the processor's basic unit of data (i.e., its word size) is expressed in number of bits. Generally, the larger the word size, the more efficient the transfer of data between the processor and the central computer system. Main memory cycle times are presented to give some indications of the raw data handling speeds of these processors. Main memory capacity, expressed in range of sizes, can directly affect overall performance; the larger the main memory, the more and larger data buffers can be allocated, and the more software processing routines can be resident and instantly accessible in main memory.

The number of priority interrupt levels is listed to indicate how the hardware can assist in line control operations. Ideally, if there were a separate interrupt level for each line, upon receipt of a line-generated interrupt the processor would automatically know the source of that interrupt. Since the ideal situation rarely prevails, the processor must engage in some software testing in order to identify the sources of specific interrupts. Special hardware techniques, such as the use of a microprocessor like Data General's DCU 50 in its Nova and Eclipse series processors, are key details that should be carefully investigated.

The entry also lists the various types of on-line peripheral devices, if any, that can be directly connected to the programmable communications processor. By far the most important of such devices are the auxiliary storage units, i.e., the on-line disks, drums, and magnetic tape units. The disk or drum units can be especially valuable in message buffering, batching, and queuing operations. They can also store less frequently used processing routines. Magnetic tape units can be useful in logging messages on a journal basis or in recording statistics.

The other on-line peripheral devices, such as punched card units, paper tape units, and line printers, generally play a less direct role in the communications-oriented functions of these processors. However, they are of

Communications Processors — Basic Characteristics

direct value in enabling the processor to perform as an independent data processing system when it is either operating in a multi-function environment or is off-line from its primary data communications control activities. These devices can also be valuable in testing and debugging the processor's software control programs.

The charts also list whether or not the processors include console performance monitors. These devices may be only a panel of lights and switches, CRT display units, simple Teletype teleprinters, or highly specialized units. But in any case, depending on how comprehensive the software programs that support them are, they can provide the system operator with immediate access to the status of all lines and can permit him to change this status, for example, from idle to enabled, as necessary. Some devices can also provide statistics on the performance of the network, indicating the amount of time lines are idle, the numbers of retransmissions, the amount of time spent processing interrupts, etc. In any event, these devices can be especially useful in helping to diagnose system failures, since the operator can quickly determine the operational status of all connected lines.

Software. This entry shows what levels of software are provided with the processor, in addition to the specific supported applications discussed above, and also whether the software is supplied along with the hardware ("standard") or is priced separately ("optional"). If the processor is equipped with a software operating system to control all its operations, the charts so indicate. Likewise, if the software provided includes message control programs to automatically format, route, and queue messages, the charts so indicate. If message control routines are not provided, then the buyer must realize that he must provide for such routines either through use of his in-house programmers or through an independent software supplier. The vendor of the programmable processor may also offer to write such software, but obviously for an additional price.

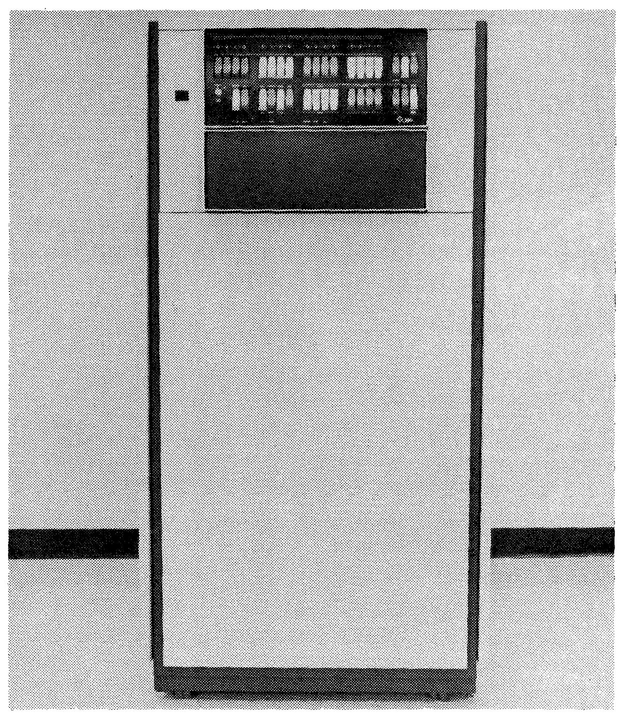
The software entries also list the specific terminal handling routines, or handlers, that are offered as part of the standard processor package. Other handlers can often be easily provided, but on a special-order basis. The user may choose to write his own terminal handlers if none exists for this specific terminals, or he may commission the supplier of his "foreign" terminal to prepare appropriate handlers as part of the terminal system support package. (These entries refer to the popular Teletype terminals by the abbreviation "TTY.")

The entries also list whether or not the processor comes equipped with an assembler so that the user can write and modify control and processing routines as required during the installation lifetime of the processor. In some cases, the vendor provides two versions of the assembler: one that functions on the communications processor itself, and another that functions on the host or central computer (cross assembler) for greater speed in assembling the program.

The "Turnkey systems" entry informs potential users whether or not the vendor is willing to undertake to provide complete systems, including all applications software.

Pricing and availability. The charts list the purchase and monthly rental prices for each processor, except where the suppliers declined to provide such information. In many cases, price ranges are listed, indicating that actual prices in specific situations will be determined by such items as number and type of lines controlled, amount of main memory selected, number and type of on-line peripheral devices selected, and number and extent of software functions desired. As mentioned earlier, it can be extremely dangerous to casually compare the prices of two apparently similar programmable processors without knowing precisely what is included. The charts can at best serve as rough guidelines on the relative pricing of these processors.

The suppliers of these processors were asked to provide two other significant items of information: date of first delivery (actual or expected) and number of processors installed to date. (In most cases, they provided this information; those that declined are clearly indicated.) This information can be valuable in differentiating those products that have been installed for a substantial period



The Modular Computer (Modcomp) II and IV (shown above) minicomputer systems are available with an additional set of macro instructions implemented in control storage specifically for communications functions. With the special control memory, the models are designated II/CP and IV/CP. In addition, Modcomp has developed MAXNET software for support of multiple Modcomp systems network. Several other minicomputer vendors are noted for special efforts in communications processors; such vendors include Data General, Digital Equipment, Hewlett-Packard, Interdata, Systems Engineering Laboratories, Texas Instruments, and Varian.

Communications Processors — Basic Characteristics

of time and in a number of installations from those that are essentially untried to date. In those cases where the systems have been installed and running for some period of time, the buyer should check with the supplier as to whether or not the installed systems are functioning in the same application areas as those he has planned. If they are performing radically different functions, the "proven performance" assertion loses some significance.

Comments. At the bottom of the charts are listed any unusual features or characteristics of the programmable communications processors which are not reflected in the standard entries

Suppliers of Communications Processors

Listed below for your convenience in obtaining additional information are the full names and addresses of the 37 suppliers whose 84 products are summarized in the following comparison charts.

Action Communications Systems, Inc., 10300 N. Central Expressway, Dallas, Texas 75231. Telephone (214) 750-3000.

American Systems Incorporated, 123 Water Street, Watertown, Massachusetts 02172. Telephone (617) 923-1850.

Burroughs Corporation, Second Avenue at Burroughs, Detroit, Michigan 48232. Telephone (313) 972-7000.

Chi Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

Collins Radio Group, Rockwell International, Dallas, Texas 75207. Telephone (214) 690-5000.

Computer Automation Inc., 18651 Von Karman Avenue, Irvine, California 92664. Telephone (714) 833-8830.

Computer Communications, Inc., 2610 Columbia Street, Torrance, California 90503. Telephone (213) 320-9101.

Computer Transmission Corporation (Tran), 2352 Utah Avenue, El Segundo, California 90245. Telephone (213) 973-2222.

Comten, 1950 W. County Road B-2, St. Paul, Minnesota 55113. Telephone (612) 633-8130.

Control Data Corporation, Box O, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Data General Corporation, Southboro, Massachusetts 01772. Telephone (617) 485-9100.

Data Pathing Inc., 370 San Aleso Avenue, Sunnyvale California 94086. Telephone (408) 734-0100.

Digital Communications Associates, Inc., 135 Technology Park/Atlanta, Narcross, Georgia 30074. Telephone (404) 448-1400.

Digital Computer Controls Inc., 12 Industrial Road, Fairfield, New Jersey 07006. Telephone (201) 227-4861.

Digital Equipment Corporation. 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

GSC Data Systems, Inc. (formerly Wells TP Sciences, Inc.), 99 West Sheffield Avenue, Englewood, New Jersey 07631. Telephone (201) 569-7711.

GTE Information Systems, Inc., 5300 E. La Palma Avenue, Anaheim, California 92807. Telephone (714) 524-4431.

Harris Corp., Data Communications Division, 11262 Indian Trail, P.O. Box 44076, Dallas, Texas 75234. Telephone (214) 620-4400.

Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California, 94304. Telephone (415) 493-1501.

Honeywell Information Systems, Inc., 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 890-8400.

IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

Intercomputer Corporation, 2201 East University Drive, Phoenix, Arizona 85034. Telephone (601) 267-7545.

Interdata, Inc., 2 Crescent Place, Oceanport, New Jersey 07757. Telephone (201) 229-4040.

Memorex Corporation, San Tomas at Central Expressway, Santa Clara, California 95052. Telephone (408) 987-1000.

Modular Computer Systems, 1650 W. McNab Road, Fort Lauderdale, Florida 33309. Telephone (305) 974-1380.

Norfield Electronics, Inc., 3 Depot Place, East Norwalk, Connecticut 06855. Telephone (203) 853-2777.

North American Philips Communications Corp., 91 McKee Drive, Mahwah, New Jersey 07430. Telephone (201) 529-3800.

Omnus Computer Corporation, 1538 E. Chestnut Street, Suite E. Santa Ana, California 92701. Telephone (714) 547-8444.

Periphonics Corporation, 75 Orville Drive, Bohemia, New York 11716. Telephone (516) 567-1000.

RCA Global Communications, Inc., 60 Broad Street, New York, New York 10004. Telephone (212) 363-2121.

Systems Engineering Laboratories, Inc. (SEL), 6901 W. Sunrise Blvd., Ft. Lauderdale, Florida 33313. Telephone (305) 587-2900.

Telefile Computer Products Incorporated, 17131 Daimier St., Irvine, California 92705. Telephone (714) 557-6660.

Telex Corporation, Box 1526, Tulsa, Oklahoma 74101. Telephone (918) 627-1111.

Texas Instruments, Inc., P.O. Box 1444, Houston, Texas 77001. Telephone (713) 494-5115.

UNIVAC (division of Sperry Rand Corporation), P.O. Box 500, Blue Bell, Pennsylvania 19422. Telephone (215) 542-4011.

Varian Data Machines, 2722 Michelson Drive, Irvine, California 92806. Telephone (714) 833-2400.

Western Union Information Systems, Inc., 82 McKee Drive, Mahwah, New Jersey 07430. Telephone (201) 529-4600.□

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Action Communications Systems Telecontroller	American Systems Nucleus 4000	Burroughs B 774	Burroughs B 776	Chi Communications Processor (front end)
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370	IBM/360, IBM/370, Burroughs B 1700, Data General Nova, custom	Burroughs B 4700/ B 3700/B 2700	Burroughs B 4700/ B 5700/B 6700/ B 7700	UNIVAC 1100 Series
Host computer comm. software:					
Used as is	No	Yes	MCPV-MCS	Yes	No
Altered	Yes	Yes	—	Yes	Yes
Alterations provided	No	Yes	—	Yes	Yes
Replaced	Yes	Yes	—	Yes	Yes
Replacement provided	No	Yes	—	Yes	Yes
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	No	Yes	No	No	No
IBM 370X emulation without NCP	No	No	No	No	No
IBM 370X emulation with NCP	Yes	No	No	No	No
Remote concentration	Yes	Yes	No	Yes	No
Message switching	Yes	Yes	Custom	Yes	Yes
Other supported applications	—	Inquiry/response; data collection; banking; retail credit network	RJE; time-sharing	Distributed communications	Security; spooling
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	128	256	32	32	240
Narrow-band lines	128	256	32	32	240
Voice-band lines	128	128	32	4	240
Wide-band lines	128	48	None	1	240
Maximum number of lines active simultaneously	128	256	32	32	240
Effect of full-duplex operation	Reduces lines by half	Reduces line by half	Reduces line by half	Reduces line by half	No effect
PROCESSOR AND MEMORY					
Processor identity	Data General 1200, 800	DEC PDP-11 Series	Burroughs B 774-1	Burroughs B 776-1	Interdata 80
Word length, bits	16	16	16	16	32
Memory cycle time, microseconds	1.2/0.8/0.3	Function of DEC PDP-11 model used	0.5	1.0	0.27
Memory capacity, bytes	128		8K to 96K	40K to 96K	64K
Priority interrupt levels	64	—	—	—	4
On-line peripheral devices	Card reader, disk mag. tape, paper tape, printer	Disk paper tape, or any standard peripheral	None	Disk cartridge, mag. tape, card readers, punches, etc.	Card reader, disk, printer
Console performance monitor	Yes	Yes	No	—	No
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Host	Yes	Yes
Assembler	Yes	Yes	No	Yes (compiler)	Yes
Cross assembler	No	Yes	Yes	No	Yes; UNIVAC 1100
Terminal handlers	Most terminals	Most terminals; CRT's; async. and Bisync.; financial	Burroughs terminals; Teletype; Bisync. terminals	Burroughs terminals; Teletype; Bisync. terminals	IBM 2780; U 1004; IBM 360/20; Teletype
Software pricing	Standard	Standard	$2,000 (purchase); $50/mo. (rental)	Standard	Standard
Turnkey systems	Available	Available	—	—	Available
PRICING AND AVAILABILITY					
Purchase price	$100K to $1M	$30,000 and over; varies by model	$39,800 to $125,000	—	$40,000 (basic)
Monthly rental	$3,500 to $31,000	—	$850 to $2,900	—	$1,300 (basic)
Date of first delivery	1971	1974	January 1975	December 1975	August 1972
Number installed to date	75	9	—	—	—
Serviced by	Sorbus	American Systems & Digital Equipment	Burroughs	Burroughs	Chi and Interdata
COMMENTS		Supports voice response; does not require IBM telecom. access methods	Microprogram controlled	Also see Reports 70D-112-01 through 70D-112-13 for specifications of the numerous Burroughs Terminal Computers	

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Chi Communications Processor (remote concentrator)	Collins Radio Group C-System Model 8562	Collins Radio Group C 900 Series	Computer Automation LSI-1 & LSI-2	Computer Communications Inc. CC-8
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	UNIVAC 1100 Series	IBM/360, IBM/370 UNIVAC 1100 & 490 Series, custom	Custom	Application dependent	IBM/360, IBM/370
Host computer comm. software:			See Comments		
Used as is	Yes	No	—	—	Yes
Altered	No	Yes	—	—	No
Alterations provided	No	Yes	—	—	No
Replaced	No	Yes	—	—	No
Replacement provided	No	Yes	—	—	No
SUPPORTED APPLICATIONS					
Front-end processing	—	Yes	No	No	Yes
IBM 270X emulation	No	No	No	No	Yes
IBM 370X emulation without NCP	No	No	No	No	Yes
IBM 370X emulation with NCP	No	No	No	No	Yes
Remote concentration	Yes	Yes	Yes	No	Yes
Message switching	No	Yes	Yes	No	Yes
Other supported applications	—	Multiple mixed host CPU interprocessing	Funds transfer	Software modules permit constr. of emulator progs.	Intelligent network processing
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	240	1024	256	Over 32	240
Narrow-band lines	240	1024	256	—	240
Voice-band lines	240	256	20	—	120
Wide-band lines	240	128	10	—	64
Maximum number of lines active simultaneously	240	1024	256	—	240
Effect of full-duplex operation	No effect	—	No effect	—	No effect
PROCESSOR AND MEMORY					
Processor identity	Interdata 80	C-8562A-1	DEC PDP-11/35 and PDP-11/05	LSI-1 & LSI-2	CCI
Word length, bits	32	32	16	16	16
Memory cycle time, microseconds	0.27	0.9	0.9	1.6	1.0
Memory capacity, bytes	64K	262K	64K to 256K	512K	8K to 512K
Priority interrupt levels	4	0 (queue-driven)	Multi-level	256	32
On-line peripheral devices	Card reader, disk, printer	Disk, mag. tape, card units, printers, others	Moving head disk, mag. tape, printer, CRT, card reader, etc.	Disk, mag. tape, CRT, card readers, line printer, etc.	Fixed and moving-head disk; CRT
Console performance monitor	No	Yes	Yes (+Op Console)	Yes	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	No	Yes
Assembler	Yes	Yes	Yes	Yes	No
Cross assembler	Yes; UNIVAC 1100	No	—	Yes; IBM 360/370	Yes
Terminal handlers	UNIVAC U-100 and DCT 2000	TTY; AT&T, WU TTYsys.;IBM 2780 & other BSC; Univac DCT 1000,etc.	SABRE Code; ATA; IATA; ASCII; SDLC; others	—	All IBM; TTY I/II; Univac; DS 40; DS V
Software pricing	Standard	Standard	Standard	—	Standard and custom
Turnkey systems	Available	Available	Available	No	Yes
PRICING AND AVAILABILITY					
Purchase price	$30,000 (basic)	$500,000 to $2M	$350,000 to $950,000	$2,760 to $3,160	$46,500 (basic)
Monthly rental	$1,000 (basic)	Contact vendor	Contact vendor	—	3-year & 5-year leases
Date of first delivery	June 1974	March 1974	January 1975	September 1973	May 1975
Number installed to date	—	Over 20	Over 10	—	2
Serviced by	Chi and Interdata	Collins	Collins	CAI	CCI
COMMENTS		System permits multiple host CPU's and flexible line terminations	System supports multi-mode environment and applications; Collins is now a subsidiary of Rockwell International	Marketed on an OEM basis to systems manufacturers	Competitor to IBM 3704; see other CCI models on next page

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Computer Communications Inc. CC-80	Computer Communications Inc. CC-8000	Computer Transmission Corp. M-3000	Comten, Inc. Comten 20	Comten, Inc. Comten 476
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, and custom	IBM/360, IBM/370, and custom	IBM/360, IBM/370, CDC 7600, DEC PDP-11, etc.	Custom	IBM/360, IBM/370, custom
Host computer comm. software:					
Used as is	Yes	Yes	Yes	—	No
Altered	No	No	No	—	No
Alterations provided	No	No	No	—	No
Replaced	No	No	No	—	Yes
Replacement provided	No	No	No	—	Yes
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	No	No	Yes
IBM 270X emulation	Yes	Yes	No	No	No
IBM 370X emulation without NCP	Yes	Yes	No	No	No
IBM 370X emulation with NCP	Yes	Yes	No	No	No
Remote concentration	Yes	Yes	Yes	Yes	No
Message switching	Yes	Yes	—	No	Yes
Other supported applications	Intelligent network processing	—	Data PABX circuit switching, port contention	—	EFTS, combined message switching & front-end processing
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	240	960	2048	128	256
Narrow-band lines	240	240	—	128	256
Voice band lines	120	240	—	128	256
Wide-band lines	64	240	—	64	128
Maximum number of lines active simultaneously	240	960	2048	128	256
Effect of full-duplex operation	No effect	No effect	No effect	No effect	No effect
PROCESSOR AND MEMORY					
Processor identity	CCI	CCI	—	Comten	Comten
Word length, bits	16	16	—	16	32
Memory cycle time, microseconds	0.54	0.54	—	0.9	0.75
Memory capacity, bytes	8K to 512K	8K to 512K	—	8K to 65K	32K to 512K
Priority interrupt levels	32	32	—	128	64 to 384
On-line peripheral devices	Fixed/moving-head disks, mag. tape, printer, cards CRT, paper tape	Fixed/moving-head disks, mag. tape, printer, cards CRT, paper tape	—	Disk, mag. tape, card reader, printer, paper tape	Disk, mag. tape, card reader, printer, paper tape
Console performance monitor	Yes	Yes	Yes	No	Yes
SOFTWARE					
Operating system	Yes	Yes	—	No	Yes
Message control programs	Yes	Yes	—	No	Yes
Assembler	No	No	—	No	Yes
Cross assembler	Yes	Yes	—	Yes; IBM 360/370; Comten 476	Yes; IBM 360/370
Terminal handlers	All CCI, all IBM, TTY 33/35/37; others custom	All CCI, all IBM, TTY 33/35/37; others custom	—	None	TTY 28/33/35/37, all IBM, SDLC, others
Software pricing	Standard	Standard	—	Optional	Standard
Turnkey systems	Available	Available	—	No	Available
PRICING AND AVAILABILITY					
Purchase price	$74,500 (basic)	$125,000 (basic)	Configuration dependent	$60,000 to $120,000	$100,000 to $350,000
Monthly rental	3-yr. and 5-yr. leases	3-yr. and 5-yr. leases	—	—	—
Date of first delivery	March 1975	October 1970	1973	March 1971	September 1975
Number installed to date	12	6	—	Over 50	Over 50
Serviced by	CCI	CCI	TRAN	Comten	Comten
COMMENTS	Emulation and network program multiprocessor	Message switch multiprocessor	Supports all std. interfaces: EIA RS-232, CCITT V.24, MIL Std., CCITT V.35, etc.	Used as remote concentrator in large networks	476 is successor to Comten 40/45 and 60/65, first delivered in June 1969

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Comten, Inc. Comten 3650	Comten, Inc. Comten 3670	Control Data Corp. Cyber 1000	Control Data Corp. 2550 Series	Data General Nova 2
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	CDC 6000, Cyber 70, Cyber 170, 3000 Series	IBM/360, IBM/370, custom
Host computer comm. software:					
Used as is	Yes	Yes	No	Yes	Yes
Altered	No	No	Yes	No	—
Alterations provided	No	No	Yes	No	—
Replaced	No	No	Yes	No	—
Replacement provided	No	No	Yes	No	—
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	Yes	Yes	No	No	No
IBM 370X emulation without NCP	Yes	No	No	No	No
IBM 370X emulation with NCP	Yes	Yes	No	No	No
Remote concentration	Yes	Yes	Yes	No	No
Message switching	Yes	Yes	Yes	No	No
Other supported applications	Communications networking	Communications networking systems (CNS)	—	6671/6676 emulation	—
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	128	384	32 to 512	256	128/mux
Narrow-band lines	128	384	32 to 512	256	128/mux
Voice-band lines	128	384	32 to 512	256	4/mux
Wide-band lines	64	192	32 to 128	128	1
Maximum number of lines active simultaneously	128	384	32 to 640	256	All
Effect of full-duplex operation	No effect	No effect	No effect	No effect	No effect
PROCESSOR AND MEMORY					
Processor identity	Comten	Comten	Control Data	Control Data	Data General Nova 2
Word length, bits	16	16	27	16 + 2	16
Memory cycle time, microseconds	0.65	0.65	0.9	0.65	1.0
Memory capacity, bytes	16K to 256K	16K to 512K	24K to 192K	48K to 512K	8K to 64K
Priority interrupt levels	256 to 768	256 to 768	4	16	16
On-line peripheral devices	—	—	Fixed/moving-head disk, mag. tape, card reader/punch, line printer	Moving-head disk, line printer, card reader	Fixed/moving-head disk, mag. tape, card reader, line printers, diskette
Console performance monitor	Yes	Yes	Yes	Yes (CRT, TTY)	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	No	No	Yes	No	Yes
Cross assembler	Yes; IBM 360/370, Comten 476	Yes; IBM 360/370, Comten 476	No	Yes; CDC 6000, Cyber 70, 170	Yes; IBM/360
Terminal handlers	TTY 28/33/35/37, all IBM, SDLC, others	TTY 28/33/35/37, all IBM, SDLC, others	TTY;IBM BSC ter.; AT&T, WU TTY systems; TC 500, TTY 40; others	TTY 28/33/35/38, CDC 200 UT, 731, 734, 711, 714, 713, others	TTY 33, IBM 2780
Software pricing	Standard	Standard	Standard, opt.	Standard	Standard
Turnkey systems	Available	Available	Available	Optional	None
PRICING AND AVAILABILITY					
Purchase price	$50,000 to $150,000	$100,000 to $400,000	$250,000 to $1,500,000	$50,000 to $150,000	$4,550 to $75,000
Monthly rental	$1,000 to $3,000	$2,400 to $8,000	$5,000 to $35,000	$2,500 to $7,500	Third-party lease
Date of first delivery	March 1975	March 1972	March 1969	September 1975	September 1973
Number installed to date	Over 60	Over 150	58	15	20,000 (all types)
Serviced by	Comten	Comten	Control Data	Control Data	Data General
COMMENTS					See Comments for other Data General models (next page)

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Data General Eclipse Nova 3	Data General Eclipse S/100	Data General Eclipse S/200	Data General Eclipse C/300	Data Pathing Inc. Series 2000
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	No
Altered	—	—	—	—	Yes
Alterations provided	—	—	—	—	Yes
Replaced	—	—	—	—	No
Replacement provided	—	—	—	—	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	No	No	No	No	No
IBM 370X emulation without NCP	No	No	No	No	No
IBM 370X emulation with NCP	No	No	No	No	No
Remote concentration	Yes	Yes	Yes	Yes	Yes
Message switching	Yes	Yes	Yes	Yes	No
Other supported applications	RJE, time-sharing	HASP, RJE, time-sharing	HASP, RJE, time-sharing	HASP, data base systems (INFOS), RJE, time-sharing	Data collection
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	256/mux	256/mux	256/mux	256/mux	6
Narrow-band lines	256/mux	256/mux	256/mux	256/mux	0
Voice-band lines	32/mux	32/mux	32/mux	32/mux	6
Wide-band lines	4/mux	4/mux	4/mux	4/mux	0
Maximum number of lines active simultaneous	256/mux	256/mux	256/mux	256/mux	6
Effect of full-duplex operation	Reduces lines by half	Reduces lines by half	Reduces lines by half	Reduces lines by half	No effect
PROCESSOR AND MEMORY					
Processor identity	Data General Nova 3	Data General Eclipse w/ERCC	Data General Eclipse w/ERCC	Data General Eclipse w/ERCC	DPI 2103
Word length, bits	16	16	16	16	16
Memory cycle time, microseconds	0.7	0.2 to 0.8	0.2 to 0.8	0.2 to 0.8	8.0
Memory capacity, bytes	16K to 256K	16K to 256K	32K to 256K	64K to 256K	16K
Priority interrupt levels	16	64	64	64	16
On-line peripheral devices	Fixed/moving-head disk, mag. tape, line printers, cassette tape, card reader, paper tape units, diskettes, CRTs, others				Mag. tape
Console performance monitor	Yes	Yes	Yes	Yes	No (op. console)
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	Yes; IBM/370	Yes; IBM/370	Yes; IBM/370	Yes; IBM/370	No
Terminal handlers	TTY 33, CRT's, IBM 2780/3780, BSC, ASCII, SDLC	TTY 33, CRT's, IBM 2780/3780, BSC, ASCII, SDLC	TTY 33, CRT's, IBM 2780/3780, BSC, ASCII, SDLC	TTY 33, CRT's, IBM 2780/3780, BSC, ASCII, SDLC	DPI data collection
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	None	None	None	None	Available
PRICING AND AVAILABILITY					
Purchase price	$2,900 to $50,000	$9,200 to $75,000	$16,300 to $100,000	$30,000 to $250,000	$24,150
Monthly rental	3rd-party lease	—	—	—	$812 to $900
Date of first delivery	1975	April 1975	March 1975	July 1975	1967
Number installed to date	20,000 (all types)	—	—	—	85
Serviced by	Data General	Data General	Data General	Data General	DPI
COMMENTS	Each mux supports up to 9600 bps per line (asynch. 256 lines/synch. 32 lines); the DCU 50 user-programmable communications preprocessor supports 16,000 char/sec throughput each, or 4,800 char/sec per DG system				Turnkey support for data collection systems

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Data Pathing Inc. System 150-30	Data Pathing Inc. System 150-60	Data Pathing Inc. Series 2100	Digital Communications Associates Smart/MUX	Digital Computer Controls Inc. D-116
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, custom	IBM/360, IBM/370, custom	IBM/360, IBM/370, others	DECsystem-10, IBM/360, IBM/370, others	IBM/360, IBM/370, others
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	No
Altered	No	No	No	Yes	Yes
Alterations provided	No	No	No	Yes	No
Replaced	No	No	No	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	No
IBM 270X emulation	Yes	Yes	Yes	Yes	No
IBM 370X emulation without NCP	Yes	Yes	Yes	No	No
IBM 370X emulation with NCP	No	No	No	No	No
Remote concentration	Yes	Yes	Yes	Yes	Yes
Message switching	Yes	Yes	Yes	Yes	No
Other supported applications	Data collection, source data management, stand-alone applications, 3270 emulation		Data collection, source data management	Time-sharing, RJE	Data collection
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	11	31	10	128	128
Narrow-band lines	0	0	0	128	128
Voice-band lines	11	31	10	4 to 6	128
Wide-band lines	0	0	0	2	128
Maximum number of lines active simultaneously	11	31	10	All	128
Effect of full-duplex operation	No effect	No effect	No effect	No effect	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	DPI 2015 & Intel 8080	DPI 2106 & Intel 8080	DPI 2104	DEC PDP-8 Series	DCC
Word length, bits	16	16	16	12	16
Memory cycle time, microseconds	1.0	1.0	2.0	1.2	1.2/0.96
Memory capacity, bytes	32K to 128K	32K to 256K	32K	8K to 48K	256K
Priority interrupt levels	7	7	NA	NA	16
On-line peripheral devices	Disk, mag. tape, printers, CRT, others	Disk, mag. tape, printers, CRT, others	Mag. tape, disk, CRT, printers, drum	Disk, mag. tape, card reader, line printer	Disk, mag. tape, card reader, printer, punch, CRT, paper tape, etc.
Console performance monitor	No (op. console)	No (op. console)	No (op. console)	Yes	No
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	No
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	No	No	No	Yes; DEC PDP-10, IBM/360, IBM/370	No
Terminal handlers	DPI data collection, TTY, 3270 BSC, others	DPI data collection, TTY, 3270 BSC, others	DPI data collection	ASCII, BSC, IBM 2741 (corres.); SDLC planned	Most prominent terminals
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$105,000 to $160,000	$105,000 to $160,000	$85,050 to $109,410	$6,000 to $50,000	$2,975 to $29,370
Monthly rental	$2,852 to $5,251	$2,852 to $5,251	$2,276 to $3,123	3rd-party lease	—
Date of first delivery	1973	1973	1970	August 1972	Jan. 1972
Number installed to date	100 of 150 Series	100 of 150 Series	150	Over 100	2,340
Serviced by	DPI	DPI	DPI	Data 100	DCC and representatives
COMMENTS	Turnkey support for data collection/management information systems	Turnkey support for data collection/management information systems	Turnkey support for data collection, source data management systems	Previously sold as models PTC 8 and PRC 8	Turnkey support for data collection

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Digital Equipment Corporation Front End System Base	Digital Equipment Corporation PDP-11 Family	GSC Data Systems T-578 System	GTEIS IS/1100	GTEIS IS/1101
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370	—	IBM/360, IBM/370	IBM/360, IBM/370, CDC 3000/6000 Series, Honeywell 425	IBM/360, IBM/370
Host computer comm. software:					
Used as is	Yes	No	Yes	Yes	Yes
Altered	No	No	No	Yes	No
Alterations provided	No	No	No	Yes	No
Replaced	No	No	No	Yes	Yes
Replacement provided	No	No	No	Yes	Yes
SUPPORTED APPLICATIONS					
Front-end processing	Yes	No	Yes	Yes	Yes
IBM 270X emulation	No	No	No	Yes	Yes
IBM 370X emulation without NCP	No	No	No	Yes	Yes
IBM 370X emulation with NCP	No	No	No	Yes	No
Remote concentration	No	No	Yes	Yes	No
Message switching	No	No	Yes	Yes	No
Other supported applications	None	IBM 2780 emulation; RJE	—	—	—
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	NA	—	128	—	—
Narrow-band lines	Groups of 16	—	128	256	24
Voice-band lines	Groups of 1	—	32	128	16
Wide-band lines	Groups of 1	—	1	64	16
Maximum number of lines active simultaneously	NA	—	128	Variable	40
Effect of full-duplex operation	—	—	No effect	No effect	—
PROCESSOR AND MEMORY					
Processor identity	DEC PDP-11/10, 11/40, 11/50	DEC PDP-11/10, 11/40, 11/50	IBM 1130, GA 18/30	GTEIS	GTEIS
Word length, bits	16	16	16	16	16
Memory cycle time, microseconds	0.9/0.9/0.3	0.9/0.9/0.3	1.2	0.75	0.75
Memory capacity, bytes	56K	56K to 256K	128K	128K	128K
Priority interrupt levels	Multi-level	Multi-level	8	16	16
On-line peripheral devices	Line printer, card reader	Disk, card reader, line printer, mag. tape	Disk, mag. tape, printers	Disk, mag. tape, card reader/punch, printer, paper tape reader/punch	None
Console performance monitor	Yes	Yes	Yes	Yes	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	No	No	No	Yes	Yes; IBM/360, IBM/370
Terminal handlers	TTY; DEC LA36, VT50; IBM 2741	TTY; DEC LA36, VT50; IBM 2741	All IBM and TTY, Wiltek, Mohawk	IBM, Data 100, TTY, GTEIS, Honeywell 716	IBM, Data 100, TTY, GTEIS
Software pricing	Standard	Standard	Standard, optional	Optional	Standard
Turnkey systems	No	No	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$32,000 to $56,000	$10,000 to $90,000	$150,000 to $500,000	Contact vendor	$25,000 to $40,000
Monthly rental	—	—	$4,500 to $15,000	Contact vendor	$754 to $2,000
Date of first delivery	June 1972	February 1972	December 1969	April 1971	—
Number installed to date	150	Over 300	15	—	200
Serviced by	DEC	DEC	GSC Data Systems, Inc.	GTEIS	GTEIS
COMMENTS					

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	GTEIS IS/1102	Harris Corp. 4705	Harris Corp. CO-65	Hewlett-Packard 3000CX Series	Honeywell System 700
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370, CDC 6000/7000, UNIVAC 1100 Series	—	Honeywell Series 200, 2000, 6000;
Host computer comm. software:					
Used as is	Yes	Yes	No	NA	Yes
Altered	No	No	Yes	—	No
Alterations provided	No	No	Yes	—	No
Replaced	Yes	No	No	—	No
Replacement provided	Yes	No	No	—	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	No	Yes
IBM 270X emulation	Yes	Yes	No	—	No
IBM 370X emulation without NCP	Yes	Yes	No	—	No
IBM 370X emulation with NCP	No	No	No	—	No
Remote concentration	No	No	No	—	Yes
Message switching	No	No	No	Yes	No
Other supported applications	—	RJE	RJE	DBMS with QUERY; RJE; Time-sharing	RJE
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	—	255	24	32	128
Narrow-band lines	96	255	0	32	128
Voice-band lines	16	24	24	32 (all to 2400 bps)	64
Wide-band lines	16	0	8	(real-time proc.)	4
Maximum number of lines active simultaneously	112	180	24	32	128
Effect of full-duplex operation	—	No effect	No effect	No effect	—
PROCESSOR AND MEMORY					
Processor identity	GTEIS	Harris	DEC PDP-8	HP 3000CX	Honeywell 700
Word length, bits	16	16	12	16	16
Memory cycle time, microseconds	0.75	1.0	1.5	0.9	0.775
Memory capacity, bytes	128K	128K	6K to 96K	96K to 128K	131K
Priority interrupt levels	16	30	16	253	64
On-line peripheral devices	—	Console	Console, printer, mag. tape, card	Plotter, printer, disk, mag. tape, card I/O	Printer, mag. card, paper tape, reader, punch, tape cassette
Console performance monitor	Yes	Yes	Yes	Yes	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes (MPE/C)	Yes
Message control programs	Yes	No	Yes	—	Yes
Assembler	Yes	Yes	Yes	Yes (SPL)	Yes
Cross assembler	Yes; IBM/360, IBM/370	Yes; IBM/360, IBM/370	Yes	—	—
Terminal handlers	IBM, Data 100, TTY, GTEIS	All IBM terminals except SDLC	CDC, Harris, and IBM terminals	CRT, TTY, PTP, graphics, BSC	TTY, Honeywell VIP CRT's, BSC
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$30,000 to $90,000	$40,000 to $140,000	$150,000 to $400,000	$99,500 (basic)	Contact vendor
Monthly rental	$1,075 to $2,425	$1,000 to $3,500	$3,000 to $10,00	3rd-party lease	Contact vendor
Date of first delivery	—	1970	1968	November 1972	July 1972
Number installed to date	100	—	—	250	—
Serviced by	GTEIS	Harris Corp.	Harris Corp.	Hewlett-Packard	Honeywell
COMMENTS				Supports HP's IMAGE data base management system with QUERY language	

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Honeywell Datanet-30	Honeywell Datanet-2000	Honeywell Datanet-355	Honeywell Datanet-6624	Honeywell Datanet-6632
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	Honeywell Series 200, 400, 600	Honeywell Series 200, 2000	Honeywell Series 600, 6000	Honeywell Series 60 Level 66	Honeywell Series 60 Level 66
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	Yes
Altered	No	No	No	No	No
Alterations provided	No	No	No	No	No
Replaced	No	No	No	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	No	No	No	No	No
IBM 370X emulation without NCP	No	No	No	No	No
IBM 370X emulation with NCP	No	No	No	No	No
Remote concentration	No	No	Yes	Yes	Yes
Message switching	Yes	No	Yes	Yes	Yes
Other supported applications	—	None	—	None	None
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	128	120	200	56	380
Narrow-band lines	128	120	200	56	380
Voice-band lines	10	120	32	32	96
Wide-band lines	7	—	16	16	48
Maximum number of lines active simultaneously	128	120	200	56	Appx. 200 to 300
Effect of full-duplex operation	—	Reduces lines	No effect	No effect	No effect
PROCESSOR AND MEMORY					
Processor identity	Honeywell	Honeywell	Honeywell	Honeywell	Honeywell
Word length, bits	18	16	18	18	18
Memory cycle time, microseconds	6.94	0.755	1.0	1.2	1.2
Memory capacity, bytes	16K	64K	32K/64K	48K/64K	64K/128K/256K
Priority interrupt levels	1	64	256	256	256
On-line peripheral devices	Disk, mag. tape, card units, printer	Disk, TTY	Card reader, printer	Disk, TTY; card reader, printer, mag. tape opt.	Disk, TTY; card reader, printer, mag. tape opt.
Console performance monitor	Yes	Yes	Yes	No	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	No	No	Yes
Cross assembler	—	No	No	No	No
Terminal handlers	TTY; Honeywell 100 computers,760 CRT; GE TermiNet 300; IBM 2741	TTY 35, 35; most Honeywell terminals; IBM BSC; others	All HIS hard copy and CRT terminals and Remote Network Processors; all TTY; IBM 2741; GE TermiNet 300/1200; Execuport; IBM 2780; and many others		
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$37,160 to $65,475	$45,750 to $175,000	$118,320 to $840,000	$85,380 to $168,660	$128,474 to $597,594
Monthly rental	$2,000 to $4,000	$1,221 to $4,700	$2,620 to $18,345	$1,676 to $3,507	$2,519 to $12,283
Date of first delivery	August 1963	December 1972	November 1970	July 1974	September 1974
Number installed to date	—	—	—	—	—
Serviced by	Honeywell	Honeywell	Honeywell	Honeywell	Honeywell
COMMENTS	No longer in production				Configuration simulator included for host Level 66 system. Any remote terminal or group of terminals can be network control stations

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	IBM 2701	IBM 2702	IBM 2703	IBM System/370 Model 125 with ICA	IBM 3704
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370	Stand-alone computer system	IBM/360, IBM/370
Host computer comm. software:					
Used as is	Yes	Yes	Yes	—	Yes
Altered	No	No	No	—	No
Alterations provided	No	No	No	—	No
Replaced	No	No	No	—	No
Replacement provided	No	No	No	—	No
SUPPORTED APPLICATIONS					
Front-end processing	No	No	No	—	Yes
IBM 270X emulation	—	—	—	Yes	Yes
IBM 370X emulation without NCP	—	—	—	—	Yes
IBM 370X emulation with NCP	—	—	—	—	Yes
Remote concentration	—	—	—	Yes	Yes
Message switching	—	—	—	Yes	Yes
Other supported applications	Field-developed programs for many applications	Field-developed programs for many applications	Field-developed programs for many applications	Field-developed programs for many applications	Field-developed programs for many applications, remote NCP mode
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	2	15	88	22	32
Narrow-band lines	4	31 (200 bps)	176 (165 bps)	16	32
Voice-band lines	4	15 (600 bps)	24	6	32
Wide-band lines	4	—	—	1	2
Maximum number of lines active simultaneously	4	31	176	22	32
Effect of full-duplex operation	Reduces lines by half	Reduces lines by half	Reduces lines by half	Reduces lines by half	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	Hard-wired controller	Hard-wired controller	Hard-wired controller	IBM 3125	IBM
Word length, bits	—	—	—	32	—
Memory cycle time, microseconds	—	—	—	0.480	—
Memory capacity, bytes	—	—	—	98K to 262K	16K to 64K
Priority interrupt levels	—	—	—	16	—
On-line peripheral devices	None	None	None	All standard S/370 devices	None
Console performance monitor	No	No	No	Yes	No
SOFTWARE					
Operating system	—	—	—	Yes	Yes
Message control programs	—	—	—	Yes	Yes
Assembler	—	—	—	Yes	Yes
Cross assembler	—	—	—	NA	No
Terminal handlers	TTY; all IBM including BSC and 2260 (but not SDLC)	TTY; all IBM (except SDLC) operting at up to 600 bps	TTY; all IBM except 2260 and SDLC terminals	All IBM, TTY terminals (except SDLC, unless 370X is used)	All IBM, TTY terminals
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$12,400 to $80,500	$40,000 to $77,600	$83,748 to $350,000	$385,000 to $615,000	$35,000 to $122,000
Monthly rental	$308 to $1,800	$993 to $1,800	$1,790 to $7,000	$8,500 to $14,600	$852 to $2,800
Date of first delivery	1965	1965	—	April 1973	May 1973
Number installed to date	—	—	—	—	—
Serviced by	IBM	IBM	IBM	IBM	IBM
COMMENTS	Hard-wired communications controller	Hard-wired communications controller	Hard-wired communications controller		

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	IBM 3705 Version I	IBM 3705 Version II	Interdata Model 8/32	Interdata Model 6/16	Interdata Model 7/32
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370
Host computer comm. software:					
Used as is	Yes	Yes	No	No	No
Altered	No	No	Yes	Yes	Yes
Alterations provided	No	No	Yes	Yes	Yes
Replaced	No	No	Yes	Yes	Yes
Replacement provided	No	No	Yes	Yes	Yes
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	Yes	Yes	Yes	Yes	Yes
IBM 370X emulation without NCP	Yes	Yes	Yes	Yes	Yes
IBM 370X emulation with NCP	Yes	Yes	No	No	No
Remote concentration	Yes	Yes	Yes	Yes	Yes
Message switching	Yes	Yes	Yes	Yes	Yes
Other supported applications	Field-developed programs for many applications	Field-developed programs for many applications	RJE, Time-sharing	RJE, Time-sharing	RJE, Time-sharing
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	352	352	255	128	255
Narrow-band lines	352	352	255	128	255
Voice-band lines	128	352	255	128	255
Wide-band lines	8	32	40	20	40
Maximum number of lines active simultaneously	352	352	255	128	255
Effect of full-duplex operation	Reduces lines by half	Reduces lines by half	Reduces lines by half	Reduces lines by half	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	IBM	IBM	Interdata 8/32	Interdata 6/16	Interdata 7/32
Word length, bits	—	18	32	16	32
Memory cycle time, microseconds	1.2	1.0	0.3	1.0	0.75
Memory capacity, bytes	16K to 240K	32K to 256K	128K to 1MB	8K to 65K	32K to 1M
Priority interrupt levels	4	4	1024	255	1024
On-line peripheral devices	None	None	All Interdata peripherals	All Interdata peripherals	All Interdata peripherals
Console performance monitor	No	No	Yes	Yes	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes (OS/32MT)	Yes (OS/16MT)	Yes (OS/32MT)
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	Yes; IBM/370	Yes; IBM/370	Yes; IBM/370	Yes; IBM/370	Yes; IBM/370
Terminal handlers	All IBM, TTY terminals	All IBM, TTY terminals	IBM BSC, and asynchronous terminals	IBM BSC, and asynchronous terminals	IBM BSC, and asynchronous terminals
Software pricing	Standard	Standard	Optional (ITAM/32)	Optional (ITAM/32)	Optional (ITAM/32)
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$49,500 to $700,000	$46,800 to $600,000	$50,000 to $500,000	$2,000 to $25,000	$1,500 to $1,500,000
Monthly rental	$1,285 to $17,700	$1,250 to $16,000	—	—	—
Date of first delivery	July 1972	August 1976	July 1975	Spring 1976	July 1974
Number installed to date	—	—	100	—	—
Serviced by	IBM	IBM	Interdata	Interdata	Interdata
COMMENTS					

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Intercomputer i5X	Memorex 1270 Model D4A	Memorex 1270 Model D5A	Memorex 1270 Model D6A	Memorex 1380
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, custom	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	Yes
Altered	No	No	No	No	No
Alterations provided	No	No	No	No	No
Replaced	No	No	No	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	No	No	No	Yes
IBM 270X emulation	Yes	Yes	Yes	Yes	Yes
IBM 370X emulation without NCP	Yes	No	No	No	Yes
IBM 370X emulation with NCP	Yes	No	No	No	Yes
Remote concentration	Yes	No	No	No	No
Message switching	Yes	No	No	No	No
Other supported applications	Spooling, IBM 2821 emulation	None	None	None	—
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	250	32	64	96	240
Narrow-band lines	250	32	64	96	240
Voice-band lines	24 to 48	32	64	96	120
Wide-band lines	2 to 8	6	6	6	16
Maximum number of lines active simultaneously	250	32	64	96	240
Effect of full-duplex operation	No effect	No effect	No effect	No effect	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	i5X	None used	None used	None used	CCI CC-80
Word length, bits	18	—	—	—	8
Memory cycle time, microseconds	1.0/0.25	—	—	—	0.560
Memory capacity, bytes	128K	—	—	—	64K to 512K
Priority interrupt levels	14 to 21	—	—	—	8
On-line peripheral devices	All	None	None	None	None
Console performance monitor	Yes	No (CE panel only)	No (CE panel only)	No (CE panel only)	Yes
SOFTWARE					
Operating system	Yes	No	No	No	Yes
Message control programs	Yes	No	No	No	No
Assembler	Yes	No	No	No	Yes
Cross assembler	Yes 360/370	No	No	No	No
Terminal handlers	"All"	No	No	No	TTY, CRT, ASCII, all IBM (except SDLC now)
Software pricing	Standard	—	—	—	Standard
Turnkey systems	Available	—	—	—	—
PRICING AND AVAILABILITY					
Purchase price	\$20,000 to \$180,000	\$30,000 to \$50,000	\$40,000 to \$80,000	\$60,000 to \$100,000	\$60,000 to \$140,000
Monthly rental	—	\$800 to \$2,000	\$1,100 to \$3,200	\$1,700 to \$4,000	\$2,000 to \$8,000
Date of first delivery	January 1973	August 1972	October 1973	May 1971	January 1976
Number installed to date	36	500	300	300	2
Serviced by	Sorbus and third party	Memorex	Memorex	Memorex	Memorex
COMMENTS		Hard-wired replacement for IBM 2701, 2701, 2703 and 2906	Hard-wired replacement for IBM 2701, 2702, 2703 and 2906	Upgrade of D1A model and expansion from D4A and D5A models	SDLC in 4th quarter of 1976

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Microdata 1600/60	Modular Computer Systems Modcomp I	Modular Computer Systems Modcomp IICP	Modular Computer Systems Modcomp IVCP	Norfield Electronics, Inc. DCS 400
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	UNIVAC 1108	None	IBM/360, IBM/370, CDC 3000/6000/ Cyber, custom	IBM/360, IBM/370, CDC 3000/6000/ Cyber, custom	IBM/360, IBM/370, Univac
Host computer comm. software:					
Used as is	Yes	No	No	No	Yes
Altered	No	Yes	Yes	Yes	Yes
Alterations provided	No	No	No	No	Yes
Replaced	No	No	No	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	No	No	Yes	Yes	Yes
IBM 270X emulation	No	No	No	No	Yes
IBM 370X emulation without NCP	No	No	No	No	Yes
IBM 370X emulation with NCP	No	No	No	No	No
Remote concentration	No	No	Yes	No	Yes
Message switching	No	No	Yes	Yes	Yes
Other supported applications	—	Custom	Process control/ Maxnet, custom	Process control/ Maxnet, custom, HASP, RJE	HASP
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	256	48	256	256	64
Narrow-band lines	256	48	256	256	64
Voice-band lines	256	4	256	256	4
Wide-band lines	256	1	256	256	1
Maximum number of lines active simultaneously	256	48	256	256	32
Effect of full-duplex operation	No effect	No effect	No effect	No effect	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	Microdata	Modcomp I	Modcomp II/CP	Modcomp IV/CP	—
Word length, bits	16	16	16	16/32	16
Memory cycle time, microseconds	1.0	0.8	0.8	0.5	0.96
Memory capacity, bytes	128K	64K	128K	512K	128K
Priority interrupt levels	1	4 + 128 vectored	16 + 128 vectored	16 + 128 vectored	8
On-line peripheral devices	Microdata peripherals	Disk, mag. tape, card reader, printer, etc.	Disk, mag. tape, card reader, printer, etc.	Disk, mag. tape, card reader, printer, etc.	Terminals, printers
Console performance monitor	Yes	Yes	Yes	Yes	Yes
SOFTWARE					
Operating system	No	Yes (MAX I)	Yes (MAXCOM)	Yes (MAX IV)	Yes
Message control programs	Yes (firmware)	No	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	Yes	Yes; IBM/370, CDC 6000	Yes; IBM/370, CDC 6000	Yes; IBM/370, CDC 600	No
Terminal handlers	Hazeltine 2000, ADDS 580	None	TTY, IBM BSC, CDC 200 UT	TTY, IBM BSC, 2780/3780, CDC 200 UT, Univac 1004	DS 40, TTY, TWX, IBM 2780/3780
Software pricing	Optional	Standard	Standard	Optional	Standard
Turnkey systems	Not available	Not available	Not available	Not available	Available
PRICING AND AVAILABILITY					
Purchase price	$10,000 to $25,000	$3,600 and up	$16,000 and up	$29,500 and up	$14,900 to $41,500
Monthly rental	—	—	—	—	$520 to $1,470
Date of first delivery	July 1973	October 1971	March 1973	December 1975	March 1975
Number installed to date	—	Over 50	Over 60	—	10
Serviced by	Microdata	Modcomp	Modcomp	Modcomp	Northfield
COMMENTS		Dedicated special-purpose CPU; custom configured	Front end or message switch; up to 16 programmable transmission rates; 4-port memory	Front end or message switch; up to 16 programmable transmission rates; 4-port memory	50,000 bps maximum throughput

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	North American Philips DS 714/xx	North American Philips DS 18	North American Philips DS 7	Omnus Computer Corporation Omnus-1/CU	Periphonics T-Comm 7
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	Custom	Custom	Custom	Univac 1100 Series	IBM/360, IBM/370, Burroughs (all), NCR, Honeywell, others
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	Yes
Altered	No	No	No	Yes	Yes
Alterations provided	No	No	No	—	Yes
Replaced	No	No	No	No	Yes
Replacement provided	No	No	No	No	Yes
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	RPQ	RPQ	RPQ	No	Yes
IBM 370X emulation without NCP	RPQ	RPQ	RPQ	No	Yes
IBM 370X emulation with NCP	RPQ	RPQ	RPQ	No	Yes
Remote concentration	Yes	Yes	Yes	Yes	Yes
Message switching	Yes	Yes	Yes	Yes	Yes
Other supported applications	Telex/TWX/Gentex packet switching; process control	Telex/TWX/Gentex packet switching; process control	Telex/TWX/Gentex packet switching; process control	Store and forward; full network control	IBM 2803, 2848
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	—	—	—	384	93
Narrow-band lines	31,000	375	512	384	93
Voice-band lines	3,968	60	60	384	93
Wide-band lines	112	—	4	16	5
Maximum number of lines active simultaneously	Varies	Varies	All	384	All
Effect of full-duplex operation	Reduces lines by half for voice and wide-band	No effect	Reduces lines by half	No effect	No effect
PROCESSOR AND MEMORY					
Processor identity	Philips	Philips	Philips	Omnus-1	DEC PDP-11
Word length, bits	36	16	16	16	16
Memory cycle time, microseconds	2.0	0.84	1.0	0.65	1.0
Memory capacity, bytes	1 million	64K	32K	32K to 262K	16K-2M (Peri-Pacs)
Priority interrupt levels	128	64	1	32	8
On-line peripheral devices	Drum, fixed/moving-head disk, card reader/punch, line printer, etc.	Drum, fixed/moving-head disk, mag. tape cassette, line printer, paper tape	Drum, fixed/moving-head disk, mag. tape cassette, line printer, paper tape	Disk, drum, mag. tape, card reader, paper tape reader/punch	Disk, mag. tape, printer, cassette TTY
Console performance monitor	Yes	Yes	Yes	Yes	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes (Peri-Comm)
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	No	Yes	Yes
Cross assembler	No	No	Yes, DS 714	Yes, UNIVAC, IBM, Xerox, DEC	Yes, IBM 360/370
Terminal handlers	Computek, IDI, CCI, & Delta CRTs; TTY/TWX; Telex; custom	TTY/TWX; Telex; custom	TTY/TWX; Telex; custom	UNIVAC DCT 500/1000/2000, U 100, 1004; IBM 2741, 2780, TTY	CRT, teleprinter, banking, and POS devices, etc.
Software pricing	Standard, custom	Standard, custom	Standard, custom	—	Optional
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	$400,000 (basic)	$100,000 (basic)	$35,000 (basic)	$43,000 to $400,000	$80,000 (basic)
Monthly rental	$8,000 (basic)	$2,000 (basic)	$1,000 (basic)	$2,500 to $100,000	$2,500 (basic)
Date of first delivery	1967	1972	1974	June 1974	1st qtr. 1971
Number installed to date	67	14	12	3	Over 200
Serviced by	North American Philips	North American Philips	North American Philips	Omnus	Periphonics
COMMENTS				Replacement for Univac C/SP or CTMC	System can also include voice response module (Voicepac 2000)

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	RCA Global Communications Miniplus	Systems Engineering Laboratories SEL 32	Telefile Computer Products TCP-64	Telex 6705	Texas Instruments EMS II
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, others	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370	IBM/360, IBM/370, DECsystem 10
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	Yes
Altered	Yes	Yes	Yes	No	Yes
Alterations provided	Yes	Yes	No	No	No
Replaced	No	No	Yes	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	No	Yes	Yes	Yes	No
IBM 370X emulation without NCP	No	Yes	Yes	Yes	No
IBM 370X emulation with NCP	No	Yes	No	No	No
Remote concentration	Yes	No	Yes	No	Yes
Message switching	Yes	Yes	Yes	No	Yes
Other supported applications	—	Dedicated communications	RJE, HASP	Multiplexing, DDS, network management	None
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	180	128	512	244	256
Narrow-band lines	180	128	512	244	256
Voice-band lines	16	—	112	244	6
Wide-band lines	4	—	80	—	8
Maximum number of lines active simultaneously	—	128	512	244	256
Effect of full-duplex operation	No effect	—	No effect	Reduces lines by half	Reduces lines by half
PROCESSOR AND MEMORY					
Processor identity	General Automation SPC-16	SEL 32	Lockheed LEC 16	Own	TI 980B
Word length, bits	16	32	16	16	16
Memory cycle time, microseconds	0.96	0.6	1.0	1.2	0.75
Memory capacity, bytes	256K	1,024K	8K to 128K	128K	128K
Priority interrupt levels	—	128	16 to 64	4	3 to 64
On-line peripheral devices	Disk, mag. tape, paper tape, CRT, teleprinters	Standard types	Drum, disk, mag. tape, card readers/ punches, ppr. tape rdrs./punches, etc.	None	Disk, mag. tape, card reader, printer, console
Console performance monitor	Yes	Yes	Yes	Yes (see below)	Yes
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	—	No	Yes; IBM/360, IBM/370	—	Yes; IBM/360, IBM/370
Terminal handlers	Most prominent	TTY, CRT, etc.	IBM 2740/2741/ 2260; TTY 28/33/ 35; BSC terminals	IBM I, II, III, BSC; TTY; 83/B3; HASP, 2740, 2780, 2260, 3270	TTY, TI 700, GE TermiNet, Wiltek, Dataspeed
Software pricing	—	Standard and custom	Standard	—	Standard
Turnkey systems	Available	Available	Available	—	Available
PRICING AND AVAILABILITY					
Purchase price	$70,000 to $200,000	$75,000 to $200,000	$40,000 to $200,000	$30,000 to $75,000	$60,000 to $300,000
Monthly rental	$2,000 to $15,000	—	$1,500 (basic)	$900 to $2,500	—
Date of first delivery	1972	October 1975	June 1969	October 1973	1973
Number installed to date	17	12	15	40	—
Serviced by	RCA	SEL	Telefile	Telex	Texas Instruments
COMMENTS	Pricing is for single-processor system		Hard-wired controller (synchronous) has DMA and operates on data block basis	Console offers command and control, display, trace and alter	

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Texas Instruments DXS	Texas Instruments Model 700 TPS	UNIVAC C/SP	UNIVAC 3760
COMPUTER SYSTEMS INTERFACED				
Manufacturers and models interfaced	IBM/360, IBM/370	IBM/360, IBM/370	UNIVAC 1106, 1108, 1110	IBM/360, IBM/370
Host computer comm. software:				
Used as is	Yes	Yes	Yes	Yes
Altered	No	No	No	No
Alterations provided	No	—	No	No
Replaced	No	—	No	No
Replacement provided	No	—	No	No
SUPPORTED APPLICATIONS				
Front-end processing	Yes	No	Yes	Yes
IBM 270X emulation	Yes	No	No	Yes
IBM 370X emulation without NCP	Yes	No	No	Yes
IBM 370X emulation with NCP	—	No	No	No
Remote concentration	Yes	—	Yes	No
Message switching	No	—	—	No
Other supported applications	EFTS, hospital accounting	—	—	Broadcast statistics; line testing
COMM. LINES CONFIGURATION				
Maximum number of half-duplex lines	60 (FDX)	4	128	384
Narrow-band lines	44	—	128	384
Voice-band lines	16	4	128	384
Wide-band lines	—	—	16	6
Maximum number of lines active simultaneously	All	4	128	384
Effect of full-duplex operation	No effect	—	Reduces lines by half	Reduces lines by half
PROCESSOR AND MEMORY				
Processor identity	TI 960B (multiple)	TI 960B	UNIVAC	UNIVAC
Word length, bits	16	16	16	16
Memory cycle time, microseconds	0.75	0.75	0.63	0.75
Memory capacity, bytes	128K	48K	32K to 131K	16K to 131K
Priority interrupt levels	1	3	5	4
On-line peripheral devices	Disk, mag. tape, card reader, printer, console	TI "Silent 700" terminal (742)	Card reader/punch, printer, paper tape	None
Console performance monitor	Yes	Yes	Optional	Yes
SOFTWARE				
Operating system	Yes	Yes	Yes	Yes
Message control programs	Yes	Yes	Yes	Yes
Assembler	Yes	Yes	Yes	No
Cross assembler	Yes; IBM/370	No	Yes; UNIVAC 1100 Series	Yes; IBM/360, IBM/370
Terminal handlers	TI 913/914 CRT, TI "Silent 700" data terminals	TI "Silent 700" data terminals	All UNIVAC, all TTY, and all IBM BSC terminals	Most IBM terminals and all UNIVAC terminals
Software pricing	Extra	Standard	Standard	Standard
Turnkey systems	Available	Available	No	Available
PRICING AND AVAILABILITY				
Purchase price	$40,000 to $500,000	NA	$80,000 to $175,000	$55,000 to $325,000
Monthly rental	$2,000 (Excl. Maint.)	NA	$2,000 (basic)	$1,200 to $7,000
Date of first delivery	1972	1976	March 1972	January 1973
Number installed to date	—	—	—	—
Serviced by	Texas Instruments	Texas Instruments	UNIVAC	UNIVAC
COMMENTS	DXS stands for Data Exchange System	TPS stands for Terminal Polling System	C/SP stands for Communications/ Symbiont Processor	

Communications Processors — Equipment Specifications

MANUFACTURER AND MODEL	Varian Data Machines V 72	Varian Data Machines V 73/V 74	Varian Data Machines V 75	Varian Data Machines V 76	Western Union Information Systems C2100
COMPUTER SYSTEMS INTERFACED					
Manufacturers and models interfaced	IBM/360, IBM/370, CDC 3000/6000, Burroughs 300/3500	IBM/360, IBM/370, CDC 3000/6000, Burroughs 300/3500	IBM/360, IBM/370 CDC 3000/6000, Burroughs 300/3500	IBM/360, IBM/370, CDC 3000/6000, Burroughs 300/3500	Univac 1100, 490 Series, 418
Host computer comm. software:					
Used as is	Yes	Yes	Yes	Yes	No
Altered	No	No	No	No	Yes
Alterations provided	No	No	No	No	Yes
Replaced	No	No	No	No	No
Replacement provided	No	No	No	No	No
SUPPORTED APPLICATIONS					
Front-end processing	Yes	Yes	Yes	Yes	Yes
IBM 270X emulation	No	No	No	No	No
IBM 370X emulation without NCP	No	No	No	No	No
IBM 370X emulation with NCP	No	No	No	No	No
Remote concentration	Yes	Yes	Yes	Yes	Yes
Message switching	Yes	Yes	Yes	Yes	No
Other supported applications	RJE, data base management, (TOTAL), TSS	RJE, data base, management, (TOTAL), TSS	RJE, data base management, (TOTAL), TSS	RJE, data base management, (TOTAL), TSS	Line multiplexing and demultiplexing
COMM. LINES CONFIGURATION					
Maximum number of half-duplex lines	512	512	512	512	256
Narrow-band lines	512	512	512	512	256
Voice-band lines	512	512	512	512	64
Wide-band lines	128	128	128	128	8
Maximum number of lines active simultaneously	512	512	512	512	256
Effect of full-duplex operation	No effect	No effect	No effect	No effect	No effect
PROCESSOR AND MEMORY					
Processor identity	Varian V 72	Varian V 73/V 74	Varian V 75	Varian V 76	Hard-wired/own microprocessor
Word length, bits	16	16	8, 16, 32	8, 16, 32	18
Memory cycle time, microseconds	0.66, .99	0.33, .66, .99	0.66	0.66	0.9
Memory capacity, bytes	512K	512K	512K	512K	16K
Priority interrupt levels	64	64	64	64	Scanner logic
On-line peripheral devices	Disk, mag. tape, card reader/punch, printer	Disk, mag. tape, card/reader/punch, printer	All common peripherals	All common peripherals	—
Console performance monitor	Yes	Yes	Yes	Yes	—
SOFTWARE					
Operating system	Yes	Yes	Yes	Yes	Firmware
Message control programs	Yes	Yes	Yes	Yes	—
Assembler	Yes	Yes	Yes	Yes	Yes
Cross assembler	Yes; IBM/360, IBM/370	Yes; IBM/360, IBM/370	Yes; IBM/360, IBM/370	Yes; IBM/360, IBM/370	Yes; Univac 1100
Terminal handlers	TTY and equiv., IBM 3270, BSC, common financial terminals	TTY and equiv., IBM 3270, BSC, common financial terminals	TTY and equiv., IBM 3270, BSC, common financial terminals	TTY and equiv., IBM 3270, BSC, common financial terminals	"All"
Software pricing	Standard	Standard	Standard	Standard	Standard
Turnkey systems	Available	Available	Available	Available	Available
PRICING AND AVAILABILITY					
Purchase price	\$10,500 to \$200,000	\$10,000 to \$300,000	\$35,000 to \$200,000	\$8,000 to \$200,000	\$88,300 to \$250,000
Monthly rental	Lease plans available	Lease plans available	Lease plans available	Lease plans available	—
Date of first delivery	October 1973	October 1972	August 1975	March 1976	October 1973
Number installed to date	Over 250	Over 500	—	—	—
Serviced by	Varian	Varian	Varian	Varian	Univac
COMMENTS					Hard-wired controller with programmable line adapters