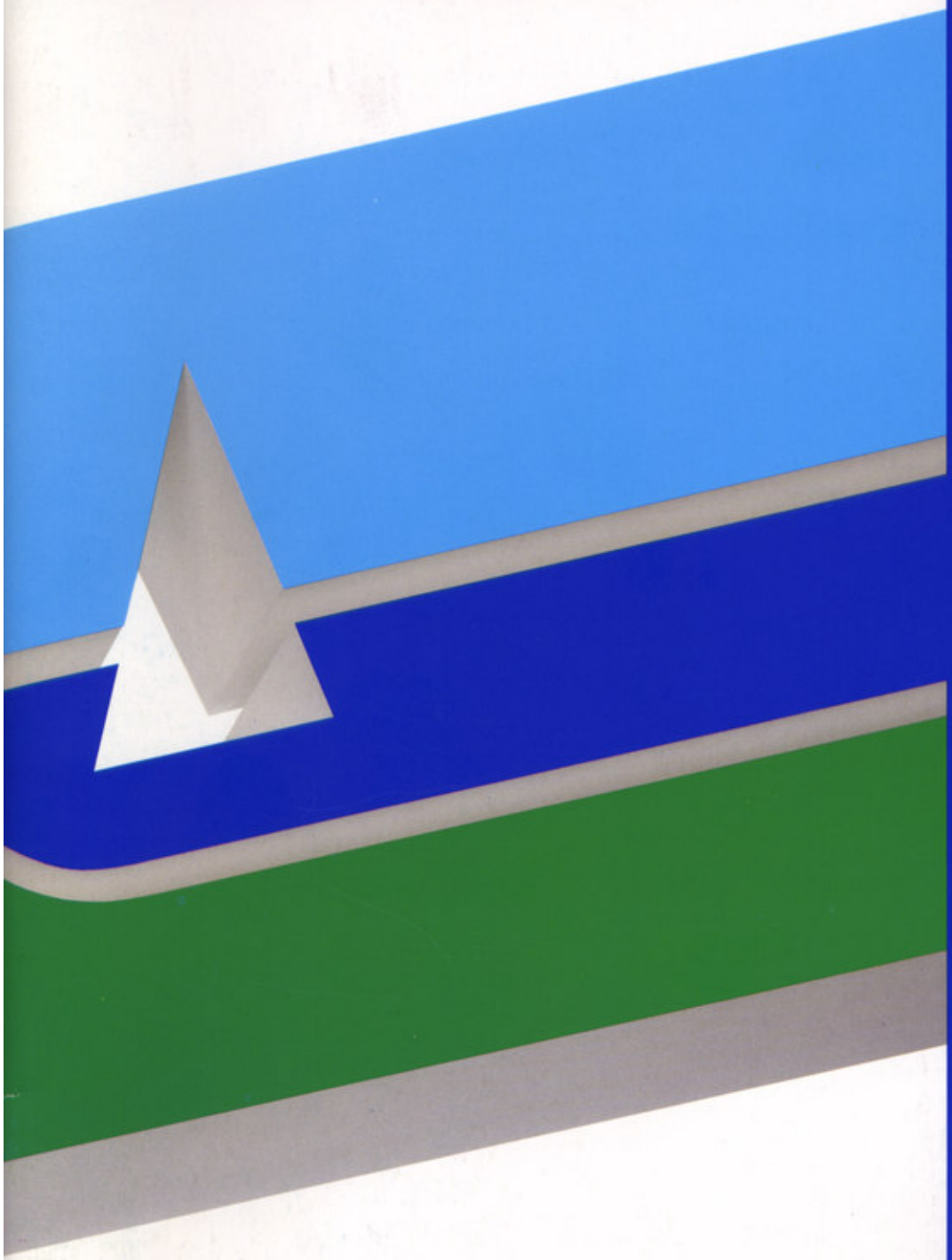
SUPERMAX COMPUTERS

TECHNICAL INFORMATION



dde supermax

COMPUTER SYSTEMS

The Modular Supermax Architecture

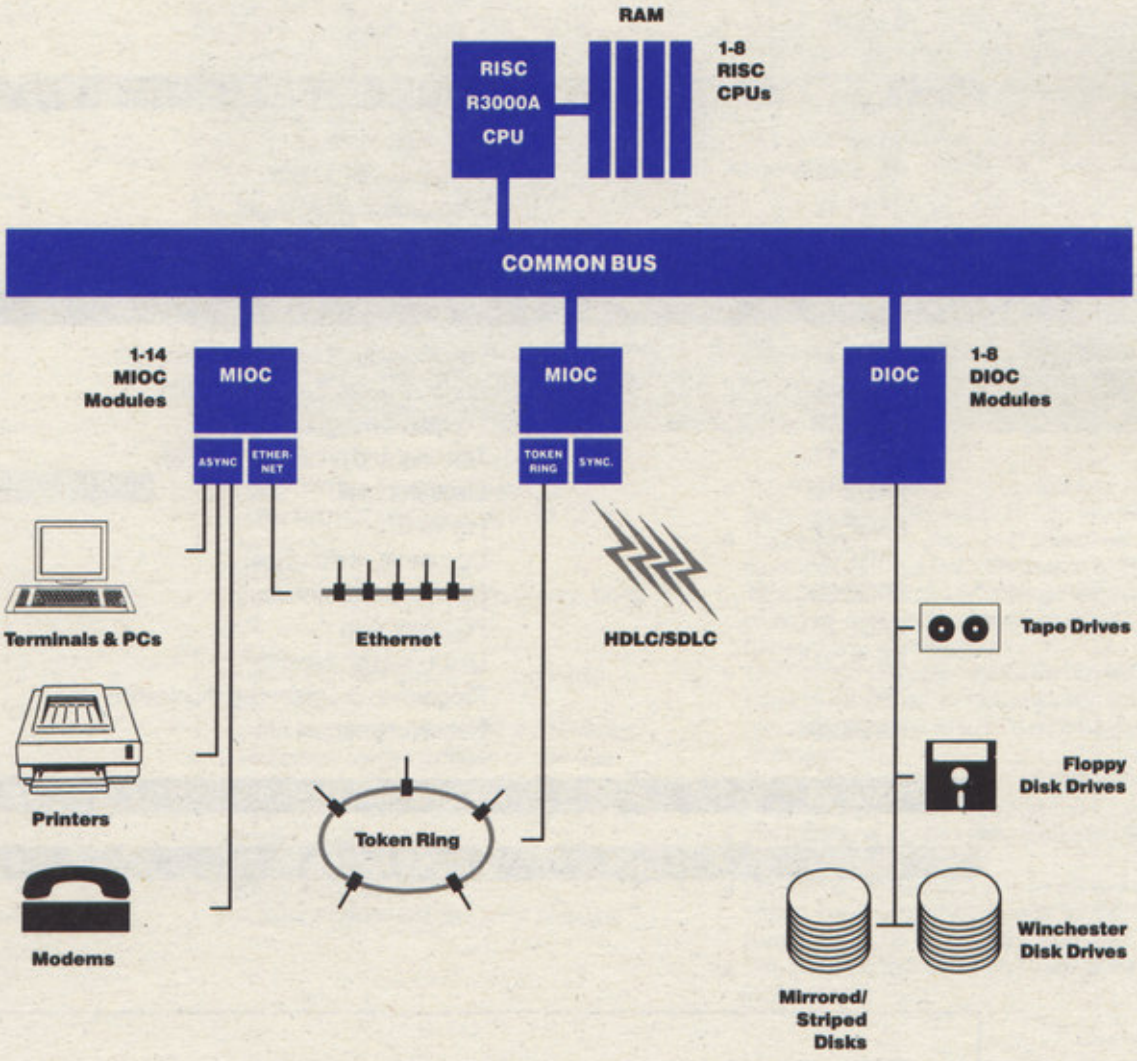


Table of Contents

Nomenclature:

Memory sizes and cache sizes:

1 kb = 2^{10} bytes = 1024 bytes.
1 kbit = 2^{10} bits = 1024 bits.

1 Mb = 2^{20} bytes = 1.048.576 bytes.
1 Mbit = 2^{20} bits. = 1.048.576 bits.

1 Gb = 2^{30} bytes = 1.073.741.824 bytes.

Disk sizes and transfer rates:

1 kb = 10^{3} bytes = 1000 bytes.
1 kbit = 10^{3} bits = 1000 bits.

1 Mb = 10^{6} bytes = 1.000.000 bytes.
1 Mbit = 10^{6} bits = 1.000.000 bits.

1 Gb = 10^{9} bytes = 1.000.000.000 bytes.

PCB Modules

The modular design principles of the Supermax® concept allow maximum flexibility in the configuration. Completely interchangeable PCB modules of different types are fitted into identical slots on the bus system. Modules can be added at random, thereby building a system that is not only flexible but also fully scalable, performance- and connectivitywise.
The mix of modules is determined by the need for processing power and storage capacity as well as the need for networking and other communication capabilities. As the needs grow, modules can be added to make a more powerful system.
Supermax computer systems contain three different types of intelligent PCB modules (Printed Circuit Boards) and one memory module. The application processor board is based on the RISC technology, and the unique multi-CPU architecture enables the Supermax to contain from one to eight processors. Up to a total of eight DIOC boards (Disk I/O Controllers) handle all disk access in a fast and efficient manner. The MIOC (Multiple I/O Controller) is a multi-purpose board which is capable of handling all networking and other communication tasks. A total of 16 intelligent boards can reside simultaneously in the computer - and a maximum of 24 boards including memory modules.

APPLICATION PROCESSORS

The application processor executes the operating system and the application programs. The processsor board is based on the standard RISC processor designed by MIPS Inc. and produced by several semiconductor companies in USA, Japan and Europe.

R3000A CPU

- 25 MHz R3000A RISC processor.
- 25 MHz R3010A RISC Floating Point Coprocessor (FPC).
- 23.0 Mips. 17.3 SPECmark.
- Split, direct mapped and physical cache, 64 kb each.
- Line size of 8 32-bit words.
- Write-through with a four word deep write buffer.
- Max. cache memory bandwidth of 200 Mb/sec.
- 1 - 4 memory mother modules can be connected.
- Max. 256 Mb memory with error detection and correction code.
- Max. burst rate from memory system to cache memory is 100 Mb/sec.
- Includes a POWER ON diagnostic program.

- The R3010A Floating Point Coprocessor is tightly coupled to the R3000A RISC processor.
- The pipelined FPC executes in parallel with the pipelined CPU. The FPC conforms to ANSI/IEEE Standard for Binary Floating Point Arithmetic 754-1985 and contains four independent arithmetics functional units.
- The R3000A processor utilizes caches with very high bandwidth for high execution speed and uses advanced features like instruction streaming.
- The processor cache system is closely coupled to a high bandwidth memory system.
- The memory supports block mode transfers and is two-way interleaved.
- The memory system supports an efficient interface to the I/O bus with concurrent operations and support for fast block transfers.
- Provides early fault detection by use of the initial self test.

MEMORY MODULES

Memory mother modules are connected to an application processor through one of the memory buses located in the multiple bus backplane. The memory mother modules contain a memory bus interface, control logic, configuration logic and interfaces to four memory daughter modules. The daughter modules contain memory drivers, configuration information and the memory array.

RAM 4400

- Memory mother module for 2 - 4 daughter modules.

- Easy and flexible upgrading possibilities.
- Simple configuration and efficient servicing.

- Controlled by the R3000A application processsor module.
- Supports the R3000A memory bandwidth requirements.
- Supports error detection and correction code.

- Allows upgrading with state-of-the-art DRAM technology.

Memory daughter modules are available with 256 kbit, 1 Mbit or 4 Mbit dynamic RAM technology. The daughter modules are 32 bits wide plus seven error detection and correction bits. A daughter module holds a memory of 1 Mb, 4 Mb or 16 Mb. The maximum size of memory on one memory mother module is 64 Mb, i.e. four daughter modules of 16 Mb each.

I/O CONTROLLER MODULES

The Supermax multiple application processor capability is complemented with a high performance I/O system. The I/O system provides a high degree of configuration flexibility and prevents I/O bottlenecks. The I/O controllers contain local processing power, large I/O buffers and independent DMA channels. The processing power is used to offload the application processors from intensive interrupt handling and to provide as many concurrent executions as possible. A large number of independent DMA channels with scatter/gather functions guarantee an effective I/O system.

DIOC3 Disk I/O Controller

- 32 bit 20 MHz MC68020 processor.
- Dedicated 1 Mb memory for programs and data.
- 4 - 32 Mb multiport memory for disk cache and buffers.
- One standard interface for floppy disk drives.
- Two independent standard SCSI host interfaces for connection to SCSI standard peripheral units.
- The SCSI interfaces conform to ANSI X3.131.
- The multiport memory system contains multiple concurrent DMA channels with scatter/gather functions.
- The I/O bus interface supports burst operations.
- Includes a POWER ON diagnostic program.

- Dedicated processor with an optimized memory system for efficient offloading of the application processors.
- The disk cache is implemented using an advanced software algorithm for a very low miss rate.
- The caching facilities are configurable depending on the system needs.
- The standard interface guarantees access to a large number of state-of-the-art peripheral units, i.e. disk drives, 1/4" streaming tape drives, 8 mm video tape drives, DAT drives, 1/2" magtape drives etc.
- Concurrent operation of the two SCSI interfaces supports advanced features, such as mirrored disk systems, striped disk systems and dual hosted disk systems.
- Efficient transfer of data between the SCSI interface and the application processors' memory modules.
- High I/O throughput.
- Provides early fault detection through use of an initial self test.

MIOC Multiple I/O Controller

- 20 MHz MC68030 processor with on-chip split instruction and data cache, 256 bytes each, and with on-chip Memory Management Unit (MMU).
- Communications controller used for connection of LANs, WANs and asynchronous peripherals (terminals, printers, PCs, modems etc.)
- 2-16 Mb parity protected local memory.
- Memory cache bandwidth of 53 Mb/sec.
- One asynchronous channel for a serial RS232 console connection.
- 1-2 I/O submodules may be mounted on the MIOC.
- I/O bandwidth of 20 Mb/sec.
- Includes a POWER ON diagnostic program.

- The MIOC is a half-sized Supermax submodule leaving space for two I/O submodules within the same bus position.
- The local memory is interleaved and arbitrated between the Supermax I/O bus, the onboard MC68030 processor and the two I/O submodules.
- For each MIOC a maximum of two I/O boards may be selected from an expanding number of I/O boards, now including: Ethernet, Token Ring (4MHz or 16MHz), four channel synchronous communication, 8 or 32 channel asynchronous communication.
- Provides early fault detection through use of an initial self test.

HARDWARE DIAGNOSTICS

Supermax Diagnostic Programs

- Used for test of Supermax configurations.
- Test Supermax modules (CPUs and I/O controllers) and peripheral units as stand-alone units.
- Test the interaction between the units.
- Loaded into each Supermax module from a diskette (operator mode) or from a Winchester disk (non-operator mode).

- Every module in a Supermax is easily tested and properly diagnosticized, to the smallest field-changeable module.
- Can run automatically in non-operator mode, and test results can be reviewed during normal operation of the Supermax.

Service Computer

- Stand-alone microcomputer for installation in the Supermax.
- A MC68000 microprocessor.
- 512 kb dynamic RAM memory.
- 128 kb EPROM memory.
- A 2400 BPS modem.
- A 3 1/2" floppy disk drive.
- Fan control logic.
- 4 serial asynchronous RS232 channels.
- Service port amplifier.
- Front panel LCD display.

- Service computer for supervision of the Supermax.
- Battery-backed-up real time clock.
- Temperature monitoring.
- Power supply voltage monitoring and adjustments during diagnostics.
- Supermax up-time statistics.
- Extended error logging.
- Connection for remote diagnostics and troubleshooting.
- Reduced noise level in the office environment.

BACKPLANE BUS SYSTEM

The backplane bus system implements multiple buses. One bus is a common I/O bus connecting all intelligent boards in the computer system to each other.
One to eight buses are used to connect application processors to memory modules. A separate service bus is used for hardware maintenance, system configuration and troubleshooting. This multiple bus system guarantees a sustained high throughput and low latency. Supermax models are available with 4, 6, 12 or 24 slots in the backplane.

I/O Bus

- Non-multiplexed asynchronous multi-master bus.
- Addressing capability of 1 Gb in 16 different units.
- 32 bit data path.
- Supports 8, 16 and 32 bit read and write transactions.
- Supports 32 bit burst read and write transactions.
- Supports locked read/write transactions.

- Technology independent architecture.
- Very large addressing capability.
- Supports the necessary and effective transactions required in a bus-based multi-processor system.

Memory Buses

- Multiplexed synchronous single master bus.
- Addressing capability of 256 Mb.
- 32 bit data path plus 7 bit error detection and correction code.
- Architectural bus bandwidth exceeds 100 Mb/sec.
- Supports 32 bit read and write transactions.
- Supports 32 bit burst read and write transactions.

- All single bit errors are detected, corrected and logged.
- All dual bit errors are detected and logged.

Mass Storage

The Supermax computer system mass storage connections are based on the ANSI SCSI standard. The disk I/O controller supports two independent SCSI channels, and a fully configured Supermax contains 16 SCSI channels and allows concurrent access to more than 100 disk drives.
The intensive use of the SCSI standard in the industry and in the Supermax ensures that a wide selection of „state of the art" peripheral units are available.
The Supermax integrates floppy disk drives, Winchester disk drives, 1/4 inch cartridge streaming tape drives, 1/2 inch magnetic tape drives, 8 mm video streaming tape drives and Digital Audio Tape (DAT) drives.
The Supermax system supports techniques like disk mirroring, disk striping and dual hosted disk systems. Disk striping and disk mirroring are combined into a high performance, high availability disk system. The dual hosted disk technique is used to provide access to critical disk data from two redundant Supermax computer systems.

COMPUTER INTERFACE

SCSI Small Computer Standard Interface

- Connects the Supermax to intelligent peripherals, such as Winchester disks, magnetic tapes etc.
- The DIOC module is supplied with two SCSI interfaces.
- As the DIOC has two SCSI interfaces, up to 14 separate SCSI channels can be connected to the Supermax.
- The Supermax is able to provide concurrent access to more than 100 Winchester disks.

WINCHESTER DISK DRIVES

1.5 Gb Winchester Disk Drive

- MTBF of 150.000 hours.
- Full-height 5 1/4" form-fit mounting.
- Formatted capacity of approx. 1398 Mb.
- Closed-loop digital servo system.
- Average seek time of 14 msec.
- Average latency of 8.33 msec.
- Internal data transfer of 23.33 Mbits/sec.
- Interface data transfer of 1.6 Mb/sec asynchronous or 4.8 Mb/sec synchronous.
- N-segment Read Ahead Caching.
- High performance, embedded SCSI controller.
- Caching allows data requests to be serviced from the 256 kb dual ported buffer.
- Sophisticated defect handling via inline defect management.
- Data integrity and retry mechanisms include interface parity and retry using data and servo strobe offset.
- 48 bit computer generated Error Correcting Code (ECC).

760 Mb Winchester Disk Drive

- MTBF of 150.000 hours.
- Full-height 5 1/4" form-fit mounting.
- Formatted capacity of approx. 674 Mb.
- Closed-loop digital servo system.
- Average seek time of 16 msec.
- Average latency of 8.33 msec.
- Internal data transfer of 15 Mbits/sec.
- Interface data transfer of 1.6 Mb/sec asynchronous or 4.0 Mb/sec synchronous.
- Read Ahead Caching.
- High performance, embedded SCSI controller.
- Caching allows data requests to be serviced from the 64 kb dual ported buffer.
- Sophisticated defect handling via inline defect management.
- Data integrity and retry mechanisms include interface parity and retry using data and servo strobe offset.
- 48 bit computer generated Error Correcting Code (ECC).

380 Mb Winchester Disk Drive

- MTBF of 150.000 hours.
- Half-height 5 1/4" form-fit mounting.
- Formatted capacity of approx. 336 Mb.
- Closed-loop digital servo system.
- Average seek time of 14 msec.
- Average latency of 8.33 msec.
- High performance, embedded SCSI controller.
- Caching allows data requests to be serviced from the 64 kb dual ported buffer.
- Sophisticated defect handling via inline defect management.
- Data integrity and retry mechanisms include

- Internal data transfer of 15 Mbits/sec.
- Interface data transfer of 1.6 Mb/sec asynchronous or 4.0 Mb/sec synchronous.
- Read Ahead Caching.

interface parity and retry using data and servo strobe offset.
- 48 bit computer generated Error Correcting Code (ECC).

180 Mb Winchester Disk Drive

- MTBF of 150.000 hours.
- Half-height 5 1/4" form-fit mounting.
- Formatted capacity of approx. 145 Mb.
- Closed-loop digital servo system.
- Average seek time of 16 msec.
- Average latency of 8.33 msec.
- Internal data transfer of 10 Mbits/sec.
- Interface data transfer of 1.6 Mb/sec asynchronous or 4.0 Mb/sec synchronous.
- Read Ahead Caching.

- High performance, embedded SCSI controller.
- Caching allows data requests to be serviced from the 64 kb dual ported buffer.
- Sophisticated defect handling via inline defect management.
- Data integrity and retry mechanisms include interface parity and retry using data and servo strobe offset.
- 48 bit computer generated Error Correcting Code (ECC).

DISK SYSTEMS

The Supermax disk subsystems are based on the RAID technology (Redundant Array of Inexpensive Disks). The arrays are available in two configurations.
One configuration is based on mirrored disks, a technique ensuring data availability and enhanced performance. The other configuration combines disk striping and disk mirroring into a „fault tolerant" subsystem with an extremely high performance.
The Dual Hosted Disk System extends these features to the computers as well, making the system tolerant of both disk errors and system errors.

Mirrored Disks

- Mirroring duplicates each data disk drive. Uses drives in multiples of two. Writes to both disks simultaneously.
- Any drive can be selected for read operations.
- If a disk drive fails, its mirror drive continues the operation.
- Four sets of mirrored disk can be connected to a DIOC module.
- A pair of mirrored disks connects to separate SCSI channels.

- Increases data availability.
- During multiple reads, any drive can satisfy a single read operation, thus doubling the read transaction rate.

Disk System

- This system combines two techniques: Disk mirroring and disk striping.
- Striping divides data into multiple pieces and transfers these pieces to multiple disk drives in parallel.
- The disk system contains a DIOC module with two SCSI channels and eight disks.
- The disks are seen as a single disk with a capacity of 1520 or 3040 Mb.
- The bandwidth is 6 to 8 times the bandwidth of one Winchester disk.

- High performance and high availability disk system.
- The techniques offer an improved data rate and a dramatic improvement in disk transaction rate.
- Enables six to eight times as many simultaneous user transactions compared to one disk.

Dual Hosted Disk System

- A technique connecting a single disk, a set of mirrored disks or a disk system to two Supermax computer systems.
- The dual hosted disks are owned by a computer system, but the ownership can be changed to the other system in case of system error.

- Redundant computer system securing access to critical user data in case of error in one of the computer systems.
- High performance and high availability disk system.
- Ensures high availability for the total Supermax computer system.

FLOPPY DISK DRIVES

5 1/4" Floppy Disk Drive

- High-capacity unit used for booting the Supermax, software distribution and transaction logging.

- Supports formats with capacities from 320 to 1200 kb.
- SA400 type interface to the DIOC module.
- Average access time of 100 msec.
- Average latency of 100/83.3 msec.
- Data transfer rate of 250 or 500 kb/sec.

3 1/2" Floppy Disk Drive

- High-capacity unit used for booting the Supermax, software distribution and transaction logging.
- Supports formats with the capacities of 720 kb and 1.44 Mb.
- SA400 type interface to the DIOC module.
- Average access time of 100 msec.
- Average latency of 100 msec.
- Data transfer rate of 250 or 500 kb/sec.

TAPE DRIVES

5000 Mb 8 mm Video Streamer

- Provides high-speed backup for fixed disks.
- Also used for software distribution between systems and transaction logging.
- Full-height 5 1/4" form-fit mounting.
- Capacity of 5000 Mb on an 8 mm video cartridge.
- Sustained data transfer rate of 500 kb/sec.
- 8 mm helical-scan recording.
- Backward read and write compatible with 2000 Mb video streamer.
- Automatic read after write error detection and Error Correcting Code (ECC).

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connects to one SCSI interface.
- 1 Mb speed matching buffer.

2000 Mb 8 mm Video Streamer

- Provides high-speed backup for fixed disks.
- Also used for software distribution between systems and transaction logging.
- Full-height 5 1/4" form-fit mounting.
- Capacity of 2000 Mb on an 8 mm video cartridge.
- Sustained data transfer rate of 246 kb/sec.
- 8 mm helical-scan recording.
- Automatic read after write error detection and Error Correcting Code (ECC).

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connect to one SCSI interface.
- 256 kb speed matching buffer.

1300 Mb DAT Streamer

- Digital Audio Tape Streamer.
- Provides high-speed backup for fixed disks.
- Also used for software distribution between systems and transaction logging.
- Half-height 5 1/4" form-fit mounting.
- Capacity of 1300 Mb on a 4 mm DAT cartridge.
- Sustained data transfer rate of 183 kb/sec.
- ANSI Digital Data Storage (DDS) format.
- Automatic read after write error detection and Error Correcting Code (ECC).

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connect to one SCSI interface.
- 512 kb speed matching buffer.

525 Mb 1/4" Cartridge Streamer

- Provides high-speed backup for fixed disks.
- Also used for software distribution and transaction logging.
- Half-height 5 1/4" form-fit mounting.
- Capacity of 525 Mb on a DC 6525 cartridge.
- Sustained data transfer rate of 220 kb/sec.
- Reads and writes QIC-525, QIC-150 and QIC-120 tape formats.
- Backward read compatible with QIC-24 tape format.
- Automatic read after write error detection and Error Correcting Code (ECC).

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connect to one SCSI interface.
- A patented tape-edge seeking method ensures track positioning during writing.
- A 256 kb buffer ensures streaming operation.

150 Mb 1/4" Cartridge Streamer

- Provides backup for fixed disks.
- Also used for software distribution and transaction logging.
- Half-height 5 1/4" form-fit mounting.
- Capacity of 150 Mb on a DC 6150 cartridge.
- Sustained data transfer rate of 90 kb/sec.
- Reads and writes QIC-150 tape formats.
- Backward read compatible with QIC-120 and QIC-24 tape formats.
- Automatic read after write error detection.

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connect to one SCSI interface.
- A patented tape-edge seeking method ensures track positioning during writing.

Magtape

- 1/2" tape drive providing high-speed backup for fixed disks.
- Can be used for data interchange (fully ANSI and IBM compatible).
- 19" form-fit mounting.
- Unformatted capacity of 46 Mb (1600 bpi) or 92 Mb (3200 bpi).
- Data transfer rate of 160 kb/sec.
- Recording modes: 9 track 1600/3200 bpi phase encoded, ANSI and IBM compatible at 1600 and 6250 bpi.
- Fully automatic tape loading.

- An embedded SCSI controller connects to the SCSI interface.
- Several tape units of various types connect to one SCSI interface.

Magtape

A different drive is available with enhanced features:

- Unformatted capacity of 180 Mb (6250 bpi).
- Data transfer rate of 552 kb (6250 bpi).
- Recording modes: 9 track 6250 bpi group code recording, ANSI and IBM compatible at 6250 bpi.

Systems Software

OPERATING SYSTEM

The advanced Supermax hardware architecture must be matched in software to ensure maximum utilization of the hardware resources. The Supermax Multi-CPU Operating System (SMOS) is a standard UNIX®-based operating system tailored to the Supermax hardware. It solves the complex problems involved in coordinating the work within a multi-CPU computer. SMOS also includes a specially designed Virtual Terminal Interface that ensures uniform access to terminals and printers.

SMOS

- Supermax Multi-CPU Operating System.
- Multi-processor system providing all the features of AT&T's System V Interface Definition.
- Based on UNIX System V Release 3.1.
- Supports up to 8 simultaneous MIPS R3000A CPUs.
- Handles keyboard inputs from all connected terminals simultaneously without delay.
- Includes a Virtual Terminal Interface (VTI).
- Supports automatic logging of hardware errors, exhausted resources etc.
- Supports 8 bit ISO character set:

Supermax ISO character set

	0	@	P	`	p		°	À	Ð	à	ð
!	1	A	Q	a	q	¡	±	Á	Ñ	á	ñ
"	2	B	R	b	r	¢	²	Â	Ò	â	ò
#	3	C	S	c	s	£	³	Ã	Ó	ã	ó
$	4	D	T	d	t	¤	´	Ä	Ô	ä	ô
%	5	E	U	e	u	¥	µ	Å	Õ	å	õ
&	6	F	V	f	v	¦	¶	Æ	Ø	æ	ö
'	7	G	W	g	w	§	·	Ç	×	ç	÷
(	8	H	X	h	x	¨	¸	È	Ø	è	ø
)	9	I	Y	i	y	©	¹	É	Ù	é	ù
*	:	J	Z	j	z	ª	º	Ê	Ú	ê	ú
+	;	K	[	k	{	«	»	Ë	Û	ë	û
,	<	L	\	l	|	¬	¼	Ì	Ü	ì	ü
-	=	M	]	m	}	-	½	Í	Ý	í	ý
.	>	N	^	n	~	®	¾	Î	Þ	î	þ
/	?	O	_	o		¯	¿	Ï	ß	ï	ÿ

- The user perceives the eight CPUs as a very powerful single computer.
- The modular multi-processor system enables easy system growth as users' needs increase.
- This standard operating system is an open, XPG compliant system ensuring:
- COMPATIBILITY - Applications will be able to run on future versions of SMOS;
- PORTABILITY - Applications running on a given hardware platform can be moved to and run on any other hardware platform supporting the open system;
- SCALABILITY (CONFIGURABILITY) - Applications can be run on a wide range of computer architectures and sizes, from laptop PCs to mainframes; and
- INTEROPERABILITY (CONNECTIVITY) - Applications can communicate with any other computer system supporting the same data communications protocols.

VTI

- Virtual Terminal Interface.
- Configurable device-independent terminal and printer facilities.
- Programmable device-independent terminal and printer interfaces.
- Programmable 8 bit character set.

- A single terminal and printer interface ensures easy programming and minimizes the need for customization of programs.
- A programmable 8 bit character set facilitates internationalization of programs.

UTILITY PROGRAMS / TOOLS

A number of versatile and powerful tools are available for the management of the Supermax computer. These tools include various means for monitoring the behaviour of the computer and a menu-driven system administration package that facilitates the work of the system administrator.

Accounting Utilities

- Used for registration of events on the Supermax.
- Items registered are logins, executed commands, CPUs, disk and core usage, uptime, boots etc.
- Consists of a number of utilities and is prepared for local extensions.
- Accounting reports are generated every day, accumulated and saved for a year.
- Includes facilities for installations selling processsor time.

- May be used to check which programs are executed and by whom.
- May be used to find out which programs or users are taking up most resources.
- Reports are formatted for direct output to printer.
- The system is self-managing and needs no maintenance.

C-ISAM

- Industry Standard Access Method developed by Informix Software.
- Consists of a library of C functions.
- Creates, manages and manipulates indexed files.

- A quick and efficient programming tool, providing a solid foundation of speed and data integrity.

Data Access Logging System

- Logs queries, deletions and alterations made by various applications.
- Closely related to the ORACLE RDBMS.
- Allows library functions to be utilized by programmers.
- Meets the demands of the Danish authorities' 3rd security level.

- The uniform transaction logging enables easy system administrator monitoring at the process-, user- and terminal device levels.

GKS

- Graphical Kernel System.
- Implementation of the international standard GKS (ISO 7942) on Supermax computers.
- Primarily a set of subprograms developed in C with a standard interface to the various programming languages.
- Allows a free choice of peripheral devices (graphic screens, printers, plotters etc.)

- A suitable tool for the development of applications including graphics.
- Allows programmers to manipulate graphics devices through a set of standardized functions and procedures.
- The standard interface makes it possible to move programs between computers.

Job Spooler

- Serializes background jobs in different job queues.
- Can allocate a job queue to a single CPU.
- Executes jobs on a given time and date as defined by the user.
- Schedules jobs in priority order. Priority for a given job is defined by the user.
- Mails the result of a given job to the user.
- The Supermax administrator can move jobs among job queues.
- The user/administrator can start/stop job queues.
- Allows alternative display of the job spooler status.

- Facilitates the user's and system administrator's task of scheduling background jobs in a way that does not disturb the online users.

Modem Logon System

- Performs dial-back to the user.
- Logs the status of dial-back requests.
- Communicates with a modem using standard Hayes commands.
- When a call is disconnected, a modem connected to the Supermax must be able to signal this to the computer which, subsequently, logs off the user.
- When a user logs off, the Supermax signals to the modem to disconnect the telephone line.

- The addition of a modem to a Supermax via the Modem Logon System ensures that only users configured in the Modem Logon system are able to log in.
- Hayes dial-back commands are placed in a separate file, making it possible to design dial-back command files different from Hayes.
- The disconnection options ensure a greater security against unauthorized access to the Supermax computer.

SG

- Screen Generator.
- One part is an editor for interactive description and manipulation of screen layout and data field description.
- The other part is a library of C routines to manipulate the user-specified screen images and data fields from user programs.
- Can be linked to C programs or other C compatible languages, e.g. Pascal.

- An independent system tool for the management of screen images and data fields from user programs in a general manner, so that programming is independent of specific screen layout and data field specification.

SOS

- Supermax System Supervision.
- Reports when a resource in the Supermax is approaching the configurable limit (e.g. disk space or internal operating system resources).
- Sends warnings and status information via UNIX mail.
- Messages can be sent to a central IBM installation via SNA.
- Meets the IBM standard format for alerts.

- Reporting via UNIX mail enables users to supervise remote Supermax computers, thus making it a suitable tool for the system administrator.

Sysadm

- Menu-driven system administration tool.
- General system set-up.
- Creation and maintenance of user logins and terminal connections.
- Installation, use, administration and removal of software packages.
- Administration of files, disks and portable media.
- Administration of the printer spooler system.
- Reading of system logfiles.
- Information about active users.
- Shutdown and reboot facilities.
- Backup administration.

- Facilitates the system administrator's tasks.
- The comprehensive menu takes into account nearly all the tasks, a system administrator will meet in connection with a Supermax computer system.

X Window System

- Networked graphics windowing system originally developed at MIT.
- The version ported to the Supermax is X11R5.
- Allows users to run programs on several different hosts in a network.
- Divides the screen into multiple input and output areas.
- Controls a „bit-mapped" display in which every pixel on the screen is individually controllable.
- Handles text and graphical input and output from keyboard and mouse.
- Designed as a network protocol between an X application (X client) and a display server (X server).
- Supports the graphical user interface Motif from Open Software Foundation (OSF).
- Runs on X terminals, PCs and workstations.

- X has become an industry-standard windowing system acceded by all the major computer manufacturers.
- Introduces the issue of graphical user interfaces to UNIX based systems.
- Enables a „look and feel" approach to application design.
- By connecting the graphical terminals/X terminals to the network, users can run several windows (applications) on the screen simultaneously. This is made possible by a networked concept using a client/server architecture.
- Can be used on a variety of raster display devices, ranging from simple, monochrome frame buffers to deep, true colour graphics processors.

PROGRAMMING LANGUAGES

Programming Languages

The following languages are available for use on Supermax computers:

- C
- C++
- MIPS Fortran
- MIPS Pascal
- RM/COBOL-85.

DATABASES / 4TH GENERATION TOOLS

A database management system (DBMS) provides easy and fast data storage and retrieval. The DBMS handles data security and integrity as well as transaction management. Data are accessed through a flexible and powerful query language such as SQL. 4th generation application tools dramatically improve productivity in development- as well as production environments. 4GL may be an alternative or supplement to standard 3GL.

DataFlex

- 4th generation language and development tool developed by Data Access Corporation.

- Provides the comprehensive functions of a 4th generation command language, a screen image processor, a menu system, code and report generators, and on-line, multifile query facilities.

INFORMIX

- 4th generation language and development tool developed by Informix Software, Inc.
  The following INFORMIX subproducts are available on the Supermax:
- INFORMIX-4GL
- INFORMIX-4GL Interactive Debugger
- INFORMIX-4GL Rapid Development System
- INFORMIX-ESQL/C
- INFORMIX-SQL
- INFORMIX-OnLine
- INFORMIX-Simple Engine.

- A complete 4th generation language and programming environment, allowing users to develop sophisticated applications.
- Provides a true relational database management system.
- Allows programmers to combine functionality with flexibility.

ORACLE

- 4th generation language and relational database management system developed by Oracle Corporation.
  The following ORACLE subproducts are available on the Supermax:
- ORACLE RDBMS - including SQL*Loader, SQL*Report and National Language Support (NLS) for Danish, American, German, French, Italian, Spanish, Dutch, Swedish, Norwegian and Finnish
- Transaction Processing Option (TPO)
- PRO*C
- PRO*Fortran
- SQL*Calc
- SQL*Forms - including NLS for several languages
- SQL*Menu
- SQL*Net
- SQL*Net TCP/IP
- SQL*Plus
- SQL*ReportWriter.

- The ORACLE Relational Database Management System (RDBMS) includes a complete set of 4th generation tools for decision support and application development.
- Provides multiuser support, backup and recovery, row-level locking, monitoring of system performance and resource utilization.
- Provides transparent client/server net architecture allowing multisite query and point-to-point update.
- SQL language conforms to the ANSI/ISO SQL standard.
- PL/SQL, a procedural SQL language extension, provides improved performance and easier application development and maintenance.
- 24-hour on-line production with backup and recovery to last committed transaction.

Progress

- 4th generation language and relational database management system developed by Progress Software.
  The following Progress subproducts are available for use on Supermax:
- Progress 4GL/RDBMS
- Progress Database
- Progress Developer's Tool Kit
- Progress Fast Track.

- Used for rapid creation of applications utilizing a high-level development environment.
- Allows transaction processing with multiuser concurrency and crashproof recovery features for each application developed.

Networking

Being a server based on open systems, the Supermax is integratable in a large variety of networking environments. Whether it is an SNA, an OSI or a TCP/IP environment, or even a combination of these different environments, the Supermax is fully integratable on WANs (Wide Area Networks) as well as on Ethernet and Token Ring LANs (Local Area Networks).

Which products on which protocols?

	Inter-networking	Terminal & Printer Connectivity	Electronic Mail	File Transfer	Document Interchange
SNA Protocols	Supermax SNA	3270/SNA 3179G/SNA 4224/SNA	SNADS Mail	3770/SNA RJE 3270/SNA File Transfer	DIA
OSI Protocols	OSI LAN/WAN Transport	X.3 PAD X.29 Remote Login NTC2	X.400	FTAM	
TCP/IP Protocols	SupermaxTCP	Telnet NTC2	SMTP UUCP	FTP UUCP	

	Distribted File Systems	PC Integration	Distributed Processing	Program to Program Communication	Network Management
SNA Protocols			SNADS	3270/SNA API LU6.2 API	NetView/ Supermax
OSI Protocols	LAN Manager/X	LAN Manager/X DDE-Term		TLI OSI NetBIOS LAN Manager/X	
TCP/IP Protocols	SupermaxNFS LAN Manager/X	LAN Manager/X DDE-Term ORACLE SQL*Net	ORACLE SQL*Net	TLI Sockets NetBIOS TCP LAN Manager/X	SNMP

Protocol Suites

SNA PROTOCOLS

SNA (Systems Network Architecture) is the name of a set of protocols defined by IBM.
The SNA protocols integrate the Supermax in SAA (Systems Application Architecture) environments and provide access to SAA interfaces.
The SNA protocols are typically used to communicate between a remote cluster of terminals and a central mainframe. The SNA protocols are also used to connect departmental computers like the Supermax in a distributed application environment.
SNA networks will typically consist of a large number of network units (computers, terminals etc.), and therefore SNA comprises a set of highly integrated network management protocols and applications.

OSI PROTOCOLS

OSI (Open Systems Interconnection) is the generic name of ISO's (International Standardization Organization) suite of data communications protocols.
All major vendors and user organizations, including DDE, are committed to OSI. Great efforts are put into defining sets of standard profiles (requirements for OSI implementations). The most common profiles are defined in the so-called GOSIPs (Government OSI Profiles).
The combination of ISO's OSI standards and profiles promises a world-wide possibility of both technically and politically accepted connectivity.
The OSI protocol suite contains a rich set of constantly evolving application protocols, thereby supporting present as well as future communication needs. Likewise, OSI protocols support connectivity through a range of physical networks and network topologies.

TCP/IP PROTOCOLS

TCP/IP (Transmission Control Protocol/Internet Protocol) is the common name of a suite of protocols originally developed for the U.S. Department of Defense but used with great success in commercial applications.
TCP/IP is an open communication standard, and its specifications are in the public domain as is much of its coding. TCP/IP has been implemented on nearly all types of computers, and today it is the most commonly used set of vendor-independent communications protocols.
TCP/IP supports a large and proven set of user applications ranging from graphical user interfaces to distributed databases. TCP/IP also includes all necessary network service protocols ranging from name-to-address translation to network management.

INTERNETWORKING

Any protocol suite contains protocols which are mainly concerned about moving raw data from one place to another; these protocols may be referred to as „Internetworking Protocols". The complex task of moving data is transparent to the application and, thus, to the end user. Internetworking protocols recover from lost or duplicated data. In addition they relay data in complex network topologies and handle connectivity through different physical transmission paths.

Supermax SNA

- Implements the SNA protocol, on which products like 3179G, 3770 and SNADS are emulated.
- Supports up to 254 simultaneous 3270, 3770 and LU6.2 sessions on each SNA line.
- Emulates both PU 2.0 and PU 2.1.
- NetView is supported both as entry point and as service point.
- The connection possibilities are: Local modem, non-switched, dial-up, DATEX X.21 bis and X.21 Short Hold Mode, X.25, Token Ring and Ethernet.

- With Supermax SNA the Supermax is able to operate both as a cluster controller and as a departmental computer.
- No previous knowledge of the Supermax is required at the operating centre of the mainframe.
- Enables central management of Supermax computers from NetView.

OSI LAN/WAN Transport

- Implements the service definition of the OSI Transport Layer via standard UNIX TLI.
- OSI LAN Transport connects simultaneously to two LANs (Ethernet or Token Ring) and one WAN.
- OSI WAN Transport connects simultaneously to up to eight WANs and two LANs (if X.25 on LAN is desired).
- OSI WAN Transport contains the X.25 protocol to be used by OSI and other protocol suites requiring world-wide connectivity through a public packet switched network.
- OSI LAN Transport may be configured to run as either an End System or as an Intermediate System (router).
- Implemented in STREAMS for execution in the intelligent I/O controller MIOC.

- OSI applications can be implemented using a standardized transport provider interface and may be employed on LANs as well as on WANs.
- It is possible to route between two LANs or between LANs and WANs.
- The MIOC handles the routine work associated with internetworking. As the MIOC may be configured with two submodules, routing can be performed entirely in the MIOC without involving the application processors. This is a cost-effective alternative to dedicated routers.
- A Supermax computer may contain several MIOCs to share the load of internetworking. This provides the Supermax computer with a great capacity, also for OSI communications.
- If running as an Intermediate System, OSI LAN Transport handles sophisticated routing tables.

SupermaxTCP

- Implements the suite of TCP/IP protocols.
- The Internet Protocol (IP) is the universal network protocol used by all TCP/IP transport protocols and applications.
- IP does not make any specific demands on the physical subnet.
- IP is responsible for the routing of data between the individual networks of an internet.
- May be configured to act as a gateway between all connected networks independent of type (LAN, WAN or serial lines).
- Two transport protocols are provided: TCP for connection-oriented and UDP for datagram-oriented communication.
- SupermaxTCP may be executed in several I/O processors (MIOCs) simultaneously.

- The concept of internetworking is fundamental to the design of TCP/IP.
- Essential to networking is a common addressing scheme and network protocol - the Internet Protocol (IP).
- Almost any interconnecting media may be used.
- The increasing complexity of networking is not a problem, as automatic distribution of routing information greatly simplifies the concerns of the user.
- Applications in need of the services of UDP only do not generate the overhead of the more extensive TCP. As an example, the popular NFS protocol uses the services of UDP only.
- The capacity range of SupermaxTCP is very wide and may be tailored to the actual need of the individual installation.

TERMINAL AND PRINTER CONNECTIVITY

Computer users often need to have their terminals - in the client/server model called the clients - connected to other computers/servers in order to get access to applications or databases not available on their own computers. For this purpose, the Supermax supports the following products:

3270/SNA

- Emulates IBM 3270 type terminals and printers.
- Supports programming interface (HLLAPI).
- Supports file transfer between Supermax and the host computer.
- Supports the allocation of terminal sessions to pre-defined LUs or groups of LUs.
- Supports Response Time Monitoring (RTM).
- User definable character conversion between EBCDIC and ASCII.
- User definable keyboard layout.
- 8 colours are supported on colour terminals.
- Screen copies can be redirected to any printer or disk file.

- Enables Supermax users to access and run IBM mainframe applications.
- Users may at any time switch between local Supermax applications and 3270 applications.
- Easy selection of destination printer for hardcopy.

3179G/SNA

- Emulates an IBM 3179-G Color Graphics Display Station.
- Graphics hardcopies and text can be redirected to local laser printers and Calcomp plotters or to disk files for later processing.
- Supports mouse as graphical input device.

- Enables Supermax users to access IBM graphical mainframe applications based on IBM's GDDM.
- Supports all peripheral units (terminals, printers and plotters) for which Supermax GKS drivers are implemented.
- Inexpensive PCs with graphics option can be used as terminal devices.

4224/SNA

- Emulates an IBM 4224 printer.
- Supports text data embedded within the SNA character stream.
- Supports text and vector graphics embedded within the Intelligent Printer Data Stream (IPDS).
- Graphics and text print data may be redirected to a disk file or to one of 5 printer types.

- Allows text and graphics created on an IBM mainframe to be printed immediately on a graphics laser printer or plotter attached to the Supermax.
- Supports all printers and plotters, if only a Supermax GKS driver is implemented.

X.3 PAD

- Gives access to host computers on an X.25 network.
- Allows automatic call and login procedures.
- Allows predefinition of host descriptors and PAD parameter profiles.

- Offers world-wide connectivity to computers and databases.
- Sharing the same X.25 connection as other X.25 products, X.3 PAD is line-cost effective.

X.29 Remote Login

- Enables the Supermax to be a host computer on an X.25 network.
- Includes facilities to log any access from the X.25 network.
- May be configured to allow access from certain X.25 addresses only.
- May be configured to listen on a certain subaddress only.
- Shares the X.25 connection with other X.25-based products.

- Offers connectivity to the Supermax from terminals world-wide.
- Gives security against unauthorized access.
- Enables different services to be accessed on different subaddresses.
- Line-cost effective.

Telnet

- Gives Supermax terminals access to other computers.
- Gives access to the Supermax from terminals on other computers or terminal servers.
- Optional support for predefined parameters such as terminal type, local or remote echo etc.

- Offers connectivity to almost all types of computers from PCs to mainframes.
- Offers the same functionality, user interface and configuration via any network supported by TCP/IP: LAN, serial lines and X.25.
- Effective line utilization.

NTC2

- Network Terminal Controller.
- Connects asynchronous terminals and printers to Ethernet.
- Optional support for parallel printer.
- Provides the choice of TCP/IP Telnet or OSI terminal access to host computers.
- Configuration, software updates and troubleshooting are managed from the Supermax.

- Offers Ethernet connectivity for terminals and printers using standard protocols.
- Allows centralized management and trouble-shooting from the Supermax.

ELECTRONIC MAIL

Electronic mail combines the advantages of telephone conversation and printed mail. Two parties can exchange information without actually being available at the same time. But still with a very short time delay. Furthermore, you can benefit from the advantages of your preferred word processing system to create messages or to modify old ones.

SNADS Mail

- SNADS application based on the Supermax SNADS programming interface.
- Integrates electronic mail systems on the Supermax with mail systems on other UNIX computers and IBM or IBM compatible computers.
- Provides automatic translation between DCA and ASCII files.
- Uses the same communications line as 3270/SNA, 3770/SNA and SNA DIA.

- Allows Supermax Mail users to operate on equal terms with e.g. DISOSS users in an electronic mail system.
- May operate as a gateway between a SNADS network and the global UUCP network, thus opening the two worlds to one another.
- Uses UNIX Mail and is, thus, able to integrate all mail systems with UNIX Mail interfaces, e.g. Uniplex.

X.400

- Fully compatible with the 1984 X.400 Message Server.
- Includes Message Transfer Agent, Reliable Transfer Server and ISO Sessions Basic Activity Subset.
- Integrates electronic mail systems on the Supermax with mail systems on other hosts supporting X.400.
- Provides full support of P1 and P2 protocols.
- Offers an object-oriented C programming interface.

- Provides world-wide messaging capability, integrating public and private electronic mail services.
- Secures reliable message transfer via automatic routing and tracking.
- Supports recovery and re-transmission of messages in case of line failure.
- Minimizes transmission costs by optimizing routes and minimizing copies of messages in the network.
- Uses UNIX Mail and is, thus, able to integrate all mail systems with UNIX Mail interfaces, e.g. Uniplex.

SMTP

- Simple Mail Transfer Protocol.
- Enables the exchange of electronic mail with virtually all other systems.

- Uses UNIX Mail and is, thus, able to integrate all mail systems with UNIX Mail interfaces, e.g. Uniplex.
- Offers the same functionality and configuration via any network supported by TCP/IP, presently LAN, serial lines and X.25.
- Effective line utilization.

UUCP

- Performs electronic mail transfer.
- Can be used via literally any network available (TCP/IP, X.25, modem lines, TTY lines etc.)
- The transfer protocol is automatically selected to match the network used.
- May use indirect connections passing other hosts on the way.

- May transfer mail across the world via telephone lines.
- Using TCP/IP, it makes a very fast and reliable mail transfer system.
- By use of UUCP for all mail transfer lines, users get a uniform and easily managed mail system.
- Uses UNIX Mail and is, thus, able to integrate all mail systems with UNIX Mail interfaces, e.g. Uniplex.

FILE TRANSFER

In a multi-computer environment there is often a need for transfering files from one computer to another. This need varies from simple file transfers to applications directly accessing files on other computers/ servers.

3770/SNA RJE

- Emulates an IBM 3777 RJE model 3 workstation.
- Accepts any user terminal as a console monitor.
- Allows up to 32 simultaneous 3770/SNA RJE users.
- The screen is divided into parts for message display and commands.
- Session activity is logged, and the log file can be scrolled on the screen.
- Data can be redirected to any file or 3770 peripheral device.
- Can be executed as a remote job.
- User defined command files.
- Background processing.
- Data compression.
- Automatic conversion between EBCDIC and ASCII.

- Allows a Supermax user to initiate programs on an IBM host computer and to transfer files between the host computer and a Supermax.
- User-friendly operation via menus.
- Whereas a standard 3770 workstation supports up to 6 simultaneous data streams, a Supermax supports up to 32 simultaneous 3770/SNA RJE emulators, each of them with its own data stream.

3270/SNA File Transfer

- Allows transfer of text files and binary files between the Supermax and an IBM mainframe.
- Conforms to the IBM 3270-PC File Transfer Standard (IND$FILE).
- Optional extension to 3270/SNA, 3179G/SNA and 3270/SNA API.

- Permits easy file transfer and causes minimum software requirements on the mainframe.

FTAM

- File Transfer, Access and Management - a true OSI application used to transfer files or to access and manage files on remote systems.
- Standard UNIX login IDs and passwords must be supplied before files can be accessed.
- May be configured to allow access to certain remote systems only.
- A database keeps track of the attributes of incoming files before the attributes are mapped to UNIX file attributes.
- Offers the same services on LANs and WANs.

- Since all major vendors and user organizations are committed to the OSI de jure standards, FTAM promises a widespread connectivity.
- Gives security against unauthorized access.
- A file can be stored and retrieved without the attributes being distorted due to the mapping.
- The functionality is available for high-speed local applications as well as world-wide use.

FTP

- File Transfer Protocol.
- Enables the exchange of files with virtually all other systems.
- Standard UNIX login IDs and passwords must be supplied before files can be accessed.
- Includes facilities to limit the remote access to local files.
- Includes facilities to log any access from remote hosts.
- Offers the same services on LANs and WANs.

- The de facto standard for file transfer.
- Gives security against unauthorized access.
- Offers the same functionality, user interface and configuration via any network supported by TCP/IP, presently LAN, serial lines and X.25.

UUCP

- A system for file transfer and remote execution.
- Can utilize literally any network available (TCP/IP, X.25, modem lines, TTY lines etc.)
- Batch-oriented in a store and forward manner.
- The transfer protocol is automatically selected to match the network used.
- May use indirect connections passing other hosts on the way.

- Available for all UNIX- and many other systems, including PCs.
- Enables the transfer of files across the world via the telephone net.
- A very flexible and reliable system.
- Moves large quantities of data unattended.
- Offers a uniform interface for file transfer independently of the network used.

DOCUMENT INTERCHANGE

The interchange of documents between computers of different kinds is more than a simple file transfer or mail exchange. The reason is that documents (and attributes associated with documents) are represented differently on different computer types. Therefore, there is a need for a common representation of the document, when it is transferred from one computer to another. Depending on the kind of document in question, a number of de jure or de facto standards attempt to solve this problem.

DIA

- Programming tool, e.g. for writing programs which can read the contents of central DISOSS libraries.
- Emulates IBM's Document Interchange Architecture as SRN (Source/Recipient Node).
- Based on LU6.2 API.
- Supports document distribution services, document library services, application processsing services and session services.
- C program interface on DIA Verb level.

- DIA is the IBM document interchange method in the IBM office system DISOSS, enabling Supermax users to handle DISOSS documents.

DISTRIBUTED FILE SYSTEMS

A further sophistication of the file transfer facility is the distributed file system. In this case files are not actually transferred from one computer to another. Two or more computers are simply seeing the same files as being part of their respective file systems. Thus, the Supermax can act as file server for various kinds of clients.

LAN Manager/X

- Enables the Supermax to be a file server for DOS and OS/2 PCs.
- Makes the LP spool printers on the Supermax accessible for DOS and OS/2 PCs.
- Supports TCP/IP and OSI standard protocols.

- Recognized as an industry standard Network Operating System (NOS) for PCs.
- Facilitates streamlined integration of local PC applications with Supermax applications.

SupermaxNFS

- Network File System.
- Enables the Supermax to share files with any other computer supporting NFS.
- Includes facilities to limit remote access to certain users and groups.
- The Supermax also works as a PC-NFS server, allowing PCs to share files with the Supermax and to use its printer spooling facility.
- Uses TCP/IP protocols.

- NFS is the de facto standard for distributed file systems.
- The majority of UNIX systems and a majority of other systems are supporting NFS.
- Provides the easiest and most transparent way of data sharing in a network.
- Users neither have to know network addresses nor machine names.
- Due to stateless design, NFS is very insensitive to crashes on both the client and the server side.

PC INTEGRATION

In the client/server model, the Supermax acts as a server for a number of clients, these being PCs also used as intelligent terminals. This offers the great advantage, that for each application there is now a choice between running it on the server or on the client, depending on where it is most appropriate. In some cases, the application is even split, so that part of it is running on the server, and the other part is running on the client.

LAN Manager/X

- Enables PCs to use the Supermax as a file and printer server.
- Integrates the DOS, OS/2 and UNIX operating systems.
- Supports TCP/IP and OSI standard protocols.
- Incorporates LAN Manager technology from AT&T and Microsoft.

- Simplifies the system administrator's tasks by centralizing backup and software/data updating.
- Facilitates streamlined integration of local PC applications with Supermax applications.
- Provides the foundation for client/server-based applications.
- Recognized as an industry standard for PC LAN systems.

DDE-Term

- Provides terminal access for PCs, hereby enabling the Supermax to be an application server.
- Enables users to run 5 sessions on the Supermax via one terminal connection.
- Multiplexes printing to a printer connected to the PC.
- Connects via the COM1 port or a LAN adapter.
- Modem support with auto dial by use of the COM1 port.
- Supports NetBIOS, TCP/IP Telnet and OSI terminal access to host computers by use of a LAN adapter.
- Interoperable with LAN Manager/X.

- Facilitates the integration of local PC applications with Supermax applications.
- Enables users to run applications concurrently using windows.
- Needs only one connection for both terminal access and printing.

ORACLE SQL*Net

- Connects applications running on one computer with ORACLE database servers on other computers.
- PCs are functioning as clients, larger machines as ORACLE servers.
- A PC application program can access ORACLE databases on mini- and mainframe computers.

- Enables users to utilize cheap processing power on PCs for applications.
- Permits the usage of computing resources and cost-effective storage on server machines.
- Allows access to corporate data from PCs all across the network.

DISTRIBUTED PROCESSING

With Distributed Processing, an application can access data which are distributed across the entire network and activate instances of other applications on other processors in the network. As an example, this allows you to build up ORACLE client/server configurations on LANs or WANs. In this way you can create transactions combining data from several ORACLE databases at different locations.

SNADS

- Applied as a transfer protocol between different Office System Nodes (OSN).
- Programming interface (API) used by SNADS applications written in C.
- Based on Supermax LU6.2 API.
- Part of Common Communications Support in SAA (Systems Application Architecture).
- Uses the same communications line as 3270/SNA, 3770/SNA and SNA DIA.

- Enables distribution of all kinds of documents and files in a network in a store and forward manner.
- As SNADS is a part of SAA, products based on SNADS will be compatible with future IBM applications.

ORACLE SQL*Net

- Connects applications to any ORACLE database on the network.
- Database servers can access data from other database servers at remote sites.
- Transparent to users and applications where data are physically stored.
- Data/transaction integrity in client/server configurations across the network.
- A transaction may access data which are physically spread across several databases.

- Permits distribution of all parts of a central database to computers, where storage and computing power is available.
- Allows users to move database data to other computers without re-writing applications.
- Allows local applications to use and maintain corporate data.
- Enables you to balance the load of database servers and clients across the network.
- Permits PCs to run application programs connecting to database servers on larger computers.

PROGRAM-TO-PROGRAM COMMUNICATION

Programs running on different computers may sometimes have to exchange data with one another. This may be done over a communications channel or over a network by using a program-to-program communication facility.

3270/SNA API

- Application Program Interface for Supermax 3270/SNA.
- Compliant with the IBM HLLAPI standard.
- Permits data entry, use of PF keys, reading and validation of a 3270 screen image, and file transfer.
- Comprises a set of library routines to be called from a utility program.
- Allows a utility program to have up to 12 simultaneous 3270 sessions.

- May be used to automatize 3270 sessions to the host computer. Hence, sessions are not user-operated but program-controlled.
- The product is supplied with sample programs in order to facilitate the use of the API.

LU6.2 API

- Establishes program-to-program connection, synchronisation and data interchange between programs in an SNA network.
- Supports Control Operator Verb Interface and Basic and Mapped Conversation Verb Interface through parallel sessions.
- C programming interface.

- With LU6.2 API it is possible to implement distributed applications.
- LU6.2 API makes it possible to write Supermax APPC programs which can communicate with LU6.2 programs on other systems, e.g. DISOSS or user-written LU6.2 programs.

TLI / Sockets

- TLI (Transport Layer Interface) offers a protocol-independent programming interface defined by AT&T.
- Sockets offer a protocol-independent programming interface defined by the University of Berkeley.
- TLI is used on OSI or TCP/IP protocols.
- Sockets are used on TCP/IP protocols.

- TLI or Sockets allow the user to implement his own network applications using TCP/IP or OSI.
- Sockets are used and implemented on almost all systems running TCP/IP.
- Applications using TLI or Sockets are widely portable.

OSI NetBIOS

- Offers integration of Supermax with distributed PC applications via OSI protocols.
- Uses a broadcast-based name-resolution protocol.
- Defined by the user organization TOP (Technical and Office Products).

- OSI NetBIOS can be used by LAN Manager/X.
- Several vendors support the TOP specifications.
- Minimizes the need for configuration and hides numerical addresses from the user.
- The de facto standard for running NetBIOS via standard OSI protocols.

NetBIOS TCP

- NetBIOS via TCP/IP offers integration of Supermax with distributed PC applications.

- Several vendors support NetBIOS over TCP/IP.
- NetBIOS via TCP/IP can be used by LAN Manager/X.

LAN Manager/X

- Provides named pipes and mailslot application programming interface (API) for building distributed applications.
- Supports distributed applications based on named pipes and mailslot communication.
- Supports TCP/IP and OSI standard protocols.
- Incorporates LAN Manager technology from AT&T and Microsoft.

- Recognized as an industry standard for PC LAN systems.
- Facilitates streamlined integration of local PC applications and Supermax applications.
- Provides the foundation for client/server-based applications.

NETWORK MANAGEMENT

Along with their growing numbers and size, the management of client/server models and networks has become an increasingly complex task, thus creating the need for a standardized network management system. As an example, it must be possible to manage the clients centrally from the server.

NetView/Supermax

- Allows supervision and management of a Supermax in an SNA network.
- In NetView the Supermax is both an „entry point" and a „service point". The host is a „focal point" to which problems are reported.
- The most frequent UNIX commands are included in a host-based menu system.
- A programming interface (API) is supported.
- The same facilities as in e.g. IBM 3174, IBM System/36 and IBM APPC/PC are supported.
- Integrated with SOS (Supermax System Supervision).

- NetView is the cornerstone of the IBM solution for supervision and management of SNA networks, equalizing the Supermax with any other SNA equipment.
- Apart from registering problems, NetView also prevents operational failures, such as insufficient storage capacity or CPU overload.
- No new/special routines are required.
- As UNIX commands can be chosen from a menu system on the host, NetView operators need not be familiar with UNIX.

SNMP

- Simple Network Management Protocol.
- Manages TCP/IP-based networks.
- Allows monitoring of status and statistics from a remote management station.
- Allows configuration of all pertinent parameters from a remote management station.

- SNMP is the de facto standard for the management of TCP/IP networks.
- Easy management of SupermaxTCP and other network components, e.g. bridges and routers, from any SNMP-based management station.

Peripheral Devices

A wide range of peripheral devices secure that the customer always has a series of technologically up-to-date products to choose from. The peripherals are hand-picked among the most functionally advanced and ergonomically correct products on the market. Examples are:

- Display terminals for text and graphics
- X terminals
- PCs and PC attachments
- Laser printers
- Matrix printers
- Ink-jet printers
- Line printers
- Postscript printers (B/W and colour)
- Ticket printers
- Plotters
- Modems
- Multiplexers
- Bar code scanners
- Cash register equipment
- Accessories
- Uninterruptable Power Supply systems (UPS)
- LAN equipment (repeaters, transceivers, bridges etc.).

Supermax Cabinets

The Supermax computer range consists of four basically identical models. The only significant differences between them are the cabinet sizes and the bus length. The model numbers refer to the maximum numbers of boards that can reside and function simultaneously in each computer system. Independent of model, the Supermax computers are thus modularly upgradeable using identical PCB modules.

	Supermax 24	Supermax 12	Supermax 6	Supermax 4	Supermax Disk Cabinet
Maximum Configuration					
- CPU Modules	8	4	2	1	0
- I/O Modules	15	10	4	2	0
- DIOC Modules	8	4	3	1	0
- Intelligent Units	16	11	5	3	0
Modules in all	24	12	6	4	0
Mass Storage					
Winchester Disk Drives:					
- Half-height (HH)	16	8	6	2	32
- Full-height (FH)	8	4	3	1	16
- 2 X FH + HH	16	8	6	2	32
Front Mounted Peripherals:					
- Half-height (HH)	8	8	4	4	4
- Full-height (FH)	4	4	2	2	2
- 2 X FH + HH	8	8	4	4	4
Input Power Requirements					
- Voltage V	400 2N ±15% 230 ±15%	- 230 ±15%	- 230 ±15%	- 230 ±15%	400 2N ±15% 230 ±15%
- Current A	2 X 6 12	- 6	- 3	- 2	2 X 2 4
- Frequency Hz	47 - 63	47 - 63	47 - 63	47 - 63	47 - 63
Environmental Requirements					
- Temperature	10 - 35°C	10 - 35°C	10 - 35°C	10 - 35°C	10 - 35°C
- Humidity	20 - 80% non cond.	20 - 80% non cond.	20 - 80% non cond.	20 - 80% non cond.	20 - 80% non cond.
Physical Dimensions					
- Height	890mm	890mm	890mm	580mm	890mm
- Width	550mm	550mm	280mm	260mm	280mm
- Depth	1140mm	840mm	850mm	650mm	850mm
- Weight (max.)	220kg	160kg	110kg	45kg	135kg
Electro Magnetic Compatibility	The Supermax is designed to meet the requirements specified in VDE 0871 class B and FCC part 15 subpart J class B.				
Safety	The Supermax is designed to meet the requirements specified in IEC 950, EN 60950 and UL 1950.				

Max. Disk Capacity					
- Internal	12.8 Gb	6.4 Gb	4.8 Gb	1.6 Gb	25.6 Gb
- External	>150 Gb	>70 Gb	>50 Gb	-	-
Max. SPEC Thruput	125.0 (8 CPUs)	66.1 (4 CPUs)	33.9	17.1	-
Max. number of workstations supported	1024	512	128	64	-

Group headquarters:
Dansk Data Elektronik A/S
Herlev Hovedgade 199,
DK-2730 Herlev, Denmark
Tel: (+45) 42 84 50 11. Fax: (+45) 42 84 52 20.

Danish sales offices:
Dansk Data Elektronik A/S
Vindingvej 2C,
DK-7100 Vejle, Denmark
Tel: (+45) 75 72 26 00. Fax: (+45) 75 72 27 76.

Dansk Data Elektronik A/S
Lucernevej, Klokkerholm,
DK-9320 Hjallerup, Denmark
Tel: (+45) 98 28 45 44. Fax: (+45) 98 28 45 65.

International subsidiaries:
DDE Sverige AB
Kanalvägen 12,S-194 61 Upplands Väsby, Sweden
Tel: (+46) 760 74040. Fax: (+46) 760 74485.

DDE Norge A/S
Svovelstikka 1
Postbox 6437, Etterstad
N-0605 Oslo, Norway
Tel: (+47) 2 672267. Fax: (+47) 2 672215.

DDE Great Britain Limited
2-4 Oxford Road, Newbury
Berkshire RG13 1PA, England
Tel: (+44) 635 550909. Fax: (+44) 635 550900.

DDE Belgium N.V.
Excelsiorlaan 45
B-1930 Zaventem, Belgium
Tel: (+32) 2 725 1225. Fax: (+32) 2 726 0305.

Dansk Data Elektronik S.A.
Comte d'Urgell nº 240, 6º-B
E-08036 Barcelona, Spain
Tel: (+34) 3 4301619. Fax: (+34) 3 4307356.

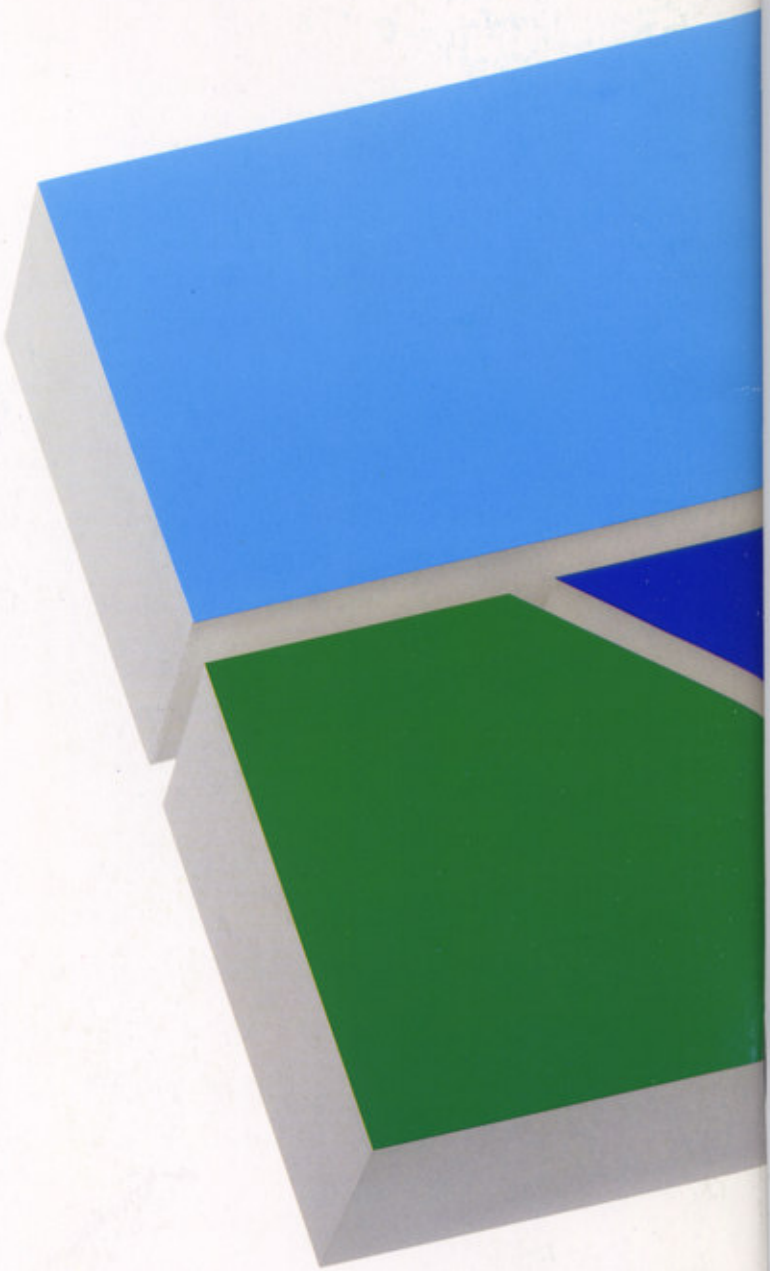
Dansk Data Elektronik Italia S.r.l.
Via Cantù 29
I-20092 Cinisello Balsamo (MI), Italy
Tel: (+39) 2 66014381. Fax: (+39) 2 66014380.

Dansk Data Elektronik (NZ) Limited
598 Main Street,
Palmerston North, New Zealand
Tel: (+64) 6 356 1544. Fax: (+64) 6 357 1522.

International sales offices:
DDE Sales Office France
6 Parc de Noailles
78100 Saint Germain en Laye, France
Tel: (+33) 1 39 73 03 13. Fax: (+33) 1 39 73 03 13.

DDE Sales Office Asia/Pacific
13th Floor, Technology Resources Tower
161-B, Jalan Ampang,
50450, Kuala Lumpur, Malaysia
Tel: (+60) 32622852. Fax: (+60) 32622855.

92.03 S-sweary/S



dde supermax
COMPUTER SYSTEMS