

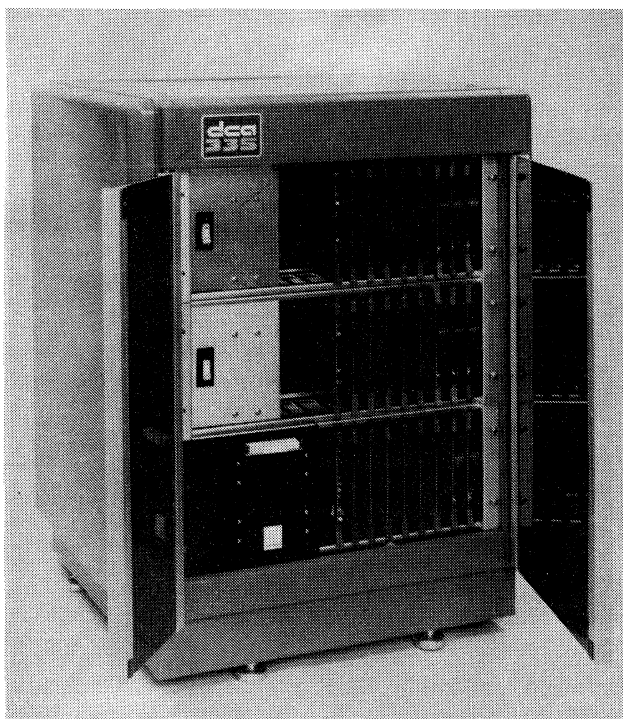
Digital Communications Associates (DCA) Series 300 Network Processors

MANAGEMENT SUMMARY

UPDATE: *This report is being updated to reflect any changes that have occurred to the DCA Series 300 Network Processors since it was last updated. User ratings on the DCA Series processors from the 1985 Datapro Network Users Survey are also included.*

Digital Communications Associates (DCA) introduced the System 355 Master Network Processor in May 1980, as a central routing and switching node for networks of its statistical multiplexers. In March 1983, the company introduced the smaller System 335 Network Processor as a subsidiary node for large DCA networks and as a substitute for the System 355 in small configurations. In April 1984, DCA announced System 375 as a high end to Series 300. The new processor's principal improvements over System 355 included greater capacity and higher data rates on system trunks.

Currently, DCA offers an integrated line of networking products that are collectively used to configure private and public networks. These include the System 105, 110, 120 (replaces 115), and System 125 microprocessor-based entry-level statistical multiplexers that support from 2 to 32 ports; System 205 Unibus Interface Statistical Multiplexer that emulates up to 16 Digital Equipment Corporation DZ11s to provide up to 128 user ports; System 207 Unibus Interface Network Processor that emulates up to 16 DMF



System 335 is the smaller of DCA's two Series 300 processors. Shown here in its three-foot enclosure, the unit is also available in a rackmountable configuration.

The DCA Series 300 products, from Digital Communications Associates (DCA), are bus-centered, firmware-based processors that provide master switching, communication control/management, and point-to-point, multipoint, and multilink statistical multiplexing in medium- to large-scale dedicated networks. The Series 300 has three members: the System 355 Master Network Processor, the System 335 Network Processor, and the high-end System 375 Master Network Processor. The processors support interactive, batch, and block mode applications; control routing, host selection, and port contention; and can operate as master network processors controlling a complete network.

FUNCTION: Standalone communications processors for host-independent networks using DCA statistical multiplexers.

HOST COMPUTERS SUPPORTED: Any, as host-independent network controllers.

ARCHITECTURE SUPPORTED: Integrated Network Architecture, a transparent, DCA-proprietary transport architecture using DDCMP and X.25 as trunk protocols.

OPERATING SOFTWARE: DCA-proprietary communications handlers.

COMPETITION: High-end switching multiplexers from Infotron Systems, Timeplex, Paradyne, CASE Communications, and Codex.

PRICE: All three Series 300 processors are fully modular systems, expandable in uniform increments. Purchase price for a basic, freestanding System 335 starts at \$6,795; hardware for a fully configured System 335 able to support 42 communications lines costs \$24,515.

CHARACTERISTICS

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

DATE OF ANNOUNCEMENT: System 355, 1980; System 335, 1983; System 375, April 1984.

DATE OF FIRST DELIVERY: System 355—1980; System 355—1983; System 375—1984.

NUMBER INSTALLED TO DATE: Information not available.

SERVICED BY: Digital Communications Associates, Inc. (DCA).

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➤ 32s to provide up to 128 user ports; and Systems 335, 355, and 375 microprocessor-based network processors. Products that work in conjunction with the Series 300 Network Processors include the ATC Asynchronous Terminal Controller, BTS Binary Synchronous Communications Transport System, Network Control Concentrator (NCC), Network Design System (NDS), Network Management System (NMS), Ethernet/LAN support, X.25 gateways, Bit-Oriented Protocol Passthrough (BOPP), and the ETI Private Line Prices. DCA also produces the 325 NetSwitch which was primarily designed to control terminal access to multiple hosts in the education environment. In addition, the DCA X.25 PAD is offered as a special version of the 110 and 120 multiplexers and includes integral CCITT X.3 PAD with X.25 Level 3 link facility.

DCA also offers Netlink, a high-speed TDM, and Series 900, a complete line of modems. Finally, DCA offers a complete line of personal computer-to-mainframe interface products, known as the IRMA family.

Of the DCA products, Systems 335, 355, and 375 are the most flexible, versatile, and central products to implement networks. System 335 is an entry-level system that can operate as a master network processor for small networks or as a subsidiary processor to a larger System 355. Both systems can function as point-to-point, multipoint, multi-link, statistical multiplexers; master switch/nodal processors; front-end controllers for terminal access to multiple hosts; and gateways to X.25 networks. The systems provide network management and control. Features include routing, port contention, host selection, and multiplexing. Both systems also include a console port for operator network control; a printer port can provide network status reports for network analysis.

The Series 300 has much in common with DCA's line of statistical multiplexers. In particular, it uses the same microprocessor, the Zilog Z-80A, and the same network-side hardware, the Astra-AS port card. For high-speed trunk control, the Systems 355 and 375 use the Motorola 68000 microprocessor. The feature that differentiates the Series 300 from simple statistical multiplexers is a two-level processing hierarchy. A microprocessor-based statistical multiplexer usually has a single processor in charge of its high-speed port, or, if it is a switching multiplexer, a single processor in charge of each of its high-speed ports. A communications processor like the DCA 335, 355, or 375 uses multiple port-controlling processors which are coordinated by a supervisory processor, allowing subsidiary processors to be dedicated not only to specific ports, but to specific communications functions, such as routing, switching, and protocol conversion.

The Series 300 units serve as nodal processors in DCA's Integrated Network Architecture (INA). As nodal processors, they route and switch data from DCA statistical multiplexers, as well as from hosts and terminals attached directly over asynchronous communications lines. The Series 300 handles synchronous data from DCA multiplexers at rates up to 19.2K bps; handles synchronous data between Series 300 nodes at rates up to 72K bps. The units ➤

➤ MODELS

DCA's Series 300 includes three models: the System 375 and System 355 Master Network Processors, and the System 335 Network Processor. With the exception of special processing modules, all use the same components, and all can perform essentially the same functions. The System 375 can support up to 124 communications ports and 114 high-speed trunk links. The System 355 can support up to 124 communications ports and up to 44 high-speed, multiplexed trunk links. The System 335 can support up to 42 communications ports and up to four trunk links.

CONFIGURATION

The unit of configuration for Series 300 network processors is the NCF card, which includes a parallel, backplane bus, a local power supply, and either a bus controller or a bus adapter for connection to other card files. Each card cage has space for up to eight communications modules, which can be either processing modules or communications line interfaces.

The System 355 comes in three configurations: a single-cage, rackmountable unit with program loading diskette, a 4-foot enclosure with space for five card cages, and a 6½-foot enclosure with space for nine card cages.

The System 335 comes in two configurations: a single-cage, rackmountable unit, and a 3-foot enclosure with space for three card cages.

The System 375 comes in two configurations: a two-card cage, rackmountable unit, and a two-cage unit installed in a 6½-foot rack enclosure.

The program loading module for all Series 300 systems is a single or dual 360K-byte diskette drive that attaches to the supervisory processing module over a local serial connection.

Processing modules and communications line interfaces, which reside in the same card file, communicate with one another over the unit's backplane, or A-bus. Modules in different card files communicate with one another over a parallel cable connection called the C-bus. Communication over the C-bus is controlled by a C-bus controller, or CK module, in the same card cage as the unit's supervisory processing module. A C-bus adapter in each additional card cage handles communications between modules in that cage and the C-bus.

Systems 335, 355, and 375 can act as master switches to resolve port contention from multiple terminals to multiple hosts for cable-connected, dial-up, and leased-line ports. They can be configured to support point-to-point statistical multiplexing where a host computer supports multiple devices over a single telephone line. It provides a multipoint statistical multiplexing environment that supports up to 15 clusters of remote terminals (or 15 drops) from a single line; in this case, the system polls the buffers in the slave multiplexer (a DCA 100 or 120) to permit sequential transfer of data over a single telephone line. A System 300 can support a full-function multinode data communication environment that requires extensive network management capabilities. Subnetworks can select and control terminal access to host facilities (subnetting), and provide routing, switching, trunk handling, and port contention. In addition to the Series 100-based clusters, the Systems 335, 355, and 375 can also support an X.25 PAD-based cluster of 32 devices. The systems also support the 325 NetSwitch, which itself can handle port contention for up to 1,376 local or remote terminals. ➤

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▷ handle asynchronous data from attached hosts and terminals at rates from 50 to 9600 bps, with automatic data rate detection (autobaud). They use both special characters (X-on/X-off) and modem lead signaling for flow control on high-speed asynchronous lines.

DCA uses a derivative of the Digital Data Communication Message Protocol (DDCMP) or X.25 for data transmission over its trunk lines. DCA has found DDCMP to be an efficient and flexible protocol. Generally, users of DCA networks are most impressed with response time rather than overall throughput.

DCA also offers an X.25 Level 3 gateway to networks for communication between a packet mode host that supports X.25 protocols and a packet switched public data network (PDN) such as Telenet or Tymnet. In addition, DCA offers an X.25 PAD that uses the X.25 protocol to interface to a host computer or to an X.25 packet switched network.

A new high-speed trunk protocol allows internodal trunking through an X.25 packet switched network. The Series 300 processors and link efficiency of the packet network transport provide faster response times. The DCA network can also function as a packet switch.

The DCA Systems 335, 355, and 375 are implemented with multiple microprocessors that provide link and trunk control and a supervisory processing module (PM) for overall system control. Additional PMs are added for X.25 gateways and other features. PMs support 64K or 512K bytes of RAM memory loaded from diskettes included in each system. Systems can also be downline loaded from the diskette on another system.

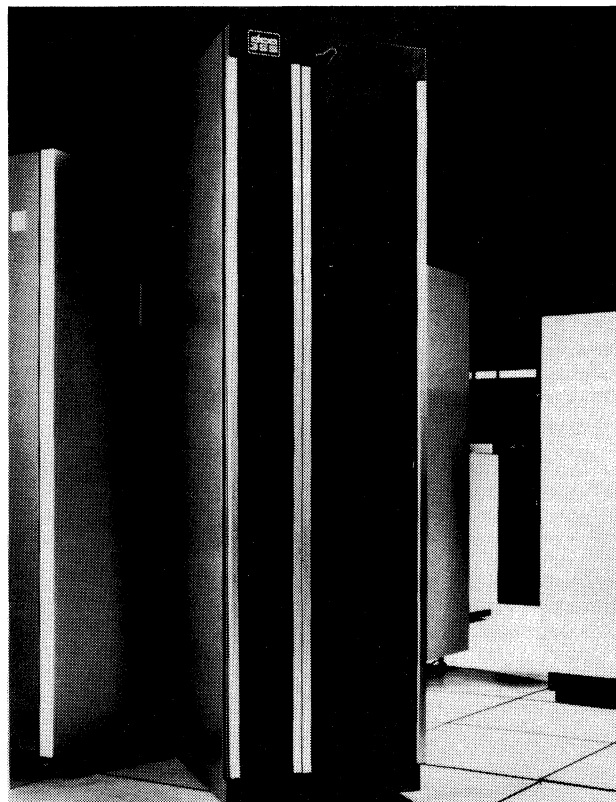
The DCA is not user programmable. The user specifies network parameters and DCA supplies the diskettes loaded with the appropriate programs. The user, however, can use the Network Design System (NDS) to develop or reconfigure a system on-site.

The Systems' 335, 355, and 375 modular architecture allows flexible configuration and expansion. Processing modules (PMs) can be added and individually programmed to suit specific communications functions. Systems 335, 355, and 375 are compatible with all DCA 100 and 200 Series multiplexing/processors, and field upgrades are a matter of adding modules. Upgrading from a System 335 and 355 to a 375 can also be done by adding modules.

A centralized Network Management System (NMS) collects data throughout the network to provide reports and alarms. A graphics display provides network maps with status indications and location of alarms.

COMPETITIVE POSITION

The Series 300 processors compete with a number of products marketed as nodal processors or concentrators at the high ends of lines of statistical multiplexers. Among these are Infotron Systems' 790, Paradyne's DCX 840 and



The DCA System 355 Master Network Processor handles up to 124 communications lines and up to 44 DDCMP trunks.

▶ PROCESSING COMPONENTS

All processing in Series 300 processors takes place in the units' processing modules. DCA makes three kinds of processing modules: one that can operate only in System 335 processors, one that can operate in either System 335 or System 355 processors, and one for high-speed trunk handling on all Series 300s. Each processing module of the first two types contains a single Z-80A microprocessor and 64K-bytes of random access memory. The high-speed module for Series 300 is based on a Motorola 68000 microprocessor with 512K bytes of RAM.

A Series 300 processor may contain more than one processing module, depending on the line-handling requirements and special software features of a given configuration. In all configurations, one processing module must be designated as the supervisory processor; it runs a number of software modules, called handlers, necessary for the overall operation and maintenance of the system and of the network it controls. Other processing modules may be dedicated to the handling of specific groups of communications lines, or to the performance of functions specified by individual communications handlers.

Each Z-80-based processing module supports up to 19.2K bps throughput on one or two trunks. The 68000-based module supports up to 72K bps throughput on each of two trunks. For efficient operation, users should dedicate one processing module to each high-speed trunk. Some special features, such as the X.25 interface software, require dedicated processing modules.

CONNECTION TO THE NETWORK

All connections between Series 300 processors and their networks of trunks and communications lines take place

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▷ 850, Timeplex's NM96 and NM144, and Codex's 6050. All such products dwell on a fine line of definition between intelligent, switching multiplexers and true communications processors. Indeed, most of DCA's competitors choose to call their products multiplexers. The Series 300's most important competitors are the Infotron and Timeplex products.

ADVANTAGES AND RESTRICTIONS

The DCA Series 300 processors are most useful in configurations of small- to medium-size. DCA's Integrated Network Architecture, while it lacks the sophisticated flow control and end-to-end protocol support of a full-blown computer vendor's architecture (such as SNA), is a good, low-overhead alternative to such architectures, especially for networks in which hosts and terminals from a number of vendors participate.

Specific advantages of the Series 300 products are their X.25 interface and their high degree of integration with other DCA products, including statistical multiplexers and protocol converters.

USER REACTION

In Datapro's 1985 Network Users Survey, conducted in conjunction with Data Communications Magazine, 17 users of the DCA Series processors responded, reporting on a total of 108 processors. Ten users, with 78 units installed, reported on the DCA 355, while seven users, with 30 installed units, reported on unspecified models. These ratings have been combined and their totals are given below:

	Excellent	Good	Fair	Poor	WA*
Overall performance	13	4	0	0	3.8
Ease of installation	12	4	1	0	3.7
Ease of operation	11	5	1	0	3.6
Ease of expansion	14	2	1	0	3.8
Hardware reliability	11	4	2	0	3.5
Quality of vendor's software/firmware	9	6	1	1	3.4
Ease of programming	10	5	0	1	3.5
Quality of vendor's maintenance service	9	5	3	0	3.4
Quality of vendor's technical support**	9	5	3	0	3.4

*Weighted Average based on a scale of 4.0 for Excellent.

**Technical support includes documentation, training, and troubleshooting provided by the vendor. □

▶ through AS port cards. An AS card is a serial interface that connects to the backplane A-bus of the Series 300 processor and to one or two communications lines; all AS cards have two serial ports. All communications through the AS cards take place under the control of the system's processing modules. The AS cards, which are also used as the principal network interface for DCA's statistical multiplexers, support either RS-232-C, V.24/V.28, or active 20-milliamp current loop interfaces.

TRANSMISSION SPECIFICATIONS

Series 300 processors support two kinds of connections: trunk links and user equipment ports. Trunk links are high-

speed connections between Series 300 processors, or between Series 300 processors and DCA statistical multiplexers. User equipment ports are connections between Series 300 processors and end-user hosts and terminals.

The Series 300 processors support two kinds of trunk links: one between two Series 300 processors, and the other between Series 300 processors and DCA statistical multiplexers or X.25 packet switching networks. Both carry synchronous data at rates up to 19.2K bps or 72K bps, and use the Digital Equipment Corporation's DDCMP data link protocol or CCITT X.25 level 3.

The X.25 Gateway Interface option allows direct connection of asynchronous terminals to packet switched computers supporting X.25 protocol and to public packet switched networks such as Telenet, Tymnet, and Datapac. All three levels of X.25 are supported. In addition, the systems can be cabled into the DCA 325 NetSwitch (which supports up to 1,376 local and remote multiplexed ports) for full-scale networking. The NetSwitch is primarily used in educational environments, connecting many terminals to one or more hosts. Also, the system communicates with DCA 205/207, and 250 processors; the 205/207 statistical multiplexer interfaces remote terminals to a Digital Equipment Corporation's Unibus host, such as Digital Equipment Corporation's PDP-11 and VAX-11 computers.

An additional internodal transport method is provided using a 10M bps Ethernet LAN and a proprietary protocol that is IEEE 802.3-compatible. With a single Ethernet port, a Series 300 can transmit to all other Series 300s attached to the LAN with a single message. This decreases the number of accesses, reduces the number of collisions, and maximizes throughput with minimum delay for character-oriented applications. The Ethernet trunk is accessed through a 3PM-200 which connects to a transceiver or local network interface.

User equipment ports handle asynchronous data in any character format at rates from 50 to 9600 bps, with standard clock rates of 110, 300, 600, 1200, 2400, 4800, and 9600 bps. The units support automatic data rate detection (autobaud) for two preset groups of data rates. Group 1 includes rates up to 1200 bps; Group 2 includes rates up to 9600 bps.

The Series 300 processors support two types of flow control. The first is flow control by special characters, such as X-on and X-off. The second is flow control signalled by the raising and lowering of specified modem leads.

User equipment ports can handle synchronous data in 3270 bisync, SDLC, and HDLC at rates from 1200 to 9600 bps. 3270 bisynchronous ports feature remote polling, host selection, port contention, and routing. SDLC and HDLC are stat muxed on a point-to-point basis.

Communications through the Series 300 processors are essentially transparent to line protocol with the exception of flow control, session control, BTS, and the X.3 PAD option.

OPERATOR INTERFACE

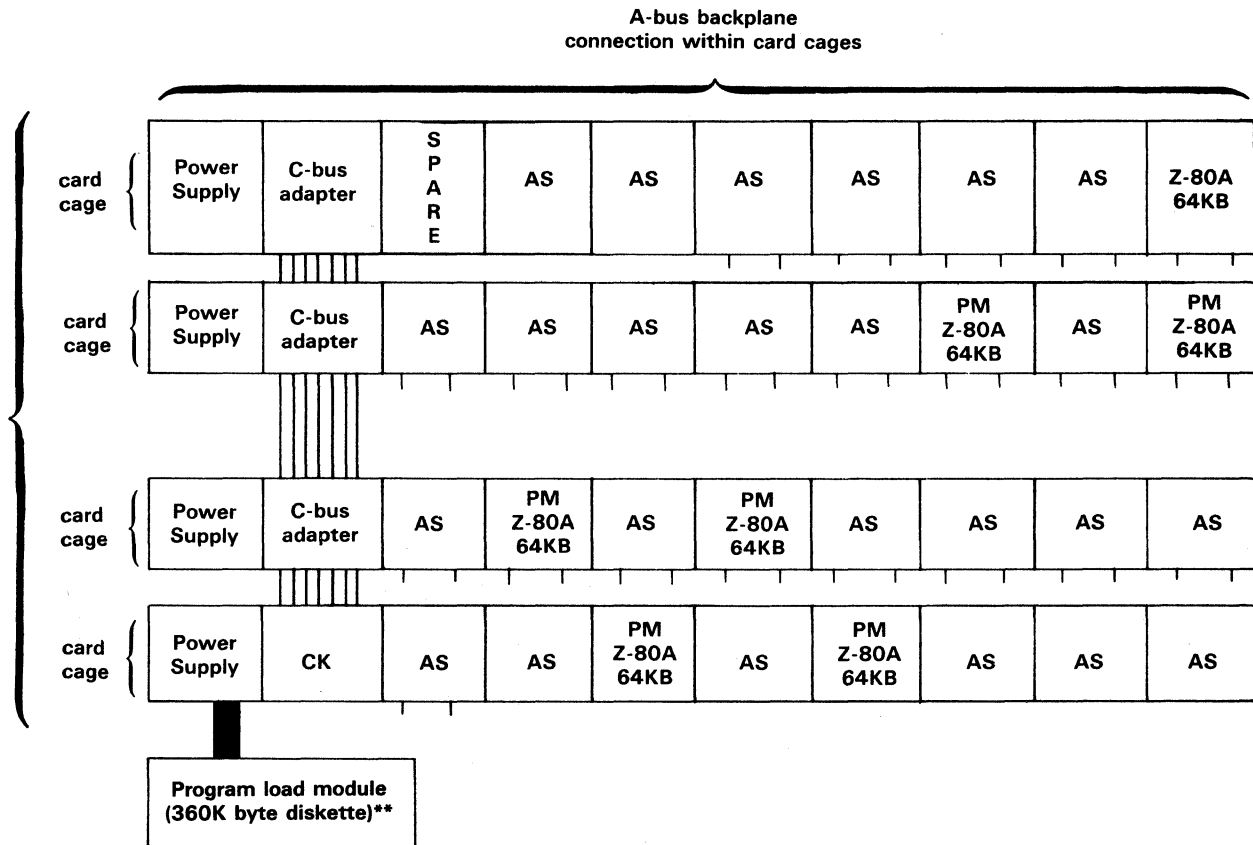
Series 300 processors support a user-supplied ASCII terminal as a console. The console operates under control of the console handler, a special software module that resides in a processing module of Series 300 processors.

The console handler supports a large set of commands that operators can issue. There are eight groups of commands:

- *Console access commands* control operators' access to the processor through the console;
- *Inquiry commands* allow the operator to request processor and network status and configuration information;

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DCA System 355 Component Configuration*



*This diagram shows a configuration with four card cages.
The System 355 can contain up to eight cages.
**Diskette drive is located next to power supply.

- ▶ **Port-reconfiguration commands** allow the operator to change the arrangement or characteristics of individual ports or groups of ports on the processor;
- Fault diagnosis commands** allow the operator to perform traces and loopback tests on the processor's ports;
- Startup/shutdown commands** allow the operator to start or stop the processor;
- File subsystem commands** allow the operator to edit files on the processor's configuration disk;
- Debugging commands** allow the operator to alter or correct the processor's operating software;
- Miscellaneous commands** provide several services to the operator, including date and time information and access to a help file.

In addition to the status and control services available through the console, the Series 300 processors provide limited status and diagnostic information through status LEDs on the individual processing and AS modules, and

through a four-digit alphanumeric LED display on each processing module.

SOFTWARE

The operating software of the Series 300 processors consists of a number of *handlers*, each of which performs a specific function. In operation, the handlers reside in the processing modules of a Series 300 processor. The standard Series 300 operating software consists of 12 handlers, three of which must reside in the supervisory processing module, and nine of which may reside in other processing modules. Some optional handlers, such as the X.25 interface, must reside in dedicated processing modules.

The three handlers that control the normal operation of the entire Series 300 processor are:

- The *Node Supervisor (NS)*, which controls interactions among all other handlers, maintains information on the configuration of the processor and of the network, and establishes and routes virtual circuits through the processor;

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- The *Node Host* (NH), which controls communications between individual users and the node supervisor, conducting the dialog with the user at the establishment of a virtual circuit and reporting any connection failures to the user;
- The *Program Loading System handler* (TPLS), which controls communications between the supervisory processor and the program loading module for the up- and downloading of handlers and configuration data;
- The *Console/Log handler* (CL), which controls communications between the operators' console and the processor, and interprets and executes console commands.

The nine other handlers that may reside in processing modules other than the supervisory processing module all control communications through the Series 300 processor's network ports. Depending on the configuration of a specific Series 300 processor, each of a number of processing modules dedicated to specific ports may run its own copy of one of these handlers. The Series 300's network port handlers are:

- The Series 300 *Tandem Access handler* (TA), which controls communications over one high-speed DDCMP trunk to another Series 300 processor;
- The Series 300 *Slave Trunk handler* (ST), which controls communications over one point-to-point or multidrop DDCMP link between a Series 300 processor and one of a number of DCA statistical multiplexers;
- The *user equipment port handler* (TT), which controls communications between a Series 300 processor and a number of asynchronous terminals or host ports through one or more Astra-AS ports.
- The *Series 300 high-speed tandem access trunk handler* (HT), which connects two Series 300s in a back-to-back configuration or through an X.25 network. It provides one or two high-speed internodal links (total throughput of up to 10,000 characters per second).
- The *high-speed X.25 trunk handler* (Z25), which connects a Series 300 to an X.25 network and a packet-mode host. The "passthrough" mode of the Z25 handler allows a DCA network to route and switch X.25 packets; therefore, an entire X.25 network may be built from Z25 handlers and other DCA components.
- The *high-speed X.25 and tandem access trunk handler* (HX), which combines the functions of the HT and Z25 handlers, allows users to access points both inside and outside a connected X.25 network on the same trunk line.
- The *X.25 Gateway interface*, which connects a Series 300 processor to an X.25 network, runs in a processor module and supports the 1980 version of the CCITT X.3, X.28, and X.29 standards of a PAD.
- The *INA/BTS handler* (BTS), which allows users located at a remote IBM 3270 Information Display System terminal (or equivalent) to communicate with one or more IBM host computers (or equivalent) through a DCA network, gives the 3270 user the features of switching, routing, and port contention that previously were available only under IBM's SNA.

- The *Bit-Oriented Protocol Passthrough handler* (BOPP), which allows equipment using the SNA/SDLC or HDLC communications protocols (or equivalent) to communicate through DCA networks on permanent subnets.
- The *Network Control Concentrator handler* (NCC), which turns an asynchronous terminal into a central network console. NCC enables the central console operator to perform all major functions such as temporary network reconfigurations, diagnostics, and statistics collection.
- The *Ethernet/LAN handler* (TX), which allows users in a Series 300-based network to transmit data over the Ethernet/LAN.
- The *Camp-on handler* (CO), which automatically queues users when they cannot connect to their destination due to a host/trunk failure. When the virtual circuit can be completed, CO connects users in their original order. CO periodically tells users what their queue positions are. If users need to connect, they can phone the network operator and obtain a single-use password which "jumps" them to the top of the queue.

An Advanced Features Software package is available as an option for all Series 300 products. It includes a macro language for console communications, downline file loading among Series 300 processors, a dedicated log port distinct from the console port, faster initial program loading, and a number of alarms and counters for network management.

The two trunk handling modules (TA and ST) and the node supervisor (NS), together with similar trunk handling software running in DCA statistical multiplexers, implement DCA's Integrated Network Architecture (INA), of which the Series 300 processors form the central component. INA is a protocol-transparent architecture designed to support hosts and terminals regardless of vendor. Its main features as an architecture are statistical multiplexing onto trunk lines in the DCA multiplexers, access control through the establishment of subnetworks, DDCMP/X.25 framing and error control on the trunk lines, and virtual-circuit establishment and routing in the Series 300 processors. INA also features some protocol conversion, such as the Series 300's X.25 interface and the functions of standalone DCA protocol converters.

DCA provides three other software packages for use in a Series 300-based network. The Network Management System (NMS) allows an IBM PC XT or PC AT to function as an intelligent monitoring and reporting device with the ability to handle all the chores of network administration and control. The Network Design System (NDS) is a software package, which runs on a Digital Equipment VAX or an IBM PC, that enables network managers to configure their network. The ETI Line Pricer is a software package that runs on an IBM PC or AT and calculates rates for voice, data, and other private line services specified by the interstate tariffs of AT&T, MCI, GTE, and other common carriers. It enables the user to forecast and evaluate line charges and termination costs in a simple, cost-effective manner.

PRICING

Series 300 network processors are available for purchase or for leases of one, two, three, four, or five years. Contact Digital Communications Associates, Inc. for details. Equipment prices are listed below.

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EQUIPMENT PRICES

		Monthly Charge				
		Purchase Price (\$)	One Year Lease (\$)	Two Year Lease (\$)	Three Year Lease (\$)	Four Year Lease (\$)
Series 300 Models						
355-111	System 355 Master Network Processor (rackmount)	9,995	400	375	350	300
355-112	System 355 Master Network Processor (4-foot enclosure)	10,995	440	412	385	330
355-113	System 355 Master Network Processor (6½-foot enclosure)	11,295	452	424	395	339
335-201	System 335 Network Processor (rackmount)	6,795	272	255	238	204
375-101	System 375 Master Network Processor (rackmount)	15,995	640	600	560	480
375-102	System 375 Master Network Processor (6½-foot enclosure)	16,995	700	637	595	510
Series 300 Accessories						
3PM-003	Processing module, 64K bytes (for 355 or 335)	3,500	140	131	123	105
3PM-335	Processing module, 64K bytes (for 335 only)	2,995	120	112	105	90
ASTRA-AS2	2-port serial interface	325	13	12	11	10
NCF-60	60 Watt card file assembly	1,765	71	66	62	53
NCF-D60	60 Watt card file assembly with C-bus adapter	2,065	83	77	72	62
300-2FDB	Dual diskette drive card file assembly	4,950	198	186	173	149
3AD-001	Card file adapter module	300	12	11	11	9
3CK-001	C-bus controller (CK module)	750	30	28	26	23

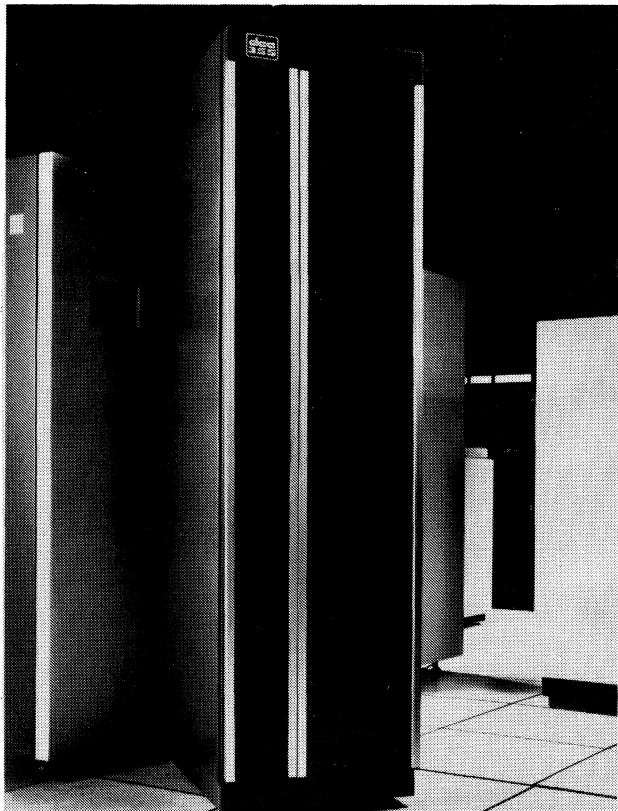
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MANAGEMENT SUMMARY

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In April 1984, DCA announced System 375 as a high end to Series 300. The new processor's principal improvements over System 355 are greater capacity and higher data rates on system trunks.

The Series 300 has much in common with DCA's line of statistical multiplexers. In particular, it uses the same microprocessor, the Zilog Z-80A, and the same network-side hardware, the Astra-AS port card. (For high-speed trunk control, the System 375 uses the Motorola 68000 microprocessor). The feature that differentiates the Series 300 from simple statistical multiplexers is a two-level processing hierarchy. A microprocessor-based statistical multiplexer usually has a single processor in charge of its



The DCA System 355 Master Network Processor is based on a multi-Z-80A processing configuration. It handles up to 124 communications lines and up to eight DDCMP trunks.

The DCA Series 300 has three members: the System 355 Master Network Processor, the System 335 Network Processor, and the high-end System 375 Master Network Processor. All are multi-microprocessor-based communications processors that perform virtual circuit switching and management for networks based on DCA statistical multiplexers.

FUNCTION: Standalone communications processors for host-independent networks using DCA statistical multiplexers.

HOST COMPUTERS SUPPORTED: Any, as host-independent network controllers.

ARCHITECTURE SUPPORTED: Integrated Network Architecture, a transparent, DCA-proprietary transport architecture using DDCMP as a trunk protocol.

OPERATING SOFTWARE: DCA-proprietary communications handlers.

COMPETITION: High-end switching multiplexers from Infotron Systems, Timeplex, Paradyne, Rixon, and Codex.

PRICE: All three Series 300 processors are fully modular systems, expandable in uniform increments. Purchase price for a basic, freestanding System 335 starts at \$7,195; hardware for a fully configured System 335 able to support 42 communications lines costs \$24,515. DCA has not yet set pricing for System 375.

CHARACTERISTICS

VENDOR: Digital Communications Associates, Inc., 303 Technology Park/Atlanta, Norcross, GA 30092. Telephone (404) 448-1400.

DATE OF ANNOUNCEMENT: System 355, 1980; System 335, 1983; System 375, April 1984.

DATE OF FIRST DELIVERY: System 355, 1980; System 355, 1983; System 375, information not available.

NUMBER INSTALLED TO DATE: System 355, over 200; Systems 335 and 375, information not available.

SERVICED BY: Digital Communications Associates, Inc.

MODELS

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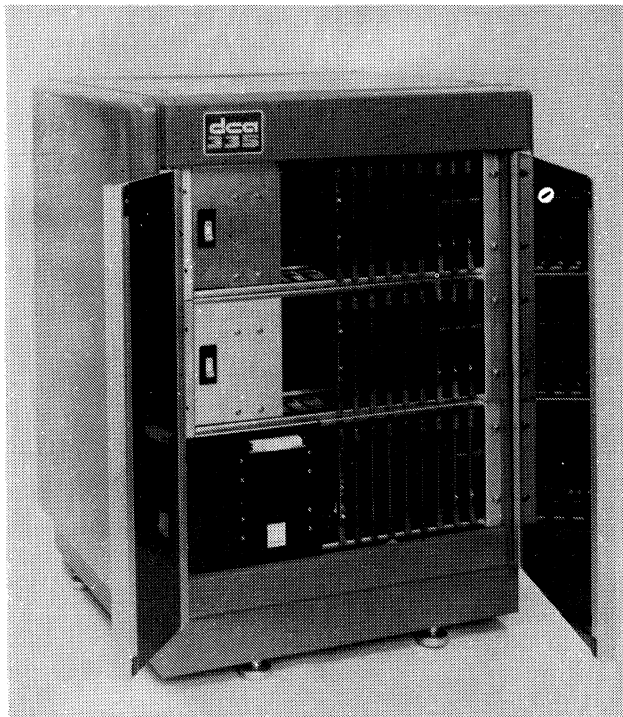
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The Series 300 units serve as nodal processors in DCA's Integrated Network Architecture (INA). As nodal processors, they route and switch data from DCA statistical multiplexers, as well as from hosts and terminals attached directly over asynchronous communications lines. The Systems 335 and 355 handle synchronous data from DCA multiplexers at rates up to 19.2K bps; System 375 handles synchronous data at rates of 56K to 72K bps. All three models use the DEC DDCMP data link protocol for framing and error control. The units handle asynchronous data from attached hosts and terminals at rates from 50 to 9600 bps, with automatic data rate detection (autobaud). They use both special characters (X-on/X-off) and modem lead signalling for flow control on high-speed asynchronous lines.

COMPETITIVE POSITION

The Series 300 processors compete with a number of products marketed as nodal processors or concentrators at the high ends of lines of statistical multiplexers. Among these are Infotron Systems' 790, Paradyne's DCX 840 and 850, Timeplex's NM96 and NM144, and Codex's 6050. All such products dwell on a fine line of definition between intelligent, switching multiplexers and true communica-



System 335 is the smaller of DCA's two Series 300 processors. Shown here in its three-foot enclosure, the unit is also available in a rack-mountable configuration.

▷ System 375 can support up to 114 communications ports, all of which may be high-speed trunk links. The System 355 can support up to 124 communications ports and up to eight high-speed, multiplexed trunk links. The System 335 can support up to 42 communications ports and up to four trunk links.

CONFIGURATION

The unit of configuration for Series 300 network processors is the Astra-C6 card cage, which includes a parallel, backplane bus, a local power supply, and either a bus controller or a bus adapter for connection to other Astra-C6 cages. Each card cage has space for up to eight communications modules, which can be either processing modules or communications line interfaces.

The System 355 comes in three configurations: a single-cage, rack-mountable unit with program loading module, a 4-foot enclosure with space for four card cages and a program loading module, and a 6½-foot enclosure with space for eight card cages and a program loading module.

The System 335 comes in two configurations: a single-cage, rack-mountable unit, and a 3-foot enclosure with space for three card cages.

The System 375 is a new product. As of this writing, DCA has not revealed any specific System 375 configurations.

The program loading module for all Series 300 systems is a 360K-byte diskette drive that attaches to the supervisory processing module over a local serial connection.

Processing modules and communications line interfaces, which reside in the same Astra-C6 card cage, communicate with one another over the unit's backplane, or A-bus. Modules in different Astra-C6 card cages communicate with one another over a parallel cable connection called the C-bus. Communication over the C-bus is controlled by a C-bus controller, or CK module, in the same card cage as the unit's supervisory processing module. A C-bus adapter in each additional card cage handles communications between modules in that cage and the C-bus.

PROCESSING COMPONENTS

All processing in Series 300 processors takes place in the units' processing modules. DCA makes three kinds of processing modules: one that can operate only in System 335 processors, one that can operate in either System 335 or System 355 processors, and one for high-speed trunk handling on System 375. Each processing module of the first two types contains a single Z-80A microprocessor and 64K-bytes of random access memory. The high-speed module for System 375 is based on a Motorola 68000 microprocessor.

A Series 300 processor may contain more than one processing module, depending on the line-handling requirements and special software features of a given configuration. In all configurations, one processing module must be designated as the supervisory processor; it runs a number of software modules, called handlers, necessary for the overall operation and maintenance of the system and of the network it controls. Other processing modules may be dedicated to the handling of specific groups of communications lines, or to the performance of functions specified by individual communications handlers.

Each Z-80-based processing module supports up to 19.2K bps throughput. The 68000-based module supports up to 72K bps throughput. For efficient operation, users should dedicate one processing module to each high-speed trunk. Some special features, such as the X.25 interface software, require dedicated processing modules.

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tions processors. Indeed, most of DCA's competitors choose to call their products multiplexers. The Series 300's most important competitors are the Infotron and Timeplex products.

ADVANTAGES AND RESTRICTIONS

The DCA Series 300 processors are most useful in configurations of small to medium size, especially those with little or no high-speed traffic. DCA's Integrated Network Architecture, while it lacks the sophisticated flow control, network management, and end-to-end protocol support of a full-blown computer vendor's architecture (such as SNA), is a good, low-overhead alternative to such architectures, especially for networks in which hosts and terminals from a number of vendors participate.

Specific advantages of the Series 300 products are their X.25 interface and their high degree of integration with other DCA products, including statistical multiplexers and protocol converters. A specific restriction is the low data rate supported on the trunk connections by Systems 335 and 355. DCA has eliminated this restriction on System 375, which performs the high-speed trunking at 56K or 72K bps.

USER REACTION

In Datapro's 1984 Network Users Survey, conducted in conjunction with Data Communications Magazine, nine users of the DCA System 355 responded, reporting on a total of 34 processors. Their ratings are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	3	6	0	0	3.3
Ease of installation	2	5	2	0	3.0
Ease of operation	3	4	2	0	3.1
Ease of expansion	5	4	0	0	3.6
Hardware reliability	5	3	1	0	3.4
Quality of vendor's software/firmware	1	6	2	0	2.9
Ease of programming	2	2	3	0	2.9
Quality of vendor's maintenance service	1	4	4	0	2.7
Quality of vendor's technical support**	2	5	2	0	3.0

*Weighted Average based on a scale of 4.0 for Excellent.

**Technical support includes documentation, training, and troubleshooting provided by the vendor.

The System 335 was a new product at the time Datapro conducted the survey and System 375 had not yet been announced; no System 335 or 375 users responded. Datapro was unable to contact any of the respondents for further comment. □

CONNECTION TO THE NETWORK

All connections between Series 300 processors and their networks of trunks and communications lines take place through Astra-AS port cards. An Astra-AS card is a serial interface that connects to the backplane A-bus of the Series 300 processor and to one or two communications lines; all Astra-AS cards have two serial ports. All communications through the Astra-AS cards take place under the control of

the system's processing modules. The Astra-AS cards, which are also used as the principal network interface for DCA's statistical multiplexers, support either RS-232-C or passive 20-milliamp current loop interfaces.

TRANSMISSION SPECIFICATIONS

Series 300 processors support two kinds of connections: trunk links and user equipment ports. Trunk links are high-speed connections between Series 300 processors, or between Series 300 processors and DCA statistical multiplexers. User equipment ports are connections between Series 300 processors and end user hosts and terminals.

The Series 300 processors support two kinds of trunk links, one between Series 300 processors, and the other between Series 300 processors and DCA statistical multiplexers or external X.25 or IBM BSC networks. Both carry synchronous data at rates up to 19.2K bps (Systems 355 and 335) or 72K bps (System 375), and use the Digital Equipment Corporation's DDCMP data link protocol.

User equipment ports handle asynchronous data in any character format at rates from 50 to 9600 bps, with standard clock rates of 110, 300, 600, 1200, 2400, 4800, and 9600 bps. The units support automatic data rate detection (autobaud) for two preset groups of data rates. Group 1 includes rates of 110, 134.5, 150, 300, 600, and 1200 bps; Group 2 includes rates of 300, 600, 1200, and 2400 bps.

The Series 300 processors support two types of flow control. The first is flow control by special characters, such as X-on and X-off. The second is flow control signalled by the raising and lowering of specified modem leads.

Communications through the Series 300 processors are essentially transparent to line protocol with two exceptions. The first is the DDCMP framing for trunk transmission between DCA devices. The second is packet-level X.25 transmission between Series 300 processors and X.25-based hosts or packet switched networks.

OPERATOR INTERFACE

Series 300 processors support a user-supplied ASCII terminal as a console. The console operates under control of the console handler, a special software module that resides in the supervisory processing module of Series 300 processors with the standard software package, and in a dedicated processing module on System 355 processors with the optional Advanced Features Software.

The console handler supports a set of 40 commands that operators can issue. There are eight groups of commands:

- *Console access commands* control operators' access to the processor through the console;
- *Inquiry commands* allow the operator to request processor and network status and configuration information;
- *Port-reconfiguration commands* allow the operator to change the arrangement or characteristics of individual ports or groups of ports on the processor;
- *Fault diagnosis commands* allow the operator to perform traces and loopback tests on the processor's ports;
- *Startup/shutdown commands* allow the operator to start or stop the processor;
- *File subsystem commands* allow the operator to edit files on the processor's configuration disk;
- *Debugging commands* allow the operator to alter or correct the processor's operating software;

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- *Miscellaneous commands* provide several services to the operator, including date and time information and access to a help file.

In addition to the status and control services available through the console, the Series 300 processors provide limited status and diagnostic information through status LEDs on the individual processing and Astra-AS modules, and through a four-digit alphanumeric LED display on each processing module.

SOFTWARE

The operating software of the Series 300 processors consists of a number of *handlers*, each of which performs a specific function. In operation, the handlers reside in the processing modules of a Series 300 processor. The standard Series 300 operating software consists of seven handlers, four of which must reside in the supervisory processing module, and three of which may reside in other processing modules. Some optional handlers, such as the X.25 interface, must reside in dedicated processing modules.

The four handlers that control the normal operation of the entire Series 300 processor, and thus must reside in the supervisory processing module are:

- The *Node Supervisor (NS)*, which controls interactions among all other handlers, maintains information on the configuration of the processor and of the network, and establishes and routes virtual circuits through the processor;
- The *Node Host (NH)*, which controls communications between individual users and the node supervisor, conducting the dialog with the user at the establishment of a virtual circuit and reporting any connection failures to the user;
- The *program loading system handler (TPLS)*, which controls communications between the supervisory processor and the program loading module for the up- and downloading of handlers and configuration data;
- The *console/log handler (CL)*, which controls communications between the operators' console and the processor, and interprets and executes console commands.

The three handlers that may reside in processing modules other than the supervisory processing module all control communications through the Series 300 processor's network ports. Depending on the configuration of a specific Series 300 processor, each of a number of processing modules dedicated to specific ports may run its own copy of one of these handlers. The Series 300's network port handlers are:

- The Series 300 *cross-link handler (TA)*, which controls communications over one high-speed DDCMP trunk to another Series 300 processor;
- The Series 300 *slave trunk handler (ST)*, which controls communications over one point-to-point or multidrop DDCMP link between a Series 300 processor and one of a number of DCA statistical multiplexers;
- The *user equipment port handler (TT)*, which controls communications between a Series 300 processor and a number of asynchronous terminals or host ports through one or more Astra-AS ports.

An Advanced Features Software package is available as an option for System 355. It includes a macro language for console communications, downline file loading among System 355 processors, a dedicated log port distinct from the console port, faster initial program loading, and a number of alarms and counters for network management. With the Advanced Features package, the console/log handler must run in a dedicated processing module, rather than in the supervisory processing module.

The two trunk handling modules (TA and ST) and the node supervisor (NS), together with similar trunk handling software running in DCA statistical multiplexers, implement DCA's Integrated Network Architecture (INA), of which the Series 300 processors form the central component. INA is a protocol-transparent architecture designed to support hosts and terminals regardless of vendor. Its main features as an architecture are statistical multiplexing onto trunk lines in the DCA multiplexers, access control through the establishment of subnetworks, DDCMP framing and error control on the trunk lines, and virtual-circuit establishment and routing in the Series 300 processors. INA also features some protocol conversion, such as the Series 300's X.25 interface and the functions of standalone DCA protocol converters.

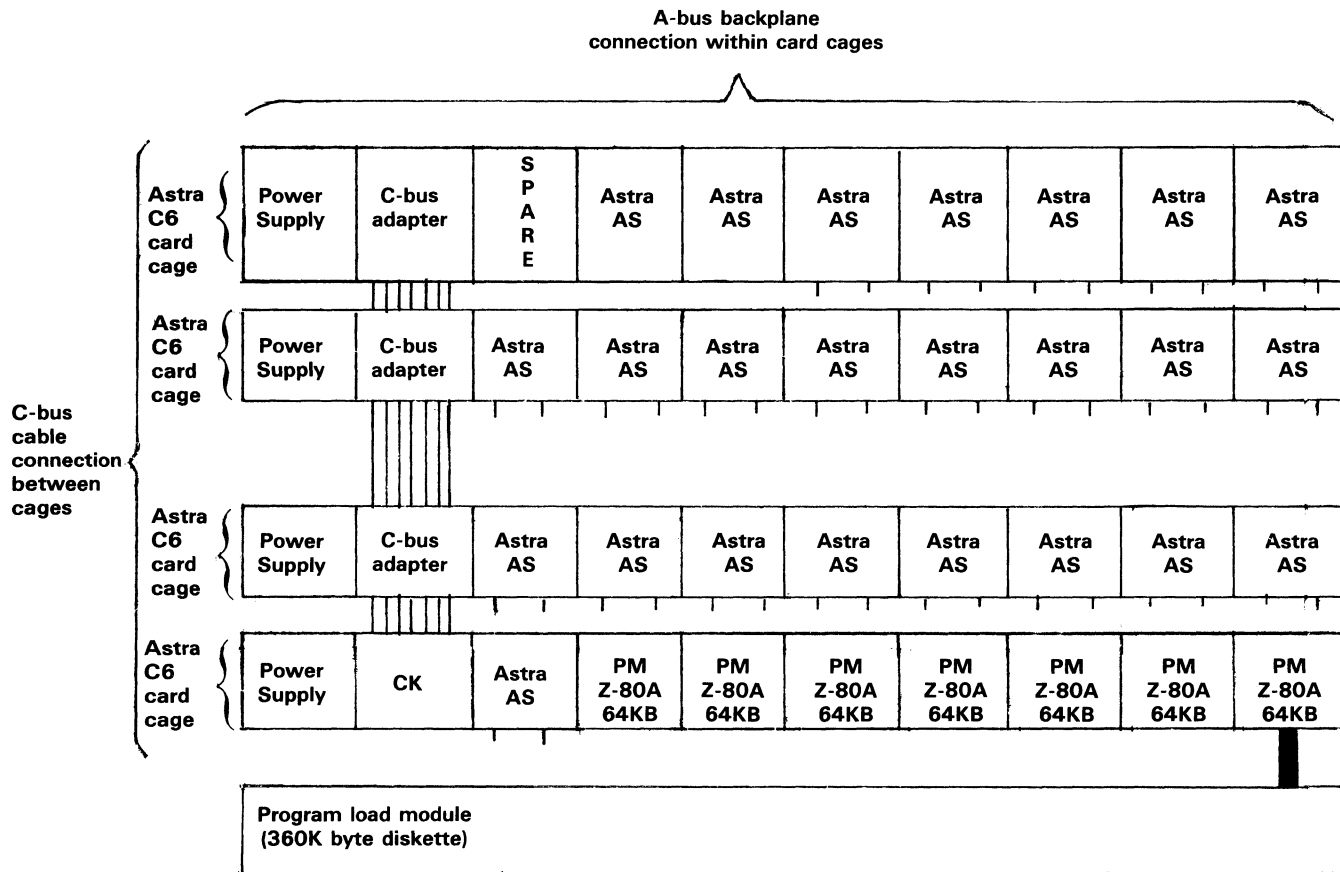
Another special handler is INA/BTS, which can connect IBM 3274 control units to IBM mainframes through Series 300-based INA networks using IBM's BSC protocol. INA/BTS provides DDCMP framing and error control for BSC data passing through the INA network.

PRICING

Series 300 network processors are available for purchase or for leases of one, two, three, four, or five years. Contact Digital Communications Associates, Inc. for details. DCA has not yet set pricing for System 375.

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DCA System 355 Component Configuration*



*This diagram shows a configuration with four Astra-C6 card cages.
The System 355 can contain up to eight Astra-C6 cages.

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EQUIPMENT PRICES

		<u>Monthly Charge</u>					
		<u>Purchase</u>	<u>1 year Lease</u>	<u>2 year Lease</u>	<u>3 year Lease</u>	<u>4 year Lease</u>	<u>5 year Lease</u>
355-100	System 355 Master Network Processor (rack mountable)	\$ 9,995	\$ 400	\$ 375	\$ 350	\$ 300	\$ 250
355-102	System 355 Master Network Processor (4-foot enclosure)	10,995	440	412	385	330	275
355-103	System 355 Master Network Processor (6½-foot enclosure)	11,295	452	424	395	339	282
335-100	System 335 Network Processor (rack mountable)	6,795	272	255	238	204	170
335-200	System 335 Network Processor (3-foot enclosure)	7,195	288	270	252	216	180
3PM-003	Processing module, 64K bytes (for 355 or 335)	3,500	140	131	123	105	88
3PM-335	Processing module, 64K bytes (for 335 only)	2,995	120	112	105	90	75
ASTRA-AS	2-port serial interface	325	13	12	11	10	8
ASTRA-C6	Card cage assembly	1,765	71	66	62	53	44
ASTRA-3C6	Card cage assembly with C-bus adapter	2,065	83	77	72	62	52
ASTRA-CT1	Card cage assembly with program loading module	3,800	152	143	133	114	95
3AD-001	Card file adapter module	300	12	11	11	9	8
3CK-001	C-bus controller (CK module)	750	30	28	26	23	19