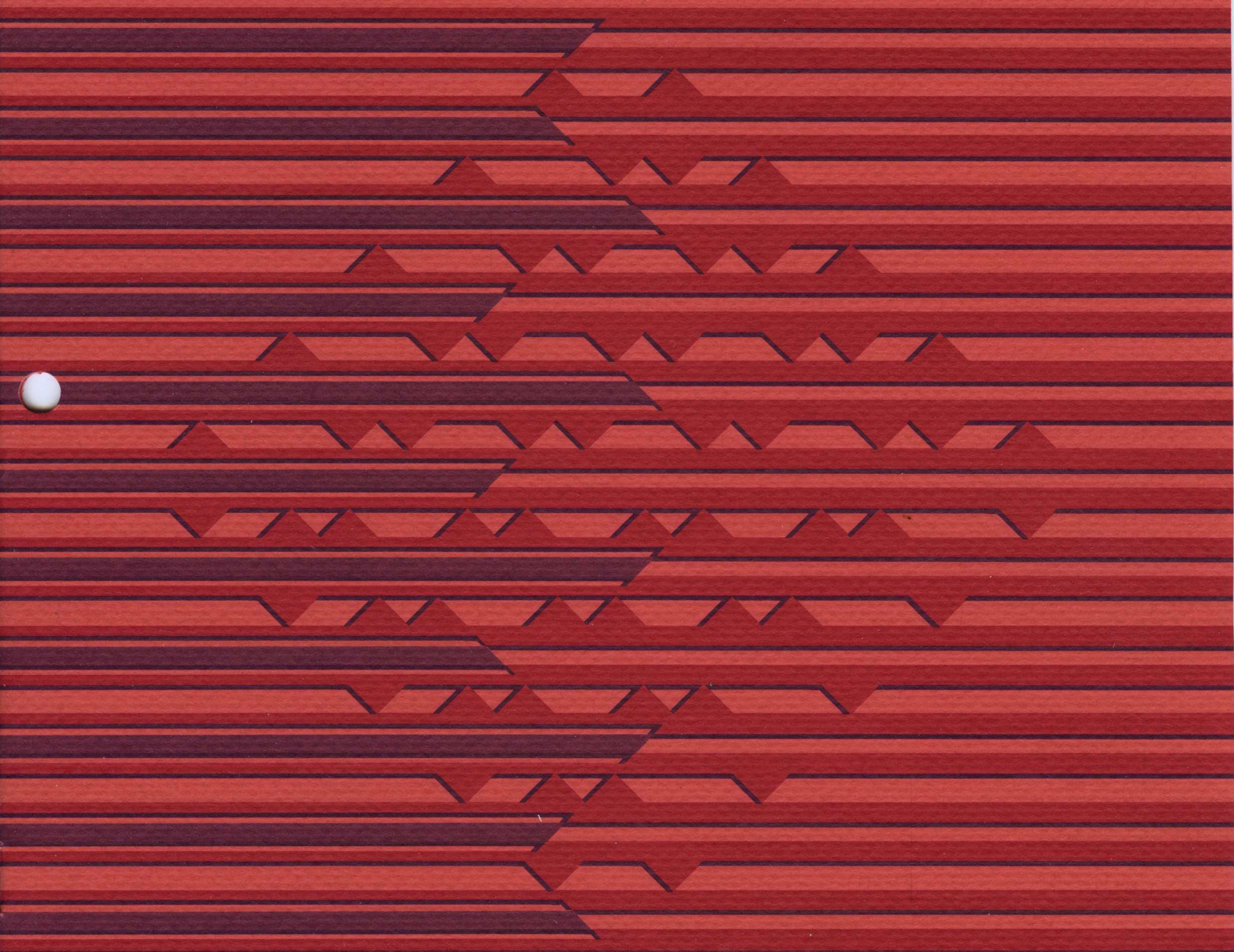
SPERRY

# DCP/Telcon

## Facts and Figures



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## Introduction

The DCP/Telcon system provides a powerful and versatile communications system, designed to handle intelligent network communications in demanding environments.

Based on a unified family of hardware and software components, the DCP/Telcon system takes over the burden of network control from host systems.

With its resources freed, the host system can handle its remaining work more efficiently, and with network control consolidated in one system, you gain a more reliable, responsive and efficient communications network.

The principal hardware used by the Telcon system is:

- The SPERRY Distributed Communications Processor/10A (DCP/10A)
- The SPERRY Distributed Communications Processor/20 (DCP/20)
- The SPERRY Distributed Communications Processor/40 (DCP/40)

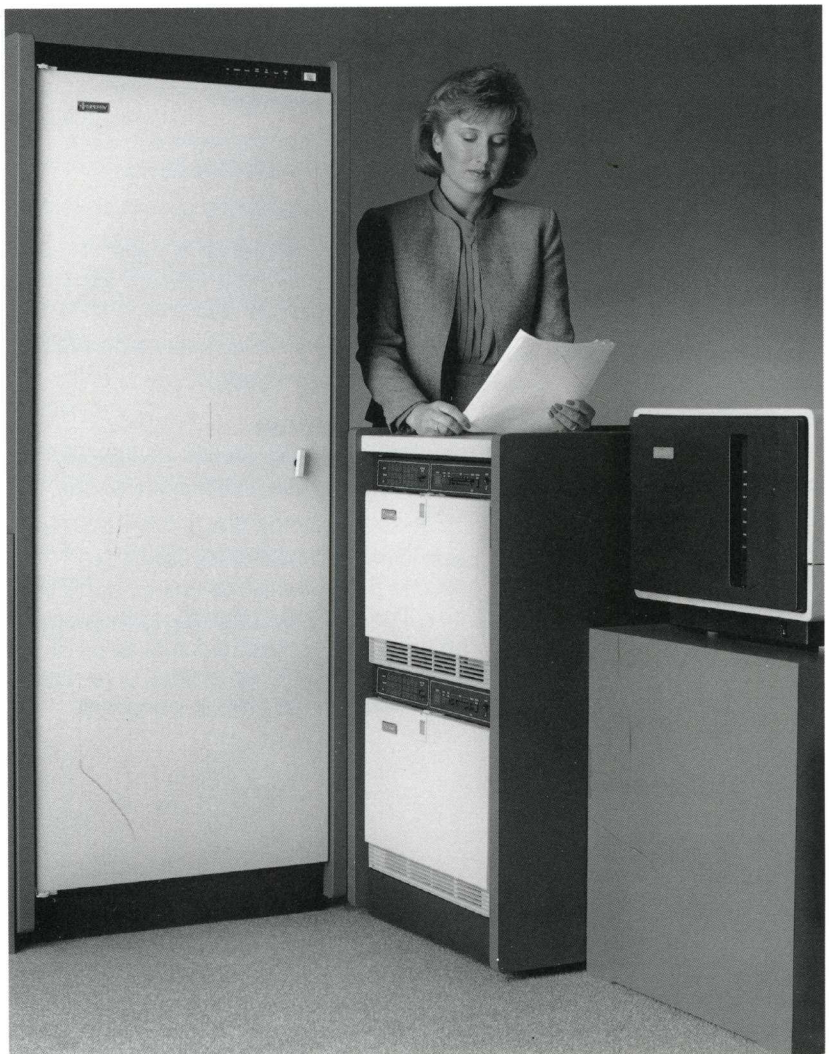
The DCP hardware is modular and can be configured to fit a broad range of needs, from the simple to complex. The software is also modular and can be structured to meet the demanding requirements of today's networks.

The Telcon system follows the SPERRY Distributed Communications Architecture (DCA). This ensures that you have a state-of-the-art system and that, in the future, your network can accommodate new network design concepts.

## Principal Features of the Telcon System

The main features of the Telcon system are that it:

- Can operate as a front-end processor, remote concentrator and network processor
- Can serve both Series 1100 and Series 90 virtual systems as a front-end processor (DCP/10A supported on Series 1100 only)
- Supports multiple host connections as a front-end processor
- Supports transaction, timesharing, remote job entry and distributed processing applications simultaneously
- Can serve in redundant configurations
- Provides distributed network management services, including control, security maintenance and monitoring
- Uses common software for DCP/10A, DCP/20 and DCP/40
- Handles a wide variety of configurations of asynchronous, synchronous and wide-band communications lines
- Supports equipment for local initialization, unattended operation and redundant applications
- Uses state-of-the-art LSI and VLSI design
- Has microcode and hardware architecture built specifically for communications processing
- Employs a modular hardware design that uses the building block concept
- Uses a versatile and powerful instruction set, tailored for communications programming
- Can have larger hardware configurations that support independent I/O processors containing direct memory access.



## Hardware Configuration

The Distributed Communications Processors are a new generation of communications processors designed specifically for network applications.

They provide network control, a wide range of data transmission rates, multiple terminal type support, line cost savings, modularity, growth capabilities and the capability to tailor communications networks to fit data processing and data transmission needs.

The DCP/40 is the largest member of the DCP family, supporting up to 1000 Terminations. The DCP/20 is the intermediate member, supporting up to 180 Terminations. The DCP/10A is the entry level member, supporting up to 24 Terminations. Each Termination may be used to attach communications lines, host interfaces or peripheral devices.

The architecture of the DCPs distributes processing among the following:

- Communications processor
- I/O processor
- Local storage
- Line modules
- Disk and tape peripheral subsystems.

The communications processor, I/O processor and local storage attributes of each DCP family member determine their performance and connectivity range. Line modules and peripherals subsystems are common to all family members.

**Communications Processor**

The communications processor serves as a general-purpose processor to manage network operations. Virtual addresses access local storage, providing the communications processor with a wide address range.

The following features assure hardware reliability:

- Dual arithmetic logic units, for comparing and checking computations
- Automatic instruction retry, in the event of failing microinstructions
- Byte parity checking on data buses and internal registers, for accuracy
- Error logging of microcontroller failure and errors, for quick detection of errors
- Autorecovery and autorestart procedures, for recovery from power interrupts and other system failures
- Parity and duplication in 16-bit data path, for accuracy.

Other features of the communications processor include:

- A storage interface of 32 bits (16 bits for the DCP/10A) plus byte parity with a 24-bit address range
- A total of 128 general registers, each consisting of 16 bits plus parity
- Microcycle times of:
  —65 nanoseconds for the DCP/40
  —80 nonoseconds for the DCP/20
  —250 nonoseconds for the DCP/10A
- A total of 300 communications processor instructions.

**I/O Processor (IOP)**

The IOP is a microcontroller specifically designed to handle input/output for the DCPs.

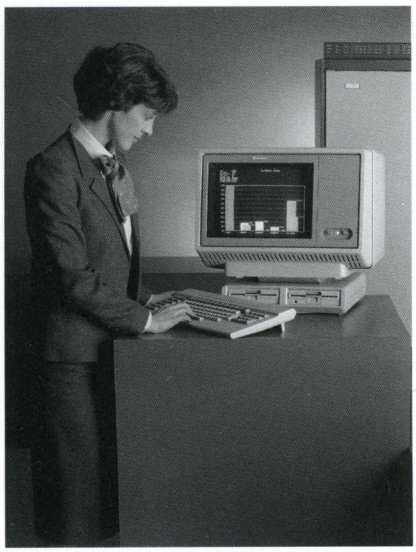
Each IOP in the DCP/20 and DCP/40 provides programmed control for up to 16 ports. The DCP/10A provides eight ports. The ports can connect a combination of full- and half-duplex serial lines to remote equipment, parallel links to peripheral devices and channel connections to either the Series 1100 or, except for the DCP/10A, the Series 90 Virtual system on-site host processor. The IOP uses virtual addressing to access the full storage of the DCPs.

In addition to controlling the reception and transmission of data, these instructions can be used to control a full range of specialized activities, such as:

- Polling and calling for data from a remote terminal
- Allocating buffers for temporary storage or input/output messages
- Checking messages for errors and requesting retransmission of data
- Reporting operational status on the various communications lines
- Maintaining traffic and error statistics.

A total of 16 IOPs can be used with the DCP/40. The DCP/20 can have a total of three IOPs, with the first handling both communications processor and I/O processor functions. The DCP/10A has a single processor which provides both communications processor and I/O processor functions. The IOP for the DCP/20 and DCP/40 uses a 16-bit microinstruction, an 8-bit data path, a 32-bit storage address plus byte parity, a 24-bit byte addressing system and 1024 internal registers that use 32-bit stacks with byte parity.

To control IOPs, programmers can use 85 macroinstructions that are executed from local storage through input/output chains.



**Local Storage (DCP/40)**
The high-performance local storage consists of 512K bytes of integrated circuit, multibank, error correcting storage that can be expanded in 512K-byte increments to 2M bytes. An expansion cabinet can be added, providing an additional 4.0M bytes in 512K-byte (16K chips) increments. The total storage capacity for the DCP/40 is 6.0M bytes.

Specific storage characteristics are:

- Four storage ports that can be optionally expanded in large systems
- Correction of all single-bit errors and the detection and logging of all double-bit errors
- A word length of 32-bits, plus 4 parity bits at the interface. Internally, storage uses a 32-bit word with seven bits designated for error correction
- A read cycle time and a full-word write cycle time of 450ns.

**Local Storage (DCP/20)**
The memory of the DCP/20 is an integrated circuit, error correcting storage system that can be expanded from 512K bytes in 512K-byte increments to a maximum of 2.0M bytes. Specific characteristics are:

- Correction of all single-bit errors and the detection and logging of all double-bit errors
- A word length of 32-bits, plus a 4-bit byte for parity at the interface. Internally, storage uses a 32-bit word with seven bits designated for error correction
- A read cycle time of 400ns and a full-word write cycle time of 450ns.

**Local Storage (DCP/10A)**
The integrated circuit memory of the DCP/10A is an error correcting storage system that can be expanded from 512K-bytes in 512K-byte (256K chips) increments to a maximum of 2.0M bytes. Specific characteristics are:

- Correction of all single-bit errors and detection and logging of all double-bit errors.
- A word length of 16 bits plus two bits for parity at the interface. Internally, storage uses a 16-bit word with six error correcting bits.
- A read-cycle time of 1000 nanoseconds and a full-word write cycle of 750 nanoseconds.

**Data Security**
The DCP processing components are designed to provide security and privacy in handling electronic data.

A wide range of protective mechanisms in both the software and hardware safeguards data from unwarranted intrusion and inadvertent modification.

These protective measures include the traditional approaches, such as privileged instructions and virtual addressing, and some unique to the DCPs.

Some of the mechanisms used to preserve privacy and keep data secure are:

- Byte parity checking in data buses and internal registers
- Error logging of microcontroller failures and errors
- Storage protection to control access rights to local storage
- Architectural designs to confine and isolate programs and data within protected environments
- Error detection and recovery procedures to protect data from inadvertent alteration
- Autorecovery and autorestart procedures for recovery from power interrupts and other system failures.

**Communications Line Modules**
All communications line modules handle both full-duplex and half-duplex communications and terminate one line per port, except the multi-line asynchronous line module. This latter module multiplexes four circuits onto one port.

Line module functions include:

- Character assembly and disassembly
- Character parity and block check sequence generation and checking
- Data buffering
- Control character recognition
- Line timing and asynchronous clocking
- Automatic data rate detection

Electrical interfaces, at line speeds up to 64K bps, are supported as follows:

- RS232C (V.24, V28)
- V.35
- RS449
- Auto dial (US RS366)
- Bell 303
- Auto dial (Japan NTT)
- X.21

**Parallel Line Modules**
Parallel line modules provide the hardware interfaces between the DCP and both the peripheral subsystems and host processors. The five parallel modules provided are:

- Host Byte Channel Module, which provides an 8-bit interface to a host byte or block multiplexer channel
- Host Word Channel Module, which provides full duplex, 32-bit interface to a SPERRY UNIVAC Series 1100 host channel
- Sixteen-bit Peripheral Module, which provides an interface to a peripheral subsystem in either an 8- or 16-bit mode (DCP/20 and DCP/40)
- Byte I/F Module, which provides an 8-bit interface to an 8409 disk and a flexible disk (DCP/10A and DCP/20)
- The Front End Processor Interface (FEPI) module connects a System 11/Mapper 10 system to a standalone DCP/10A.

**UNISERVO 10 Magnetic Tape System (DCP/20 and DCP/40)**
This tape subsystem offers convenience, technological innovation, reliability and economy. The tape subsystem provides phase encoded (PE) and non-return to zero (NRZI) recording. It operates at 25 ips for a transfer rate of 40KB per second PE and 20KB per second 9-track NRZI.

This tape unit provides operator convenience features for fast and efficient tape handling. Automatic load and wrap around cartridge compatibility are standard.

Specific operational functions are:

- Reads and writes 9-track tapes
- Reads in a forward and backward direction
- Writes in a forward direction
- Has read after write check capability
- Can record in phase encoding and non-return to zero mode
- Can use 1600 bits per inch (PE) and 800 bits per inch (NRZI) recording densities
- Has a tape speed of 25 inches per second
- Has a transfer rate of 40/20KB per second (PE/NRZI 9-track)
- Has a rewind speed of 200 inches per second maximum
- Uses an interblock gap of 0.6 inches for both PE and NRZI 9-track
- Uses a tape medium of 0.5 inches wide up to 2400-foot length on reels of tape up to 10.5 inches in diameter.

**8409 Disk Subsystem**
The 8409 disk subsystem is a freestanding medium performance mass storage device offered for those communications environments where extensive capability is required. It can be used as a storage device for the Telcon system, for network data base files and for distributed data processing applications.

The disk subsystem can be ordered with one or two disk drive assemblies initially supporting either 4.75, 14.25 and 23.8 megabytes of storage each.

Specific operational functions are:

- An average access time of 45ms with an average rotational latency of 8.3ms
- A transfer rate of five megabits per second
- A recording density of 5800 bytes per inch and a track density of 478 tracks per inch
- A rotational speed of 3600 RPM.

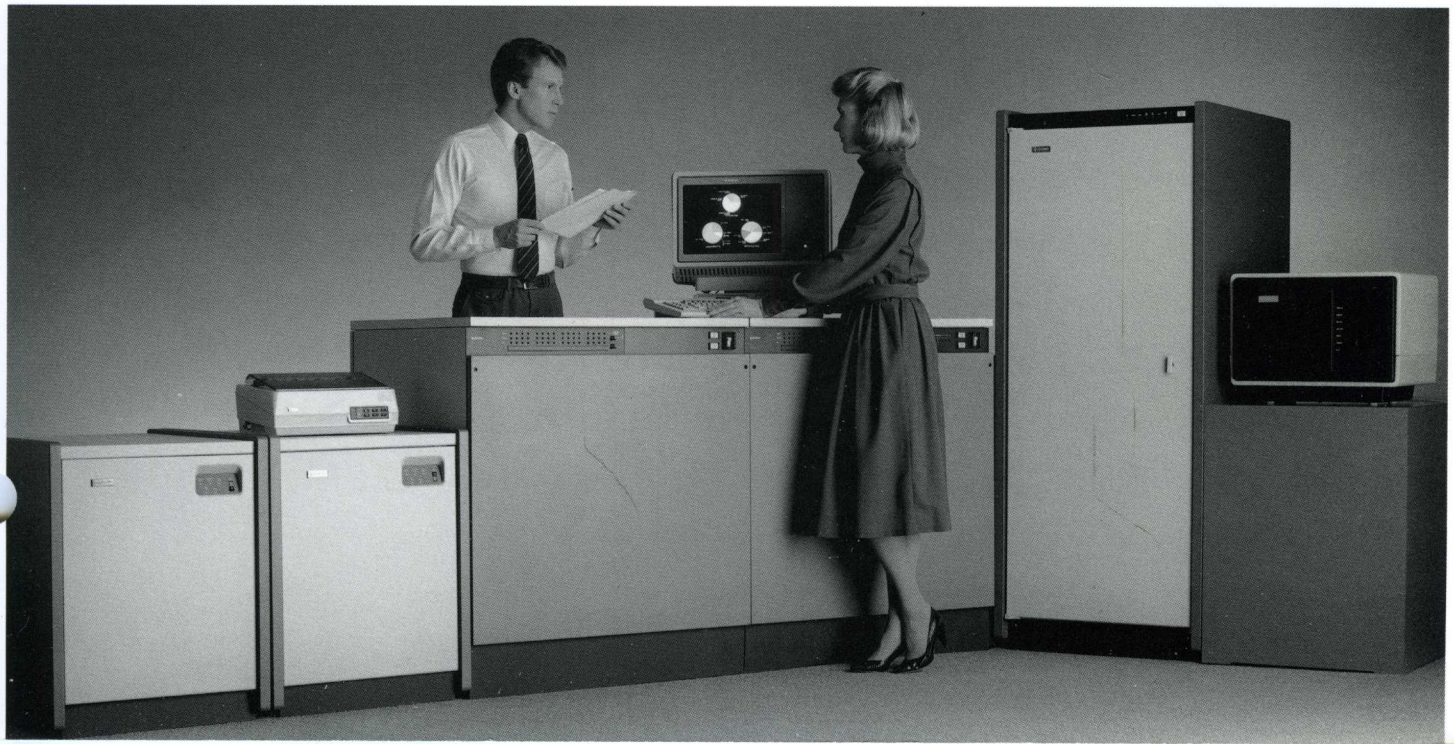
**Flexible Disk Subsystem (DCP/20)**
This unit provides storage for the Telcon software, including the operating system and diagnostic programs, and is a cost-effective storage device where the high performance of the 8409 disk system is unneeded.

This unit also provides storage for logging network operational statistics and for keeping configuration files.

The basic subsystem contains one disk. It can be expanded to two disks.

Specifications for one drive are:

- A storage capacity of 1 megabyte
- A total of 77 data tracks
- A track-to-track seek time of 3ms
- A head load and seek overlap setting time of 50ms
- A head load time of 70ms
- A disk rotational speed of 360 rpm
- A transfer rate of 31.25 kilobytes a second.



**Integrated Disk Drive (DCP/10A only)**
The integrated disk drive is a low cost mass storage device which offers a capacity of 10M-bytes utilizing Winchester technology. It shares the same controller and peripheral adapter as the integrated flexible disk included with each DCP/10A, and is physically located within the DCP/10A enclosure. It is a cost effective storage device for those systems not requiring the higher capacity available on the 8409 free-standing disk subsystem. It provides storage for the Telcon software, including the operating system and diagnostic programs. It also provides storage for logging network operation statistics as well as configuration files.

**Remote Control Module (RCM)**
The RCM controls the operation of an unattended DCP operating remotely.

It provides control of power, system program load and start/stop operations for as many as four processors. Control commands are transmitted to the remote control module via a UDLC communications circuit.

**Line Switch Module (LSM)**
The LSM supports unattended operation of the communications subsystem, switching communications lines and peripheral subsystems between DCP systems.

Switching control is affected three ways: Manually; under remote program control; and under local program control. The LSM, under Telcon's control, enhances the operation of redundant configurations in both local and unattended modes.

Control commands are transmitted to the LSM through a UDLC communications circuit.

## Telcon System Software

The Telcon system saves valuable data processing resources by decreasing the need for host processor services in the network. The Telcon system disperses functions among network components, heightening overall system performance, and it reduces cost by establishing better line utilization and response times throughout the network.

The general features of the advanced communications Telcon system include:

### Stand-alone Capability

After an initial load, the Telcon system can operate without being attached to host processors.

Functions such as local loading, initialization and diagnostic testing can be carried out independently through the Telcon system software and hardware.

Perhaps most importantly, the network control functions reside directly in the DCPs, allowing continued Telcon operation even during complete failure of an allied host system. If this occurs, users can continue to exchange data and routing controls can continue to move data through the system.

### Network Transparency

The complexities of communications, such as device control, data formatting and buffering restraints, are of no concern to the user with the Telcon system. The same applies with network control. These functions, such as route establishment and flow control, are carried out according to system requirements. The system is also insensitive to higher-level protocols sent between applications layers in the DCA-defined architecture.

The Telcon system also provides transparency by easily handling demand, transaction, file transfer and remote batch modes of operation.

### Scope of Network Control

In the Telcon system, each DCP network node contains network control services and network management features. There are four levels of network supervisory access in DCA. These are, in ascending order of scope:

1. Region level, which is one or more terminals
2. Local level or node (one or more regions)
3. Area level (one or more nodes and/or regions)
4. Global level (one or more areas)

### General Network Management

In the Telcon system, each DCP network node contains network control services and network management features. There are four levels of network supervisory access in DCA. The region, local, area and global levels provide extensive flexibility.

Inherent in all control levels of the Telcon system are the services needed for establishing, maintaining and terminating communications. These services provide the following:

- Data control flow, including pacing and throttling
- End to end message acknowledgement
- Message routing and alternate routing
- Determination of message priorities for message classes, such as network commands for batch or interactive transactions
- Handling of unsolicited or undeliverable messages
- Handling of broadcast messages to multiple destinations
- Reports on status and communications events, provided automatically or upon request
- Logging of system activities.

### Network Administration

The communications network can be administered at each level of control. The administrator can use the console of an attached host system or a terminal interfaced to a DCP. Each console can control different areas, such as security, maintenance and general network administration. The control functions from a console include:

- Initialization, rebooting and shutdown operations of any part of the system
- Reconfiguration of network facilities
- Maintenance of network configuration information and system files
- Performance of diagnostic and debugging procedures and direct recovery procedures for network facilities
- Solicitation of status information for network elements and for inspection of the system
- Start and stop control over I/O operations
- Control of automated line switching.

### Session Control

A session is the logical path created when two users exchange data. This exchange can involve the following equipment connections in the network:

- Host to host
- Host to terminal and terminal to host

Although only two users can be directly connected, multiplexing techniques enable other users to exchange data through the same physical path by means of a logical session. All session paths are bidirectional, allowing users at beginning and ending points of the path to exchange data freely.

Significantly, the Telcon system shifts primary responsibility for session management from external devices to the communications system. The system also provides control of system sessions by fixed or dynamic methods.

**Statistics Collection**
The Telcon system collects statistics that aid in analyzing both system performance and utilization and in identifying real and potential network problems. The statistics can be on the local and global level and can include:

- Node Statistical counts at the local level of message throughput, buffer and line utilization, line, peripheral and trunk errors, and an alarm count.
- Network statistical count at the global level of trunk and node errors and an alarm count.

**Network Security**
The system's security measures prevent unauthorized access to the network and network data. Access to the network can be controlled by passwords and their accompanying validations. Similar security measures can be used for controlling use of operator consoles.

The Telcon system's security features are also designed to ensure messages are carried accurately and safely across the network. On those occasions when a message is lost, the event is logged for the network administrator.

**User Programmability**
The Telcon system allows for user-written programs and applications to be implemented for:

- Terminal and line handlers
- File access methods and file control
- Communications applications such as message switching and store-and-forward services
- Extension of standard Telcon services such as security and statistics collection and analysis.

**File Management**
For file control, mechanisms are provided for handling and maintaining system information, and manipulating data files. These files include the following:

- Load files
- Program segment files
- Configuration files
- Error log files
- Dump files
- Statistics files

**Remote File System**
A remote file system application is available for transfers of system and application files between DCPs. Copy, create and delete services are included.

**Automatic Data Rate Detection (ADRD)**
ADRD allows support of asynchronous devices operating on the same communications port at different data rates. This feature examines the first character sent by a remote terminal, determines an operating speed, then sends a message back to the remote terminal confirming that the line is open for data reception.

**Automatic Dialing and Answering**
The Telcon system contains automatic dialing and answering services for communications over switched lines. These services can be used for establishing sessions within the network and for providing backup services to the regular communications lines or channels in the Telcon System.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