Sun Enterprise™ 450 Server

Just the Facts

Copyrights

Table of Contents

Positioning

Figure 1: Sun Enterprise™ 450 server, front view

Introduction

The Sun Enterprise™ 450 server is a member of Sun's powerful line of UltraSPARC™ processor−based servers for enterprise network computing. This tremendously flexible and versatile mid−range server delivers a potent combination of stellar performance, outstanding reliability, and a remarkably affordable price. This rackmountable tower server's exceptional blend of computing power, storage capacity, disk I/O throughput, and network I/O performance make it ideal for running or front−ending databases from Oracle, Sybase, and Informix, for delivering e−mail or web services to hundreds of concurrent users, or for implementing thousands of other critical two−tier and three−tier client−server business applications.

With up to four 400−MHz or 480−MHz UltraSPARC−II 64−bit RISC microprocessors, 4 GB of memory, 20 internal 36.4−GB UltraSCSI−3 disk drives, and six high−performance PCI I/O buses that can move over one gigabyte of data per second, the Sun Enterprise 450 server is ideal for applications that demand more processing power, integrated storage, or expandability than offered by the Sun Enterprise 250 server, but that do not require the seamless growth path or extensive datacenter RAS features offered by the Sun Enterprise 3500–6500 server family. The Sun Enterprise 450 server is designed to satisfy many of the demanding information management, processing, and delivery requirements found in medium−sized businesses, branch offices, workgroups, and distributed applications within large−scale or global enterprises.

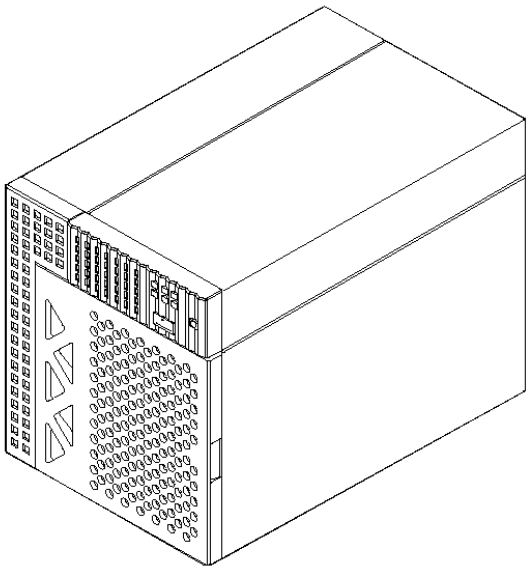

Figure 2: Sun Enterprise 450 server, side view

Product Family Placement

The Sun Enterprise 450 server is an advanced member of the current workgroup server product family, which scales from the low−cost, high−performance Sun Enterprise Ultra™ 5S and 10S systems, to the two−way Sun Enterprise 220R and 250 servers, and up to the four−way Sun Enterprise 420R and 450 servers.

These systems have several things in common, including:

- The UltraSPARC processor
- 100 percent binary compatibility from the low end to the high end, including Sun's server family
- Scalable from the low−end uniprocessor systems to the 64−way Sun Enterprise 10000 (Starfire™) server
- Modular, easy−to−swap components

Systems	Target Users and Markets
Sun Ultra 5S (1−way)	Designed as the lowest priced system solution, the Sun Enterprise Ultra 5S server appeals to customers looking for a low−price system offering expandability, fast application performance, and investment protection. With its "pizza box" form factor, this system is ideal in simulations where space and cost are at a premium.
Sun Ultra 10S (1−way)	With architecture similar to the Sun Enterprise Ultra 5S system, the Sun Enterprise Ultra 10S server offers an additional low−priced PCI−based system, but with added expandability and a tower enclosure.
Sun Enterprise 220R (2−way)	Designed for customers who require a rack solution at an affordable price. The target customers are Internet, application, and network service providers, along with financial services, compute farms, or any customers running demanding applications in space−constrained environments.

Systems	Target Users and Markets
Sun Enterprise 250 (2−way)	Designed for customers who are looking for the RAS features of a high−end system, but in an affordable tower package that is also rackmountable. The Sun Enterprise 250 server is built to handle the most demanding business−critical applications and with its Remote System Control (RSC), users can monitor the system 24x7 from virtually anywhere they have access to a browser.
Sun Enterprise 420R (4−way)	Designed to provide compute density at an affordable price. With the 450−MHz UltraSPARC−II processor with 4 MB of external cache, the Sun Enterprise 420R server offers exceptional processing power in a compact, flexible server package. The target customers are Internet, application, and network service providers, along with financial services, compute farms, or any customers running demanding applications in space−constrained environments.
Sun Enterprise 450 (4−way)	Sun's most powerful workgroup server. The Sun Enterprise 450 system's blend of computing power, storage capacity, disk I/O throughput, and network I/O performance make it perfect for running or front−ending databases from Oracle, Sybase, and Informix or for implementing thousands of other critical two−tier and three−tier client−server business applications.

Key Messages

- Scalable performance
- Price/performance
- Reliability and availability
- Application growth path

Availability

The Sun Enterprise 450 server base systems and standard configurations are currently available.

Market Value Proposition

THe Sun Enterprsie 450 server is Sun's most powerful workgroup server. The Sun Enterprise 450 system's blend of computing power, storage capacity, disk I/O throughput, and network I/O performance make it perfect for running or front−ending databases from Oracle, Sybase, and Informix or for implementing thousands of other critical two−tier and three−tier client−server business applications.

Target Markets

Industry	Applications
Financial Services • Insurance • Banking • Securities traders and brokerages	• Branch office servers, customer management (CMS), and electronic commerce
Publishing	• Digital media management, web publishing, and electronic commerce

Industry	Applications
Manufacturing • Automotive • Aerospace • Electronics • Pharmaceuticals and process industries	• IT, finance and accounting, HR, manufacturing, engineering, sales and marketing, customer service/CMS, and electronic commerce
Telecommunications and Internet Services • Long distance carriers, PTTs • RBOCs • Cable operators • Wireless operators • Internet service providers • Equipment OEMs	• Internet HTTP, e−mail, FTP, directory servers, and electronic commerce • CV
Retail • Major retail chains	• In−store electronic retail systems, HQ customer management, merchandising systems, inventory management, distribution, and electronic commerce
Government • Federal/national • State/provincial	• Branch office systems
Health Care • Hospitals and clinics • HMOs and managed care providers • Medical equipment OEMs	• Satellite office servers, patient records, billing, claims processing, medical imaging systems, picture archival, and communications systems
Education • Colleges and universities	• Registration and student records, library management, financial aid administration, and academic research

Enabling Technology

The Sun Enterprise™ 450 server is a high−performance, shared memory, symmetric−multiprocessing server system. It is designed around Sun's high−speed Ultra™ port architecture (UPA) cross−bar system interconnect and Sun's UltraSPARC™−II processors to deliver outstanding overall system performance.

The Sun Enterprise 450 server technology is focused around reliability, availability, and serviceability (RAS) functions. System reliability, availability, and serviceability are enhanced by features that include:

- Error correcting code on memory and all data paths
- Parity checking on all address buses
- Front panel status indicator lights
- Hot−pluggable disk drives with easy front access
- Support for various RAID implementations
- Thermal sensing and over−temperature protection
- Power system monitoring and fault protection
- N+1 power supply redundancy
- Hot−swap power supplies with easy rear access
- Automatic system recovery
- Four levels of system diagnostics
- Easy side access to all internal replaceable components

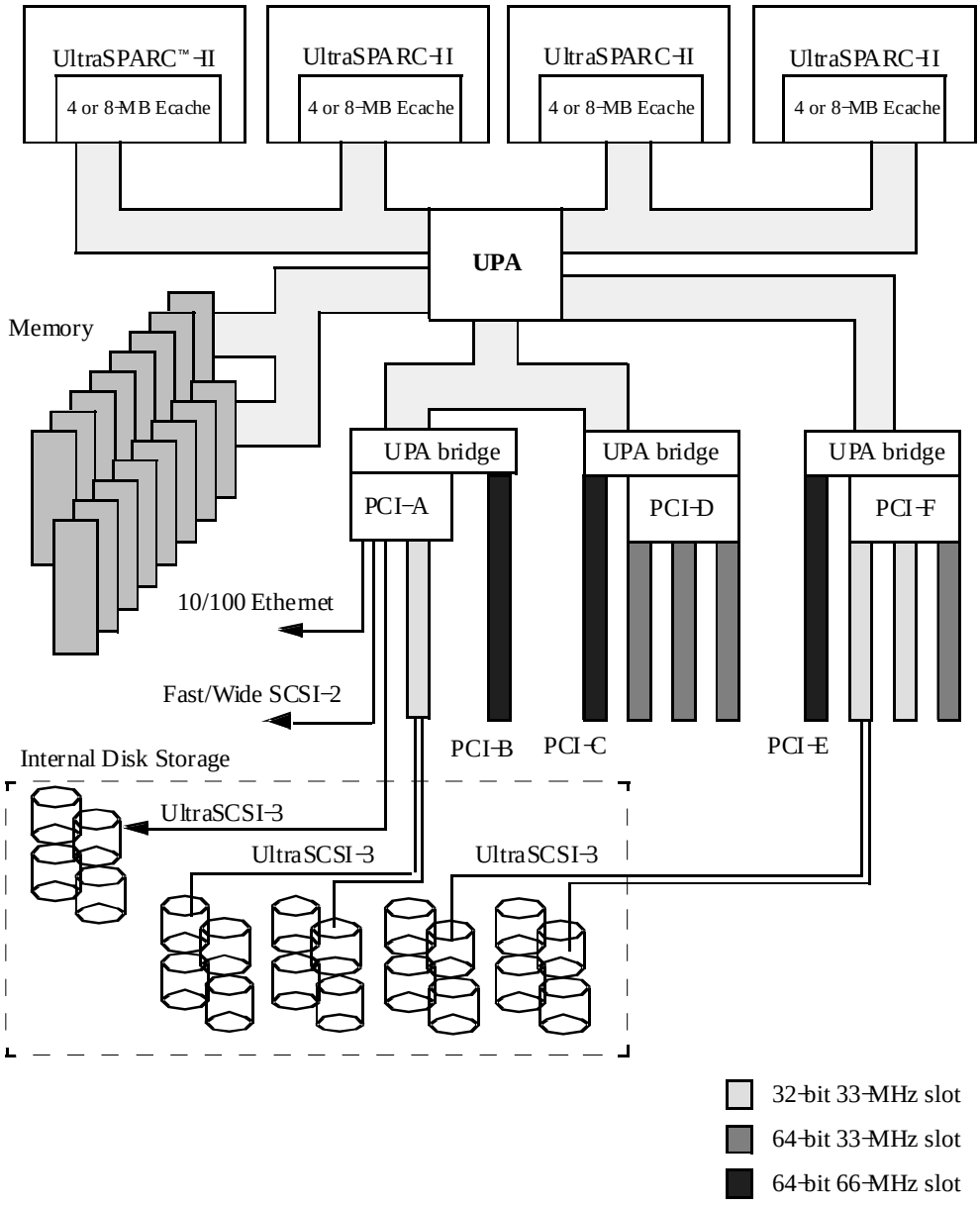

Figure 3: Sun Enterprise™ 450 server architecture

Overview

The Sun Enterprise™ 450 server is a shared−memory, symmetric−multiprocessing system built around the UltraSPARC™−II microprocessor. The UltraSPARC−II processor is a member of Sun's SPARC™ family and the second generation of 64−bit UltraSPARC chips. It utilizes 0.35−micron technology (versus the 0.5−micron technology of the UltraSPARC−I processor), which shrinks the die size to 149^2 mm (from 218^2 mm). This reduced die size is the key to the higher clock rates and increased performance of the UltraSPARC−II processor. This smaller die size also enables the UltraSPARC−II

processor to operate at a core voltage of 2.5 volts, rather than at the 3.3 volts, of the UltraSPARC−I processor. This lower voltage reduces power consumption and allows the chip to operate at higher frequencies without increasing total power requirements or heat dissipation, both major design issues in today's high performance systems.

UltraSPARC−II processors used in the Sun Enterprise 450 server are individually mounted on 4−inch x 6−inch field−installable module cards along with associated Ultra™ port architecture (UPA) data buffers and up to 8 MB of high−speed SRAM external cache memory (4−MB cache with 400−MHz CPU). These modules are similar to those used in the Sun Enterprise 250 server. This modular design facilitates easy system expansion (adding additional CPUs), processor upgrades (to higher performance UltraSPARC processors), and system service.

The Sun Enterprise 450 server is designed to exploit the full processing power of up to four high performance UltraSPARC−II CPUs. Processors with clock rates of 400 MHz or 480 MHz are supported, and all processors installed in a single system must operate at the same clock frequency. The system's UPA interconnect, main memory, and I/O subsystems have been carefully architected to sustain the high data rates necessary to use these processors fully, resulting in highly scalable system performance that is remarkably linear from a lightly loaded uniprocessor configuration to a "maxed−out" four−processor system.

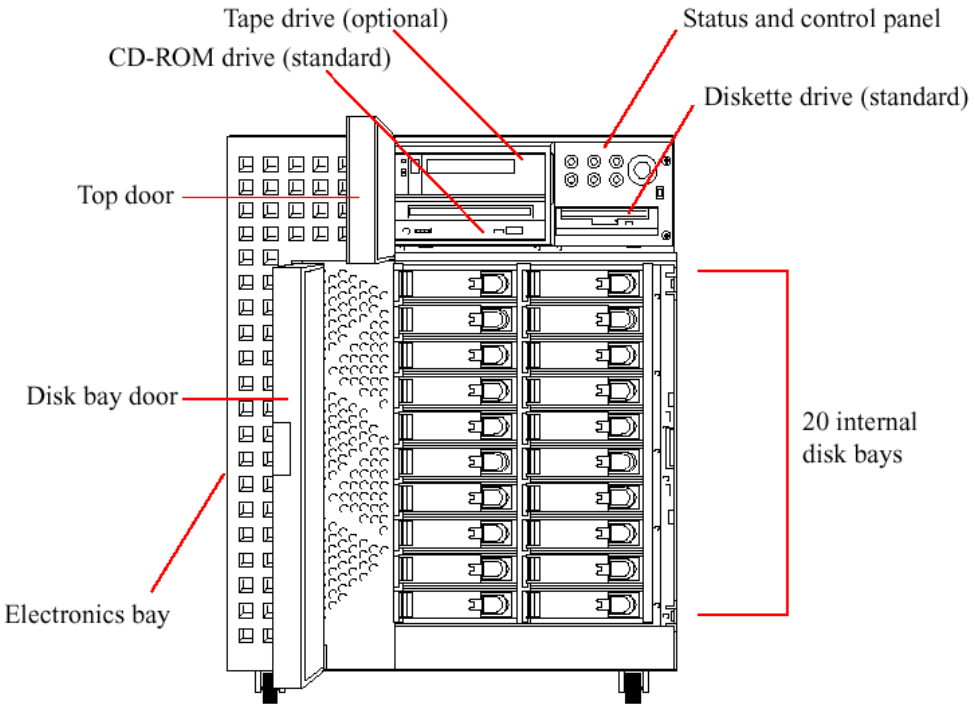

Figure 4: Sun Enterprise 450 server, front view, panels open

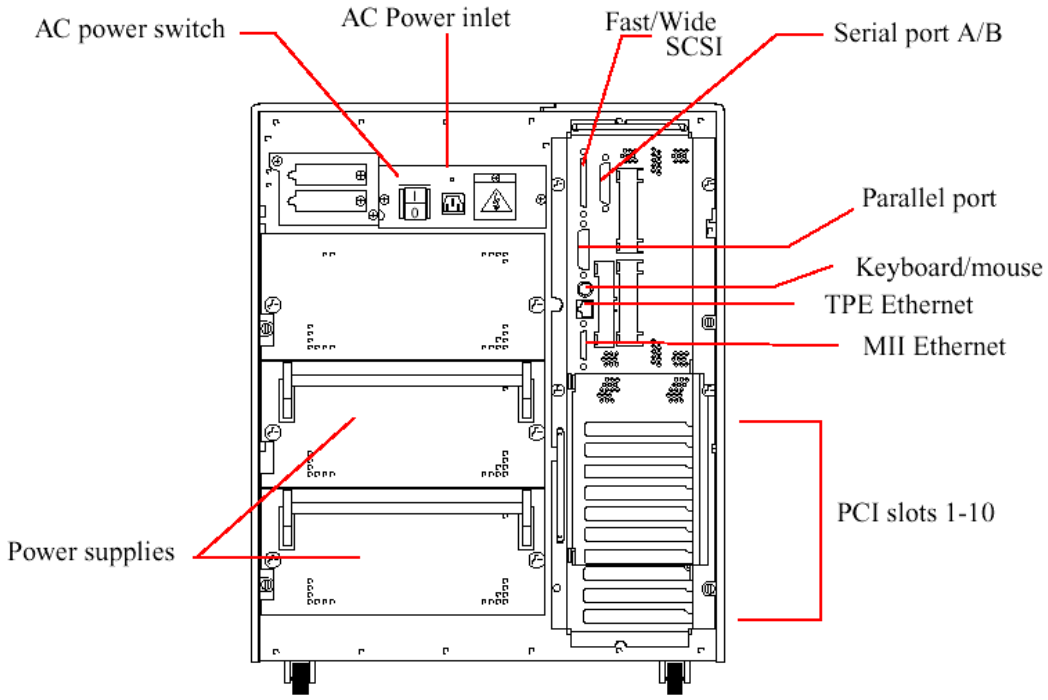

Figure 5: Sun Enterprise 450 server, rear view, panels open

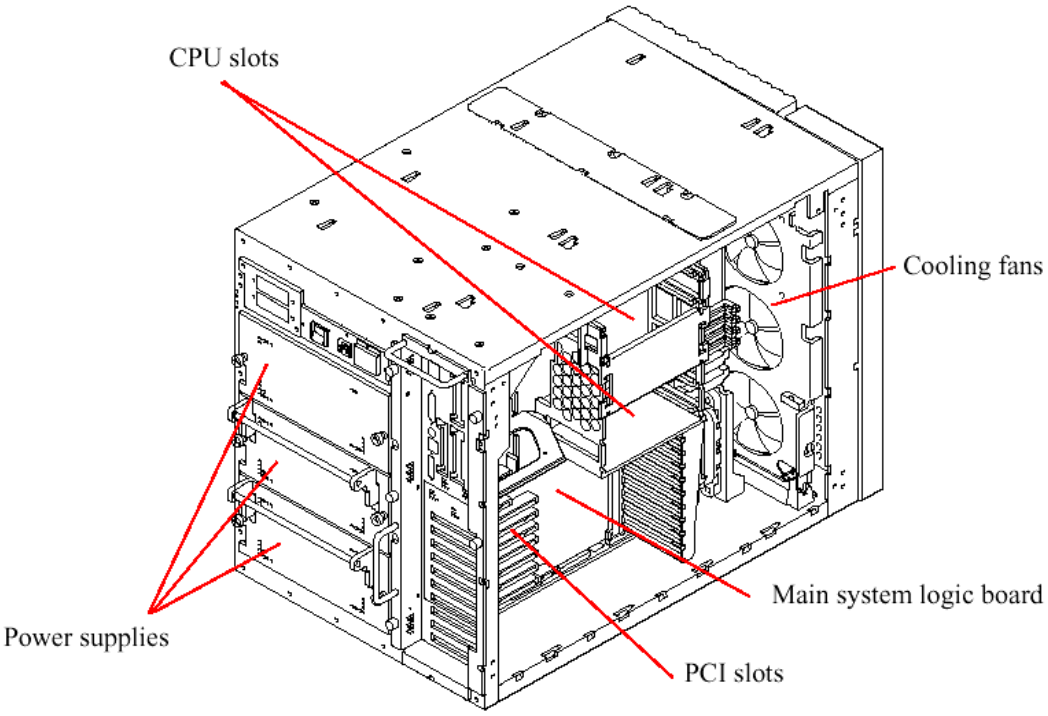

Figure 6: Sun Enterprise 450 server, rear cutaway view

Solaris Server Features and Benefits

Installation and Administration

Features	Benefits
• Solaris™ Web Start software enables fast, easy network−based installation of the Solaris Operating Environment	• Eases and speeds the installation of the Solaris Operating Environment on hosts and clients
• Solaris Web Start Server, available free from the Web, makes it easier to perform replicated installs onto numerous systems simultaneously	• Lowers cost of deployment; easy−to−use graphical user interface increases the number and type of personnel who can install Sun software
• Includes Solstice AdminSuite™ software, which provides a consistent, easy−to−use, graphical interface for common system administration functions. Includes a user manager for managing user accounts, a database manager for manipulating Solaris administration data, a host manager for connecting client systems to the network, a software manager for controlling installation of Solaris software packages, a serial port manager for managing serial ports remotely, and a print manager for network printing.	• Eases system administration
• Includes AnswerBook™ software for on−line network access to all Sun manuals, including browse and network print capability	• Speeds access to information, reduces cost
• Solstice SunNet Manager™ software enables administration, monitoring, and troubleshooting of LANs and WANs	• Remote monitoring and control of networks lowers costs, increases uptime
• Third−party network and system management tools provide administration, monitoring, and troubleshooting tools for distributed systems	• Users have a choice of network management solutions

Compatibility

Features	Benefits
• The Sun Enterprise 250 server runs Sun's powerful and dependable Solaris Operating Environment and is 100 percent binary compatible with all software that runs on the Sun Enterprise 3500–6500 server family	• Runs over 12,000 of some of the most extensively tested, highest quality software packages available today for both commercial and technical applications
• The Solaris Operating Environment is binary−compatible across all SPARC platforms, from desktops to enterprise servers	• Allows customers to deploy systems with confidence, knowing their applications can grow and their investment in network technology, software, and training will be protected

Features	Benefits
• The Solaris Operating Environment is supported on SPARC, x86, and PowerPC platforms	• Makes it easy to deploy applications developed on SPARC platforms on other platforms

Performance and Scalability

Features	Benefits
• Outstanding performance and functionality in a variety of application areas, including database, networking, groupware, and multiuser business applications	• Provides maximum productivity for individuals and workgroups
• Highly scalable symmetric multiprocessing (SMP)	• Accelerates application throughput by distributing tasks among multiple processors (MP) • Delivers exceptional MP system price/performance and investment protection
• Multithreading	• Enables a single application to be partitioned into independent components that can be executed simultaneously, reducing response time and increasing throughput

Reliability

Feature	Benefit
• Proven and reliable network operating system	• Maximum uptime for running business−critical applications

Low−Cost Data Management and Backup

Features	Benefits
• Solstice DiskSuite™ software provides data redundancy and enhanced disk system performance using RAID technology	• Increases data availability and speeds system throughput
• Journaling File System improves performance of directory operations and reduces file system check times during system restarts	• Enhances system throughput and increases system availability
• Solstice Backup™ software automates network backup, recovery, and media management	• Simplifies data administration, improves data security and availability

Global Networking and Resource Sharing

Features	Benefits
• Connectivity for TCP/IP, NFS, NetWare, IPX™/SPX, LAN Manager, and AppleTalk	• Enables complete corporate−wide connectivity and integration
• NFS	• Provides easy transparent network access to remote file systems, applications, and data on heterogeneous computer systems

Security

Feature	Benefit
• Simple Key Management for IP (SKIP) is a standard protocol that provides privacy and authentication services for data over the network	• Allows for secure communications over the Internet or intranet, without requiring any changes to the application

Electronic Mail

Feature	Benefit
• Sun Internet Mail Server™, a high−performance, Internet−standard mail server that supports diverse types of e−mail clients from a single mail server	• Provides fast e−mail response, scalability to support large numbers of users and large quantities of data

Internet Services

Features	Benefits
• WebNFS™ software is a robust and scalable file system that enables users to quickly access and share files over the Web	• Enables users to quickly access and share files over the Web
• Dynamic host configuration protocol (DHCP) allows administrators to easily add clients to the intranet by dynamically assigning IP addresses	• Eliminates need for administrator to assign IP addresses manually to each client
• HotJava™ Browser software provides an easy−to−use, customizable user interface	• Provides easy−to−use interface for installing software, performing web−based administration tasks, and accessing data over the Web
• Sun WebServer™ software	• Provides fast response for accessing data over the Internet or when performing Web−based administration tasks

Reliability, Availability, and Serviceability (RAS)

Reliability, availability, and serviceability are aspects of a system's design that affect its ability to operate continuously and minimize the time necessary to service the system. Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity. System availability refers to the percentage of time that a system remains accessible and usable. Serviceability relates to the time it takes to restore a system to service following a system failure. Together, reliability, availability, and serviceability provide for near continuous system operation.

To deliver high levels of reliability, availability, and serviceability (RAS), the Sun Enterprise™ 450 server offers the following features:

- Error correction and parity checking for improved data integrity
- Easily accessible status indicators
- Hot−pluggable disk drives
- Support for RAID 0, 1, and 5 storage configurations
- Environment al monitoring and fault protection
- N+1 power supply redundancy
- Hot−swappable power supplies
- Automatic system recovery (ASR)
- Hardware watchdog mechanism
- Three different levels of system diagnostics
- Remote System Control (RSC)

Cabinet

Hardware Dimensions

	U.S.	Metric
Height	22.87 in.	58.1 cm
Width	17.64 in.	44.8 cm
Depth	27.4 in.	69.6 cm
Weight	120–205 lb.	54.46–93.04 kg
Shipping Weight*	205 lb. max.	94 kg, max.

*Actual weight depends on the installed options

Environment

Temperature

	Fahrenheit	Celsius
Operating	41° to 95°	5° to 35°
Nonoperating	−4° to 140°	−20° to 60°

Humidity (noncondensing)

Operating	20% to 80% RH
Nonoperating	95% RH

Noise (in accordance with ISO 9296)

Operating acoustic noise	49/55 dB(A) closed office (idle/seeking)
Idling acoustic noise	57/65 dB(A) open area (idle/seeking)

Regulations

Meets or exceeds the following requirements.

Safety	EN60950/ IEC950 DEMKO, TUV UL 1950, CB Scheme IEC 950, C22.2 No. 950 from UL
RFI/EMI	EN55022/CISPR22 Class B VCCI Class II FCC part 15 Sub Part B
X−ray	DHHS 21 Subchapter J PTB German X−ray Decree

Requirements and Configuration

System Requirements

Operating System

The Sun Enterprise™ 450 server supports the following versions of the Solaris™ Operating Environment

- 400−MHz CPU: Solaris™ 2.51 (11/97), Solaris 2.6 (5/98), Solaris 7 (10/99), and Solaris 8 (1/00) Operating Environment
- 480−MHz CPU: Solaris (2.6) 5/98, Solaris 7 (10/99), Solaris 8 (1/00) Operating Environment

System Configuration

Base Model

- **A25−CA**: Sun Enterprise 450 server in deskside tower; four CPU slots, 16 memory slots, 10 PCI I/O slots, four hot−swap UltraSCSI disk bay, DVD, 1.44−MB floppy drive, removable media bay, 10/100 Ethernet, two power supplies, Solaris server license, no CPU, memory, or disk included, rackmountable.

Standard Configurations

- **A25−UJD1−1GFA1**: Sun Enterprise 450 server in deskside tower; includes 400−MHz CPU with 4−MB cache, plus three open module slots, 1−GB memory, 10 PCI I/O slots, DVD, two power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, one 18−GB 10000−rpm drive.
- **A25−UJD2−2GGB1**: Sun Enterprise 450 server in deskside tower; includes two 400−MHz CPUs each with 4−MB cache, 2−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, two power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, two 36−GB 10000−rpm drives.
- **A25−UMF2−2GGB1**: Sun Enterprise 450 server ; includes two 480−MHz CPUs each with 8−MB cache, 2−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, two power supplies, Solaris server license, four hot swap UltraSCSI disk bays, two 36−GB 10000−rpm drives.
- **A25−UMF4−4GGD1**: Sun Enterprise 450 server ; includes four 480−MHz CPUs each with 8−MB cache, 4−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, three power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, four 36−GB 10000−rpm drives.

Licensing/Usage

All Sun Enterprise 450 servers include a Solaris Server License.

System Administration

Built into the Solaris™ 8 Operating Environment are systems management and security features that will help deliver the computing environment demanded by these customers. Sun also offers unbundled systems management products that will supplement the systems management features in the Solaris 8 Operating Environment. Together, the Solaris 8 Operating Environment management features and Sun's unbundled systems management products create one of the most stable and available computing environment, in the industry.

Virtually any administrative task can be executed over a remote connection from any client by an authenticated administrator. And since a Solaris Operating Environment rarely requires rebooting, administrators will not lose their network connection when adding new software or reconfiguring the system. Solaris Operating Environment applications can be installed or upgraded on a Solaris server without affecting users and without disabling the network services running on that computer.

Software

OpenBoot™ Diagnostics

OpenBoot™ Diagnostics (OBDiag) reside in flash PROM on the server's main logic board. OBDiag can isolate errors in the following system components:

- Main logic board
- Diskette drive
- Internal DVD drive
- Tape drive
- Disk drives
- Any option card that contains on−board self−test capabilities

OBDiag tests not only the main logic board, but also its interfaces:

- PCI
- SCSI
- Ethernet
- Serial
- Parallel
- Keyboard/mouse

OBDiag reports test results via the LEDs located on the system front panel. OBDiag also displays detailed diagnostic and error messages on a local console or terminal, if one is attached to the system.

OBDiag tests run automatically under certain conditions. Users can also run OBDiag interactively from the system OK prompt. When users run OBDiag interactively from the OK prompt, they invoke the OBDiag menu, which lets users select which tests they want to perform. The system also provides configuration variables that users can set to affect the operation of the OBDiag tests.

OpenBoot Firmware

The OpenBoot firmware is stored in the boot programmable read−only memory (PROM) of the system. It is executed immediately after the customer turns on the system. The primary task of the OpenBoot firmware is to boot the operating system from either a mass storage device or from a network. The firmware also provides extensive features for testing hardware and software interactively.

The OpenBoot firmware provides a command line interface for customers at the system console. Customers can enter the OpenBoot environment by halting the operating system, using the Stop−A key sequence from the keyboard, or by power−cycling the system.

The OpenBoot device tree is a data structure that describes both the permanently installed and plug−in devices attached to a system. Both the user and the operating system can determine the hardware configuration of the system by inspecting the OpenBoot device tree.

Power On Self Test (POST)

The POST diagnostic code resides in flash PROM on the system's main logic board. It runs whenever the system is turned on or when a system reset command is issued. POST tests the following system components:

- CPU modules
- Memory modules
- NVRAM
- Main logic board

POST reports its test results via LEDs located on the system keyboard and on the system front panel. POST also displays detailed diagnostic and error messages on a local terminal, if one is attached to the system's serial port A.

ShowMe How™ Software: State of the Art Installation and Maintenance Instruction

ShowMe How™ software is a documentation system that presents information in a highly understandable multimedia format. ShowMe How software is included in Solaris Easy Access Server package. Installation and service tutorials, as well as reference information provide users with comprehensive, easy−to−use instruction. ShowMe How software streamlines installation and maintenance to lower service costs and maximize system uptime. Some of the features of this CD−ROM distributed tool are:

- Movies of installation and replacement procedures (can be played through ShowMe TV™ software)
- Photo sequences with narrated installation and replacement procedures
- Text−based instructions (can be viewed on−line and printed, excerpted from standard Sun documentation)
- Photos with active callouts link to more detailed photos and text−based reference information

Solaris Bandwidth Manager Software

Solaris Bandwidth Manager software, available with Solaris for ISPs™ server software, allows the administrator to control the bandwidth assigned to particular applications, users, and departments that share the same Internet link. By installing Solaris Bandwidth Manager software on their network's major links and application servers, and by setting consistent policies, customers can distribute bandwidth evenly. And customers can prioritize traffic, preventing a small number of applications or users from consuming all available bandwidth.

Solaris Bandwidth Manager software enables customers to:

- Provide differentiated classes of service to users, and bill accordingly
- Provide bandwidth to priority users, applications, or servers
- Reduce traffic congestion and increase network efficiency
- Control users and applications in their access to network resources
- Gather detailed network use statistics and accounting data for usage−based billing

Solaris Bandwidth Manager software enables network service providers to get the most out of their existing network resources. It helps them to enable adequate levels of service to their customers, and collect accurate accounting information for usage−based billing.

Solaris Management Console™ Software

Solaris Management Console™ software, an integral component of Solaris Easy Access Server software, makes it easy for administrators to configure and administer Solaris Operating Environment systems. Based on Java™ technology, Solaris Management Console software can launch any UNIX® application on any Solaris server in a network. It provides views of servers on the network as well as applications on those servers, which allows for easy local and remote administration of multiple servers running Solaris Management Console software. It also delivers powerful capabilities to make the process of adding users, hosts, or applications as simple as pointing and clicking from virtually any client on the network.

Solaris Management Console software enables administrators to register other Solaris Management Console servers and applications on the network. When the console is accessed, it dynamically configures tree views of registered hosts and services, making it easier to manage each Solaris server. Solaris Management Console software enables administrators to view activity on all their servers and modify applications and services running on them.

Solaris Management Console software allows administrators to launch applications, such as administration tools on a remote server, while monitoring the application via a light front−end GUI on the client. This eliminates the need to download large applications over the network and install and run them on the client. With Solaris Management Console software, remote servers can be managed easily with tools already located on the server. This remote capability allows administrators to manage administrative and network services from home or virtually any other location without having to come in to the network operation center when a trouble call comes in.

Solaris Management Console software makes Solaris Operating Environment administration easier by providing:

- Centralized administration−current Solaris Operating Environment administration tools can be integrated and run from one location
- Centralized management−all servers on a network can be managed from a single console
- Single login−eliminates multiple logins into applications launched by Solaris Management Console software
- Instant access to administration tools by running existing Solaris Operating Environment administration tools found in Solaris Easy Access Server

Solaris Management Console software also provides a set of wizards to simplify complex administration tasks:

- DNS server configuration
- DNS client configuration
- Default router modification
- Change root password

- Network connection computer
- Shutdown/restart computer

Solaris Administration Wizards software can be run from Solaris Management Console software or invoked via the command line. The wizards make the Solaris Operating Environment easy to administer by providing a point−and−click, Java technology−based graphical user interface (GUI) for configuring Solaris Operating Environment systems.

Solaris Resource Manager™ Software

Solaris Resource Manager™ software is a tool for enabling resource availability for users, groups and applications. It provides the ability to allocate and control major system resources such as CPU, virtual memory, and number of processes. Solaris Resource Manager software is the key enabler for server consolidation and increased system resource utilization. With this product, multiple applications and groups receive a consistent level of service on a single server. In fact, resources can be allocated to the individual user. Resource utilization can actually increase because unused capacity is dynamically allocated to active users and applications. Systems can become easier to manage because system administrators have the ability to set and enforce resource usage policies. Solaris Resource Manager software makes resource usage data available for use in user−defined reports, accounting tools and scripts.

Solaris Resource Manager software includes the following features:

- Ability to control CPU, virtual memory, number of processes, number of logins, and connect time
- Dynamically allocate resources according to predefined policies
- Map resources to groups within applications and individual users within groups
- Ability to automate dynamic resource allocation through easy to set resource policies

Solaris WBEM Services

Part of the Solaris Easy Access Server, Solaris WBEM Services makes the Solaris Operating Environment manageable by tools from other enterprise management vendors. It also allows Solaris software tools to manage existing heterogeneous networks. This is because WBEM is compatible with existing major protocols, such as Simple Network Management Protocol (SNMP), Desktop Management Interface (DMI), and Common Management Information Protocol (CMIP). Developers can write WBEM agents or providers to convert information from these protocols to the CIM schema.

Solaris WBEM Services contains a set of tools (Sun WBEM SDK) and services to make it easier for software developers to create applications based on the CIM schema and XML/HTTP communication standards that manage Solaris software systems and administer the Solaris Operating Environment. By combining information from diverse applications, objects from different vendors can be managed as if they were from one vendor, which can greatly reduce the complexity and cost of managing such a heterogeneous system.

Solaris Web Start Software

Solaris Web Start software, a key component of the Solaris Operating Environment, is an easy−to−use Java technology−based application that guides system administrators through the installation of both the Solaris Operating Environment and copackaged application software. Solaris Web Start software makes installing the Solaris Operating Environment as simple as clicking a button. Solaris Web Start software offers the industry's first Web−based installation process, enabling all of the setup and administration to be done locally or remotely through a web browser. It also virtually eliminates the UNIX system administration normally associated with software installation and setup. As a result, Solaris Operating

Environment and copackaged software can be installed by less−experienced administrators, or administrators familiar with Microsoft Windows installations, safely and easily.

Solaris Web Start Wizards™ Software

Solaris Web Start Wizards™ technology extends the point−and−click simplicity of Solaris Web Start software, bringing this same ease of use to applications written for the Solaris Operating Environment. Built into new applications, Solaris Web Start Wizards software simplifies the installation, setup, and administration of native Solaris Operating Environment and Java technology−based applications.

Applications built with Solaris Web Start Wizards software can be installed on a Solaris Operating Environment system locally or remotely from virtually any client running a web browser supporting the Java programming language.

With Solaris Web Start Wizards software, the source for an application may be a CD−ROM drive on the administrator's PC, a drive on the network, or a URL on the Web. The administrator may be using a Solaris Operating Environment workstation, a Microsoft Windows or Macintosh PC, or a network computer.

Solaris Web Start Wizards software is based on technology supplied by and supported by InstallShield Software Corporation, a industry−leading install tools vendor. For administrators, the inclusion of Solaris Web Start Wizards software with the Solaris Operating Environment makes installing applications as easy as installing Microsoft Windows applications.

Solstice AdminSuite™ Software

Solstice AdminSuite™ software is a collection of graphical user interface tools and commands that enable system administrators to locally or remotely perform tasks such as managing users, groups, hosts, system files, printers, disks, file systems, terminals, and modems.

Solstice Backup™ Software

The Solstice Backup™ software products provide a tightly integrated backup and storage management solution for distributed enterprise environments. It provides scalable, high−performance, lights−out data protection and management services for environments ranging from a stand−alone server to networks with hundreds of multi−platform systems and multi−gigabytes of data. This solution delivers the best heterogeneous data protection available today and provides consistent, reliable data protection as well as comprehensive, automated storage management. These products reduce administrative overhead, improve data accessibility to users and applications, and reduce cost of ownership.

Solstice Backup software allows a Solaris Operating Environment server to provide automated, high−performance backup, recovery, and storage management services to a wide array of machines on the network. This heterogeneous platform support enables a consistent, centralized approach to data storage management across the enterprise. Solstice Backup software, through the use of its SNMP module, can be integrated with Solstice Site Manager™ software, Solstice Domain Manager™ software, and Solstice Enterprise Manager™ software for improved, centralized network management of larger, complex environments.

Solstice Backup software provides simple, centralized administration through a single, unified view of the entire data management operation from any point on the network. All Solstice Backup software applications are cooperatively managed and fully integrated, greatly simplifying administration in a large, dynamic environment. Intuitive user interfaces simplify administrative tasks such as configuring clients and servers and setting up enterprise−wide backup schedules for file systems and databases. Network users can also backup, recover, or archive their local files without assistance from the system administrator.

Solstice Backup software delivers high−speed backup through parallel processing of client backup that can be directed to multiple devices simultaneously. This dramatically improves client performance and backup throughput for reduced backup time.

Through archival services, data can be optionally removed from disk for conservation of storage space once it has been safely stored off−line. Hierarchical storage management services automatically moves less frequently used data on disk to less expensive media, freeing up on−line storage space. Automated media handling such as labeling and mounting media reduces operator intervention.

Solstice Backup Server Edition software brings high−performance, automated, unattended parallel backup and restore capabilities to stand−alone servers. The Server Edition software is ideally suited for backup/restore services for high−volume database and file servers. The Server Edition software can be upgraded to the Network Edition software to support network backups.

Solstice Backup Network Edition software delivers network storage backup for distributed networks of servers and clients. The Network Edition software is ideally suited for multiplatform, enterprise−wide installations.

Solstice CMIP Software

Solstice CMIP 8.2.1 software is the foundation of the Solstice Telecommunications Management Network (TMN) product family. It is the Common Management Information Protocol (CMIP) for other Solstice™ TMN software products such as Solstice Enterprise Manager software, Solstice TMN Agent Toolkit, Solstice TMN Agent Tester, Solstice TMN/SNMP Q−Adaptor, and Solstice TMNscript™ software.

Solstice CMIP software is the ideal solution for system integrators and telecommunications equipment manufacturers who want to develop CMIP−based management applications for their products and to deploy these applications to their customer base.

Solstice CMIP software enables the development and deployment of TMN applications and is delivered as two related products. The Solstice CMIP Standard Development Environment (SDE) is used to develop management applications that conform to the TMN management model.

Solstice CMIP Runtime (RT) is a standard implementation of the CMIP and the Common Management Information Service (CMIS). When it is combined with the SunLink™ OSI Communications Platform, Solstice CMIP RT forms a TMN Q3 stack and supports any application developed using Solstice CMIP SDE.

Solstice DiskSuite™ Software

Solstice DiskSuite™ software, part of Solaris Easy Access Server, is a disk and storage management solution for enterprise environments. It provides high data availability and reliability, delivers excellent I/O performance, and simplifies large system and disk administration. With Solstice DiskSuite software, customers get a powerful set of tools to enhance data availability.

- **Mirroring**

  Solstice DiskSuite software provides a comprehensive data−redundancy solution. It transparently maintains a mirror copy of data on another disk, and automatically uses the surviving copy in the event of hardware failure.

- **RAID 5**

  The RAID 5 feature in Solstice DiskSuite software provides highly available data storage at a lower cost—using less disk space—than mirroring. By distributing parity information across all disks in the RAID array, it allows recovery from any single disk failure within the array without the loss of data.

- **Hot spare**

  Online system recovery is supplemented by the use of a hot−spare utility that automatically replaces failed mirror or RAID−5 components. This facility migrates new partitions to replace failing ones. Users continue to access the surviving copy of the data—while a new mirror is automatically generated —with no interruptions of operation.

- **UNIX File System (UFS) logging**

  When coming back online after a reboot, UNIX software typically checks file systems for integrity. Although a time−consuming process−especially on large systems−it was necessary to avoid data corruption. With the UFS logging feature in Solstice DiskSuite software, the need for this process has been eliminated. Reboots are much shorter, and system recovery is faster.

Solstice DiskSuite software offers a powerful yet simple graphical user interface (GUI) in addition to the traditional command−line interface. The GUI provides error−free setup of disks such as mirrors and UFS logs, as well as easy, on−going administration of disk subsystems. It delivers a visual representation of the storage subsystem along with drag−and−drop capabilities, both of which are invaluable in managing large, complex disk subsystems.

Other Solstice DiskSuite software features:

- Disk striping enables parallel I/O and load balancing for improved performance
- Alternate pathing support enables Solstice DiskSuite software to use multiple data paths in the case of failure
- A performance monitor helps eliminate bottlenecks
- Concatenation and the grow file system command allow the construction of large, logical devices, and enable online expansion and reconfiguration

Solstice Domain Manager Software

Solstice Domain Manager software is designed for managing larger sites (1,000 to 10,000 nodes). Solstice Domain Manager software provides the scalability and the extra features and user tools needed to manage large sites or multiple sites effectively. Solstice Domain Manager software includes Solstice SunNet Manager™ 2.3 software with no restriction on the number of managed nodes, the full version of Solstice Cooperative Consoles, and an advanced Layout Tool. Solstice Domain Manager software also includes the same tools as Solstice Site Manager software.

To achieve a high level of scalability and remote management, the proxy agent is included in Solstice Domain Manager software. The proxy agent distributes the SNMP polling allowing Solstice Domain Manager software to manage up to 10,000 nodes. The proxy agent also facilitates remote management as all of the polling is localized at the remote site and information is sent back to console via reliable RPC.

Solstice Domain Manager software has full console distribution, meaning it can send and receive information to other consoles. Multiple Solstice Site Manager software systems can feed information into a Solstice Domain Manager software or multiple Solstice Domain Manager software systems, hooked up as peer−to−peer, to share administration capabilities. Solstice Domain Manager software also has an advanced topology Layout Tool. In a large network there are many icons, and users are concerned about the organization of these icons on the console. The Layout Tool addresses this concern by organizing icons by visual representation on the console.

Solstice Domain Manager software solutions should meet the majority of management needs. But just in case, there are 300+ applications that run on Solstice Site Manager and Solstice Domain Manager software for additional network management and data analysis.

Solstice Enterprise Agents Software

Solstice Enterprise Agents software, included in Solaris Easy Access Server, enables a Sun server to be managed from Simple Network Management Protocol (SNMP)−based system/network management tools. Solstice Enterprise Agents software is based on an extensible agent technology or manager/subagent technology. The manager agents receive and respond to SNMP or desktop management interface (DMI) requests. After retrieving the appropriate values from the respective subagents, responses are sent. The subagents manage information bases (MIBs or MIFs) designed for specific components and applications.

Solstice Enterprise Manager Software

Solstice Enterprise Manager (Solstice EM) software is an advanced management platform designed for managing large enterprises or complex network element devices. It provides the scalability and features to better organize and manage large environments.

Solstice EM software is designed for customers who need to:

- Accommodate network growth
- Automate identification of network problems
- Manage multiple protocols from a single system

Solstice EM software is a standards−based, object−oriented, distributed network management platform that allows customers to monitor, evaluate, and refine the network. It provides tools for performing common network management tasks, such as fault management, performance management, and configuration management, and includes an application programming interface that allows developers to integrate Solstice EM software capabilities into their network management environment.

Solstice EM software provides the following features and functions:

- Support for CMIP, SNMP, and Solstice SunNet Manager software remote procedure call (RPC) protocols
- Full conformance with the TMN standards
- Support for multiple concurrent users
- Graphical user interface (GUI) applications for managing networks
- Application programming interface (API) for developing user−specific applications that integrate with the Solstice EM software platform

To help isolate complex system or network problems, the Solstice Enterprise Manager Nerve Center technology provides advanced event correlation. Plus, Solstice Enterprise Manager supports multiple protocols such as SNMP, CMIP, and allows support for proprietary protocols.

Solstice Cooperative Consoles™ software will connect Solstice Site Manager software and Solstice Domain Manager software to Solstice Enterprise Manager software.

Solstice Site Manager Software

Solstice Site Manager software is designed for small site management of PC−LAN servers, networking, and UNIX technology−based devices. Solstice Site Manager software is intended to address small site management by cost−effectively centralizing the management efforts.

Solstice Site Manager software includes Solstice SunNet Manager 2.3 software with a license restriction of 100 nodes, along with the sender portion of Solstice Cooperative Consoles software which allows management data (topology, events, and traps) to be forwarded to Solstice Domain Manager software.

All of the Solstice SunNet Manager software tools are incorporated into Solstice Site Manager software. Discover Tool automatically finds devices on the network and populates the database. Request Management handles data or event requests. Browser Tool simplifies reviewing problem areas. Finally, Grapher Tool allows data to be quickly displayed in 2−D or 3−D graphics.

Solstice Site Manager software also includes the SNM Proxy agents for remote management. In this scenario, all of the polling is localized at the remote site and sent back to the console via reliable RPC.

Solstice Site Manager software can centralize LAN management by accessing the NetWare Management Agent (NMA) 2.0. This agent resides on a NetWare server that also has TCP/IP installed on it. The NMA agent allows Solstice Site Manager software to manage the NetWare server's file system, print queues, user groups (who is logged in), and other key attributes.

Solstice Site Manager software can also import the topology data from the Novell ManageWise network management console. With this feature, Solstice Site Manager software can view the PCs that are on the NetWare LAN as a separate view from the IP network that it is managing.

Solstice TMN Product Set

Sun provides a range of telecommunications management network (TMN)−based products that let customers develop and deploy both agent and manager applications for the network. The products in the Solstice TMN product set are listed below:

- Solstice GDMO Builder
- Solstice TMN Agent Toolkit
- Solstice TMN Agent Tester
- Solstice Enterprise Manager software
- Solstice TMNscript Toolkit™
- Solstice TMNscript Runtime™
- Solstice TMN/SNMP Q−Adaptor Toolkit
- Solstice CMIP Runtime
- Solstice Enterprise Manager Dev Plus Kit
- Solstice OSI
- Solstice CMIP SDE
- Solstice TMN/SNMP Q−Adaptor Runtime

The definition of managed objects, software abstractions representing the management view of resources, is the core of network management using the TMN model. The Solstice GDMO Builder includes most of the object models that have been defined by standards organizations, for example ISO and the ITU−T. This means that customers can import and use objects from these models and then either modify them or add to them to tailor the object model to their own needs.

The Solstice GDMO Builder software provides the following tools:

- The Model Editor−a graphical tool for browsing and editing GDMO templates
- A GDMO/ASN.1 Semantic Checker−so customers can check the validity of the GDMO model
- A Proforma generator−a graphical tool for producing conformance statements
- A central database for storing GDMO models−so users can reuse objects they have created

Solstice TMN Agent Toolkit software greatly simplifies the development of TMN agent applications. It does this by automating a large part of the agent development process.

Solstice TMN Agent Toolkit has the following components:

- An ASN.1/GDMO compiler
- A library of functions common to all TMN agents (referred to as the core agent) with APIs to use when adding functions
- Commonly used object modules, used for logging information and forwarding events

Solstice TMNscript software provides a simple interface to CMISE services, allowing easy management of information model data. This facilitates the integration of systems based on the telecommunications management network (TMN) model and legacy systems. Solstice TMNscript software can also be used to build stand−alone applications, to create dedicated test tools quickly or to prototype complex management services.

Solstice TMNscript software allows customers to develop applications in the following languages:

- **Tcl**

  Solstice TMNscript software provides an extension to the generic Tcl scripting language so that customers can access CMISE services from within an application written in the Tcl language.

- **Java programming language**

  Solstice TMNscript software provides Java programming language classes that allows customers to access CMISE services from within an application written in the Java programming language.

- **C**

  An example C API allows customers to execute Solstice TMNscript commands from within programs written in the C language.

Solstice TMNscript provides client interfaces which make it possible to access the functions of Solstice TMNscript from programs written in the Java programming language or Tcl. This allows access to CMISE services from any hardware platform and not just from machines that are running Solstice TMNscript software and Solstice CMIP software.

The Solstice TMN Agent Tester software accelerates the testing of TMN agents, allowing them to be tested in isolation before they are integrated with TMN managers and deployed on the network.

Solstice TMN Agent Tester software is fully compatible with Solstice GDMO Builder and Solstice TMN Agent Toolkit software, but can also be used to validate TMN agents developed using other development tools.

To deploy a TMN application, customers require a protocol stack and a manager application. In TMN, managers and agents are connected by the Q3 protocol stack. The Solstice Enterprise Manager TMN Q3 software Interface has the following component parts:

- Solstice CMIP Runtime
- Solstice OSI
- The CMIP Management Protocol Adaptor (MPA) that forms part of Solstice Enterprise Manager software

Solstice CMIP software comes with an RFC 1006 module, which means that it is also possible to use it over the TCP/IP protocol set, allowing TMN applications to be deployed in TCP/IP environments. Both CMIP over OSI and CMIP over TCP/IP are valid Q3 stacks.

TMN applications can be managed using Solstice Enterprise Manager software. Solstice EM software is particularly well−suited for use in large, complex networks and has been designed for customers who need to:

- Accommodate network growth
- Automate identification of network problems
- Manage multiple protocols from a single system

Solstice EM software is a standards−based, object−oriented, distributed network management platform that allows customers to monitor, evaluate and refine the network. It provides tools for performing common network management tasks, such as fault management, performance management, and configuration management, and includes an application programming interface that allows developers to integrate Solstice EM software capabilities into their network management environment.

Solstice EM software provides the following features and functions:

- Support for CMIP, SNMP and Solstice SunNet Manager software remote procedure call (RPC) protocols
- Full conformance with the TMN standards
- Support for multiple concurrent users
- Graphical user interface (GUI) applications for managing networks
- Application programming interface (API) for developing user−specific applications that integrate with the Solstice EM platform

Solstice TMNscript software can be used to develop simple manager applications for use with a straightforward agent, or on a small system or network. This avoids the overheads involved in deploying a more complex system, such as Solstice Enterprise Manager software. Solstice TMNscript software can also be used to develop large applications for situations where the services provided by Solstice Enterprise Manager software are not required and for integration with legacy management systems.

The Solstice TMN/SNMP Q−Adaptor software enables a TMN management network and an SNMP management network to interoperate by enabling CMIP managers to manage SNMP agents. Using Solstice TMN/SNMP Q−Adaptor software, telecommunications operators and service providers can immediately integrate SNMP subnetworks within their TMN management framework. Telco manufacturers can immediately upgrade their existing SNMP devices to TMN standards.

There are two versions of the Solstice TMN/SNMP Q−Adaptor software. Solstice TMN/SNMP Q−Adaptor Runtime software provides a default translation dictionary that supports the standard SNMP MIB−II and Sun−specific extensions to MIB−II. Solstice TMN/SNMP Q−Adaptor Toolkit software allows customers to extend the capabilities of the runtime product to support proprietary SNMP MIBs.

Sun Bandwidth Allocator Software

Sun Bandwidth Allocator software allows Internet service providers (ISPs) and enterprise MIS departments to perform bandwidth provisioning and accounting to help ensure quality of service to their customers.

MIS departments need to be able to help ensure their users quality of service, and ISPs need to offer their customers Service Level Agreements. In order to do this, they must to be able to:

- Provide increased bandwidth and quality of service
- Monitor the levels of bandwidth and quality of service they are providing
- Keep corresponding accounts

Sun Bandwidth Allocator software is a product that provides the means to perform all of these actions. By installing Sun Bandwidth Allocator on the network’s major links and known congestion points−and by setting consistent policies−customers can implement bandwidth control throughout the network.

By enabling control of the bandwidth allocated to users, applications, and organizations which are sharing the same link, Sun Bandwidth Allocator software provides the means to enable service providers to deliver adequate levels of service without overprovisioning their network equipment. The traffic prioritization provided by Sun Bandwidth Allocator software can reduce the risk of network congestion and prevents a small number of applications or users from consuming all the available bandwidth.

Sun Bandwidth Allocator software controls traffic sent over a link. It can be installed as a Traffic Manager or as an Application Performance Manager. Installed in "IP−transparent mode" on a device which controls access to the network (LAN, WAN, or Internet), it controls traffic while remaining transparent to IP users. The IP traffic is prioritized by application, traffic type, or customer.

Installed as an Application Performance Manager, Sun Bandwidth Allocator software controls IP traffic from a server to the network (LAN, WAN, or Internet). The server may be a file server, a web server, or any applications server. Traffic can be controlled by application and/or by customer.

Sun Bandwidth Allocator software provides the following functions:

- Provisioning by rule enforcement
- Remote monitoring
- Web flow accounting
- Provisioning rules

Sun Bandwidth Allocator software manages traffic transmission based on provisioning rules which sort and prioritize traffic according to:

- Traffic type (for example, http, ftp, e−mail, news, Telnet, or NFS software traffic)
- End−user source or destination address
- Network source or destination address

Sun Bandwidth Allocator software provides real−time statistics on resource usage. These can be accessed via a Java technology−based GUI, Solstice Enterprise Manager software, or any SNMP manager (for example, Solstice Domain Manager or Solstice Site Manager software). A statistics API enables customers to integrate Sun Bandwidth Allocator software statistics into their own monitoring systems.

Flexible accounting schemas allow payment by class of service, per customer, or by actual bytes or packets transferred. A web flow agent collects statistics information and outputs it in ASCII format, which can be automatically sent to a billing system.

Sun Bandwidth Allocator software manages any type of IP−based traffic. It is transparent, and works within a heterogeneous environment without any modification of the systems accessing the gateway.

A comprehensive and user−friendly Java technology−based configuration utility makes it easy to specify bandwidth allocation policies and perform remote management from virtually anywhere on the network.

Reporting utilities can be used to monitor network use by traffic type and by IP address.

The product runs over WAN and LAN links such as Ethernet and FDDI. It can also be integrated with web servers to provide outgoing flow control.

Sun Cluster Software

Sun Cluster software provides higher levels of availability than is possible with a single server. This solution automates recovery from any single hardware or software failure by automatically restarting a failed application or migrating the application and its resources to a backup server in the event of a hardware failure.

Sun Cluster software provides mainframe−class reliability, availability, and scalability for e−commerce, ERP, data warehousing and other mission−critical applications and services. It delivers an easy−to−use, continuously available, multiplatform clustering solution that is completely integrated with the Solaris Operating Environment.

Key features of Sun Cluster software include support for Solaris 7 and 2.6 Operating Environment, up to four clustered nodes from Sun’s entire line of servers, failover agents for key applications, and a unified clustering foundation for standard and parallel applications.

Highlights:

- Cluster up to four servers to meet the needs of any workgroup, department, or data center
- Run both standard and parallel applications on the same cluster
- Dynamically add nodes
- Manage the cluster through the easy−to−use Sun Cluster Management Console
- Fault management API to customize applications for high availability
- Individual application failover, local application restart, and local network adaptor failover for fast recovery
- High−speed cluster interconnects and high−bandwidth networking deliver exceptional throughput

Sun Enterprise Authentication Mechanism™ Software

Sun Enterprise Authentication Mechanism™ software, a component of Solaris Easy Access Server, delivers an extra layer of security inside the firewall to protect the enterprise from unauthorized access. Through powerful authentication and single sign−on capabilities, Sun Enterprise Authentication Mechanism software provides increased data privacy and integrity.

While firewalls are designed to fend off intruders from the outside, they cannot address security incidents that originate from within. Today, growing evidence indicates that most security breaches start with people inside−or known to−the enterprise. For true network security, customers need to take steps to protect the company's valuable data resources from unauthorized access−from both inside and outside the enterprise.

Sun Enterprise Authentication Mechanism software provides the extra layer of security customers need to protect the enterprise. By combining centralized authentication with strong encryption, Sun Enterprise Authentication Mechanism software provides a more secure login process, which helps customers to better protect their data privacy and integrity.

- **Centralized authentication and management**

  Sun Enterprise Authentication Mechanism software offers a single repository for enterprise authentication information called the Key Distribution Center (KDC). The KDC maintains a database of user, server, and password information. Through that database, Sun Enterprise Authentication Mechanism software can authenticate users, servers, and applications. Anyone and everyone attempting to access information must first be checked against the KDC database before being ticketed as an authenticated user. Because security information is centralized, Sun Enterprise Authentication Mechanism software allows customers to manage and control all enterprise−wide logins from a single console, which helps their enterprise reduce the total cost of administering and managing security.

- **Strong encryption support**

  Sun Enterprise Authentication Mechanism software provides strong encryption support. During the authentication process, all the information exchanged between customers and the KDC is encrypted for an extra level of security. Sun Enterprise Authentication Mechanism software also uses an encrypted channel when storing KDC entries over the network.

- **Ease of use**

  Sun Enterprise Authentication Mechanism software supports a Java technology−based administrative tool for easy access and configuration. It also enables users to load authentication information in batch mode, which is particularly useful if the enterprise loses or gains large numbers of users each year.

  Sun Enterprise Authentication Mechanism software supports single sign−on capabilities. With single sign−on, Sun Enterprise Authentication Mechanism software can authenticate users (to gain access to multiple applications) by ticketing them only once when they first log in. It also spares users the need to memorize multiple passwords, or enter passwords multiple times in a session.

- **Higher availability**

  Sun Enterprise Authentication Mechanism software's distributed architecture provides enterprises with higher availability. With Sun Enterprise Authentication Mechanism software, customers can replicate their security information. This provides faster access to information as well as duplicate copies in the event of an emergency. Should the master KDC fail, the read−only replicated slave KDC still holds the necessary information for the authentication process to take place without interruption. What's more, if the master becomes unrecoverable, customers can easily convert the replicated slave to be the new master.

- **Faster performance**

  Sun Enterprise Authentication Mechanism software is faster and more reliable because its replicated KDCs reduce contention for security verification from across the enterprise. For example, replicas may be created for use by different business divisions or remote offices. Instead of competing for a single copy, the division or office has its own copy. Consequently, access to secured applications becomes faster.

- **Multiple realms**

  Sun Enterprise Authentication Mechanism software supports multiple realms. A realm is the set of users or servers registered with a specific KDC−basically, the scope of authentication for a given KDC. Separating an enterprise into multiple realms enables Sun Enterprise Authentication Mechanism software to operate across organizational boundaries and between different systems. A client in one realm can be authenticated to a server in another.

  Sun Enterprise Authentication Mechanism software allows enterprises to isolate individual departments from each other, decentralizing control to local network administrators. For large corporations, realms enable Sun Enterprise Authentication Mechanism software to be configured to allow administration at the local level.

- **A more secure environment**

  Currently, Sun Enterprise Authentication Mechanism software supports secure ftp, NFS software, Telnet, and r* commands. These secure network services, combined with strong encryption support, enable the enterprise to preserve data privacy and data integrity by eliminating snooping around the network and tampering with data. With Sun Enterprise Authentication Mechanism software, users can access files securely over the network.

- **Interoperability**

  Sun Enterprise Authentication Mechanism software is compliant with Internet RFC 1510 and RFC 1964. These RFCs define the Kerberos V5 protocols, the de facto industry standard. Through this standards compliance, Sun Enterprise Authentication Mechanism software allows enterprises to integrate with other vendors' compliant security products.

- **Cost−effective**

  Because Sun Enterprise Authentication Mechanism software is included in Solaris Easy Access Server, it offers feature−rich security mechanisms−with unlimited usage−at a significantly lower cost than many third−party solutions available today.

  It requires fewer administrators because it is centrally managed, enabling customers to lower the cost of securing their enterprise.

- **Programmable security APIs**

  Sun Enterprise Authentication Mechanism software allows ISVs to secure their applications by Remote Procedure Call API (RPCSEC_GSS). This API is an implementation of the RPCSEC_GSS security protocol defined in Internet RFC 2203. When future security products from Sun or third−parties become available, these products can be easily plugged into the interface without requiring modifications to the application, enabling customers to adopt evolving security technologies quickly

and easily. For example, if Sun developed a public−key security mechanism in the future, this mechanism would be easily accessible by any application that uses the RPCSEC−GSS interface.

Sun Management Center Software

Sun Management Center software is a scalable, SNMP−based platform for managing Sun servers. The most advanced systems management solution from Sun to date, Sun Management Center software offers a single point of management for all Sun servers, desktops, storage systems, the Solaris Operating Environment, applications, and data center services.

Sun Management Center software lets customers scale from management of a single system to thousands of systems on a single, unified management platform. And it integrates easily with leading third−party platforms for added flexibility.

With predictive failure reporting and comprehensive event and alarm management, Sun Management Center software warns customers of potential problems−so they can solve them before they cause downtime.

Sun Management Center software simplifies the management of their Sun environment, so customers can use their administration staff and technical resources more efficiently and help reduce the cost of delivering network services.

Sun Management Center software enables administrators to spend more time optimizing service delivery, less time dealing with management complexity. For example, Sun Management Center software provides remote online control, so administrators can work from virtually anywhere. "No cease" management provides uninterrupted monitoring while new features are added or existing features are reconfigured. And built−in security enables multiple administrators with different responsibilities to manage the environment.

Sun Management Center software provides real−time system performance and configuration data, enabling administrators to isolate bottlenecks. It even provides optional centralized data storage and performance analysis, including historical trend analysis.

Sun Management Center software delivers everything administrators need to perform remote system configuration, monitor performance, and isolate hardware and software faults−all through an easy−to−use Java technology interface. It provides:

- A single point of management, enabling administrative resources to be used more effectively
- Active configuration management controls, providing a secure interface for remote dynamic reconfiguration capabilities and helping to ensure availability
- A single event model, enabling information to be shared with multiple consoles or users with ease
- Multiple system support, enabling administrators to monitor and manage all Solaris Operating Environment systems remotely
- Predictive failure analysis, enabling administrators to predict potential failures before they occur
- Health monitoring, along with suggested steps for problem resolution, resulting in simplified administration
- Logical element grouping, enabling Sun systems to be grouped by geographical location, server role, administrative responsibility, among others
- A comprehensive topology map, providing a high−level view of all the objects that are being managed, along with hierarchies
- Automatic discovery of Sun systems, including IP address, subnet address, hostnames, and more
- Event and alarm management, providing administrators with the information they need when they need it

- Enterprise−wide security measures, such as authentication, data integrity, and access control lists for management of data and active management functions
- Standard interfaces and protocols, enabling integration with third−party management tools, including Tivoli, Computer Associates, and BMC
- A Java technology interface, providing heterogeneous GUI support, a common look−and−feel for all Sun Management Center applications, and the flexibility to manage the enterprise from any platform using Java technology

SunScreen™ Secure Net Software

SunScreen™ Secure Net software is a bundled solution which includes SunScreen EFS™ and SunScreen SKIP software. It enables users to establish a secure business network. SunScreen Secure Net software is a comprehensive security solution (including one of the industry's fastest firewalls) that builds on the power of the Solaris Operating Environment.

The customer can configure SunScreen Secure Net software to be a stealth box like the current SunScreen SPF−200 software, including hardening the operating system. Or the customer could select a few interfaces to be stealth and elect for other interfaces to be SunScreen EFS software interfaces, thereby allowing for functionality such as proxies. This gives SunScreen Secure Net software a unique capability of using stealth when connecting to untrusted networks (e.g., the Internet), while providing added functionality of proxies in other interfaces.

SunScreen SPF−200 Software

SunScreen SPF−200 software is Sun's strongest platform for perimeter defense, providing secure business operations over the Internet. SunScreen SPF−200 software uses a stealth design to prevent attack and state−of−the−art SunScreen SKIP encryption to protect data going over the network. SunScreen SPF software's advanced dynamic packet filtering coupled with Sun's high−speed hardware is designed to meet the most demanding performance requirements.

SunScreen EFS software was rated the fastest firewall in a recent Data Communications performance test that included the top firewall vendors. Given SunScreen SPF software's internal design and optimization, SPF should run even faster. The performance of SunScreen SPF software enables it to keep up with the demands required to screen large amounts of Internet traffic.

The stealth design, which makes SunScreen SPF software not addressable with an IP address, provides two benefits. The stealthing makes SunScreen SPF software more secure as potential intruders can not address the machine running SunScreen SPF−200 software. Also, installation of SunScreen SPF software into the network is easy, since the administrator can install it without changing routing tables.

The stealth design "hardens" the operating system and turns the system into a dedicated SunScreen SPF software system that only runs SunScreen SPF−200 software. Hardening the operating system enhances security since other applications do not run on the system, there is less exposure. SunScreen SPF software uses a separate administration station that can be any SPARC machine and need not be dedicated. State−of−the−art SunScreen SKIP encryption technology provides secure network communication and acts as the infrastructure for electronic commerce, Extranets, and secure remote access. SunScreen SKIP software protects the data being transmitted, helps ensure its integrity, and provides a high level of authentication.

SunScreen SPF software covers both TCP and UDP services. SunScreen SPF software keeps track of the sequence of events that occur with a UDP service even though UDP is in fact a stateless protocol. This is done to improve security and performance.

SunScreen SPF software allows flexibility in logging what has passed or failed through the screen. Administrators can choose what they want to monitor and also be alerted to problems through alerts to network management stations.

To provide additional protection of the internal network, network address translation (NAT) converts internal address to a different set of public addresses. This also helps those customers that didn't formally register internal host IP addresses. NAT supports both static and dynamic translation of internal addresses to public addresses. Since hackers do not know internal addresses of hosts, attacks are minimized.

Administration is done through secured remote administration stations, enhancing security, and meeting the needs of organizations for remote management.

VERITAS NetBackup Software

VERITAS NetBackup software provides high−performance, industrial−strength backup, archive, recovery and space management services for UNIX and PC clients in the large enterprise. With high−speed backup of large databases, centralized management capabilities, mainframe−class media management, and support for high−end tape drives and robotics, VERITAS NetBackup software is specially geared for the large data center customer.

VERITAS NetBackup software cost−effectively automates backup and recovery for thousands of nodes across multiple servers, while enabling the enterprise to manage its storage from a single console. With optional add−on modules, VERITAS NetBackup software provides high−performance hot or cold database backup, as well as archive capabilities that allow the enterprise to effectively manage data that is rarely accessed yet requires long−term storage. VERITAS NetBackup software features sophisticated media and device management capable of managing media across the enterprise from a single location, and enabling sharing of tape robotics hardware with other applications.

Sun StorEdge™ Instant Image Software

Sun StorEdge™ Instant Image software is a point−in−time copy facility which runs on a Solaris Operating Environment application or storage server. Instant Image will enhance the ability of businesses to achieve non−stop business processing by capturing frequent snapshots of live data for independent read and write purposes. Sun StorEdge Instant Image software enables point−in−time copies, or shadow volumes, to be created on a Sun storage system. A shadow volume is a replicated view of data which has been frozen at a specific point in time and is used to enable a secondary application to non−disruptively access a primary application's data. Product applications include the following:

- **Backups**—Enable on−line processing to continue while backup processes backup a point−in−time snapshot image of on−line data
- **Data warehouse loading**—Populate a data warehouse from a snapshot image of on−line data
- **Application development and testing**—Make a snapshot image of production data available as test data for new applications
- **Data migration**—Use Sun StorEdge Instant Image software to help migrate from one storage platform to another

Sun StorEdge LibMON™ Software

Sun StorEdge LibMON™ software is host−based software used to monitor and administer tape libraries via a web browser enabled by Java technology. Sun StorEdge LibMON software allows for event logging and notification as well as remote monitoring of library activity.

Sun StorEdge LibMON software will monitor library status and activity through periodic polling of the library, providing status on the DLT drives, library robotics, inventory, and cartridge slot status. Library status can be monitored from virtually anywhere on the network.

Library activity and Sun StorEdge LibMON software commands will be logged. Notification of important events can be sent to defined recipients via e−mail.

Sun StorEdge LibMON software will allow the operator to remotely control certain library features, such as placing the library online/offline, downloading new firmware for the library robotics, initiating the actuator self−test, and deleting libraries.

VERITAS Volume Manager Software (VxVM)

VERITAS Volume Manager (VxVM) software provides easy−to−use on−line disk storage management for enterprise computing environments. Traditional disk storage management is a labor intensive process often requiring machines to be taken off−line−a major inconvenience to users. Once the system is off−line, the system administrator is faced with the tedious process of backing up existing data, manually changing system parameters, and reloading the data. In today's distributed client/server environments, users are demanding that databases and other resources be available 24 hours a day, are easy to access and are safe from corruption or loss caused by hardware malfunction.

VxVM software provides system administrators with the tools to dynamically configure disk storage, to perform administrative tasks while the system is active, and to analyze disk usage.

VxVM software provides on−line administration of disk resources so that the disk subsystems can be managed without interrupting users or applications. Disk spanning helps eliminate media size limitations and allows load balancing and extension of file systems and databases. Disk mirroring increases data availability in the case of disk failures. It also provides a hot relocation algorithm, allowing subdisks to be relocated from a failing disk.

VxVM software provides disk striping and RAID features to increase I/O throughput and fault tolerance. It provides support for performance monitoring, and flexible allocation of free space for application load balancing.

VxVM software provides an easy−to−use graphical administrative interface, providing the ability to quickly create disk configurations, reducing administrative costs. It also presents a logical pool of free space which can be automatically or directly allocated. The on−line architecture allows the partitioning of arbitrary areas on a disk, and the creation of sparse non−contiguous mirrors, enabling the replication of critical disk areas.

SunVTS™ Software

The Sun Validation and Test Suite, or SunVTS™ software, is an online diagnostics tool and system exerciser for verifying the configuration and functionality of Sun hardware controllers, devices, and platforms. SunVTS software is included in Solaris Easy Access Server software.

Customers can run SunVTS software using any of these interfaces: a command line interface, a tty interface, or a graphical interface that runs within a windowed desktop environment.

SunVTS software lets customers view and control a testing session over modem lines or over a network. Using a remote system, customers can view the progress of a SunVTS testing session, change testing options, and control all testing features of another system on the network.

The SunVTS system exerciser is a graphically oriented UNIX application that permits the continuous exercising of system resources and internal and external peripheral equipment. Used to determine if the system is functioning properly, SunVTS software incorporates a multifunctional stress test of the system through operating−system−level calls, and allows the addition of new tests as they become available.

VERITAS File System Software

VERITAS File System (VxFS) software is a high−performance, quick−recovery file system. VxFS software augments UNIX file management with high availability, increased bandwidth, and up−to−date and reliable structural integrity. It provides scalable performance and capacity to meet the demands of increased user loads and client/server environments.

VxFS software provides fast recovery following a system crash or reboot. The system completes a file system check (fsck) in seconds, regardless of file system size. In addition, VxFS software supports on−line backup, on−line resizing (shrinking and growing of a file system), and on−line defragmentation. These capabilities allow administrators to respond to dynamic data capacity and performance requirements while reducing scheduled maintenance interruptions.

VxFS software allocates disk space to files in large, contiguous areas called extents, rather than in small fixed−size blocks. This results in a significant reduction in the number of I/O operations required to read and write large amounts of data.

Operating System

- 400−MHz CPU: Solaris 2.51 (11/97), Solaris 2.6 (5/98), Solaris 7 (10/99), and Solaris 8 (1/00) Operating Environment
- 480−MHz CPU: Solaris (2.6) 5/98, Solaris 7 (10/99), Solaris 8 (1/00) Operating Environment

Sun Enterprise™ 450 Server Part Numbers

Base System Configuration

Order Number	Description
A25−CA	Sun Enterprise™ 450 server zero base configuration The Sun Enterprise 450 server base configuration includes: • Sun Enterprise 450 server tower enclosure (rackmountable) • Sun StorEdge DVD 10 • 1.44−MB floppy drive • Two 560−watt, hot−swap power supplies • Two external 68−pin Fast/Wide SCSI port • FastEthernet port (either RJ45 or MII) • Parallel and serial ports • Slots for: – Four 400−MHz/4−MB or 480−MHz/8−MB UltraSPARC™−II CPUs – 8 memory options (16 memory modules) – 10 PCI option cards – One 5.25−inch half height removable drive – One additional hot swap power supply • Disk cage for up to 20 low profile UltraSCSI hot swap disks with a standard backplane for four drives • Supports 18.2−GB or 36.4−GB, 10000−rpm disks • Solaris™ server license • 3−year, second−day, on−site hardware warranty * • 90−day software SunSpectrum℠ warranty *
* Product warranty may vary by geographical location. Check with the local SunService℠ representative for applicable warranty coverage.	

Standard Configurations

Part Number	Description
A25−UJD1−1GFA1	Sun Enterprise 450 server in deskside tower; includes one 400−MHz CPU with 4−MB cache, 1−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet,two power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, one 18−GB 10000−rpm drive
A25−UJD2−2GGB1	Sun Enterprise 450 server in deskside tower; includes two 400−MHz CPUs each with 4−MB cache, 2−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, two power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, two 36−GB 10000−rpm drives
A25−UMF2−2GGB1	Sun Enterprise 450 server in deskside tower ; includes two 480−MHz CPUs each with 8−MB cache, 2−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, two power supplies, Solaris server license,four hot−swap UltraSCSI disk bays, two 36−GB 10000−rpm drives
A25−UMF4−4GGD1	Sun Enterprise 450 server in deskside tower ; includes four 480−MHz CPUs each with 8−MB cache, 4−GB memory, 10 PCI I/O slots, DVD, 1.44−MB floppy drive, 10/100 Ethernet, three power supplies, Solaris server license, four hot−swap UltraSCSI disk bays, four 36−GB 10000−rpm drives

Ordering Process for Systems and Factory−Installed Components

Follow the steps listed below to prepare a complete and valid sales order. Steps 1 to 4, 6, and 11 are required. Step 5 is required if more than four internal disks are ordered. Step 10 is required if four CPUs or more than four internal disks are ordered. Steps 7 to 9 and 12 to 14 are optional.

Step 1: Enter the Family Part Number (Required)

Specify:	**A25**	Sun Enterprise 450 server

Step 2: Order Base Package (Required)

Order one:	**A25−CA**	Sun Enterprise 450 server base configuration
	A25−CAV	Sun Enterprise 450 server base configuration (Denmark)

Step 3: Add CPU Modules (1 required, maximum of 4)

Order one to four:	**(X)2244A**	400−MHz UltraSPARC−II CPU module with 4−MB Ecache and DC to DC converter
	(X)2248A	480−MHz UltraSPARC−II CPU module with 8−MB Ecache and DC to DC converter

Notes:

- *All CPUs ordered for one system must be the same part number.*
- *A third power supply is recommended when 4 CPUs are installed.*

Step 4: Order Memory (2 required, maximum of 8)

Order two, four, six or eight:	**(X)7003A**	128−MB ECC memory (2 x 64−MB DIMMs)
	(X)7004A	256−MB ECC memory (2 x 128−MB DIMMs)
	(X)7005A	512−MB ECC memory (2 x 256−MB DIMMs)

Notes:

- *Each memory option includes 2 DIMMs.*
- *Each Sun Enterprise 450 server order must include a minimum of 2 memory options (4 DIMMs).*
- *Maximum memory configuration: 16 DIMMs (4 groups of 4).*
- *DIMMs must be added in matched groups of 4 (e.g., 2 x 7005A).*
- *Order additional memory options in pairs.*
- *For best performance, systems should be configured with 4 or 8 identical memory options (8 or 16 DIMMs).*

Step 5: Order Internal Storage Expansion Option (May be required, maximum of 2)

Order one or two:	**(X)6601A**	Eight−bay storage expansion option
	(X)6602A	Eight−bay RAID expansion option

Notes:

- *The Sun Enterprise 450 server system base provides 4 drive−ready internal disk bays. If more than 4 internal disks are to be installed in the server, then 1 or more internal storage expansion options are required.*
- *One (X)6601A or (X)6602A option must be installed to support 5 to 12 drives.*
- *Two (X)6601A or (X)6602A options must be installed to support 13 to 20 drives.*

Step 6: Order Internal Disks (1 required, maximum of 20)

Order one to twenty:	**(X)5237A**	18.2−GB, 10000−rpm, hot−swap UltraSCSI disk drive
	(X)5242A	36.4−GB, 10000−rpm, hot−swap UltraSCSI disk drive

Notes:

- *Internal disks may be added individually.*
- *Maximum configuration: 20 internal disks.*
- *One (X)6601A or (X)6602A 8−bay storage expansion option must be installed to support 5 to 12 disks.*
- *Two (X)6601A or (X)6602A 8−bay storage expansion options must be installed to support 13 to 20 disks.*

Step 7: Order Internal Removable Storage Device (Optional, maximum of 1)

Order one internal removable media device:		
	(X)6213A	7 to 14−GB, 8−mm tape drive
	(X)6286A	12 to 24−GB, 4−mm DDS−3 tape drive
	(X)6295A	20−GB, 4−mm DDS−4 tape drive

Note:

- *Maximum of one internal 5.25−inch, half−height tape drive may be installed.*

Step 8: Order PCI Host Adapters and Network Interface Cards (Optional)

Order up to ten:	**(X)6540A**	Dual−channel single−ended UltraSCSI host adapter, PCI
	(X)6541A	Dual−channel differential UltraSCSI host adapter, PCI
Order up to eight:	**(X)1032A**	10/100BASE−T Fast/Wide UltraSCSI adapter, 1.0, PCI
	(X)1033A	SunFastEthernet™ controller, PCI
Order up to seven:	**(X)6729A**	Single−loop PCI FC−AL host adapter (*see note, below*)
Order up to six:	**(X)1152A**	SunFDDI™/P single−attach adapter, PCI
	(X)1153A	SunFDDI/P dual−attach adapter, PCI
	(X)6542A	SRC/P Intelligent SCSI RAID controller to support external Sun StorEdge MultiPack systems, PCI
Order up to four:	**(X)1034A**	Sun QFE/P Sun Quad FastEthernet™ controller, PCI
	(X)1155A	Sun HSI/P™ high−speed serial interface, PCI
	(X)2154A	Sun TRI/P™ token ring interface, PCI
	(X)2156A	Sun SAI/P multiport serial interface, PCI
	(X)3668A	PGX32™ graphics card, PCI
Order up to two:	**(X)1141A**	Sun Gigabit Ethernet card, PCI
	(X)2069A	Sun Gigabit Ethernet plus FC−AL Adapter, PCI

Notes:

- *Maximum configuration: 10 PCI cards less any PCI slots occupied by Sun Enterprise 450 server 8−disk backplanes.*
- *Each 8−slot disk backplane installed in a Sun Enterprise 450 server occupies a PCI slot.*
- *6729A, the single−loop PCI FC−AL host adapter, requires Solaris 2.6 Operating Environment or a later operating system.*
- *Each (X)6542A includes 2 external 2−meterSCSI data cables and can control 2 external Sun StorEdge Multipack systems.To connect a third MultiPack to an (X)6542A, order X3832A.*

Step 9: Order Additional Power Supplies (2 supplied with the Sun Enterprise 450 server base system; order up to 1 additional power supply)

Order one:	**(X)9682A**	560−watt universal power supply

Notes:

- *Maximum configuration: three power supplies (two are standard).*
- *A fully loaded system will operate on two power supplies. The third power supply provides redundancy for greater system availability.*
- *A third power supply is recommended for systems in which CPUs, memory, PCI cards, and internal storage populate more than 50 percent of available slots.*

Step 10: Order Power Cord/Country Kit (Required, maximum of 1)

Order:	**X3XXL**	Power cord
	X35XXA	Type−5 Country Kit

Notes:

- *Order an X3XXL power cord if the system will not require a local graphics console.*
- *Order an X35XXA country kit if the system will host a local graphics console.*
- *See Sun Enterprise 450 Server Options for a list of available power cord and country kits.*

Step 11: Order External Disk Storage Options (Optional)

Order:	See options list in pricebook.

Notes:

- *One Sun StorEdge™ MultiPack or up to 4 Sun StorEdge UniPack disks may be attached to the system's Fast/Wide SCSI port.*
- *Additional SCSI storage devices may be supported by PCI SCSI host adapters.*

Step 12: Order External Tape Options (Optional)

Order:	See options list in ConfigGuide.

Notes:

- *Up to four external SCSI tape devices may be attached to the system's Fast/Wide SCSI port.*
- *Additional SCSI tape devices may be supported by PCI SCSI host adapters.*

Step 13: Order Other Options (Optional)

Order:	See options list in pricebook.

Typical Sun Enterprise 450 Server Configuration

Sun Enterprise 450 server with internal DVD, floppy, two power supplies, two 400−MHz UltraSPARC−II processors, 1−GB main memory, 12 internal disk bays, 72.8−GB internal disk storage, internal 7− to 14−GB, 8−mm tape drive, and local color graphics console with 17−inch monitor.

Quantity	Order Number	Description
1	**A25**	Sun Enterprise 450 server family
1	**A25−CA**	Sun Enterprise 450 server, zero base; Sun StorEdge DVD 10, floppy, two 560−watt power supplies, Solaris server license; no CPU, memory, disk drives or tape drives
2	**2244A**	400−MHz UltraSPARC−II CPU module, 4−MB external cache
4	**7004A**	256−MB memory (2 x 128−MB DIMMs)
1	**6601A**	Eight−bay storage expansion option
8	**5237A**	18.2−GB, internal, hot−plug, 10000−rpm, 1−inch high disk drive
1	**6213A**	Internal 14−GB, 8−mm tape drive
1	**3668A**	PGX32 color graphics frame buffer option
1	**X7126A**	17−inch entry color monitor
1	**X3500A**	Type−5 country kit, U.S.

Maximum Sun Enterprise 450 Server Configuration

Sun Enterprise 450 server with internal DVD, floppy, four 480−MHz UltraSPARC−II CPUs, 4−GB main memory, 20 internal disk bays, 364−GB disk storage, 7 to 14−GB, 8−mm tape drive, three fully redundant power supplies, local graphics console with 17−inch monitor, and cabinet with rackmounting kit, seven available PCI slots to support network cards, and external storage options.

Quantity	Order Number	Description
1	**A25**	Sun Enterprise 450 server family
1	**A25−CA**	Sun Enterprise 450 server, zero base; Sun StorEdge DVD 10, floppy, two 560−watt power supplies, Solaris server license; no CPU, memory, disk
4	**2248A**	480−MHz UltraSPARC−II CPU module, 8−MB external cache
8	**7005A**	512−MB memory (2 x 256−MB DIMMs)
2	**6601A**	Eight−bay storage expansion option with SRC/P controller card, internal and external SCSI cables
20	**5242A**	36.4−GB, internal, hot−plug , 10000−rpm, 1−inch high disk drive
1	**6213A**	Internal, 14−GB, 8−mm tape drive
1	**3668A**	PGX32 graphics card, PCI
4	**6729A**	Single−loop PCI FC−AL host adapter
1	**9682A**	560−watt power supply

Quantity	Order Number	Description
1	**X7126A**	17−inch entry color monitor
1	**X3500A**	Type−5 country kit, U.S.
1	**SG−XARY030A**	72−inch Sun StorEdge expansion cabinet
1	**X3800A**	Power cord for Sun Enterprise expansion cabinet
1	**X9690A**	Sun Enterprise 450 server rackmounting kit

Options

Below is a partial list of options available for the Sun Enterprise™ 450 system. Refer to the Sun Price Book for complete option listings, configuration notes, and ordering information. When no maximum number is listed, consult the configuration information for that option.

Part Number	Option Description	Maximum Number Supported	Comments
CPUs			
(X)2244A	400−MHz UltraSPARC™−II CPU module with 2−MB external cache	4	
(X)2248A	480−MHz UltraSPARC−II CPU module with 4−MB external cache	4	
Memory			
(X)7003A	128−MB memory expansion (2 x 64−MB DIMMs)	8	See memory configuration requirements
(X)7004A	256−MB memory expansion (2 x 128−MB DIMMs)	8	
(X)7005A	512−MB memory expansion (2 x 256−MB DIMMs)	8	
Internal Expansion Kit			A third power supply is recommended when (X)6602A is installed
(X)6601A	Eight−bay internal storage expansion option	2	
(X)6602A	Eight−bay storage expansion option with SRC/P Intelligent SCSI RAID controller	2	
Internal Storage Devices			
(X)5237A	18.2−GB, 10000−rpm, 3.5 x 1 inch, low−profile UltraSCSI disk drive	20	
(X)5242A	36.4−GB 10000−rpm, 3.5 x 1 inch, low−profile UltraSCSI disk drive	20	
Internal Removable Storage Devices			
(X)6213A	7 to 14−GB, 8−mm tape drive	1	
(X)6286A	12 to 24−GB, 4−mm DDS−3 tape drive	1	
(X)6295A	20−GB, 4−mm DDS−4 tape drive	1	
External Storage Interfaces			
(X)6540A	Dual−channel, single−ended UltraSCSI host adapter, PCI	10	A third power supply is recommended for systems that include (X)6542A
(X)6541A	Dual−channel, differential UltraSCSI host adapter, PCI	10	
(X)6542A	SRC/P Intelligent SCSI RAID controller to support external Sun StorEdge™ MultiPack systems, PCI	6	
(X)6729A	Single−loop PCI FC−AL host adapter; *requires Solaris™ Operating Environment 2.6 or later*	10	
(X)1032A	SunSwift™, PCI (FastEthernet plus UltraSCSI)	8	

Part Number	Option Description	Maximum Number Supported	Comments
Network Interfaces			
(X)1032A	SunSwift, PCI (FastEthernet plus UltraSCSI)	8	
(X)1033A	SunFastEthernet™ card, PCI	8	
(X)1034A	Sun QFE/P (Sun Quad FastEthernet™), PCI	4	
(X)1141A	Sun Gigabit Ethernet PCI adapter 2.0	2	
(X)1152A	SunFDDI™/P, single−attach, PCI	6	
(X)1153A	SunFDDI/P, dual−attach, PCI	6	
(X)1155A	Sun HSI/P™ high−speed serial interface, PCI	4	
(X)1157A	SunATM™−155/MFiber PCI adapter	4	
(X)1158A	SunATM−155/UTP PCI adapter	4	
(X)1159A	SunATM−622/MFiber PCI adapter	4	
(X)2069A	Sun Gigabit Ethernet plus FC−AL adapter, PCI	4	
(X)2154A	Sun TRI/P™ token ring interface, PCI	4	
(X)2156A	Sun SAI/P serial asynchronous interface, PCI	4	
External Sun StorEdge Tape Libraries			
SG−XLIBDLT1−280G	280 to 560−GB Sun StorEdge L280 tape autoloader (desktop)	20	
SG−XLIBDLT1−1TB−2	Sun StorEdge L1000 deskside tape library with one DLT 7000 tape drive	4	Sun StorEdge L1000, L1800, L3500 and L11000 tape libraries require the dual−channel differential SCSI controller, (X)6541A.
SG−XLIBDLT4−1TB−2	Sun StorEdge L1000 deskside tape library with four DLT 7000 tape drives	4	
SG−XLIBDLT1R−1TB−2	Sun StorEdge L1000 rackmountable tape library with one DLT 7000 tape drive	4	
SG−XLIBDLT4R−1TB−2	Sun StorEdge L1000 rackmountable tape library with four DLT 7000 tape drives	4	
X6077A	Sun StorEdge L1800 with two DLT 7000 tape drives	4	
X6078A	Sun StorEdge L1800 with four DLT 7000 tape drives	4	
X6079A	Sun StorEdge L3500 with two DLT 7000 tape drives	4	
X6080A	Sun StorEdge L3500 with seven DLT 7000 tape drives	4	
SG−XLIBDLT4−11TB	Sun StorEdge L11000 tape library with four DLT 7000 tape drives	4	
SG−XLIBDLT16−11TB	Sun StorEdge L11000 tape library with 16 DLT 7000 tape drives	4	
Sun StorEdge Tape UniPack Systems			
SG−STAPSLR−010A	4−GB SLR tape drive UniPack	20	
SG−XTAP4MM−011A	12−GB, 4−mm DDS−3 tape drive in a UniPack desktop enclosure	20	
SG−XTAP8MM−011A	20−GB, 8−mm drive in a UniPack desktop enclosure	20	

Part Number	Option Description	Maximum Number Supported	Comments
Sun StorEdge Disk Drive UniPack Systems			
SG−XDSK010A−9G	9.1−GB, 7200−rpm Sun StorEdge UniPack	20	
SG−XDSK010B−18G	18.2−GB, 7200−rpm Sun StorEdge UniPack	20	
Sun StorEdge FlexiPack Systems			
SG−XTAPSLR−020A	4−GB, SLR tape drive	20	
SG−XTAP4MM−021A	12−GB, 4−mm DDS−3 tape drive	20	
SG−XTAP4MM−031A	72−GB, 4−mm DDS−3 autoloader	20	
SG−XTAP8MM−020A	7−GB, 8−mm drive	20	
SG−XTAP8MM−021A	20−GB, 8−mm drive	20	
SG−XTAPDLT−020A	20−GB DLT 4000 tape drive	20	
SG−XTAPDLT−021A	35−GB DLT 7000 tape drive	20	
Expansion Drives for Sun StorEdge FlexiPack Systems			
X6106A	4−GB SLR5 internal tape drive for Ultra™ 30, 60, and Sun StorEdge FlexiPack systems		A maximum of one expansion drive may be installed in each Sun StorEdge FlexiPack system.
X6236A	20 to 40−GB, 8−mm internal tape drive for Sun StorEdge FlexiPack systems		
X6166A	32X internal CD−ROM drive for Ultra 30 and 60 systems		
X6212A	7−GB, 8−mm internal tape drive for Ultra 1, 2, 30, and 60 systems		
X6282A	12−GB, 4−mm DDS−3 internal tape drive for Ultra 1, 2, 30, 60, and Sun StorEdge FlexiPack systems		
External Sun StorEdge MultiPack Systems			
SG−XDSK020C−18G	Sun StorEdge MultiPack with 18.2 GB, 2 x 9.1−GB, 10000−rpm disk drives	20	
SG−XDSK020C−36G	Sun StorEdge MultiPack with 36.4 GB, 2 x 18.2−GB, 10000− rpm disk drives	20	
SG−XDSK040C−36G	Sun StorEdge MultiPack with 36.4 GB, 4 x 9.1−GB, 10000−rpm disk drives	20	
SG−XDSK040C−72G	Sun StorEdge MultiPack with 72.8 GB, 4 x 18.2−GB, 10000−rpm disk drives	20	
SG−XDSK060C−54G	Sun StorEdge MultiPack with 54.6 GB, 6 x 9.1−GB, 10000−rpm disk drives	20	
SG−XDSK060C−109G	Sun StorEdge MultiPack with 109.2 GB, 6 x 18.2−GB, 10000−rpm disk drives	20	

Part Number	Option Description	Maximum Number Supported	Comments
Expansion Drives for Desktop Sun StorEdge MultiPack Systems			
X5229A	9.1−GB, 7200−rpm UltraSCSI expansion drive for Sun StorEdge MultiPack system	4	
X5232A	18.2−GB, 7200−rpm UltraSCSI expansion drive for Sun StorEdge MultiPack system	4	
Note: *Up to six drives may be installed in a Sun StorEdge MultiPack system. The maximum number of drives supported depends on the number ordered with the MultiPack option.*			
External Differential SCSI Disk Storage			
Note: *All storage items in this section require Solaris 2.6 Operating Environment or later.*			
SG−XARY144A−36G	36−GB (4 x 9.1−GB, 10000−rpm disks) Sun StorEdge A1000 tabletop or deskside array with HW RAID controller	20	External differential SCSI disk storage options require the dual−channel differential SCSI controller, (X)6541A
SG−XARY144A−109G	109−GB (12 x 9.1−GB, 10000−rpm disks) Sun StorEdge A1000 tabletop or deskside array with HW RAID controller	20	
SG−XARY151A−72G	72−GB (4 x 18−GB, 10000−rpm disks) Sun StorEdge A1000 tabletop or deskside array with HW RAID controller	20	
SG−XARY151A−218G	144−GB (12 x 18−GB, 10000−rpm disks) Sun StorEdge A1000 tabletop or deskside array with HW RAID controller	20	
SG−XARY146A−36G	36−GB (4 x 9.1−GB, 10000−rpm disks) Sun StorEdge A1000 array for rackmounting in Sun StorEdge or Enterprise expansion racks	20	
SG−XARY152A−72G	72−GB (4 x 18−GB, 10000−rpm disks) Sun StorEdge A1000 array for rackmounting in Sun StorEdge or Enterprise expansion racks	20	
SG−XARY145A−109G	109−GB (12 x 9.1−GB, 10000−rpm disks) Sun StorEdge D1000 tabletop or deskside array	20	
SG−XARY153A−72G	72−GB (4 x 18−GB, 10000−rpm disks) Sun StorEdge D1000 tabletop or deskside array	20	
SG−XARY153A−218G	218−GB (12 x 18−GB, 10000−rpm disks) Sun StorEdge D1000 tabletop or deskside array	20	
SG−XARY147A−36G	36−GB (4 x 9.1 GB 10000−rpm disks) Sun StorEdge D1000 array for rackmounting in Sun StorEdge or Enterprise expansion racks	20	
SG−XARY154A−72G	72−GB (4 x 18−GB 10000−rpm disks) Sun StorEdge D1000 array for rackmounting in Sun StorEdge or Sun Enterprise expansion racks	20	

Part Number	Option Description	Maximum Number Supported	Comments
SG−XARY366A−72G	72−GB Sun StorEdge A3500−Light array (8 x 9.1−GB, 10000−rpm drives)	20	
SG−ARY370A−91G	91−GB Sun StorEdge A3500 array (10 x 9.1−GB, 10000−rpm drives)	20	
SG−ARY372A−182G	182−GB Sun StorEdge A3500 array (20 x 9.1−GB, 10000−rpm drives)	20	
SG−XARY360A−545G	545−GB Sun StorEdge A3500 array (60 x 9.1−GB, 10000−rpm drives)	20	
SG−XARY374A−273G	273−GB Sun StorEdge A3500 array (30 x 9.1−GB, 10000−rpm drives)	20	
SG−ARY380A−182G	182−GB Sun StorEdge A3500 array (10 x 18.2−GB, 10000−rpm drives)	20	
SG−ARY382A−364G	180−GB Sun StorEdge A3500 array (20 x 18.2−GB, 10000−rpm drives)	20	
SG−XARY384A−546G	546−GB Sun StorEdge A3500 array (30 x 18.2−GB, 10000−rpm drives)	20	
External Fiber Channel Disk Storage			
Note: *All storage items in this section require Solaris 2.6 Operating Environment or later.*			
SG−XARY530A−91G	91−GB Sun StorEdge A5100 array (5 x 18.2−GB, 7200−rpm, half−height, FC−AL drives)	7	External Fiber Channel disk storage options require the single−loop PCI FC−AL host adapter, (X)6729A.
SG−XARY530A−254G	254.8−GB Sun StorEdge A5100 array (14 x 18.2−GB, 7200−rpm, half−height, FC−AL drives)	7	
SG−XARY531A−254G	254.8−GB Sun StorEdge A5100 array (14 x 18.2−GB, 7200−rpm, half−height, FC−AL drives)	7	
SG−XARY533A−509G	509.6−GB Sun StorEdge A5000 array including two 254.8−GB arrays (14 x 18.2−GB, 1.625−inch, 7200−rpm, FC−AL drives)	7	
SG−XARY533A−1528G	1528.8−GB Sun StorEdge A5100 array including six 254.8−GB arrays (14 x 18.2−GB, 1.625−inch, 7200−rpm, FC−AL drives)	7	
Other Options			
X180A	SunButtons™ 32 key function I/O device	1	
X985A	Serial port Y splitter cable	1	
(X)3668A	PGX32™ PCI graphics card	4	
X3800A	Power cord for EE cabinet, U.S.	1	
X3830A	4−meter SCSI cable; VHDC to 68−pin SCSI; for use with 6541A	*	
X3831A	10−meter SCSI cable; VHDC to 68−pin SCSI; for use with 6541A	*	
X3832A	2−meter SCSI data cable to connect SRC/P controller to external Sun StorEdge MultiPack systems	6	
X3848A	Power cord for EE cabinet, international	1	

Part Number	Option Description	Maximum Number Supported	Comments
X3856A	Fast−wide 68−68 pin SCSI cable and geo−specific power cord	*	
X3857A	Fast−narrow 50−68 pin SCSI cable and geo−specific power cord	*	
X3872A	Video connector adapter, HD15 female to 13W3 male	2	
X7119A	19−inch color monitor	2	
X7121A	21−inch color monitor, 19.8 inch v.a.	2	
X7124A	24−inch wide screen color monitor	2	
X7126A	17−inch entry color monitor	2	
X9602A	Sun Enterprise cabinet floor brackets	1	
(X)9682A	560−watt hot−swap power supply	1	
X9690A	Sun Enterprise 450 server rackmounting kit	1	
Note: *The number of cables and Gigabit Ethernet switches required varies by configuration and is determined by the requirements of the individual configuration.*			

Sun Upgrade Allowance Program (Sun UAP)

Today there is a dot−com world and it is very critical that a company's technology scales as it's business grows. Whether a customer has a Sun or non−Sun system, Sun's Upgrade Allowance Program (Sun UAP) offers a broad range of options for upgrading their earlier generation servers to Sun's latest technology.

Sun UAP simplifies the upgrades process by providing a trade−in value as a percentage allowance. This percentage allowance is applied to the list price of any new Sun Enterprise™ 450 system configuration.

Upgrades to the Sun Enterprise 450 server are available as a full system swap. No components migrate such as CPUs, memory and drives. The Sun Enterprise 450 server uses UltraSPARC™−III processor technology. Customers can upgrade to the Sun Enterprise 450 server from older systems, including the following:

- SPARCserver™ 4, 5, 10, 20, 1000, or 2000 servers
- Sun Enterprise™ 1 or 2 server
- Sun Enterprise Ultra™ 5S or 10S server
- Sun Enterprise 250 and 220R servers

Systems being upgraded must be owned by, used by, and in the possession of the customer at least 90 days prior to upgrading. To qualify for the upgrade allowance, customers must return a bootable working system that is being upgraded.

How to Order

An allowance code is used when upgrading to the Sun Enterprise 450 server.

Allowance Code Numbering Scheme

Example Allowance Code = **ALW−10−S−J−A25−PX**

ALW = Every code starts with the letters ALW = allowance

10 = Percentage allowance

S = Product category (S = server)

J = Residue group

A25 = Product family

PX = Promo/flex field

To determine the upgrade allowance value, apply the allowance code percentage to the list price of the Sun Enterprise 450 server. This allowance is in addition to any contracted discounts that the costumer may be eligible for.

Customers will need to return a full functioning system within 30 days of receipt of the hardware. RMA kits (UG−RMA) must be ordered with each allowance code. UG_RMA kits provides customers instructions on where to return the used (residual) equipment. Customers will be billed for all non−returned equipment.

Workgroup server Sun UAP product matrices containing upgrade allowance codes are included in the Sun Configuration guide.

Description	Token#
Workgroup Server Matrix	94711
Server Consolidation Matrix	96194
Component Matrix	108142
Return Matrices • Workgroup Server Product Return Matrix	 92861
Migration Charts • Workgroup Server Upgrades	 90730
Returns • Non−return pricing for Exempt Parts • Step−by−Step for returning equipment	 123060 92877 (U.S. Only)

Upgrade Paths

Component Migration and Allowance Matrix

	From	To	Return
Memory			
	64−MB DIMMs (X)7036A	128−MB DIMMs (X)7003A	1 x 64−MB DIMM
	128−MB DIMMs (X)7037A	256−MB DIMMs (X)7004A	2 x 64−MB DIMMs
	128−MB DIMMs (X)7037A	512−MB DIMMs (X)7005A	2 x 64−MB DIMMs
	256−MB DIMMs (X) 7004A	512MB DIMMs (X) 7005A	2 x 128−MB DIMMs
CPUs			
	One generation difference CPU module	400/440/450/480−MHz CPUs Sun Enterprise X50 or X20R server	An UltraSPARC CPU
	Two or greater generation difference CPU module	400/440/450/480−MHz CPUs in Sun Enterprise 2, X50, or X20R server	An UltraSPARC CPU

Note: *The following upgrade part numbers are exempt from Sun UAP program. These UG part numbers are exempt from UAP because there is no standard marketing part equivalent (that is, a chassis without memory). The only way a customer can acquire a chassis without memory is by ordering the UG part. Allowance codes cannot be used against these exempt part numbers.*

- **Sun Enterprise 450 server chassis**
  - UG14−A25CA−000−ND
  - UG14−A25−9S−000−CA

- **Mother Board Upgrade Sun Enterprise 450 server**
  - UGMB−A25XA−A25CA

The 480−MHz module on the Sun Enterprise 450 server requires a new motherboard and new base server. The 480−MHz module works with the Sun Enterprise 450 server only. Order the X−option (X2248A). Allowance codes can be applied to the X option.

Service and Support

The SunSpectrum℠ program is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs, ranging from mission−critical support for maximum solution availability to backup assistance for self−support customers. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris™ Operating Environment software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value that it represents. Customers should check with their local Sun Enterprise Services representatives for program and feature availability in their areas.

FEATURE	SUNSPECTRUM PLATINUM℠ Mission−critical Support	SUNSPECTRUM GOLD℠ Business−critical Support	SUNSPECTRUM SILVER℠ Systems Support	SUNSPECTRUM BRONZE℠ Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Local customer support management	No	Yes	No	No
Personal technical account support	Yes	Yes	Option	No
SunStart℠ installation service	Yes	No	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On−site account reviews	Monthly	Semiannual	No	No
Skills assessment	Yes	No	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.−8 p.m., Monday–Friday	8 a.m.−5 p.m., Monday–Friday
Standard on−site coverage hours	7 day/24 hour	8 a.m.−8 p.m., Monday–Friday	8 a.m.−5 p.m., Monday–Friday	N/A
7−day/24−hour telephone coverage	Yes	Yes	Option	Option
7−day/24−hour on−site coverage	Yes	Option	Option	N/A
7−day/12−hour on−site coverage	No	Option	No	No
5−day/24−hour on−site coverage	No	Option	No	No

FEATURE	SUNSPECTRUM PLATINUM Mission−critical Support	SUNSPECTRUM GOLD Business−critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self−Support
Coverage / Response Time (cont.)				
Customer−defined priority setting	Yes	Yes	Yes	Option
• Urgent (phone/on−site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A
• Serious (phone/on−site)	Live transfer/ 4 hour	2 hour/next day	2 hour/next day	4 hour / N/A
• Not critical (phone/on−site)	Live transfer/ customer convenience	4 hour/ customer convenience	4 hour/ customer convenience	4 hour / N/A
• 2−hour on−site response	Yes	Option	Option	N/A
Additional contacts	Option	Option	Option	Option
Premier Support Features				
Mission−critical support team	Yes	For urgent problems	No	No
Sun Vendor Integration Program (SunVIP℠)	Yes	Yes	No	No
Software patch management assistance	Yes	No	No	No
Field change order (FCO) management assistance	Yes	No	No	No
Hardware Support Delivery				
Replacement hardware parts	On−site technician	On−site technician	On−site technician	Courier
Two day parts delivery	N/A	N/A	N/A	Yes
Overnight parts delivery	N/A	N/A	N/A	Option
Same−day parts delivery	Yes	Yes	Yes	Option
Remote Systems Diagnostics				
Remote dial−in analysis	Yes	Yes	Yes	Yes
Remote systems monitoring	Yes	Yes	No	No
Remote predictive failure reporting	Yes	Yes	No	No
Software Enhancements and Maintenance Releases				
Solaris Operating Environment enhancement releases	Yes	Yes	Yes	Yes
Patches and maintenance releases	Yes	Yes	Yes	Yes
Sun unbundled software enhancements	Option	Option	Option	Option
Internet and CD−ROM Support Tools				
SunSolve℠ license	Yes	Yes	Yes	Yes
SunSolve EarlyNotifier℠ Service	Yes	Yes	Yes	Yes

Glossary

100BASE−T	See Fast Ethernet.
DIMM	Dual inline memory module. A memory unit that can come in a variety of sizes, such as 16 MB, 32 MB, 64 MB, and 128 MB.
FastEthernet	IEEE standard for 100−Mbit Ethernet. Also called 100BASE−T.
Fault−tolerant	Systems that are fault−tolerant are able to withstand and recover from any system problem and offer 100 percent uptime. These systems are typically much more expensive that comparable fault−resistant systems.
Hot plug	A hot−plug component can be removed, replaced, and automatically configured into the system without having to shut down or reboot the system.
IPX™/SPX	NetWare's proprietary protocol stack, which provides basic connectivity between clients and servers and supports higher level services such as file− and print−sharing and remote administration.
Multiprocessing (MP)	Processing that runs concurrently on multiple CPUs, providing better performance and lowering latency. Multiprocessing systems are judged on the efficiency and linearity with which resources are allocated across a wide range of workloads. A system with a linear multiprocessing factor is said to be scalable in that system resources are not wasted and performance is predictable given the workload and hardware resources.
NFS	Network file system. Sun's distributed computing file system, providing heterogeneous data sharing. NFS, in conjunction with NIS+, AutoFS, CacheFS™, and volume management, provides the user with automatic data location, navigation, and access over wide−area networks. The data appears instantly on the user's desktop, even if it is stored on a system in another city.
PCI	Peripheral component interconnect. A industry−standard for connecting peripherals such as disk drives, tapes drives, and other devices used in the PCs.
RAS	Reliability, availability, and serviceability. Reliability is a measure of the likelihood that problems will occur. A highly reliable system will have few problems. Once a problem occurs, availability is the measure of how the system protects the user from being adversely effected by the problem. Serviceability is a measure of how easy it is to repair the problem.
SBus	High−performance IEEE I/O interconnect for options such as disk expansion and networking cards.
UPA	Ultra™ port architecture. A high−speed, crossbar−oriented, packet−switched mother board interconnect.

Materials Abstract

All materials are available on SunWIN, except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Powerpack				
– *Sun Enterprise™ 450 Server Just the Facts*	Reference Guide (this document)	Training, Sales Tool	SunWIN, Reseller Web	71649
– *Sun Enterprise 450 Server Overview Presentation*	Customer Presentation and Notes	Sales Tool	SunWIN, Reseller Web	73645, 73649, 73653, 73657
References				
– *Sun Workgroup Server Product Line Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	24517
– *Sun Workgroup Server/Competitive Summary*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web, First Resort	24515
– *Workgroup Sales and Marketing Tools Guide*	Reference Guide	Sales Tool	SunWIN	88195
– *Product: 400−MHz Sun Enterprise 450 Server TPC−C Results, 2/2/99*	Product Performance Information	Sales Tool	SunWIN	99320
Presentation				
– *Sun Solutions for the Enterprise Workgroup Golden Pitch Presentation and Slide Notes*	Information on Product Launch	Sales Tool	SunWIN, Reseller Web	88148
Product Literature				
– *Sun Enterprise 450 and 250 Server Architecture White Paper*	Technical White Paper	Training, Sales Tool	SunWIN, Reseller Web	72523
– *Literature: Sun Enterprise 450 Server Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web, COMAC	63029
– *Sun Enterprise 450 Server Performance Brief*	Product Brief	Sales Tool	SunWIN, Reseller Web	74025

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
– *Solaris for ISPs™ Product Brief*	Product Brief	Sales Tool	SunWIN	88146
– *Sun Enterprise Server and Storage Family Brochure*	Enterprise Server and Storage Family Brochures	Sales Tool	COMAC	BE607−1
– *Sun Enterprise 450 Server Product Book, 10/97*	Product Pricing Information	Sales Tool	SunWIN, Reseller Web	75933
– *Product Update Bulletin: Sun Enterprise 450 Server Disk Support, 6/99*	Product Update	Sales Tool	SunWIN, Reseller Web	104931
Competitive				
– *Workgroup Sever Competitive Brief*	Competitive Brief	Sales Tool	SunWIN	53106
Success Stories				
– *Success Story: Sun Enterprise 450 Workgroup Servers Get the Job for U.S. & Canadian Career Planning Web Site, 4/99*	Customer Success Story	Sales Tool	SunWIN	103095
– *Success Story: See's Candies'' Sweet E−commerce Site Ramps Up on Sun Enterprise 450 Workgroup Server, 4/99*	Customer Success Story	Sales Tool	SunWIN	103100
– *PRODUCT: Sun Enterprise 450 EMC Compliance, 5/99*	Customer Success Story	Sales Tool	SunWIN	103641
– *Success Story: University of Scranton Upgrades Campus Intranet with Sun Enterprise 450 Workgroup Servers, 6/99*	Customer Success Story	Sales Tool	SunWIN	106406
External Web Sites				
– *UltraSPARC™ information*	`http://www.sun.com/sparc.html`			
– *Sun Enterprise 450 Server Information*	`http://www.sun.com/servers/workgroup/450/`			