

Comparison of the NS 3000 & NS 5000

Feature	NS 3000 Base Configuration	NS 3000 Maximum Configuration	NS 5000 Base Configuration	NS 5000 Maximum Configuration
Performance				
■ NFS throughput (NFS IOPS) at 70 ms response time	350*	675	350*	1,350
Networking				
■ Number of Ethernets supported	2	4	2	8
■ IP routing speed (packets per second, aggregate)	1,500	3,000	1,500	6,000
Software				
■ Support for concatenated multidisk partitions	Yes	Yes	Yes	Yes
■ Support for mirrored disk partitions	Yes	Yes	Yes	Yes
■ Support for striped disk partitions	Yes	Yes	Yes	Yes
■ X terminal support	Yes	Yes	Yes	Yes
■ Online documentation	Yes	Yes	Yes	Yes
■ Hot-pluggable disks	Yes	Yes	Yes	Yes
■ Hot-pluggable tapes	Yes	Yes	Yes	Yes
■ Hot-pluggable CD-ROM	Yes	Yes	Yes	Yes
■ Support for online backup	Yes	Yes	Yes	Yes
■ Performance Monitor	Yes	Yes	Yes	Yes
■ Virtual Partition Manager	Yes	Yes	Yes	Yes
■ Automated administrative tools	Yes	Yes	Yes	Yes
Hardware				
■ Host Processor				
– SPARC-based Sun-4 compliant (memory size)	Yes (20 MB)	Yes (68 MB)	Yes (20 MB)	Yes (Up to 68 MB)
– 68020-based Sun-3 compliant (memory size)	Yes (8 MB)	Yes (8 MB)	Yes (8 MB)	Yes (8 MB)
■ Number of Ethernet Processors (2 Ethernet ports per processor)	1	2	1	4
■ Number of File Processors	1	1	1	2
■ Number of Storage Processors	1	1	1	3
■ I/O cache memory size	16 MB	96 MB	16 MB	96 MB
■ VME bus bandwidth	55 MB/s	55 MB/s	55 MB/s	55 MB/s
■ Number of VME slots	8	8	14	14
■ Number of parallel SCSI channels	5	5	10	30
■ Operator console	ASCII	X terminal	ASCII	X terminal
■ Number of optional write accelerators	0	1	0	3
Disk Array Subsystem				
■ Disk type—5 ¹ / ₄ ", 1.35-GB SCSI-2	Yes	Yes	Yes	Yes
■ Maximum number of disk drives	N/A	10	N/A	60
■ Maximum storage capacity	N/A	13.5 GB	N/A	81 GB
Tape Support				
■ 8-mm helical scan (5.0-GB or 2.3-GB capacity)	Yes	Yes	Yes	Yes
■ 4-mm DAT (1.3-GB capacity; 2.5-GB with data compression)	Yes	Yes	Yes	Yes
■ 1/4" cartridge (150-MB capacity)	Yes	Yes	Yes	Yes
■ 1/2" reel (140-MB capacity)	No	No	Yes	Yes
Mechanical				
■ Cabinet height x width x depth	42" x 21" x 32", 106.7cm x 53.3cm x 81.3cm	40" x 21" x 32", 106.7cm x 53.3cm x 81.3cm	76" x 24" x 39.1", 193.0cm x 61.0cm x 99.3cm	76" x 24" x 39.1", 193.0cm x 61.0cm x 99.3cm
■ Power requirements		1.2 KVA (10 drives) 4,100 BTU/hr		1.815KVA (20 drives) 6,200 BTU/hr

* with 4 Disk Drives

Auspex NetServer Family Specifications

NS 5000 Base Configuration

- Ethernet Processor supporting 2 concurrent Ethernet ports.
- File Processor.
- Storage Processor supporting 10 concurrent SCSI channels.
- Host Processor. Choice of:
 - Motorola CPU with 8-MB processor memory. Sun-3 binary compatible.
 - SPARC CPU with 20-MB base processor memory. SPARC binary compatible. Supports external SCSI connection.
- 16-MB ECC I/O cache memory.
- 14-slot VME-compatible cardcage.
- 680-MB bootable, hot-pluggable CD-ROM drive.
- FrameViewer™ software license.
- Portable Open Windows™ version 2.0 software license.
- SunOS operating system, version 4.1 software license.

NS 5000 Options

- Up to 4 Ethernet Processors (total), supporting 8 Ethernet ports.
- Up to 2 File Processors.
- Up to 3 Storage Processors.
- Up to 68 MB CPU memory in 16-MB increments (SPARC systems only).
- Up to 96 MB (2 boards) ECC I/O cache memory (data-only).
- One nonvolatile, battery-backed write accelerator per storage processor with 1 MB on-board memory.
- 15" monochrome X terminal operator console.
- Up to 27.0 GB formatted disk storage capacity (20 x 1.35-GB disk array) in the system cabinet.
- Up to 81.0 GB formatted total storage capacity with a single expansion cabinet.

NS 5000 Physical and Power

- Physical Dimensions:
Height: 76 in (193.0 cm)
Width: 24 in (61.0 cm)
Depth: 39.1 in (100.5 cm)
Weight: 960 lbs (436 kg) with 20 drives.
- Power requirements:
AC voltage: 90–264 volts
AC frequency: 47.5–66 Hz
6200 BTU/hr; 1.815 KVA (20 drives).
8200 BTU/hr; 2.4 KVA (Expansion Cabinet with 40 drives).

NS 3000 Base Configuration

- Ethernet Processor supporting 2 concurrent Ethernet ports.
- File Processor.
- Storage Processor supporting 5 concurrent SCSI channels.

- Host Processor. Choice of:
 - Motorola CPU with 8-MB processor memory. Sun-3 binary compatible.
 - SPARC CPU with 20-MB base processor memory. SPARC binary compatible. Supports external SCSI connection.
- 16-MB ECC I/O cache memory.
- 8-slot VME-compatible cardcage.
- 680-MB bootable, hot-pluggable CD-ROM drive.
- FrameViewer™ software license.
- Portable Open Windows™ version 2.0 software license.
- SunOS operating system, version 4.1 software license.

NS 3000 Options

- Up to 2 Ethernet Processors (total), supporting 4 Ethernet ports.
- 20–68 MB CPU memory in 16 MB increments (SPARC systems only).
- Up to 96 MB (2 boards) ECC I/O cache memory (data only).
- Non-volatile, battery-backed write accelerator. 1-MB on-board memory.
- 15" monochrome X terminal operator console.
- Up to 13.5 GB disk storage capacity (10 x 1.35-GB disk array).

NS 3000 Physical and Power

- Physical Dimensions:
Height: 42.0 in (106.7 cm)
Width: 21.0 in (53.3 cm)
Depth: 32 in (81.3 cm)
Weight: 440 lbs (200 kg) with 10 drives.
- Power requirements:
AC voltage: 90–264 volts
AC frequency: 47.5–66 Hz
4100 BTU/hr; 1.2 KVA (10 drives)

Tape Drive Options

- 8-mm streaming cartridge, 2.3-GB or 5.0-GB capacity, helical-scan format.
 - 4-mm streaming cartridge, 1.3-GB capacity, helical-scan DDS/DAT format, 2.5-GB capacity in data compaction mode.
 - 1/4-inch streaming cartridge, 150-MB capacity, QIC-150 format.
- The NS 5000 also supports:
■ 1/2-inch streaming reel, 6,250/1,600 BPI, 140-MB capacity (at 2,400 feet and 6,250 BPI). Maximum of one drive.

Environmental Constraints

- The NS 3000 and NS 5000 are air-cooled.
- Operating temperature:
104°F (40°C) maximum.
41°F (5°C) minimum.
- Operating humidity:
20–80% noncondensing at 40°C.
- Storage temperature:
167°F (75°C) maximum.
32°F (0°C) minimum.

Software Compatibility

- Fully SunOS and ONC compatible.
- Direct implementation of a licensed but optimized version of NFS.
- All remaining services provided by a licensed copy of SunOS that executes on the Host Processor with primarily driver-level modifications.

Application Layer

- SunOS operating system, version 4.1.
- Sun ONC services, version 4.1.
- Network File System (NFS), protocol version 2.
- Simple Network Management Protocol (SNMP).
- X Display Manager Control Protocol with X11R4 XDM.
- Sun NIS service.
- DES Key Authentication service.
- Lock Manager service.
- Automount service.
- Port Mapper service.
- Remote Execution service (REX).
- Remote Copy program (RCP).
- Remote Login program (RLOGIN).
- Remote Shell program (RSH).
- Electronic mail (SMTP, UUCP).
- Telnet (TCP/IP terminal emulation).
- FTP (TCP/IP file transfer program).

Presentation Layer

- external Data Representation (XDR).
- Session Layer
- Remote Procedure Call (RPC).
- Transport Layer
- User Datagram Protocol (UDP).
- Transmission Control Protocol (TCP).

Network Layer

- Internet Protocol (IP).

Data Link Layer

- Ethernet.

Physical Layer

- IEEE 802.3.

Hardware Compatibility

- The NS 5000 and NS 3000 are compliant with the following hardware standards and agency requirements:
- Ethernet (IEEE 802.3)
 - FCC class A
 - SCSI-1
 - CSA
 - VME
 - VDE 0871A
 - RS232V
 - UL™

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The Auspex NetServer Family

The Auspex™ NS 3000™ and NS 5000™ NetServers™ are the first Unix™ systems specifically designed to deliver truly balanced compute capability and high-throughput NFS™ file service for large department and campus network environments. With their unique Functional Multi-Processing™ (FMP) architecture, Auspex NetServers eliminate the network I/O limitations common to Unix data center



servers with conventional architectures. As a result, the NS 3000 and NS 5000 provide 3–5 times more NFS throughput than today's high-end data center servers, at a dramatically lower cost per network seat and total cost of ownership. The FMP architecture distributes NFS (Network File System) load to multiple, dedicated processors individually optimized for Ethernet™, file, storage, and Unix system functions. While NFS I/O requests are handled by multiple dedicated processors, a SPARC™ host processor provides consistently high-performance compute service which is independent of NFS workload—providing the industry's first truly balanced network server.

With support for virtual disk partitions, including disk mirroring, striping, and concatenation, the NS 3000 and NS 5000 provide higher data availability, faster access to shared data, and unmatched flexibility in file system and database organization. Effective utilization of unused and available disk partitions is easy with Auspex's Virtual Partition Manager, which displays file system, virtual partition, and physical partition information for all NetServer disks. With the Performance Monitor—a tool for measuring, recording, and displaying system and subsystem performance—the network manager can easily identify and eliminate I/O bottlenecks, assuring reliable, consistent NFS response for all users on the network.



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AUSPEX

A New Class of Unix Server

More Data to More Users

Dramatic, Scalable NFS Performance

Auspex NetServers provide high-speed data paths between individual client workstations and the server's network interfaces, file systems, and disks. Scalable to a wide range of network environments, the NS 5000 does the work of up to five of today's highest performance NFS file servers.

Auspex's virtual partition tools support disk striping that eliminates "hot" disk drives by spreading high-use file systems across multiple drives—without changing the file system. With the Performance Monitor and Virtual Partition Manager, it's easy to spot performance bottlenecks and to reconfigure hardware or virtual disk partitions to assure maximum throughput for network users.

Auspex NetServer Family Features

- 3-5 times the network I/O performance of current high-end file servers.
- 1,350 NFS IOPS* for the NS 5000; and 675 NFS IOPS for the NS 3000 at 70 ms response time.
- SPARC- or Motorola-based host processor for Sun-4 or Sun-3 binary compatibility.
- 2-8 Ethernet ports using 1-4 Ethernet Processors.
- Up to 30 parallel SCSI I/O channels for disk, tape, and CD-ROM data transfer.
- Up to 81 GB of formatted disk storage with a single optional expansion cabinet.
 - 1-27 GB of disk capacity in the NS 5000 system cabinet (20 x 1.35-GB disk array).
 - 1-54 GB of additional disk capacity in the NS 5000 expansion cabinet (40 x 1.35-GB disk array).
 - 1-13.5 GB of disk capacity in the NS 3000 system cabinet (10 x 1.35-GB disk array).
- Hot-pluggable disk, tape, and CD-ROM drives, capable of online installation and removal without service disruption.
- Removable, bootable CD-ROM.
- Write Accelerator with non-volatile write cache.
- High-speed IP routing at 6,000 and 3,000 packets per second (aggregate) for the NS 5000 and NS 3000, respectively.
- 16-96 MB ECC I/O cache memory (for data only).
- 55-MB/s enhanced VME backplane; 14 slots on the NS 5000 and 8 slots on the NS 3000.
- ASCII or optional X terminal operator console.
- Online hypertext-linked documentation.
- Compatible with Unix (SunOS™), ONC™/NFS, SNMP, TCP/IP, and Ethernet.

* NFS IOPS (I/O Operations Per Second): the number of average-mixture (LADDIS mix) NFS operations per second processed by a server at the request of network clients.

Lower Cost Per Network Seat

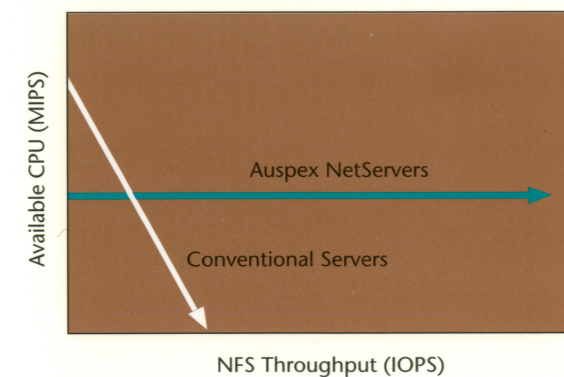
Cost-effective dataless and diskless workstations can be performance-effective, too. Adding more users won't require the purchase of yet another server. Eight Ethernets, each with heavy NFS workloads, can be connected to a single NS 5000. As a result, hardware, maintenance, administration, and facilities costs are dramatically reduced.

There's an added bonus. Auspex NetServers enhance installed conventional servers by offloading NFS processing, freeing them to perform a variety of tasks for which they are better suited, including compute, print, and electronic mail services.

High Data Availability and Online Backup

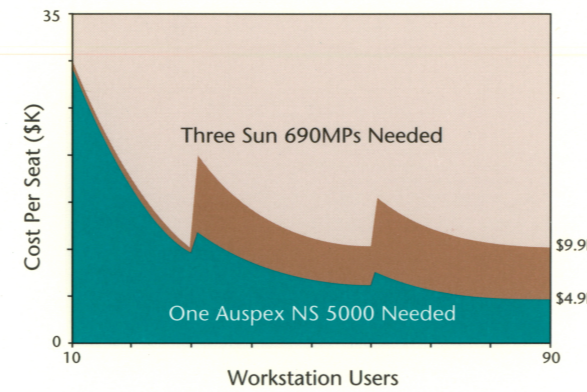
Disk mirroring allows active file systems to be replicated on separate disks. With *hot pluggability*, disk and tape drives can be removed or installed with the system online. Together, these features virtually eliminate system downtime due to disk or media failure, and provide dramatically increased data availability since a disk failure will not interrupt user applications. In addition, online backups can be performed using mirrored partitions, eliminating system interruptions and reducing operational cost for backups. Thus backup is consolidated and simplified.

Redefining "Balanced" Compute and I/O Performance



Auspex compute performance is completely independent of network I/O demand. With conventional servers, compute applications compete with I/O tasks for CPU cycles.

Lower Cost Per Seat



Because the NS 5000 supports 3-5 times more users, the cost per network seat is significantly lower. Cost per seat is the 3-year cost of ownership, including cost of equipment, service, and personnel, amortized over the number of diskless workstation users.

The modular design of Auspex NetServers allows processors, disks, and tape drives to be easily installed or replaced in the field—in minutes. The full remote diagnostic capability of the NS 3000 and NS 5000 allows Auspex's Customer Service Department to connect directly to a system to provide responsive problem resolution when required.

Simplified Network Administration

Auspex NetServers eliminate the need for redundant copies of shared applications, libraries, and data commonly found on networks with multiple servers. This frees disk space and simplifies distribution of new software. With a quick glance at the Performance Monitor and Virtual Partition Manager displays, the system administrator can monitor network, disk, and subsystem utilization. Most importantly, I/O bottlenecks are easily identified and eliminated. In addition, full SunOS compatibility means that most network managers already know how to administer Auspex NetServers.

Auspex's Functional Multi-Processing Architecture provides balanced, scalable performance by distributing NFS workload to multiple, dedicated processors, each individually optimized for Ethernet, file, storage, and Unix system functions.

The Auspex NetServer Architecture—Functional Multi-Processing

Distributed Computing at the System Level

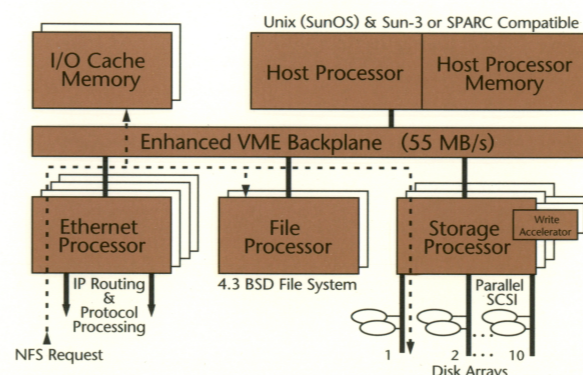
The NS 3000's and NS 5000's Functional Multi-Processing architecture distributes performance-limiting I/O functions to multiple, dedicated processors. Network file requests are directly processed by the Ethernet and File Processors, bypassing Unix to significantly reduce software overhead. As a result, Auspex's FMP architecture delivers a dramatic improvement in network I/O performance with full scalability.

The NS 3000 and NS 5000 base configurations consist of four FMP processors (Ethernet, File, Storage, and Host). As more workstation users join the network, processors and disks can be easily added (up to 10 processors and 60 disks) to accommodate the increased workload.

Ethernet Processor

The Ethernet Processor performs full protocol processing from IP through NFS, passing the resulting NFS requests directly to the File Processor. Each Ethernet Processor accommodates two fully parallel Ethernets. With four Ethernet Processors, a single NS 5000 supports a maximum of eight Ethernet networks. A single NS 3000 with two Ethernet Processors supports a maximum of four Ethernet networks. Complete IP routing is also performed among attached networks at an aggregate rate of 6,000 packets per second on the NS 5000 and 3,000 packets per second on the NS 3000.

Auspex NetServer Architecture



File Processor

The File Processor is responsible for all file system processing. NFS-specific file information passes directly between the Ethernet Processor and the File Processor for each NFS request. NFS operations are then processed rapidly by the File Processor's self-contained file system (4.3 BSD file system), bypassing the Unix host processor and eliminating the associated software overhead and latency incurred by conventional servers.

Storage Processor

The Storage Processor is responsible for SCSI channel management, SCSI disk and tape drive control and optimization, and DMA data transfers to I/O cache memory. The NS 5000 Storage Processor operates ten parallel SCSI channels simultaneously. Each channel supports two SCSI drives.



With the NS 5000 and a single expansion cabinet, up to 81 GB of formatted disk capacity is available to network users.

An NS 5000 with a single expansion cabinet supports up to three Storage Processors and a total storage capacity of 81 GB. The NS 3000 Storage Processor operates five parallel SCSI channels simultaneously and has a total storage capacity of 13.5 GB.

Write Accelerator

Auspex's optional Write Accelerator provides significant NFS performance improvements in write-intensive environments. Auspex's integrated write caching is transparent to NFS; at the client user level it's visible only through reduced latency. Auspex's Write Accelerator snaps onto a Storage Processor without occupying an additional VME data movement is required when write acceleration is used. By keeping Unix out of the write path, the Write Accelerator improves performance by write coalescing and eliminating redundant writes. The Write Accelerator includes a battery-backed, stable-storage cache to ensure data integrity. Write acceleration is independent of compute loading on the host processor, unlike write-cache implementations in conventional servers. In addition, Auspex's Write Accelerator is scalable and provides NFS write performance improvements for all system configurations.

Host Processor

Available with either a SPARC-based or Motorola-based Host Processor, Auspex NetServers are binary compatible with respective Sun-4 and Sun-3 servers. Since NFS I/O is managed by other dedicated processors, Host Processor compute performance is independent of NFS workload. The Host Processor runs user applications and provides non-NFS ONC services, online backup and restore operations, system utilities, and diagnostics.

I/O Cache Memory and Enhanced VME Bus

The Auspex NetServer's shared ECC I/O cache memory is a huge data-only file cache. No processor instructions are stored in or fetched from this memory. Memory and backplane bandwidth is devoted exclusively to I/O. Auspex's enhanced VME bus implementation provides 55 MB/s block transfers between the I/O cache memory and other NetServer processors.