Mechanical Packaging

Sun Enterprise 10000 Cabinet

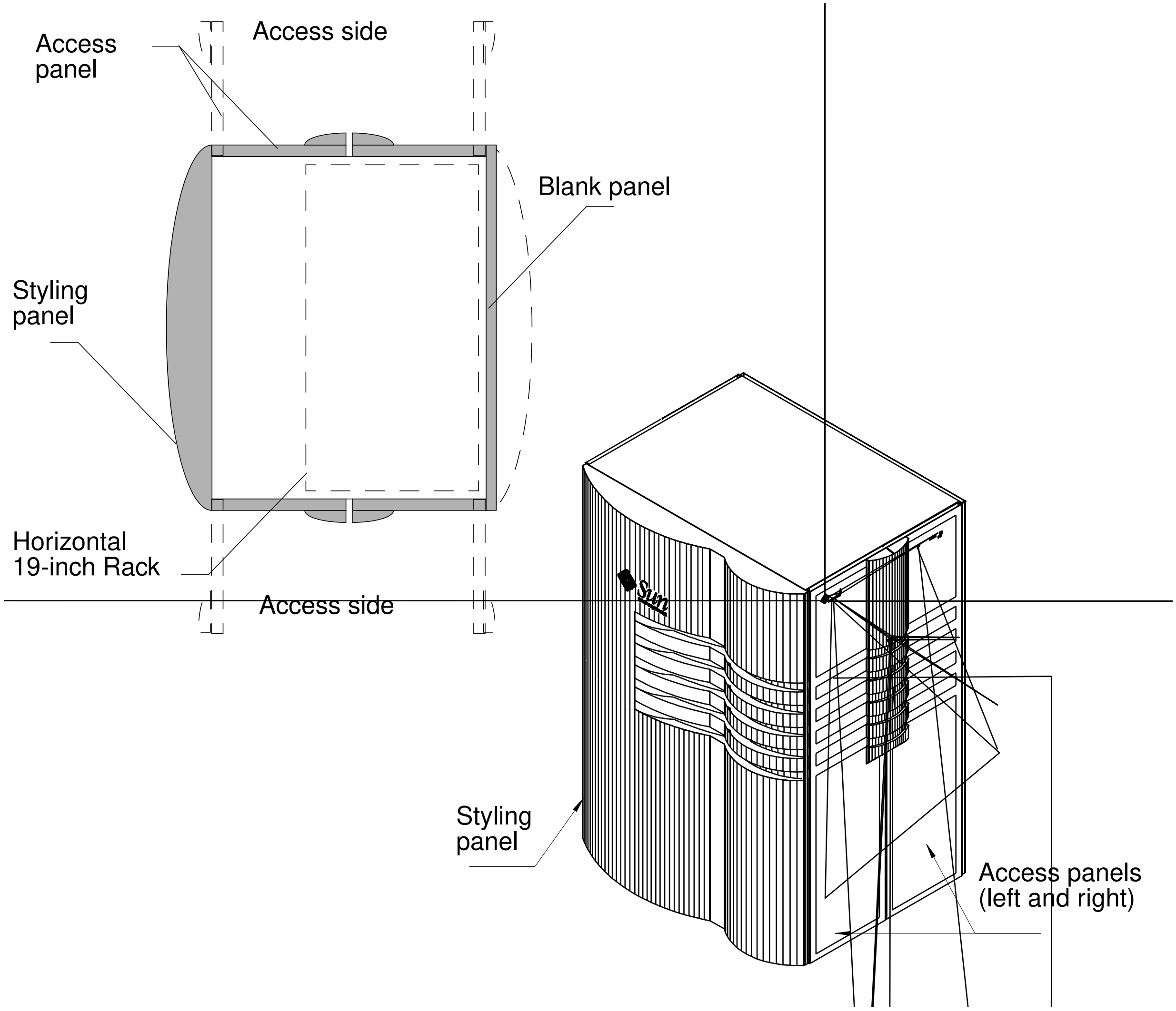

Figure 7. Sun Enterprise 10000 cabinet

Sun microsystems

i ems

Mechanical Packaging *(cont.)*

Sun Enterprise 10000 Cabinet *(cont.)*

- The Sun Enterprise 10000 enclosure is a 70-inch high, 50-inch wide, 39-inch deep, data center cabinet when viewed from the styling panel side.
- Inside the cabinet is a 18-slot card cage for system boards, control boards, and centerplane support boards.
- Directly above and below the card cage are the fan trays which draw air up though the cabinet and filters to exhaust out the top. These trays each include two fans.
- Above the top fan trays and over the control board are two power shelves. Each power shelf contains one AC input unit and two power supplies for a total of four AC input units and eight power supplies.
- Above the top fan trays, in both the primary and secondary sides of the cabinet, is the peripheral area which can be configured with up to 5U of standard RETMA, rack-mountable components. In addition to peripheral trays, this area contains one or two rack-mountable AC power sequencer units and remote power control module.
- One or two Sun StorEdge D1000 disk trays can be installed in the system cabinet or up to 16 UniPack disks for booting eight mirrored domains
- The peripheral area also houses one or two Ethernet hubs used for communicating with the SSP
- A hinged access door covers the left and right sides of the primary and secondary side of the cabinet. They can be opened without the use of tools and offer easy access to internal components.
- A modular styling panel is installed on one end, with a blank panel on the other end. I/O expansion cabinets are placed adjacent to the blank panel.

Power and Cooling

The Sun Enterprise 10000 system provides a highly configurable power and cooling system designed for N+1 system redundancy (where "N" is the minimum number of either the power supplies or fan trays required). Both the power supplies and the fan trays can be replaced or upgraded while the system is running. Power is distributed such that power supply failures, while noted by the system, do not affect the system's operation.

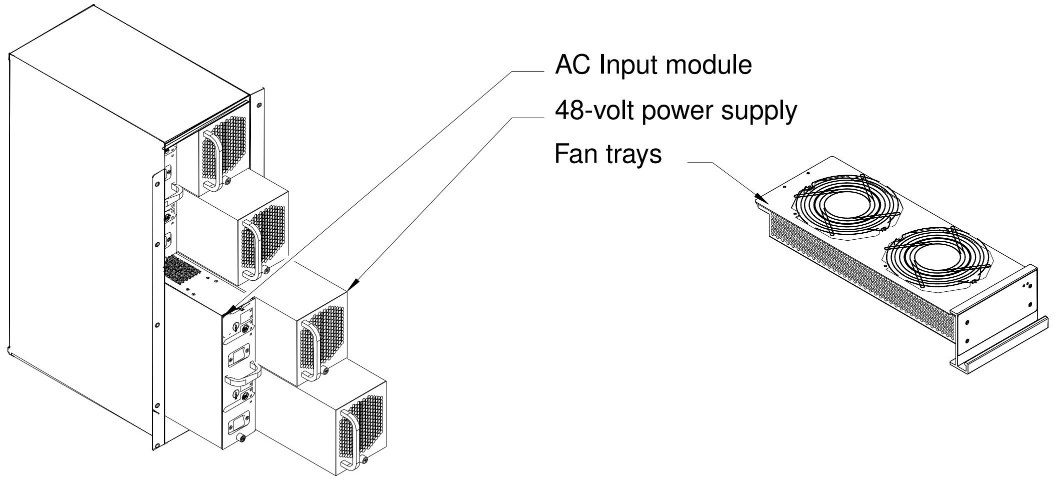

Figure 8. Hot-swappable Power and Cooling Components

48-volt Power Subsystem

The Sun Enterprise 10000 power system is distributed and consists of three functional pieces: Universal 220 VAC-to-48 DC volt, front-end power supplies, 48-volt filter, distribution and protection box, centerplane and system logic boards.

- Safe, "extra-low voltage" (ELV), 48-volt distribution system
- No individual load is capable of keeping the system from operation
- Modular design makes troubleshooting easier while providing redundant power in the event of a failure
- All power, while originating at separate sources, is bused together to provide fault tolerance
- For redundancy, each of the power shelves are separately powered via individual AC line cords
- Each of the individual power supplies is capable of being serviced without interrupting the 48-volt output of the N+1 configuration
- AC input module LEDs indicate when it is safe to service either the AC input module or the associated power supplies
- Separate circuit breakers are used to protect each of the twenty loads so that no individual load is capable of keeping the system from operation
- A separate, 19-inch, rack-mount power distribution subsystem provides power to all of the I/O peripherals in the system cabinet

Power and Cooling *(cont.)*

Cooling Subsystem

The processor cabinet is cooled by the flow of pressurized air drawn into the bottom of the cabinet from the ambient environment and exhausted out the top to the outside environment. The flow of cooled air is produced by a redundant system consisting of 16 fan trays operating through four circuit breakers to alleviate a source of single point failure (SPF). Each fan tray contains two fans and, in the event of a failure, can be removed while the system is operating.

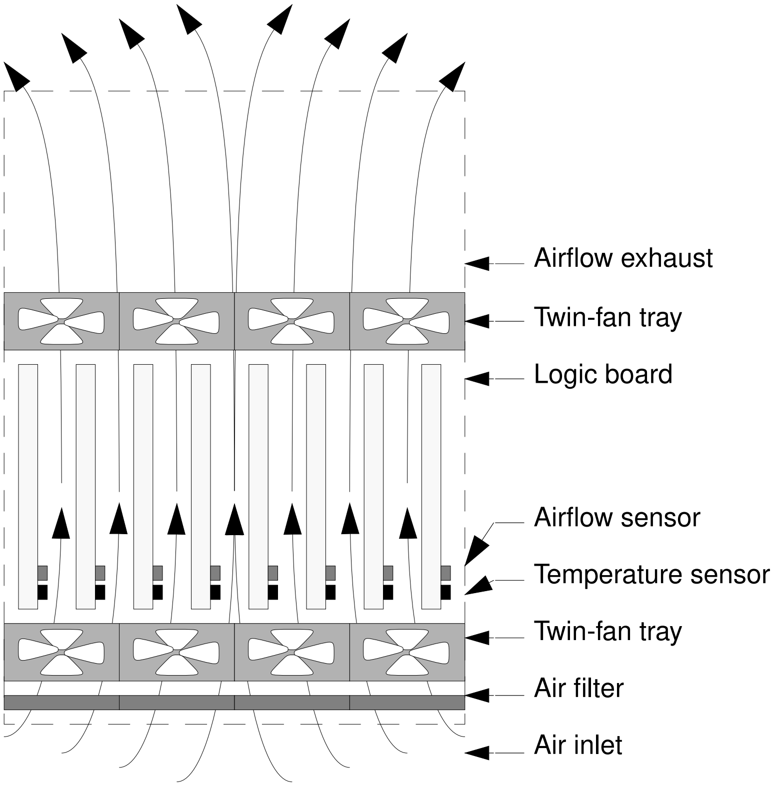

Figure 9. Airflow

- The fan trays have two fans and a tachometer that senses that both fans are rotating. A failed fan will result in a warning message being logged by the SSP.
- If a fan or fan tray fails, the fan tray can be replaced while the system is running without adverse effects to the system.
- Temperature sensors on each board detect that ambient air blowing across the board is within the specified temperature range.
- If the “temperature warning” level is reached, the condition is logged to the SSP. If the “temperature threshold” level is reached, the offending board is powered off and logically excluded from its domain.

Expansion Cabinet

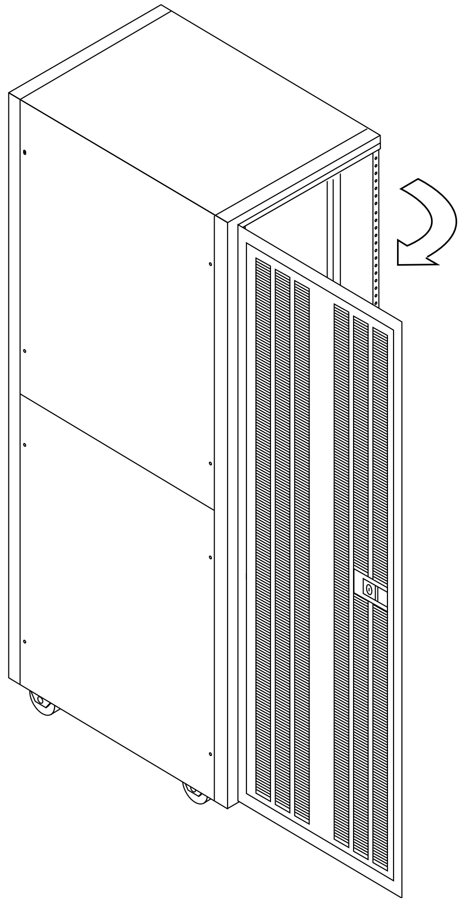

Figure 10. Data Center Expansion Cabinet

The 72-inch Sun Enterprise Expansion Cabinet is available for use with the Sun Enterprise 10000 system. The Expansion Cabinet can be configured to a user's specific needs. The following devices may be installed in an Expansion Cabinet:

- Sun StorEdge D1000 array (up to 9 per cabinet)
- Sun StorEdge A5000 fibre channel arbitrated loop array (up to 6 per cabinet)
- Sun StorEdge A3500 high availability RAID array (1 per cabinet)
- Tape devices, with and without autoloaders. Includes 4-mm DDS-3, digital linear tape and 8-mm Exabyte.

Expansion Cabinet *(cont.)*

Expansion Cabinet Cooling

- Each Expansion Cabinet has one cabinet fan tray that includes four fans supported by two power supplies. Each power supply supports two fans.
- The Expansion Cabinet features redundant cooling. If a power supply fails, two fans stop running and two fans continue to operate, providing enough cooling to keep the devices in the Expansion Cabinet cool.
- At this time one may not mix front to back cooled devices with side to side cooled devices. Front-to-back cooled devices include the Sun StorEdge D1000 and A3500 arrays and tape devices, side-to-side include the Sun StorEdge A5000 array.
- If more than two Sun StorEdge A5000 arrays are installed as X-options, please order the upper fan assembly and the front door assembly.
- Expansion Cabinets can be controlled by the System Cabinet and can send status information to the System Cabinet, through a connection between the Expansion Cabinets and the System Cabinet. Specifically, the connection supports the following:
  - When a cabinet fan tray fails in an Expansion Cabinet, the System Cabinet is notified. A system administrator monitoring the System Cabinet status can see when a cabinet fan tray fails in an Expansion Cabinet.
  - The system administrator is able to turn off the System Cabinet and all the Expansion Cabinets connected to the System Cabinet with either the System Cabinet key switch or through a software command.

Dynamic System Domains

Subdividing the Sun Enterprise™ 10000 System into Multiple Computers

The Sun Enterprise™ 10000 server's dynamic system domain feature allows the Sun Enterprise 10000 system to be subdivided into multiple computers, each consisting of one or more system boards. System domains are similar to partitions on a mainframe. Each domain is a separate, shared-memory SMP system that runs its own local copy of the Solaris™ Operating Environment. Within a system domain, the system boards share a common physical address space and can access each other's non-cacheable (command and status) address space. Key features are:

- Up to eight domains. Each one has its own copy of the Solaris Operating Environment, its own boot disk and data storage and a connection to the SSP. Domains are from one system board to 16 system boards in size.
- Domains are logical, not physical. They may be dynamically changed in size (number of system boards) online.

Because individual system domains have access to the interconnect bandwidth but are logically isolated from other system domains, software errors will be confined to their respective system domain and will not affect the rest of the system. This allows a system domain to be used to test updates to the Solaris Operating Environment, device drivers, or other, new application software without impacting production usage.

Dynamic System Domains *(cont.)*

Subdividing the Sun Enterprise 10000 System into Multiple Computers

System domains are configured to have their own disk storage and networking. Administration of each system domain is done from one SSP that services all the system domains. The system administrator may create domains dynamically without impacting work in progress on the Sun Enterprise 10000 system. Dynamic system domains may be used for many purposes that enable the site to manage the Sun Enterprise 10000 resources effectively:

- **LAN consolidation.** A single Sun Enterprise 10000 system can replace two, three, or more, smaller servers. It is easier to administer (uses a single SSP), more robust (more RAS features), and offers the flexibility to freely shift resources from one "server" to another. This is a benefit as applications grow, or when demand reaches peak levels requiring rapid deployment of additional computing resources.
- **Development, production, and test environments.** In a production environment, most sites require separate development and test facilities. Having isolated facilities enables the development work to continue on a regular schedule, while assuring that those efforts do not impact production. Using an Sun Enterprise 10000 system, those functions can safely coexist on the same platform.
- **Software migration.** Dynamic system domains may be used as a means of migrating systems or application software to updated versions. This applies to the Solaris Operating Environment, database applications, new administrative environments, or any type of application.
- **Special I/O or network functions.** A system domain may be established to deal with specific I/O devices or functions. For example, a high-end tape device could be attached to a dedicated system domain, which is alternately merged into other system domains which need to make use of the device for backup or other purposes.
- **Departmental systems.** A single Sun Enterprise 10000 system may be shared by multiple projects or departments, simplifying cost justification and cost accounting requirements.

Configuring for resource requirements

There are a variety of ways to deal with applications with special resource requirements or limitations. Projects which have resource requirements that might overflow onto other applications may be isolated to their own system domain. Also, for applications that cannot take advantage of all resources (that is, they lack scalability) multiple instances of the application may be run in separate system domains.

- **Data Warehouses Applications.** Many data warehouses use multiple systems to tier data. The Sun Enterprise 10000 system can tier data on the same system and dynamically allocate more resources to individual tiers as needed.

Dynamic System Domains *(cont.)*

Subdividing The Sun Enterprise 10000 System into Multiple Computers *(cont.)*

The figure below shows an example of how the Sun Enterprise 10000 may be divided into Dynamic System Domains. Domain #3 is a 36 processor production domain running standard the Solaris 2.6 Operating Environment. Domain #2 is running a special application with eight processors (for instance proving that the application is fully stable before allowing it to run on the production domain #3). Domain #1, with four processors, is being used to check out an early version of the Solaris 7 Operating Environment. Note that each domain has its own boot disk and storage, as well as a network connection. All are controlled from a common SSP.

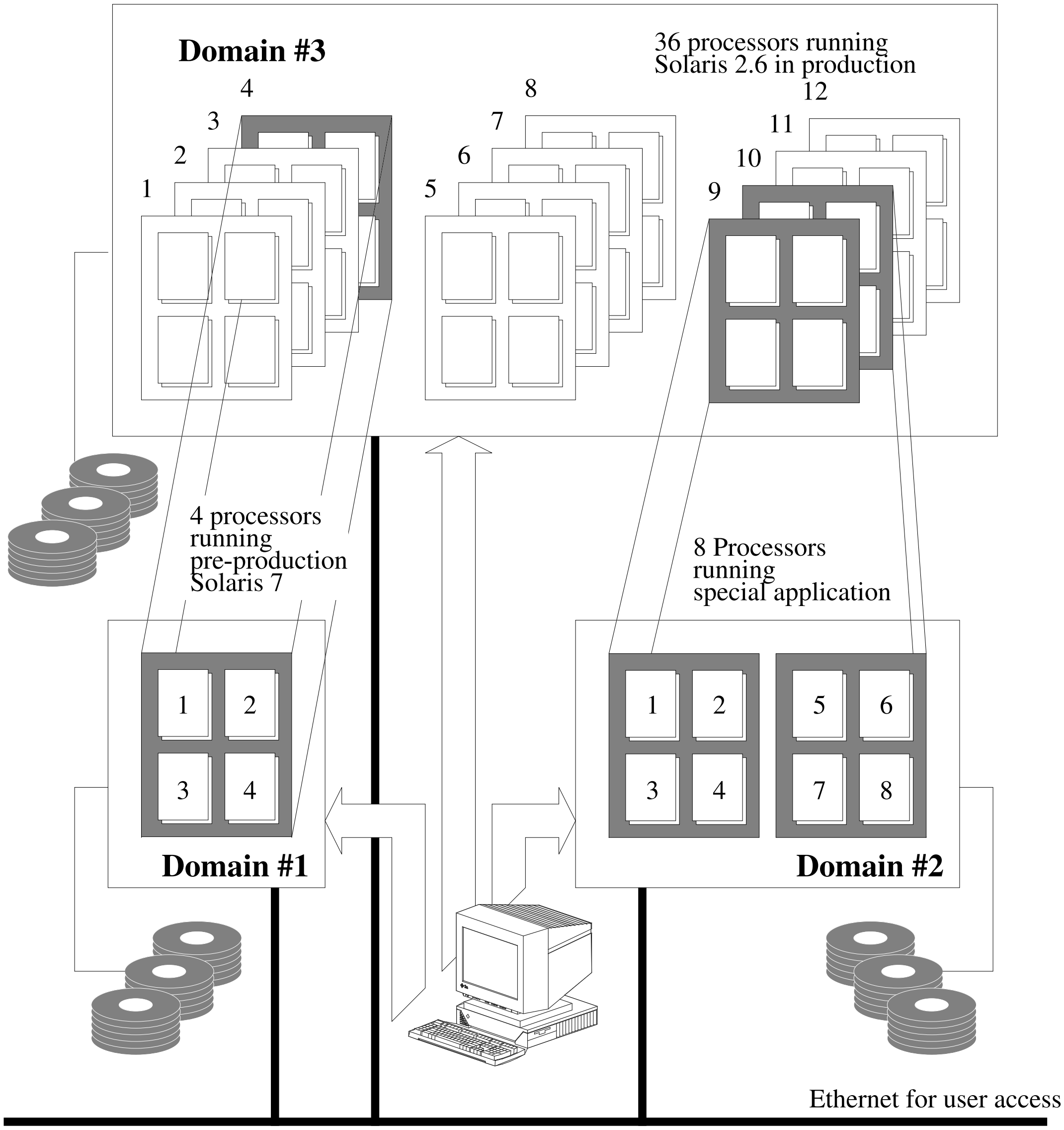

Figure 11. Sample Domain Configuration

System Service Processor

Introduction

The System Service Processor (SSP), the system console, is an UltraSPARC™-IIi workstation that runs the standard Solaris Operating Environment plus a suite of diagnostics and management programs. These include power-on self-test (POST), Hostmon, and Network Console utilities developed for use on the Sun Enterprise 10000 system. The SSP enables the operator to monitor and control the Sun Enterprise 10000 system. These programs assist the SSP with sequencing the boot process, assisting in configuration decisions, managing dynamic system domains, monitoring environmental conditions, helping the Sun Enterprise 10000 system recover from interrupts, and sending information to Sun Enterprise Services regarding interrupts. The SSP is connected via remote console support to the Sun Enterprise 10000 system using Ethernet. Using Network Console, the SSP can be accessed remotely to facilitate system administration functions of the Sun Enterprise 10000 system. Figure 12 shows the network connections between the SSP and the Sun Enterprise 10000 system. Provision is made for a second SSP acting as a hot spare to the first one.

System Service Processor *(cont.)*

The SSP

The SSP is built from a UltraSPARC-IIi workstation with 128 MB of RAM and a 4.3-GB disk. There is a color monitor and also a CD-ROM drive for loading software onto the Sun Enterprise 10000 system. The SSP runs the standard Solaris 2.5.1 Operating Environment. In addition to the Solaris Operating Environment, the SSP runs the following software:

- **Hostview.** This is a graphical user interface (GUI) that assists the system administrator with management of the Sun Enterprise 10000 system's hardware, including dynamic system domains and dynamic reconfiguration functions.
- **SSP commands.** All of the functions provided in Hostview are also available via a command line interface, which may be used for more rapid remote access or to script certain operations.
- **POST.** This software performs diagnosis on the hardware and configuration management based on the diagnosis. It assures that the system components are operational.
- **Network Console (netcon).** This software enables remote logins to the Sun Enterprise 10000 SSP. Using netcon, a system administrator can operate a Sun Enterprise 10000 system remotely, from anywhere there is a network connection, via an X-Window interface.The SSP uses these programs to assist the Sun Enterprise 10000 system to recover from the following events:
- **Heartbeat detection.** The SSP monitors the Sun Enterprise 10000 system by a "heartbeat". When a heartbeat failure is detected, the SSP attempts to send an interrupt to the Sun Enterprise 10000 system which will cause a dump and ordinary recovery. If this fails, the SSP logs this event and reboots the system.
- **Error recovery.** The SSP provides recovery for fatal errors by logging the event, initiating any required reconfiguration, and testing to try to isolate and remove components which may have caused the fatal error.
- **Message logging.** The SSP logs standard system domain messages that represent important information indicating a problem in the Sun Enterprise 10000 system (or a system partition) due to some hardware/software failure. These messages can range from a kernel panic to an over-temperature reading within the hardware. The SSP logs user software errors that include items such as what was executed, failures in booting, or incorrect command semantics. Because these messages are domain related, the messages must migrate to the master SSP managing that domain. The SSP logs seven types of messages: Emergency, alert, critical, error, warning, information, and debug.

System Service Processor *(cont.)*

The SSP *(cont.)*

- **Environmental emergency response.** The SSP protects the system from environmental conditions by signaling the Solaris Operating Environment on the host to take appropriate action when a potentially dangerous condition exists.
- **Program execution.** Supervisory programs running on each CPU export their state to the SSP to allow debug and other information to be displayed.
- **Hardware and environmental conditions**. Hardware and environmental faults are displayed until cleared by definitive action by a system administrator. The setting and clearing of events are logged.
- **Power problems.** The SSP controls, monitors, and margins the power to the Sun Enterprise 10000 system. The Sun Enterprise 10000 power status and control can be accomplished through simple network management protocol (SNMP) directly, so that standard SNMP tools can be used to power the Sun Enterprise 10000 system on and off. The SSP can power individual power supplies on and off, with the exception of housekeeping power which can only be powered off.
- **Boot heuristics.** The boot heuristics service is intended to perform as a human; trying to solve a problem not caught by diagnostics by physically or logically removing components in order to isolate a bad component, yet still have an operational configuration. Boot heuristics measures the success of the previous boot by how long it stayed up before an interrupt. If boot heuristics fail, a “boot failure” state is entered.
- **Remote service**. All functions on the SSP that can be performed remotely are set up for dumb terminal execution for use over modem connections.

System Service Processor *(cont.)*

The SSP *(cont.)*

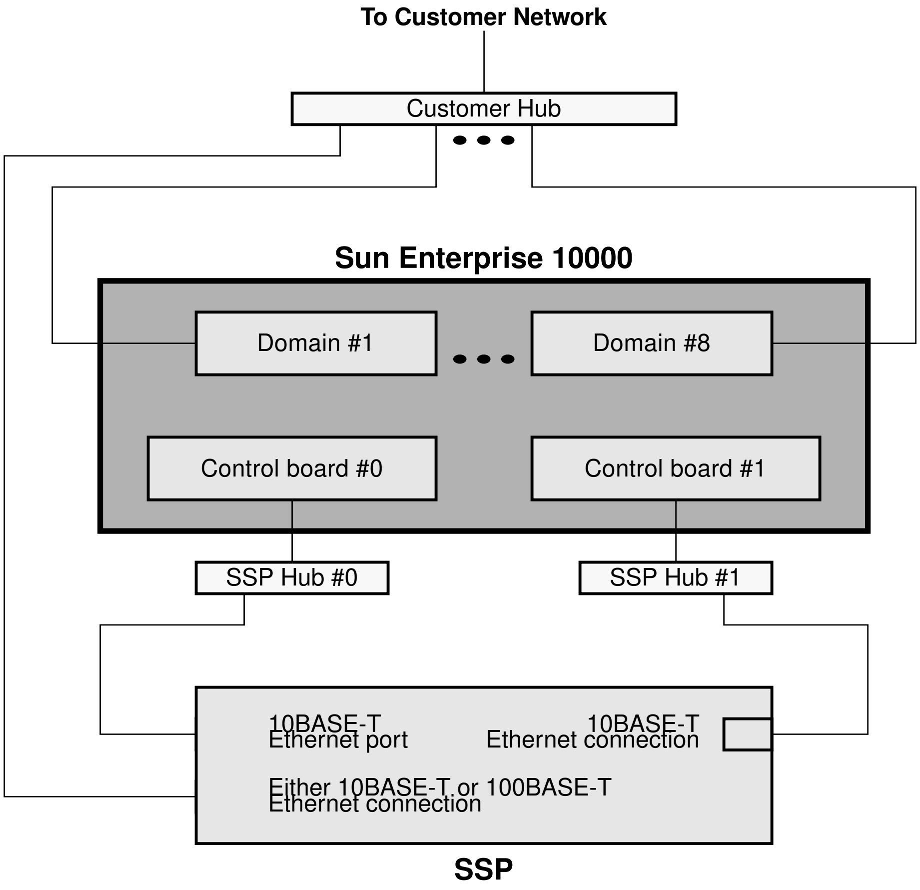

Figure 12. System Service Processor

The diagram above shows the following connections to the SSP from the Sun Enterprise 10000:

- Each control board has its own private Ethernet hub between itself and the SSP. These are 10BASE-T networks and service levels between the SSP and the Sun Enterprise 10000 are therefore efficiently communicated, as there is no other network traffic.
- Each Sun Enterprise 10000 Domain is connected to another Ethernet hub (the “customer hub”). This is a 10/100BASE-T Ethernet network to which the SSP is connected. This network is used to first-time boot up each Domain. (Subsequent boots are from the private storage connected to the Domain).
- Users can access each Domain using a common network to all Domains or a private one to each Domain.

System Service Processor *(cont.)*

Power-on Self-test (POST)

Power-on self-test (POST) is the principal, bring-up diagnostic program for the Sun Enterprise 10000 system. It verifies that all components (memory, processors, I/O controllers, etc.) are functional before allowing them to be configured into the Sun Enterprise 10000 system. Using POST helps ensure that the system can be brought up with confidence, even if there are hardware problems, and that those problems will not have an impact on the availability of the system because they are configured out of the system.

POST:

- Exercises the Sun Enterprise 10000 system logic at a level below that of the field replaceable unit, and with a high degree of accuracy, finding failing components allowing isolation to the field-replaceable unit
- Provides a highly-available platform for customer applications, even in the face of hardware failures
- Provides low-level, start-of-day configuration services, including detailed interaction with specific hardware components
- Records sufficient information about failed and marginal components so that both field replacement and subsequent factory repairs are expedited
- Remembers which components passed the tests, and will configure only those components into the final system configuration. This is possible by using the JTAG access to each of the key Sun Enterprise 10000 ASICs
- Can also be told to ignore certain components by looking them up in the *blacklist*. In this way, components scheduled for service, are of questionable functionality, or have a certain revision level can be kept out of a system configuration
- Has the responsibility of establishing the final system hardware configuration; if there is a failed or blacklisted component, there may be a variety of ways in which the final system may be configured.

  For example, if a coherency interface controller chip has failed, one option is to configure the final system with only three global address buses, thus avoiding the bad coherency interface controller, but allowing access to the processors. This maximizes compute power at the expense of system bandwidth. A second choice would be to configure the entire system board out of the system, which would allow concurrent servicing of the board at a later time without the need to do a dynamic reconfiguration operation

The amount of testing done by POST is controlled by the “level” of testing requested. At higher levels, more tests are run and POST thoroughly tests additional components—even those with little chance of failure.

System Service Processor *(cont.)*

Hostview

Hostview is the graphical user interface program on the SSP that monitors the Sun Enterprise 10000 components and functions. Hostview simplifies monitoring and control of the Sun Enterprise 10000 system by providing a series of easy-to-follow menus. Hostview is able to make reasonable decisions about environmental problems, making the Sun Enterprise 10000 system less susceptible to single-point failures.

Hostview enables you to perform the following actions:

- Power the Sun Enterprise 10000 system on and off
- Dynamically reconfigure the boards within the Sun Enterprise 10000 system, logically attaching or detaching them from the operating system, resetting them, and running diagnostics on them
- Create and manage dynamic system domains
- View status of processors (for example, booting, running the Solaris Operating Environment, etc.)
- Start an SSP window for each system domain
- Access the SSP log messages file for each system domain
- Remotely login to each system domain
- Modify the blacklist file to enable or disable hardware components on each system domain

Hostview enables the system administrator to monitor and respond to various system events, such as:

- Hardware faults; for example, over-voltage
- Environmental faults; for example, excessive heating
- Loss of "heartbeat" from the Sun Enterprise 10000 system

SunVTS™

Sun Validation Test Suite (SunVTS™) is the replacement product for SunDiag™. Like SunDiag, SunVTS is run at the UNIX® level and is designed to exercise the entire system. It supports either a graphical or TTY user interface and provides error and information logging. The key features of SunVTS are:

- **UNIX-level diagnostics.** System tests execute real UNIX code under the Solaris Operating Environment.
- **Automatic system probing.** The system configuration is displayed through the user interface.
- **Two user interfaces.** A graphical-based interface and a character-based interface are both available. The SunVTS kernel is cleanly separable from the user interface, such that multiple-user interfaces can communicate with the same SunVTS kernel. The character-based interface permits the writing of shell scripts to control SunVTS.
- **Application programming interface (API).** The API provides a defined interface into the SunVTS kernel from other processes, as well as the user interfaces. A SunVTS execution could be initiated in a cron-like fashion, with no direct user interface at all.
- **Advanced configuration and execution control.** Tests can be grouped together based on user requirements, with fine-grained execution control for status and logging information.

System Service Processor *(cont.)*

Network Console

The SSP provides a service called Network Console (netcon). Netcon provides a “console” for single-user operations. Normally, a SSP must be on the same subnetwork as the Sun Enterprise 10000 system; with netcon, they can be anywhere in the world that has a network attachment. The service is provided such that sessions, similar to rlogin sessions, can be provided to X-Windows clients on the same network as the SSP. This enables system administrators to access the SSP from any location on the same network as the SSP.

- No dedicated hardware line between host and SSP
- Remote control from any workstation
- Multiple sessions allows administrators to observe console access simultaneously

Simple Network Management Protocol (SNMP) Support

All events noted by the Sun Enterprise 10000 monitoring functions are broadcast to the network via SNMP messages. This means that, in addition to the Hostview program, they may be trapped by any software package that processes SNMP messages. Thus, messages specific to Sun Enterprise 10000 systems can be integrated conveniently into a site's existing systems and network management toolsets.

A management information base (MIB) has been defined for the Sun Enterprise 10000 series. This includes a wealth of information that can be used by third-party system and network management products. A typical monitoring tool would be Solstice™ Site Manager™, Solstice Domain Manager™, or Solstice Enterprise Manager™. The Sun Enterprise 10000 server’s MIB and adherence to SNMP provide the hooks to allow a manager such as this to support the Sun Enterprise 10000 system.

The Solaris™ Operating Environment

The Sun Enterprise servers include the industry's leading enterprise operating environment, Solaris 2.6. Built on the latest UNIX technology, the Solaris Operating Environment delivers unparalleled scaleability and performance. With enterprise integration by design, the Solaris Operating Environment provides easy access to a wide range of computing environments and network technologies. It delivers a competitive advantage to business through networked computing, scalability, and multi-architecture support. The Solaris Operating Environment provides an advanced, superior solution for all customer IT needs, both technical and business. The Solaris Operating Environment is an industrial-grade solution with the performance, quality, and robustness to deliver mission-critical reliability.

The Solaris Operating Environment delivers a unique advantage for mission-critical environments, providing advanced features and functionality that, combined with built-in networking, gives users a high-performance computing environment enabling faster, higher quality, and more productive work.

The Solaris Operating Environment delivers the power of the Sun Enterprise servers to users through enhanced networking capabilities and performance, graphics and imaging, increased standards compliance, and key operating system management advancements.

The Sun Enterprise 10000 runs the Solaris Operating Environment 2.6, or the previous revision 2.5.1. The installed base will gradually transition to the Solaris 2.6 Operating Environment over the course of 1998.

Solaris 2.6 Operating Environment Features and Benefits

Features	Benefits
Quality:	
• Full binary compatibility	• Existing Solaris Operating Environment 2.x applications run without modification on the Solaris Operating Environment 2.6
• Over 9 months of beta testing	• Extensive real-world use to ensure problem-free operation
Performance and Scalability:	
• Kernel-based sockets	• 350 percent increase in web server performance
• TCP improvements	• Fast performance over large bandwidth networks
• I/O Enhancements (UFS Direct I/O)	• Improvement of 300 percent in large file transfers
• Large file support	• Support for single files up to one TB in size
Java™ Technology:	
• Java virtual machine	• Enables the Solaris Operating Environment to run Java applications
• Java Just-in-Time Compiler	• Speeds performance of Java applications
• HotJava™ browser	• Integrated, Java technology-enabled browser

The Solaris Operating Environment *(cont.)*

Solaris 2.6 Operating Environment Features and Benefits *(cont.)*

Ease of Use and Management:

• Solaris Web Start	• Browser-based point and click installation
• CDE default desktop	• Easy-to-use graphical desktop with extensive enhancements, including application integration with the web
• Netscape™ browser	• Industry standard web browser
• Browser-based help system	• Easily accessible documentation with web-based browser interface
• Dynamic Host Configuration Protocol (DHCP Client/Server)	• Automates remote management of heterogeneous clients
• SunSoft™ Print Client	• Easier, centralized setup and management of client access to printers

Network and Security:

• WebNFS™	• Fast access to files over the Web
• Boot from Cache file system	• Speeds Solstice AutoClient™ booting and reduces network traffic
• NIS Server	• Supports the NIS server natively
• NFS Failover	• Enables continuous client availability
• GSS-API	• Enables strengthened security of NFS over networks

Standards:

• Year 2000-compliance	• Handles dates unambiguously, follows X/Open® guidelines
• X/Open UNIX 95	• “Standard UNIX” compliant
• Federated Naming Service	• Compliant with the X/Open 2.0 definition
• ISO 10646	• Supports the Unicode 2.0 standard

Developer Environment:

• Application Binary Interface Tool	• Facilitates forward compatibility for application developers
• Software Developer Kit and Device Driver Kit	• Packaged with the Solaris Operating Environment for easier access to the development environment
• Versioning/Scoped libraries	• Improved portability of applications

The Solaris Operating Environment *(cont.)*

Performance features of Solaris 2.6 compared to Solaris 2.5.1

Performance Feature of Solaris 2.6	Benefit
Large page intimate shared memory	Improved performance compared to the Solaris 2.5 1 Operating Environment in commercial and HPC workloads. The Solaris Operating Environment builds the database buffer pool with virtual memory pages of 4 MB, thereby reducing the virtual memory overhead for memory accesses to this critical area.
Processor sets	Allows the user to optimize the Sun Enterprise 10000 by allocating processes to specific groups of processors.
I/O subsystem improvements	There is a reduction of Solaris overhead and this results in improved I/O performance.
Direct I/O	This allows database file access to bypass a layer of operating system processing. This gives all the benefits of running the database on raw partitions with the Solaris Operating Environment's superior system management.
Large file support	With the Solaris 2.6 Operating Environment, files may be up to 1 TB in size. Large data access is simplified by reducing the number of files.
Larger address space	With the Solaris 2.6 Operating Environment, the limit of 2 GB on address space has been raised to 3.75 GB.
Process unmapping enhancements	Process exit is more efficient and this is useful for operations such as database shutdown.
General operating system efficiency	Many different improvements have decreased the system time required by the Solaris 2.6 Operating Environment itself.

Glossary

CIC	Coherency Interface Controller. Handles coherency transactions for the three port controllers on a board. Connects to one of four global address buses. Snoops for one quarter of the address space.
Circuit-switched bus	A bus in which a transaction is normally implemented in an automatic fashion. Simple and easy to construct, a circuit-switched bus is often less efficient than a comparable packet-switched bus. SBus is a circuit-switched bus.
ECC	Error checking and correcting. ECC code is used to verify the integrity of data and can be used to correct some data errors.The ECC code used in the Sun Enterprise™ X000 servers is able to detect and correct single-bit errors and detect double-bit errors.
Fault resistant	Systems that are fault-resistant are able to withstand and recover from many types of system problems.
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 more expensive that comparable fault-resistant systems.
GAARB	Global Address Arbiter. Arbitrates for a global address buses. Implemented by a Sun Enterprise 10000 arbiter chip.
GAB	Global Address Buses. Four 16:16, 48-bit wide multiplexers that connect a coherent interface controller from each system board. The multiplexors broadcast one of the inputs to all the outputs. Implemented by 16 XMUX ASICs. Functions like a snoopy bus for coherency purposes, but is really a point-to-point address router.
Gigaplane™	Gigaplane is the centerplane bus that is used in the Sun Enterprise 3000, 4000, 5000, and 6000 servers. The Gigaplane bus is a packet-switched bus offering a sustained data transfer rate of 2.5 GB/sec.
Gigaplane-XB™ Interconnect	The Gigaplane-XB Interconnect is the centerplane bus that is used in the Sun Enterprise 10000 system. The Gigaplane-XB interconnect is a packet-switched bus offering a data transfer rate of 10.67 GB per second with a 83.3-MHz clock and 12.8 GB per second with a 100-MHz clock
GDR	Global Data Router. Sixteen 16:1, 144-bits wide multiplexers that connect the local data routers on each system board. Implemented by 12 XMUX ASICs.
High availability	Availability is the time a particular resource, such as a system, application, or data is accessible and usable. High availability means the resource is accessible and usable a maximum amount of time.
Hostview	Hostview is the graphical user interface program on the SSP that monitors the Sun Enterprise 10000 components and functions.

Hot plug	A hot-plug component means that it is electrically safe to remove or add that component while the machine is still running. Typically, the system must be rebooted before the hot-plug component is configured into the system.
Hot swap	A hot-swap component can be installed or removed by simply pulling the component out and putting the new one in. The system will either automatically recognize the component change and configure itself as necessary or will require user interaction to configure the system, but a reboot is not required. All hot-swappable components are hot pluggable, but not all hot-pluggable components are hot swappable.
Interleaved memory	Interleaved memory helps reduce memory access time by permitting multiple memory components to operate in parallel. In interleaved memory schemes, memory is divided into *n* banks arranged so that every *n*th byte is supplied by a different memory bank. In a two-way interleaved system, the first doubleword is supplied by bank 0 while the second is supplied by bank 1; normally the size and extent of interleave is arranged so that a single typical request is satisfied by as many banks as possible. This permits a single memory request to be fulfilled without waiting for memory recycle time. The Sun Enterprise 10000 uses 4-way interleaved memory.
LDARB	Local Data Arbiter. Arbitrates for the local data router.
LDR	Local Data Router. Two unidirectional 144-bit wide 4:1 multiplexers that connect the four UPA databuses on a system board with the global data router. Implemented by four XMUX ASICs per system board.
MC	Memory Controller chip. Accepts memory addresses from the four Coherent Interface Controllers, and data from the Sun Enterprise 10000 data buffer (XDB), and performs reading and writing of 64-byte blocks of data into one to four banks of memory.
Memory bank	512 data bits, plus 64 ECC bits, made up of 8 SIMMs.
OBP	OpenBoot™ PROM. In the Sun Enterprise 10000 system, OBP is held in RAM by the SSP.
Packet-switched bus	A bus in which information is transmitted in fixed-sized units. Often associated with the use of split transactions. Gigaplane and UPA are packet-switched buses.
Parity	Parity is a simple technique used to verify the integrity of data. Parity detects single-bit errors.
PC	Port Controller chip. Interfaces UPA modules to the Sun Enterprise 10000 system. The PC controls address flow between the UPA port and the four Coherent Interface Controllers, and controls data flow between the UPA port and the Sun Enterprise 10000 data buffer (XDB).

POST	Power-on self-test. POST is a suite of hardware integrity tests implemented in firmware that verifies the integrity of system components.
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 will protect the user from being adversely affected by the problem. Serviceability is a measure of how easy it is to repair the problem.
SSP	The System Service Processor, the system console, is a SPARC™ workstation that runs the standard Solaris™ Operating Environment plus a suite of diagnostics and management programs.
SunVTS™	Sun Validation Test Suite. This is the replacement for SunDiag™.
UPA Bus	Ultra™ Port Architecture bus. Used as an intermediate bus on the CPU/memory and I/O boards.
XARB	Sun Enterprise 10000 arbiter chip. Has modes to implement three functional units: The local address arbiter, the local data arbiter, and global address arbiter.
XDB	Sun Enterprise 10000 data buffer chip. Buffers cache lines that are in transit between a UPA data port or a memory bank and the local data router.
XMUX	Multiplexer chip. Has modes to implement four functional units: The global address router, the local data router, the global data router, and the 144 / 576-bit wide pack/unpack on the memory module

Materials Abstract

All materials are available on SunWIN, except where noted.

Collateral	Description	Purpose	Distribution	Token # or Comac order #
Power Pack				
– *Sun Enterprise™ 10000 Just The Facts*	Reference information	Sales tool Training	SunWIN, Reseller web	57933, 57936
– *Sun Enterprise 10000 Presentation and Slide Notes, 2/98*	Presentation and Slide Notes covering product, market, performance, and competition	Sales tool	SunWIN, Reseller web	62298, 62304
References				
– *Sun Intro: Sun Enterprise 10000*	Introduction e-mail	Sales tool	SunWIN, Reseller web, E-mail	62201 81642
– *High Performance Computing 2.0 Just The Facts*	Detailed information concerning the Sun Enterprise 10000 in HPC	Sales tool	SunWIN, Reseller web	75001
– *Sun Enterprise Cluster Just The Facts*	Information on clustering the Sun Enterprise 10000	Sales tool	SunWIN, Reseller web	74006
– *Sun Enterprise 10000 Server Overview*	Quick reference material	Sales tool	SunWIN, Reseller web, First Resort,	66505
Product Literature				
– *Ultra™ Server family Sun Enterprise 10000*	Datasheet	Sales tool	SunWIN, Reseller web, Comac	62102, DE675-1
– *Sun Enterprise 10000*	Product brief	Sales tool	SunWIN, Reseller web	62118
White Papers				
– *Sun Enterprise 10000 Technical White Paper*	High-level architectural information	Sales tool	SunWIN, Reseller web	62355
– *Consolidation and Recentralization with the Sun Enterprise 10000 server*	One large server instead of multiple smaller ones	Sales tool	SunWIN, Reseller web	62339
– *Sun Enterprise 10000: SunTrust Reliability, Availability, and Serviceability*	High uptime features and discussion	Sales tool	SunWIN, Reseller web	62345
– *Sun Enterprise 10000: Dynamic System Domains*	Partitioning a high-end server	Sales tool	SunWIN, Reseller web	62348

Collateral	Description	Purpose	Distribution	Token # or Comac order #
Analyst Papers				
– *Andersen Consulting and Sun: Creating Breakthrough Business Strategies for the Data Center, 1/97*	Analyst paper	Sales tool	SunWIN, Reseller web	62273
– *KPMG Peat Marwick and Sun Microsystems: Enterprise Partners for the Data Warehouse*	Analyst paper	Sales tool	SunWIN, Reseller web	62214