Sun Fire™ E4900 and E6900 Servers

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Positioning

Introduction

Continuing to execute on Sun's Throughput Computing Strategy, the Sun Fire™ E4900 and Sun Fire E6900 servers now support the new UltraSPARC® IV+ processor which incorporates significant design improvements that have been built with Texas Instruments' 90 nm chip technology. The result is that the UltraSPARC IV+ processors can deliver over 2X the performance of previous UltraSPARC IV processors in the same footprint with no change in power or cooling requirements. Furthermore, compared to the original UltraSPARC III processors, the new UltraSPARC IV+ processors can deliver over 5X the performance in the same footprint, and in most cases, is upgradeable in the same chassis. Like its predecessors, the UltraSPARC IV+ processor boards are backwards compatible with previous Sun Fire enterprise servers and can be mixed in the same system or domain with UltraSPARC III and/or UltraSPARC IV processor boards, each of which will operate at rated speeds. The result is unparalleled investment protection and maximum performance.

The UltraSPARC IV+ processor is the fifth generation UltraSPARC processor and it maintains Sun's tradition of binary compatibility. This CPU preserves the investment customers have made in development tools and application software, and also helps current Uniboard-based Sun Fire server customers preserve the investments made in their systems.

This investment protection is a cornerstone of the entire product line. All previous Sun Fire 4800 and 6800 UltraSPARC III midrange servers can be upgraded with UltraSPARC IV and IV+ processor boards, and the Sun Fire E4900 and E6900 servers can be configured to mix customers' existing UltraSPARC III boards with UltraSPARC IV and IV+ boards.

Like their predecessors, the Sun Fire E4900 and E6900 servers are mission-critical, data-center systems designed with very high levels of performance and availability features, including hot-swap processor boards with dynamic reconfiguration, dynamic systems domains, and full hardware redundancy. The Sun Fire E4900 and E6900 servers are designed to fit the needs of both the commercial and high-performance computing markets by balancing the availability and manageability features required to meet today's commercial computing needs with the demanding requirements of the high-performance computing community.

Product Family Placement

The Sun Fire E4900 and E6900 servers were built to provide the following:

• Extremely high levels of performance

• Exceptionally high levels of reliability, availability, and serviceability (RAS)

• Multi-generation & multi-speed UltraSPARC processors, the Sun™ Fireplane interconnect architecture and the Solaris™ 8, 9, and 10 Operating System technology.

The following chart provides a comparison of the family of Sun Fire midrange data-center servers.

	Sun Fire™ E2900	Sun Fire E4900	Sun Fire E6900
Product Positioning	Low cost data center server	Mission critical, data center server	Mission critical, data center server
Packaging	Rack 21" high (12RU), 22" deep	Rack 32" high 17.5 RU, 28" deep	Data center Rack 75" high, 24" wide, 53" deep
Typical Environment	Data center	Data center, desk side	Data center
CPUs	4, 8 or 12	4, 8 or 12	4, 8, 12, 16, 20 or 24
Memory	192 GB	192 GB	384 GB
System Bus	9.6 GB/sec	9.6 GB redundant	9.6 GB redundant
I/O bandwidth	1.2 GB/sec	3 GB/sec.	6 GB/sec.
Internal Storage	292 GB	None	None
Removable Media	DVD, optional DAT72 tape	None	None
PCI-X slots: @100 MHz @33 MHz	6 short PCI-X slots 6	16 PCI-X 12 4	32 PCI-X 24 8
Domains	1	2	4
Integrated Network	Ultra 320 SCSI and two Gbit Ethernet	None	None
Input Power (110/240 VAC)	3300W @ 220V	4,180 W @ 220V	9,120 W @220V
RAS Features	Hot swap CPU boards, power supplies, fans, and disks. Redundant power supplies & Fireplane switches. Smart fans. Fault indicators front and back. Lights Out Management.	Hot swap CPU boards, power supplies, fans, and I/O boards. Full H/W Redundancy: power, fans, Fireplane switches, & system controllers. Self diagnostics, service indicators on all FRUs	Hot swap CPU boards, power supplies, fans, and I/O boards. Full H/W Redundancy: power, fans, Fireplane switches, & system controllers. Self diagnostics, service indicators on all FRUs
Rack Density	24 processors (48 threads) per rack	12 processors (24 threads) per rack	24 processors (48 threads) per rack
Uniboard support	No, but common with Sun Fire V1280 server	Yes	Yes
Mixed speed CPU support	Yes with previously released US III, IV, and IV+ boards	Yes with previously released 900MHz or later US III, IV, and IV+ boards	Yes with previously released 900MHz or later US III, IV, and IV+ boards

	Sun Fire™ E2900	Sun Fire E4900	Sun Fire E6900
Warranty	Duration/term: 1 year Phone hours of coverage: Business hours (M-F, 8AM-5PM) Call-back response: 8 hours On-site hours of coverage: Business hours (M-F, 8AM-5PM) Hardware response time: Next business day Delivery method: On-site or Customer Replaceable FRU Defective media support: 90 days	Duration/term: 1 year Phone hours of coverage: 7/24 (including holidays) Call-back response: Customer Defined Priority On-site hours of coverage: 7/24 (including holidays) Hardware response time: 4 hours Delivery method: On-site or Customer Replaceable FRU Defective media support: 90 days	Duration/term: 1 year Phone hours of coverage: 7/24 (including holidays) Call-back response: Customer Defined Priority On-site hours of coverage: 7/24 (including holidays) Hardware response time: 4 hours Delivery method: On-site or Customer Replaceable FRU Defective media support: 90 days
Minimum OS Level with UltraSPARC IV+	Solaris 9 9/05 Solaris 10 3/05 HW1	Solaris 9 9/05 Solaris 10 3/05 HW1	Solaris 9 9/05 Solaris 10 3/05 HW1
Minimum Firmware	5.20.1 or later	5.20.1 or later	5.20.1 or later

* Solaris 8 not supported with UltraSPARC IV+

Sun Fire E4900 and E6900 Servers Versus the Sun Fire E2900 Server

The previous chart details many of the physical aspects which differentiate the Sun Fire™ E2900 server from the Sun Fire E4900 and E6900 servers. The following chart focuses on market segmentation relative to the management and operations staff.

Criteria	Sun Fire E4900 and E6900	Sun Fire E2900
Focus	High performance and RAS, mission critical data-center applications	High price/performance, rack optimized, tier 2 and 3 data-center applications
Scope	Enterprise-wide	Enterprise-wide
Hardware Availability	99.9 to 99.99%, depending upon configuration, domains, clustering	Typically 99.9%+, depending on configuration, clustering, etc.
Storage	Centralized	Integrated boot disks, DVD and optionally tape; connection to external arrays
Backup	Centralized via network	Centralized
Connectivity	Broad range of connectivity options; hot-swap or non-hot-swap PCI; large number of IO ports; user choice of SCSI or FC-AL attachment via optional PCI cards	Smaller, focused I/O capability; integrated Ultra3 SCSI; smaller number of PCI slots; no hot-swap for PCI

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Criteria	Sun Fire E4900 and E6900	Sun Fire E2900
Price Consideration	Priority 2 or 3 after performance and availability	High priority with performance, rack density, and availability
Response time expected	Critical, Service Level Agreements (SLAs), Domains guarantee dedicated resources to particular applications	Either lower expectation of response time or achievement of critical SLAs via clustering
Management	Centralized	Centralized
Upgrades/security	Planned activity	Planned activity
Performance	Highest performance with • Fast processors • Large L3 cache • Large memory • Greater than 2 times the I/O bandwidth over Sun E2900 server	Excellent performance with • Fast processors • Large L3 cache • Large memory • Two GbE network ports

Key Messages

Sun Fire E4900 and E6900 servers offer excellent availability, resource management, performance, and scalability.

Performance

With new UltraSPARC IV+ processors, the Sun Fire E4900 and E6900 servers provide over five times the throughput compute capability of original 750MHz UltraSPARC III servers in the same footprint and over double the performance of existing UltraSPARC IV based systems.

Scalability

In today's rapidly changing marketplace, maintaining flexibility is vital to continued success. Those who are able add capacity, performance, and bandwidth with the minimum amount of complexity can able to respond more effectively to change and to anticipate its effects.

Sun delivers the architecture on which you can build a massively scalable application environment because it allows you to scale both vertically and horizontally. Horizontal scalability helps you to increase capacity by replicating applications such as web servers on multiple systems. Vertical scalability helps you to increase the resources within a domain to support applications that are not easily replicated, such as backend databases.

The Sun Fire servers have been designed from the ground up to scale easily at a pace that matches customers business requirements, so they can be ready to meet your needs.

Availability

The advanced availability features of the Sun Fire E4900 and E6900 servers support the increasing availability requirements of today's businesses. Features such as full hardware redundancy and fault-isolated domains help the systems to continue to be available when encountering failure of any single

component. The hot-swappable components, in conjunction with the dynamic reconfiguration (DR) feature, provide the capability for online repairs. The hot CPU upgrade feature provides online capacity upgrades while the users' applications continue to be available.

Investment Protection

The software architecture of the Sun Fire server family is based on the industry-leading Solaris™ Operating System and the SPARC™ V9 64-bit processor architecture. The Solaris OS is one of the only operating environments that enables compatibility between hardware and software versions on a release-to-release basis. Sun is one of the few companies that offers comprehensive hardware and software investment protection.

Unique to the Sun Fire data-center server family is the mixed-speed CPU feature[1]: Customers can add newer, faster processor boards at the rated speed along with existing processor boards. This feature extends to mixing UltraSPARC III , IV, and IV+ processor boards in the same system or domain! This provision further protects their previous investments.

Key Features and Benefits

Feature	**Benefit**
• UltraSPARC IV+ processors	• Over 5X the application performance over UltraSPARC III and over 2X the performance over UltraSPARC IV with full binary compatibility for applications running on existing Sun systems.
• Full hardware redundancy	• Very high application availability in the event of hardware failure. If properly configured, the system can survive a failure that involves a single hardware component. Only Sun Fire servers offer redundant interconnects, clocks, and system controllers.
• Hot CPU upgrades	• Upgrade to faster speed CPUs while the Solaris OS and applications continue to be available.
• Fault-tolerant, redundant power supplies, fans and system clock	• Virtually continuous availability in the event of a component failure.
• Fault-isolated dynamic system domains	• The flexibility of running multiple, isolated Solaris OS instances, and applications on one server.
	• Hot-swap resources in and out of a domain through dynamic reconfiguration without impacting availability.
• Dynamic reconfiguration (DR)	• Ability to add or remove hardware components while applications and Solaris OS continue to run. DR can be used to repair, upgrade, or move system resources between dynamic system domains.

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[1] Mixed-speed CPU is available with UltraSPARC III Cu 900-MHz and subsequent processors.

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Feature	Benefit
• Redundant, reconfigurable Sun Fireplane interconnect	• Provides for lower latency, greater memory, and I/O bandwidth than UltraSPARC III. Allows Sun Fire midrange servers to scale up to 24 UltraSPARC IV+ processors.
• Common components	• Investment protection and improved serviceability across Sun Fire E4900 and E6900 servers.
• Support for mixed speed CPUs	• Investment protection by avoiding the need to upgrade existing CPUs when additional CPU capacity is required.
• Enhanced auto recovery (system controller failover)	• The system controller (SC) failover capability enables the main SC to failover to the spare SC automatically without operator intervention. The spare SC assumes the role of the main and takes over all SC responsibilities.
• Scalability	• The Sun Fireplane interconnect system provides excellent memory and I/O bandwidth, helping to ensure that Sun Fire servers deliver balanced and predictable performance under the most demanding loads. As resources are added to the systems, the Sun Fireplane interconnect system scales, providing high-speed, low-latency access to CPU, memory, and I/O devices to help ensure consistent high performance, even in very large system configurations.
• Solaris 8, 9, and 10 Operating Systems support	• The industry-leading UNIX® software environment offers outstanding availability and scalability with support for over 12,000 applications, 64-bit support, and exceptional features for network computing.

Target Markets and Users

The Sun Fire E4900 and E6900 systems are high-performance, high-availability systems designed to meet demanding data-center requirements for mission-critical applications. These servers are general purpose and suitable for both industry and business needs. Each server has different characteristics and capabilities and can therefore be deployed in different ways, targeted to the needs of more specific markets and users.

Sun Fire E4900 Server Positioning

The Sun Fire E4900 server is a versatile server with exceptional value and scalability for companies requiring a high-performance, highly available midrange business server with the ability to scale system performance and capacity as their needs grow, as well as the versatility of dynamic system domains.

The Sun Fire E4900 sever is ideal for customers who need an enterprise-class database or application server with high reliability, availability, and serviceability. With up to two dynamic system domains and the resource management tools provided by the the Solaris OS, the Sun Fire E4900 server is an ideal vehicle for server and application consolidation. The second domain also makes for an excellent test environment, such as for new applications, while the other fault-isolated domain runs the primary business applications.

The Sun Fire E4900 server is recommended for running mission-critical applications that support thousands of users or other large workloads. These applications include large departmental databases, customer-management applications, decision-support applications, or high-performance computing (HPC) workloads.

Sun Fire E6900 Server Positioning

In addition to offering high performance and availability, the Sun Fire E6900 server is ideal for customers who want to add flexibility and robustness to their large enterprise or Internet data-center applications. The customer receives the benefits of improved scalability and compatibility, allowing applications to grow to tens of thousands of users, to multiple terabytes (TB) of data storage, and up to four dynamic system domains.

The Sun Fire E6900 server offers twice the CPU and memory expandability of the Sun Fire E4900 and up to four dynamic system domains. The Sun Fire E6900 server is an ideal choice when the Sun Fire E4900 server does not offer enough expandability or when customers require up to four dynamic system domains.

The Sun Fire E6900 server is recommended when:

• There is a requirement for high performance UltraSPARC IV+ processors

• The customer wants the latest technology

• A maximum of four domains and 24 or fewer CPUs are required

Positioning Summary

Market/User	System Choice(s)	Key Features to Highlight
Service provider or IT provider requiring high performance at lowest cost	Sun Fire E2900	• Up to 12 UltraSPARC IV+ processors, 192-GB memory • Entry-level system with upgrade path • Small footprint and rack-mountable • Excellent price/performance
Users with mission-critical applications, for example, ecommerce, 24 x 7 core business systems	Sun Fire E4900 Sun Fire E6900	• High reliability, availability, and serviceability for maximum availability • Full hardware redundancy and Hot CPU upgrades • Enhanced auto recovery (SC failover)

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Market/User	System Choice(s)	Key Features to Highlight
Customers looking to lower total-cost-of-ownership through server consolidation	Sun Fire E4900 Sun Fire E6900	• Multiple dynamic system domains • Centralized management through Sun Management Center 3.5 • Full hardware redundancy to meet strict Service Level Agreements
Technical and high-performance computing customers requiring market-leading performance and attractive prices	Sun Fire E4900 Sun Fire E6900	• High-performance UltraSPARC IV+ processors • High-bandwidth Sun Fireplane interconnect system • Low-latency Sun Fireplane interconnect system • Large physical memory • High I/O throughput, support for 100MHz, 64-bit PCI-X adapters
High performance computing customers with distributed application requirements	Sun Fire E4900 Sun Fire E6900	• High-performance UltraSPARC IV+ processors • High I/O throughput • Large physical memory space • Support for high performance interconnects
Commercial sites that require high availability, more than four domains, proven scalability	Sun Fire E20K Sun Fire E25K	• Up to 18 dynamic system domains • Automatic dynamic reconfiguration • Scalability up to 72 US IV+ processors

Selling Highlights

Market Value Proposition

The Sun Fire™ E4900 and E6900 servers offer a dramatic increase in performance with an equally dramatic reduction in the total cost of ownership (TCO). With the UltraSPARC™ IV+ processors, the Sun Fire E4900 and E6900 servers offer over double the compute capability of preceding UltraSPARC IV Sun Fire systems in the same chassis.

This allows customers to reduce cost of ownership in several ways. For an existing application, the customer can buy a smaller server or use few processors, resulting in a lower up-front cost, less power and cooling, and lower support and maintenance costs. This also allows customers to grow applications without having to buy new capacity as frequently. Additionally, due to their expanded compute capacity along with dynamic system domains, these servers are an excellent vehicle for server consolidation of aging competitive or UltraSPARC II systems.

TCO is further reduced by large increases in system availability due to the integration of key quality improvements such as improved manufacturing technologies, CPU off-lining, and memory page retirement. With higher availability, TCO is reduced as downtime is reduced and the systems become more productive.

Lastly, as with the preceding Sun Fire server line, the Sun Fire E4900 and E6900 servers offer competitively unique investment protection features, such as Uniboards, backward and forward upgradability and compatibility of processor boards, and support for mixing different speed processor boards in both new and old systems.

With these key feature sets, customers can enjoy dramatic increases in performance on both new and old servers with reduced TCO across the board.

Applications

Based on years of experience in scaling and supporting the SMP architecture, the Sun Fire E4900 and E6900 servers are designed for deploying today's mission-critical applications, from ERP to ecommerce to HPC. The scalability and flexibility are excellent features for applications that are deployed in a multi-tier environment, have indeterminate potential growth, or need extra processing capacity to satisfy monthly, weekly, or other regular excess transaction load.

The availability features of the product line are ideally suited to applications that require very high availability. Support for Sun™ Cluster 3.1 software provides for even greater availability requirements. However, when all components are configured redundantly, a single Sun Fire E4900 and E6900 system offers outstanding availability often exceeding the requirements of Sun customers.

Compatibility

The Sun Fire E4900 and E6900 servers run the Solaris 8, Solaris 9, and Solaris 10 Operating Systems, which have thousands of applications available.

Compatibility with the Solaris OS brings with it the ability to run existing Solaris applications developed for the SPARC™ 32-bit or 64-bit processor architecture. The same application programming interfaces (APIs) and the same application binary interface (ABI) in previous versions of the Solaris OS exist in the Solaris 8, 9, and 10 Operating Systems running on the Sun Fire E4900 and E6900 servers. Customers can also take advantage of the Solaris Application Guarantee program to enable a smooth migration from previous versions of the Solaris OS or earlier versions of the SPARC processor architecture. See the section on *Software* on page 57 for details.

The Sun Fire E4900 and E6900 servers are fully compatible with existing Sun servers and may coexist in networks and/or within a Sun Cluster. See the section on *Options* on page 64 for information on supported Sun PCI adapters, storage, and other options.

Reliability, Availability, and Serviceability

Reliability, availability, and serviceability (RAS) are three aspects of a system's design that contribute to continuous operation and the reduction of system downtime.

The Sun Fire™ E4900 and E6900 server family brings together the finest aspects of "high availability" engineering, extending the feature set previously offered by the UltraSPARC™ III Sun Fire line.

Reliability

Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity. The Sun Fire E4900 and E6900 server family includes the following features that enhance reliability, many of which are detailed in the *System Architecture* section on page 30.

- Extensive environmental monitoring, which helps ensure that the system is not allowed to operate outside its specifications.
- End-to-end ECC error detection and correction on all data paths within the system to detect and correct single-bit errors. This feature maintains data integrity without the need to halt system operation in the case of single-bit errors. ECC also detects double bit errors and log them to the system controller.
- Enhanced ECC to protect against naturally occurring radiation. Up to four hard failures on adjacent bits from naturally occurring radiation can be corrected. (see the *System Architecture* section on page 30 for details).
- Parity detection on all address path segments for improved data integrity. This is in addition to ECC on all data paths.
- Memory scrubbing to enable the memory contents to be frequently refreshed. This feature reduces the chance of single-bit errors.
- Extensive component and interconnect Power On Systems Test (POST) and other tests performed prior to system boot to help ensure that faulty components are excluded from the system configuration.
- Passive centerplane helps provide high mean time between failures (MTBF). Because the centerplane is passive—that is, it contains no chips on board—it is less likely to fail.
- Boards are locked in place and I/O connectors are secure, which prevents system errors due to loose connections. Boards also have different form factors, minimizing the chance of inserting the wrong board in a centerplane slot.

Availability

System availability refers to the percentage of time that a system remains accessible and usable. Sun Fire E4900 and E6900 servers offer many advanced availability features. Some of these features are detailed in the *System Architecture* section on page 30.

- **Full Hardware Redundancy**

  - Redundant CPUs

  - Memory banks

  - CPU/memory boards

  - I/O assemblies

  - I/O adapters (if configured)

  - System controllers

  - System clock with automatic failover

  - Sun™ Fireplane interconnect system switches

  - AC power sources, facilitated by the redundant transfer switch

  - Power supplies and intelligent power switching mechanism to failover to remaining power modules

  - Dual power grids option

- **Fully Fault-Isolated Environment**

  - Sun Fireplane interconnect can be configured into two segments. Each segment is isolated from failures in the other crossbar segment. This is in addition to the fault isolation at domain level, as described below.

  - Each crossbar segment can host one or two dynamic system domains. Each domain is isolated from failures that originate in other domains, including both hardware and software faults from:

    - Application or Solaris OS failures

    - Errors originating in CPUs, memory modules, CPU/memory boards, I/O assemblies, or PCI cards

  - The following diagram, at both domain and crossbar segment level, lists potential failures and the isolated environments that normally can be achieved on a carefully configured Sun Fire E6900 system by following the practices outlined in the rest of this document. Similar fault-isolated environments can also be configured on a Sun Fire E4900 server.

Domain	Domain	Domain	Domain
Failure isolation:	Failure isolation:	Failure isolation:	Failure isolation:
- Applications	- Applications	- Applications	- Applications
- O/S	- O/S	- O/S	- O/S
- CPUs	- CPUs	- CPUs	- CPUs
- memory	- memory	- memory	- memory
- CPU/Mem. bds	- CPU/Mem. bds	- CPU/Mem. bds	- CPU/Mem. bds
- I/O assemblies	- I/O assemblies	- I/O assemblies	- I/O assemblies
- I/O cards	- I/O cards	- I/O cards	- I/O cards

Fireplane Segment	Fireplane Segment
Failure isolation: Fireplane Switch	Failure isolation: Fireplane Switch

Figure 1. Potential failures

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Feature	Hot-Swappable	Hot Pluggable
Fan	Yes	Yes
CPU/Memory Board	Yes	Yes
Fireplane Switch	-	Yes
Power Supplies	Yes	Yes
I/O Assemblies	Yes	Yes

− Mixed-speed CPUs

− By separating the clock signals and device arbitration on this family of servers, the clock signals for CPUs within the system are generated by multiplying the 150-MHz signal from the system controller on a board-by-board basis. The benefit to the customer is that they have the flexibility to add processors of different speeds online as long as they do not mix processors of differing speeds within one system board.

− All UltraSPARC IV+, UltraSPARC IV, and UltraSPARC III Cu (900 MHz and faster) processor/memory boards can be mixed together on the same system and even in the same domain.

− The diagram below illustrates how processors of different speeds can be intermixed and deployed on a Sun Fire E4900 and E6900 server.

Sun Fire server

Domain A

900 MHz USIII CPUs   1.5GHz US IV+ PROCS

1.2GHz USIII CPUs   1.2GHz US IV PROCS
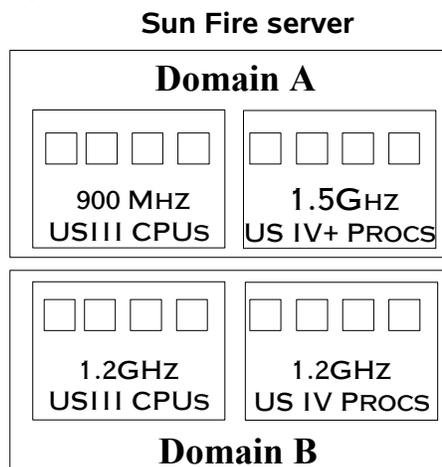
Domain B

Figure 2. Implementing mixed-speed CPUs

− There are two restrictions to observe when using mixed-speed CPUs

1. Only 900-MHz UltraSPARC III Cu and above processors support mixed speeds in a domain or system. In a system running 750-MHz UltraSPARC III processors, different speed processors are not supported.

2. UltraSPARC III or IV processor boards cannot be dynamically reconfigured into a pure domain of only UltraSPARC IV+ processor boards. UltraSPARC IV+ processor boards use larger memory page sizes, which UltraSPARC III and IV board cannot accommodate. To bring UltraSPARC III or IV processor boards into an all UltraSPARC IV+ domain, the domain must be turn off and rebooted with the additional processor boards.

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- If the domain is already a mixed domain, it will be running with smaller page sizes and therefore will accept dynamic reconfiguration of any UltraSPARC processor board.

- Additionally, it is possible to dynamically reconfigure an UltraSPARC IV+ processor board into an all UltraSPARC III and/or IV domain as the UltraSPARC IV+ board can operate with the smaller page sizes.

- Hot CPU upgrades. This feature facilitates the online upgrading of the CPUs while the rest of the system continues to be available. This feature is supported partially by the dynamic reconfiguration feature and requires that all CPUs involved be 900-MHz UltraSPARC III Cu or above.

- The diagram below illustrates the three-step upgrade process to upgrade all CPUs on two CPU/memory boards from a speed greater than 750 MHz to even faster speed. During this online upgrade process, the application remains available.
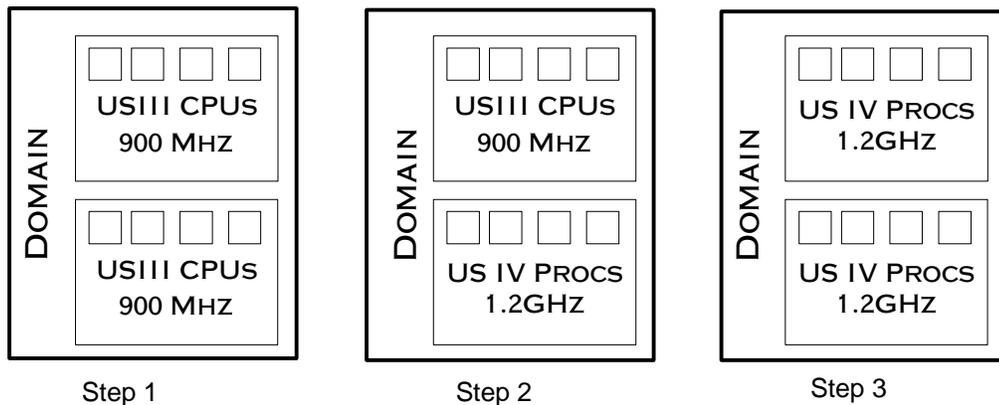
Figure 3. Hot CPU Upgrade

•

- IP multi-pathing to provide automatic network path failover.

- When two I/O paths can be defined to connect a network to a Sun Fire server through the presence of two I/O adapter cards, the IP multi-pathing (IPMP) feature of the Solaris 8 OS can be employed to map out a dual-path network connection with automatic network failover capability.

- The automatic network failover capability helps ensure that in the event of a failure of a single I/O card, the server will be able to continue communicating over the network.

- Parallel device probing

- In the event of a system reboot, if your configuration is composed of more than one CPU, then the CPUs are used to probe for devices concurrently, significantly reducing the time it takes for the operating environment to identify and configure attached devices. This feature helps to shorten down time.

What would be the impact from various failures? The following table summarizes the impacts into four categories and lists the major causes for each category. There are very few failures that would bring down a complete system, a crossbar segment or all domains.

Serviceability

No Impact, All Applications Continue to Run
fan tray, power supply, network interface card (with IPMP), SC/clock, FC-AL card (with MPxIO), memory ECC error, Ecache ECC, error, data bus ECC error, address bus parity error

Impacts Domain, Other Domains continue to run
Application, O/S, CPU, I/O assembly, CPU/Mem board

Fireplane Segment Fails
Fireplane switch, E6900 power plane

Entire System Fails
Sun Fire E4900 power plane

Figure 4. Normally expected recoverability from a single failure

Serviceability relates to the time it takes to restore a system to service following a system failure. Some of the serviceability features of the Sun Fire E4900 and E6900 server family include:

- Hot-swappable CPU/memory boards, I/O assemblies, redundant transfer switch modules, power supplies, and cooling units, which provide for on-line replacement

- Dynamic reconfiguration and IP multi-pathing, which allow for CPU/memory boards and I/O assemblies to be taken off-line for service without interruption to the Solaris OS or to the application

- Virtual key switch and virtual console features on the system controller, which allows the system to be powered on or off and rebooted remotely; with optional diagnostics

- Mechanical serviceability

    - Connectors keyed so that boards cannot be inserted incorrectly

    - No jumpers are required for configuration of the Sun Fire E4900 and E6900 servers

    - All field-replaceable units (FRUs) are designed for quick and easy replacement, with a #2 Philips screwdriver

    - Safe electrical voltages (48 VDC and below) used throughout all system boards

    - All FRUs identified with LED service indicators for positive indication of whether a FRU can be removed

    - Electronic serial numbers on all FRUs enabling improved component tracking

- Physical view of system from Sun Management Center software; also aids location of failed components, helping speed servicing and avoid mistakes

- Sun Validation Test Suite software (SunVTS™) allows administrators to perform system diagnostics

- Sun Remote Services provides remote monitoring, diagnostics, and service dispatching

- The Serial EEPROM is a part of all system FRUs. It consists of a small amount of read-only memory containing information to identify the FRU. This feature enhances serviceability.

Auto Diagnosis and Recovery Features

- Auto diagnosis and recovery provides new levels of reliability, availability, and serviceability for the Sun Fire E4900 and E6900 servers to help customers minimize both planned and unplanned downtime and significantly reduce business interruptions through faster time to service.

- Auto diagnosis with messaging: Auto diagnosis detects the first instance of an error and records the component health status (CHS) of the faulty or suspect components. Auto diagnosis provides easy-to-understand error reports that identify faulty or suspect components to a single FRU or multi-FRUs. The server's Power On Self Test (POST) then uses the CHS information to deconfigure the faulty component out of the system. Diagnostic information is reported through the platform and domain console event message or the loghost output.

- Component health status: Deconfigures faulty components (CPU/memory boards, CPUs, L2_SRAM modules, DIMMs, I/O boards, and Sun Fireplane switches) after a hard failure. CHS identifies ("blacklists") faulty components due to a fault or suspected fault. The reconfigured system is automatically rebooted. The fault is isolated from the new configuration, significantly reducing the chances of a similar failure.

- CHS and diagnostic information are persistently stored on a component, which helps prevents the reoccurrence of a fault even if the component is moved to a different location. Preventing the reoccurrence of a fault improves the availability characteristic of Sun Fire E4900 and E6900 servers. As the diagnosis information is contained inside the component, service and repair of these systems becomes faster and more efficient. Valuable service information is collected and reported to help Sun detect hardware errors and improve product quality.

- Auto restoration: Working in conjunction with the auto diagnosis engine and CHS, auto restoration automatically restores the system with the fault isolated in the event of a fatal error as a result of a faulty component. If a FRU or component is disabled because of its CHS, immediate replacement is not necessary because the domain is restored with the fault isolated.

- Automatic recovery of hung domains: system detects and recovers from hung domains. A domain hang occurs when a domain does not respond to user commands or is not reachable via the network.

- Recovery from repeated domain panics: Domain panics can be caused by both software and hardware. To prevent hardware faults from causing panic reboot loops, the SC firmware has been enhanced to run POST diagnostics at more detailed diagnostic levels. On the first panic the domain reboots and writes a core file. The core file can be used to analyze the problem. However, if further panics occur within a short time period, it is desirable to run POST automatically at a higher level as part of domain restoration. POST diagnostics verify the status of the hardware and could identify and isolate faulty components (if any). After identifying faulty components, POST updates their CHS appropriately.

- Solaris OS Enhancements: Kernel Updates for Solaris 8 OS (02/04) and Solaris 9 (04/04) OS on systems help enhance the correctable error (CE) DIMM and L2_SRAM module handling. Multiple CEs on accessing a DIMM or L2_SRAM module indicate a higher probability of experiencing an uncollectible error (UE). To prevent a fatal UE, memory pages are retired and CPUs are automatically off-lined. The availability of domain increases, because the Solaris OS does not access pages or L2_SRAM modules that have an increased failure probability.

UltraSPARC® IV+ Multithreaded Processors
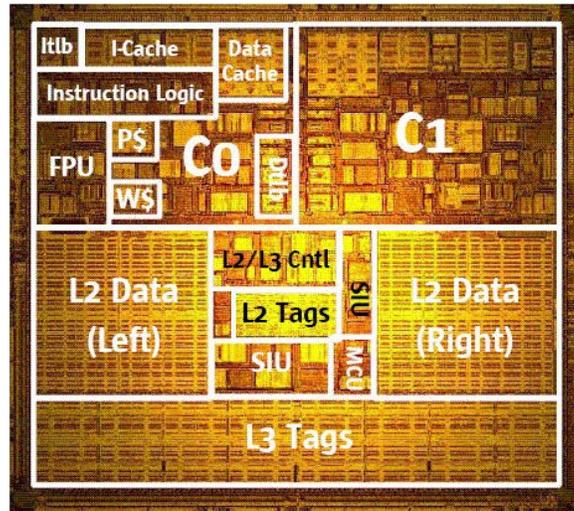
Figure 1. UltraSPARC IV+ die photo

Technology Overview—Chip Multithreading

At the heart of the Sun Fire family of enterprise servers is the new UltraSPARC IV+ processor, which incorporates significant design improvements that have been built with Texas Instruments' 90 nm chip technology. The result is that the UltraSPARC IV+ processors can deliver over 2X the performance of previous UltraSPARC IV processors in the same footprint with no change in power or cooling requirements. Furthermore, compared to the original UltraSPARC III processors, the new UltraSPARC IV+ processors can deliver over 5X the performance in the same footprint, and in most cases, is upgradeable in the same chassis. Like its predecessors, the UltraSPARC IV+ processor boards are backwards compatible with previous Sun Fire enterprise servers and can be mixed in the same system or domain with UltraSPARC III and/or UltraSPARC IV processor boards, each of which will operate at rated speeds. The result is unparalleled investment protection and maximum performance.

The UltraSPARC IV+ Processor

Each UltraSPARC IV+ processor consists of two UltraSPARC III cores (pipelines), each complete with its associated Level 1 cache. One part of the pipe handles instruction fetch and branch prediction, the
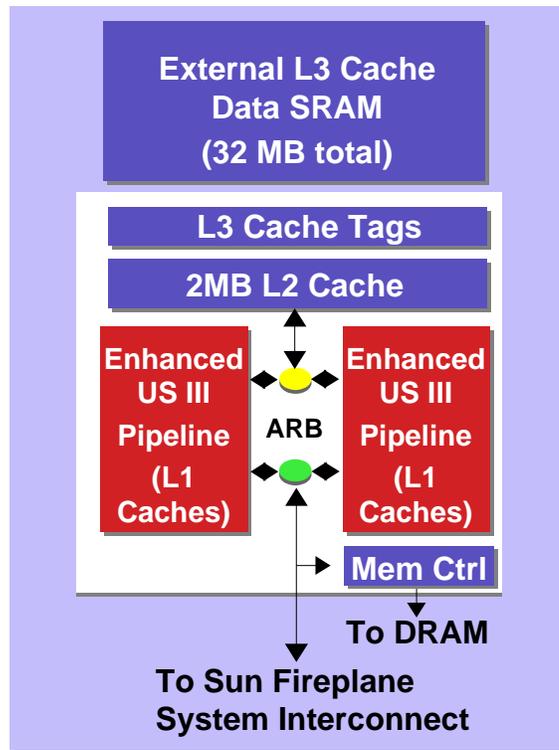
Figure 3. UltraSPARC IV+ processor architecture

right part of the pipe handles instruction execution and result retirement. The dual-core architecture supports two simultaneous threads per processor, which greatly enhances the peak throughput. The two parts of the pipe are decoupled by a 16-entry instruction queue. Data comes out of a 64 KB Level 1 data cache. Floating-point data can also come from a small 2-KB prefetch cache used to stream data. Stores are decoupled by an 8-entry store queue, and use a 2-KB fully-associative write cache to exploit spacial and temporal locality in the store stream, greatly reducing write-through traffic to the Level 2 cache.

UltraSPARC IV+ Enhancements

Operating at 1.8 GHz, the UltraSPARC IV+ offers over 2 times the throughput of the 1.05-GHz UltraSPARC IV processor . More than just a speed bump to the UltraSPARC IV processor, the UltraSPARC IV+ contains numerous enhancements that improve both performance and reliability. Some of the more significant technology differences are listed in the table below:

Feature	UltraSPARC IV+	UltraSPARC IV
Clock Speed	1. 8 GHz	1.35 GHz
Memory size support	32 GB per processor	16 GB per processor
Processor Technology	90 nm, 9LM Cu CMOS	130 nm, 8LM Cu CMOS

Feature	UltraSPARC IV+	UltraSPARC IV
Number of Transistors	295 M	66 M
Die Size	336 mm2	356 mm2
Caches • Prefetch buffer • L1 cache • L2 cache • L3 cache • L2/L3:	• 8-line • 64/64 KB I/D • 2 MB (on-chip, split/shared) • 32 MB (tags on, data off) • 4-way set associative	• 1-line • 64/32 KB I/D • 16 MB (off-chip, split only) • None • 2-way set associative

The UltraSPARC IV+ process comes with numerous enhancements from the UltraSPARC IV design (see Figure 4 for a diagram). Enhancements designed to **improve performance** are:

− The instruction pre-fetch buffer (I-PFB) was expanded from 1 line to 8 lines and programmable stride was added.

− The size of the instruction cache (I-Cache) was doubled (now 64 KB).

− The instruction translation lookup buffer (I-TLB) was expanded to have four times the entries (now 512 entries). Support for both 8- and 64-KB pages is now also provided.

− A new 32-entry branch target buffer (BTB) was added to the branch pipe, as was improved prediction.

− Support for strong prefetch and improved the latency of the P-cache was added.

− New page sizes (32MB and 256 MB) and added new scratchpad registers were added to the D-TBL.

− A hardware-based version of the pop count (POPC) instruction was added to the arithmetic logic unit (ALU)..

− Functionality was added to the FP Adder and FP Multiplier to handle integer-FP conversion and non-standard arithmetic mode with subnormal results.

− Made the write cache (W-cache) fully associative, and added FIFO allocation and optimized eviction.

Enhanced **hardware-based error detection** was added to a number of components to improve the reliability of the processor:

− I-cache

− D-cache

− P-cache

− I-TLB

− D-TLB

Despite these numerous enhancements, the UltraSPARC IV+ still maintains binary code compatibility with other SPARC-based processors, thereby providing significant software and training investment protection to Sun's customers. Customers can take advantage of newer technology without incurring

huge costs. In addition, a UltraSPARC IV+ processor board can co-exist within the same server or domain as an UltraSPARC III and UltraSPARC IV processor board.
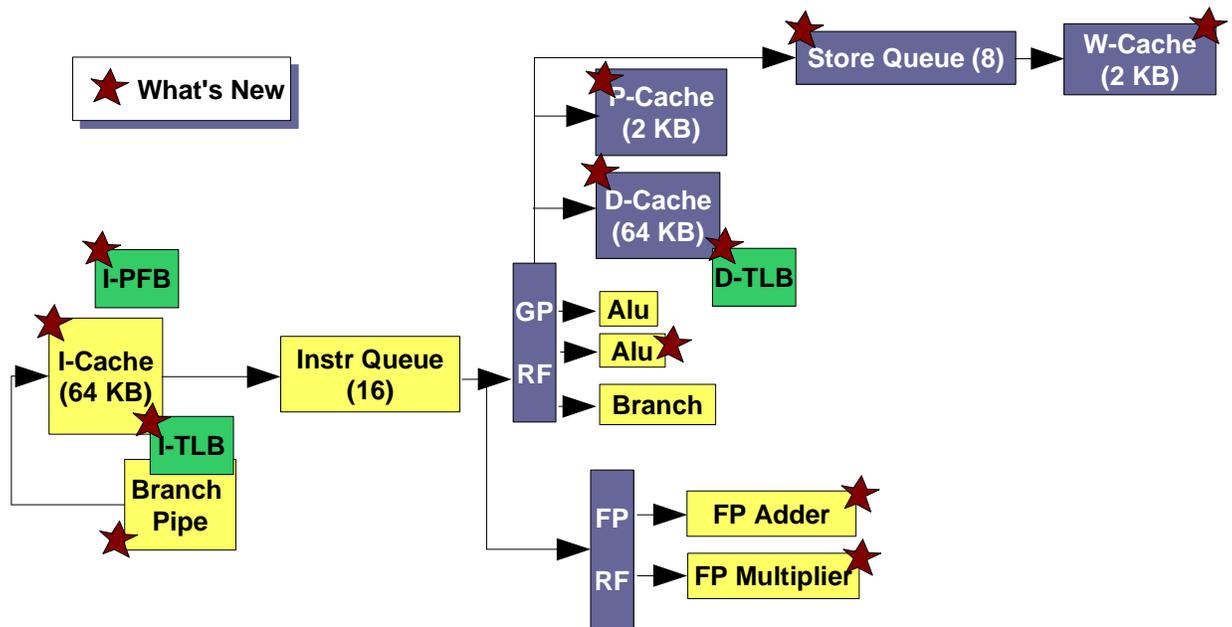
Figure 4: UltraSPARC IV+ enhancements
(enhanced components are starred)

The UltraSPARC IV+ Cache Hierarchy

The UltraSPARC IV+ processor's cache hierarchy is one of its most important features. The cache hierarchy has three levels. Each core in UltraSparc IV+ has its own private on-chip Level 1 cache. Each processor has an on-chip Level 2 cache and an external Level 3 cache that are shared by both cores.

Each Level 1 cache (one in each core) consist of an instruction cache (I-cache), a data cache (D-cache), a write cache (W-cache), and a prefetch cache (P-cache).

• The I-cache is a 64-KB, 4-way set-associative cache with a 64-byte line size. Each I-cache line is divided into two 32 byte subblocks with separate valid bits. The D-cache is a 64 KB, 4-way set-associative cache with 32 byte line size.

• The W-cache is a 2-KB, fully associative cache with a 64-byte line size.

• The P-cache is a 2-KB, 4-way set-associative cache with a 64-byte line size. Each cache line in the P-cache is divided into two 32-byte subblocks with separate valid bits.

All Level 1 caches except the P-cache are included in the Level 2 cache.

The UltraSPARC IV+ processor's on-chip Level 2 cache is shared by the two cores. The Level 2 cache is a 2-MB, 4-way set-associative cache with 64-byte lines. The Level 2 cache can sustain one request every 2 CPU cycles.

The UltraSPARC IV+ also has a large Level 3 cache that is shared by the two cores. The Level 3 cache has on-chip tags and off-chip data. The Level 3 cache is 32 MB with 64 byte lines and is a 4-way set associative cache.

The Level 3 cache is what is called a "dirty victim" cache. When a line comes into the chip, the line is loaded in the Level 2 and Level 1 caches. When a line is evicted from the Level 2 cache it is written to the Level 3 cache (both clean and dirty lines are treated the same). Lines evicted from the Level 3 cache are written back to the system if they are dirty. Either the Level 2 or Level 3 cache can be the source of data for cache-to-cache transactions. The Level 2 cache and Level 3 cache are mutually exclusive. Any content in the Level 2 cache is not in the Leve-3 cache.
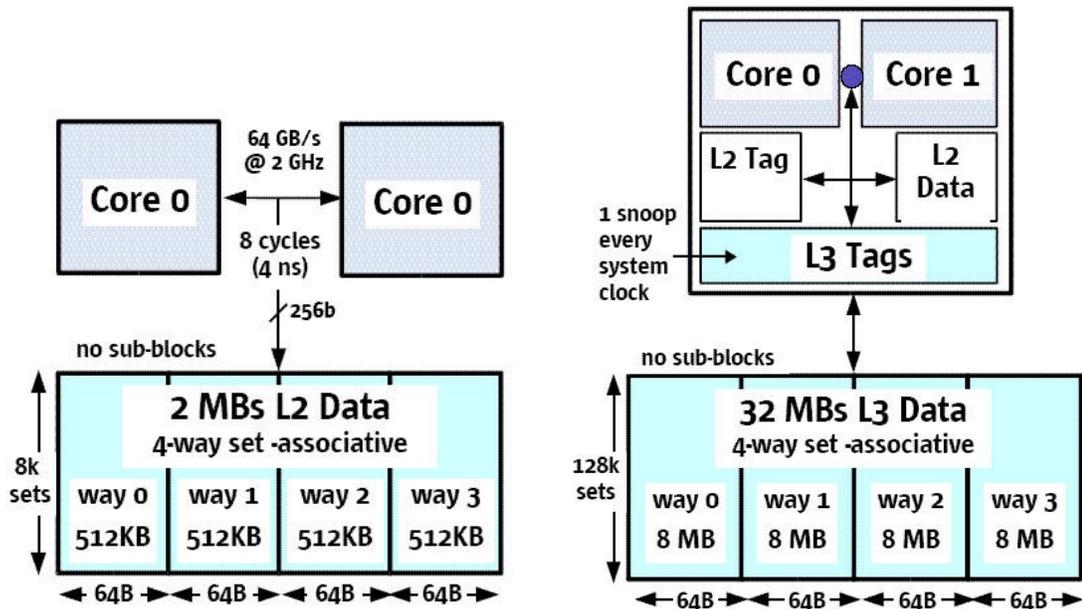
Figure 5. UltraSPARC IV+ Level 2 (left) and Level 3 (right) cache structures

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System Interface

Figure 7 illustrates how an UltraSPARC IV+ processor fits into a Sun Fireplane interconnect-based system. Memory address and control signals go directly from the on-chip memory controller to DRAM. However, all data traffic—both to and from memory and from the Sun Fireplane point-to-point interconnect fabric—is routed through a dual-processor data switch. This high-performance switch can handle up to 19.2 GB a second of aggregate data from two processor chips, the Sun Fireplane interconnect, and memory. In addition, each processor has a separate 8 GB/second interface to its Level 2 cache data. Each processor also has a separate address bus to the Sun Fireplane interconnect, able to support up to 150 million coherency transactions a second. Like the UltraSPARC III processor, the UltraSPARC IV processor directly supports snoopy cache coherency, directory-based cache coherency, or a hybrid of the two.
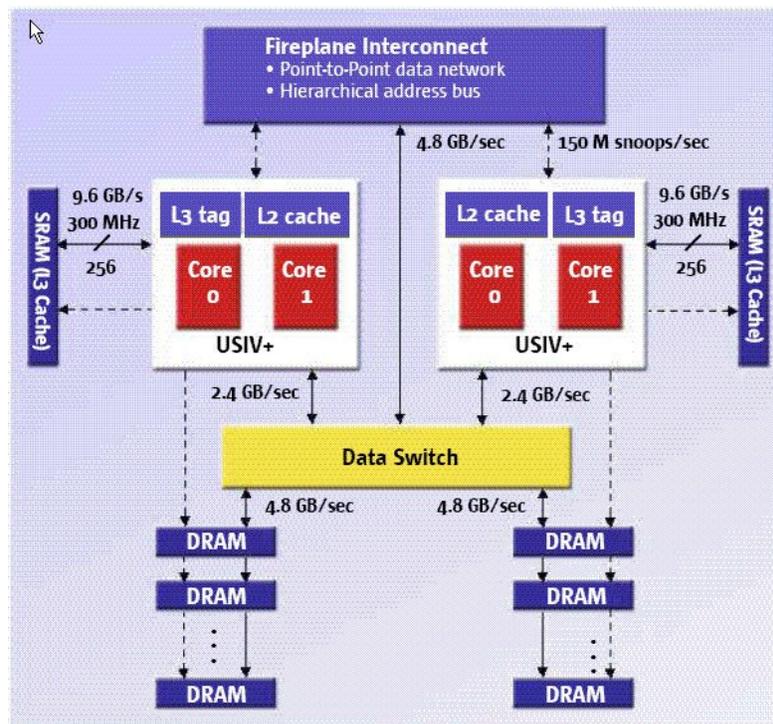
Figure 7. UltraSPARC IV+ system interface

In addition to the Level 2 cache interface, the shared system resources on the processor chip include the memory controller and the interface to the Sun Fireplane system interconnect. The on-chip memory controller provides up to 16 GB of DRAM per processor, shared between the two cores. From the standpoint of the Sun Fireplane bus, the two cores appear as a single client. Each core has its own unique interrupt ID, allowing it to be managed individually.

Chip Technology

The UltraSPARC IV+ processor is the first commercialized dual core processor manufactured to 90nm design rules by Texas Instruments. It has 4X the number of transistors as the previous UltraSPARC IV

processors, which enables the significant changes to the cache architecture and frequency improvements with no increase in power or cooling requirements. Frequencies for the UltraSPARC IV+ processors are at 1.5GHz and 1.8GHz.

Technical Fact Summary

- **High-performance Sun Fireplane interconnect**
  - Provides improved performance, improved scalability, and lower latency
  - Provides up to two dynamic system domains on the Sun Fire E4900 server; up to four dynamic system domains on the Sun Fire E6900 server

- **High-performance memory subsystem**
  - Up to 192 GB on the Sun Fire E4900, and 384 GB on the Sun Fire E6900 server; a maximum of 32 GB memory per configured processor.
  - 512-MB, 1-GB and 2-GB DIMMs supported

- **High-performance I/O**
  - PCI I/O bus offering four independent PCI buses per I/O assembly and 100-MHz PCI support

- **Hot-swappable Uniboards and I/O Assemblies**
  - Combined with Dynamic Reconfiguration, IP Multipathing (IPMP) and Sun StorEdge™ Traffic Manager software (STMS or MPxIO) provides for automatic failovers, on-line upgrades or repairs

- **Dynamic System Domains (DSD)**
  - Up to two DSDs on Sun Fire E4900 servers and four DSDs on Sun Fire E6900 servers
  - Run multiple Solaris OS instances securely with fault isolation

- **Power supplies**
  - N+1 fully redundant power supplies
  - Power supplies are hot-swappable
  - Dual independent power sources, switched via logic-controlled redundant transfer switch
  - Sun Fire E6900 server additionally offers dual power grids feature standard

- **System enclosure**
  - Sun Fire E4900 systems can be mounted in industry standard 19-inch racks or in a Sun Fire cabinet. It is is also available as a deskside tower. The Sun Fire E6900 comes in its own cabinet.
  - The Sun StorEdge D240 media tray is available with the Sun Fire servers for compact, hot pluggable boot disks, DVD/CDs and tape drives, and can be mounted in the same rack as the server.

Two-level Sun Fireplane Interconnect System

The Sun Fireplane interconnect system is a two-level interconnect that provides very low latency with high address and data bandwidth to enable 24-way scalability.

The Sun Fireplane interconnect system operates at 150 MHz. Address snoop bandwidth is 9.6 GB/second and the address portion of the interconnect provides for 150 million snoops per second. Memory latency is very low—between 180 and 240 nanoseconds, depending on whether the access is to memory on the same or a different Uniboard.

Hierarchical Interconnect Structure
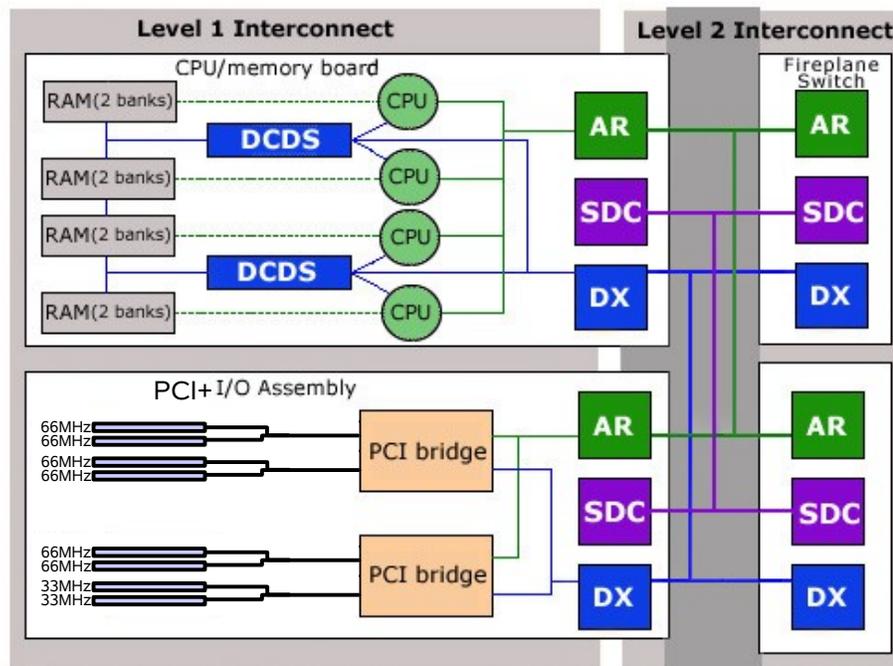
Figure 10. Logical view of Sun Fire E4900/E6900 system

Note: *The diagram above is a high-level logical view of the two-level interconnect and some of the major sub-components used in the Sun Fire E4900 and E6900 server family. The Level 2 Interconnect (Sun Fireplane interconnect system) is discussed later.*

In the Sun Fire E4900 and E6900 servers, the Sun Fireplane Level 1 (L1) interconnect exists within the Uniboard and the I/O assembly. The L1 interface for both the address and data interconnects is connected to a Level 2 (L2) interface. The Level 2 interface is responsible for directing incoming transactions back to the correct L1 target interconnect, which is responsible for directing the signal to the particular target device.

Redundant Sun Fireplane Switches

The centerplane in Sun Fire E4900 and E6900 servers is designed as a highly-available redundant crossbar. The Sun Fire E4900 centerplane has two Sun Fireplane switches (also known as L2 repeater boards). The Sun Fire E6900 has four Sun Fireplane switches. Although a single Sun Fireplane switch (or a pair of these switches in the Sun Fire E6900 server) can support the full set of system resources, the number of Sun Fireplane switches are doubled on each of the Sun Fire E4900 and E6900 servers to provide redundancy and improved availability.

Transactions are bit-sliced across the two boards. The Sun Fireplane interconnect boards are hot pluggable and fault resilient. In the event of a failure that is not recoverable, one of the Sun Fireplane boards will continue to operate following a manual system reboot, although at half the bandwidth of the full system.

In the Sun Fire E6900 server, a second pair of Sun Fireplane interconnect boards are used. These four boards are treated as two groups of two boards each. Within each group, transactions are bit-sliced across two Sun Fireplane interconnect boards. In the case of a failure, the group that contains the failing board will fail. However, the other group can survive the failure and continue to be available, if properly configured.

The centerplane provides a switched crossbar interconnection with separate address and data buses to CPU/memory or I/O Controller boards. The centerplane data path is fully ECC protected and the address is parity protected throughout.

The Sun Fireplane interconnect system is unique in the industry. The Sun Fireplane interconnect boards can be configured either as a single crossbar segment or as two independent crossbar segments. When configured as two crossbar segments the Sun Fireplane provides for fault isolation between segments, thus increasing availability.

The failure of a Sun Fireplane interconnect in a segment affects only that segment and the domains associated with that segment. The other segments and domains continue unaffected. This provides a level of availability typically not matched by other vendors.

High-Performance Design

To provide the bandwidth required by today's high performance computer systems and to avoid the shortcomings of interconnect designs that are based on bus technology that can become overloaded at high workloads where many devices are simultaneously accessing the interconnect, the Sun Fireplane crossbar interconnect is designed as a packet-switched interconnect and is built to provide very high sustained bandwidth.

The interconnect operates at 150 MHz and supports one snoop per cycle. This equals a coherency bandwidth of 150 million address snoops per second, which is three times the address of the Enterprise midrange servers (Sun Enterprise™ 3500 - 6500). The cache line size (and hence the maximum transfer size on the Sun Fireplane data crossbar) is 64 bytes. This equates to an available data bandwidth of 9.6 GB/second[2].

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[2] Where 1 GB = 1 x 10^9 bytes

The design of the interconnect leads to very high rates of utilization of the available bandwidth, so the performance of workloads that move large volumes of data are not restricted by the system interconnect.

The Sun Fireplane interconnect system has separate address and data paths. The arbitration occurs in parallel with separate address broadcasts and data transfers so it does not consume the available bandwidth. The address and data paths of the interconnect are separate, so an address broadcast does not consume the bandwidth available for transferring data. This results in an average latency of 180 nanoseconds for accessing memory on the same Uniboard, or 240 nanoseconds for accessing memory on different board by any CPU in the system. These are very low interconnect latency numbers.

Bus compared with Centerplane

	XDbus	**Gigaplane™**	**Sun Fireplane**
Sample system	SPARCcenter™ 2000	Sun Enterprise 3500-6500	Sun Fire E4900/E6900 Sun Fire 4800-6800
Architecture	Interleaved, dual packet-switched buses	Packet-switched buses	Packet-switched crossbar
Operating speed	50 MHz	100 MHz[3]	150 MHz
Snoop bandwidth	N/A	50 million addresses/sec.	150 million addresses/sec.
Cache line data width	8 bytes	32 bytes	64 bytes
Sustained bandwidth	625 MB/sec.	3.2 GB/sec.	9.6 GB/sec.
Hot plug system boards	No	Yes	Yes
Dynamic System Domains	No	No	Yes

The *packet switched* nature of the Sun Fireplane interconnect system means that requests for data do not have to be followed immediately by the data transfer in order to satisfy the request. Also, data transfers can occur *out of step*, with the Sun Fireplane interconnect system supporting a pipeline of up to fifteen outstanding requests. This means the gap between any address request and the data transfer to fulfill the request can be used to complete another unrelated request instead of incurring idle cycles on the bus.

This flexibility allows systems designed around the Sun Fireplane interconnect system to utilize virtually all of the 9.6 GB/second available bandwidth, while keeping latencies on individual transfers low—providing an excellent platform for memory-intensive computation or high-volume I/O.

Uniboard

The fundamental building block for the Sun Fire E4900 and E6900 systems is the Uniboard. The Uniboard holds processors and memory for the system. Each board contains four UltraSPARC IV+ processors and 16, 32 or 64 GB of memory. The UltraSPARC IV+ processor, by virtue of its integrated memory controller, is responsible for memory management of local memory and for running diagnostics on the Uniboard.

Memory banks are interleaved within each board to improve performance. Due to the implementation of dynamic reconfiguration, memory interleaving between boards in the system is not be supported.

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[3] 84 MHz maximum for the Sun Enterprise 6500
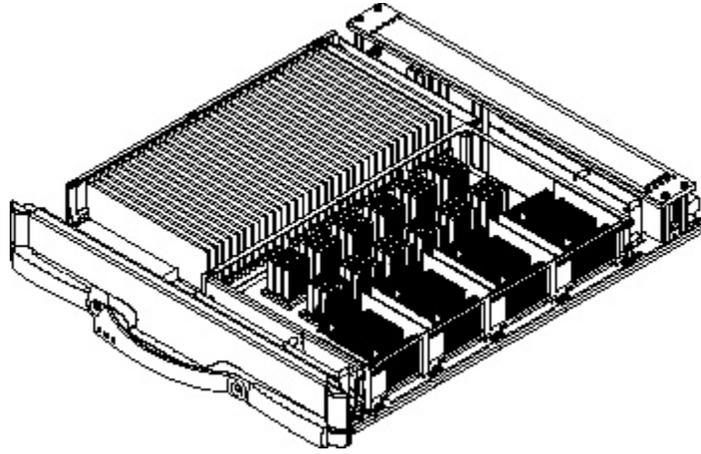
Figure 11. Uniboard (processor/e-cache cover has been removed)

The same Uniboard is used throughout the Sun Fire E4900 through E25K server family[4], so boards initially deployed in one system may be moved to another as computing needs change. Processors and memory on a board can be upgraded.

The memory is protected with ECC to correct all single-bit errors and to detect all double-bit errors. Furthermore the "enhanced ECC" feature is implemented to protect against naturally occurring radiation. Those multibit errors, induced by naturally occurring radiation, usually occur on adjacent bits and would result in a hard failure/outage with normal ECC implementation. In Sun's unique implementation, we assign error checking for every four adjacent bits to four different sets of ECC circuits. Each of the ECC circuits can detect a single-bit error. This means that failures on up to four adjacent bits can be corrected since each error is a single-bit failure within the assigned ECC circuits.

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[4]The Sun Fire E2900 server does not support Uniboards. The Sun Fire E2900 CPU/memory boards share the same technology, but the physical form factor is different due to top loading requirements on the Sun Fire E2900 server.

Each Checkword is 128 + 16 bits long and is capable of
correcting a single bit or detecting double bit error
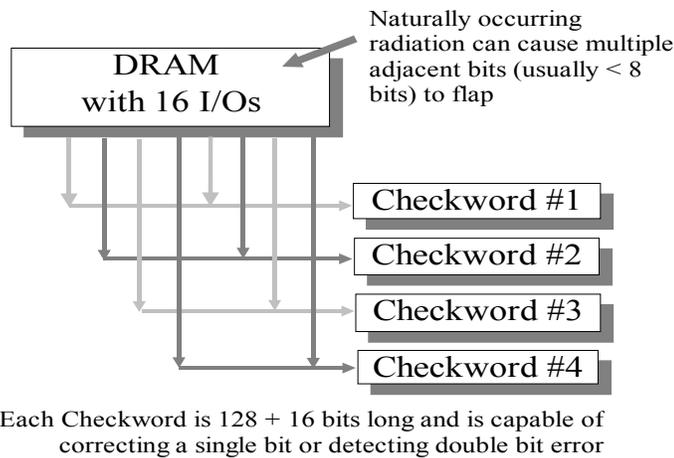
Figure 12. Enhanced ECC to protect against naturally occurring radiation.
(This feature can correct up to four single-bit failures from a single hit
from naturally occurring radiation.)

System I/O: High Performance PCI Technology

Sun continues its support of open standards in the area of I/O connectivity. The Sun Fire E4900 and E6900 servers support the widely used PCI standard. Sun has continued the use of dedicated I/O assemblies, separate from the CPU and memory boards. The "no slot tradeoffs" means that the customer does not have to choose between I/O or CPU/memory resources. It is possible to configure the Sun Fire servers with maximum CPUs/memory and I/O.

The Sun Fire E4900 and E6900 servers are now shipping with the new PCI-X I/O assembly that peak throughput up to 1.8 GB/second, which is an increase of 33% over the existing PCI+ I/O assembly. The system architecture has a design limit of 2.4 GB/second throughput to allow for future enhancements. This capability ensures support for current PCI adapters as well as higher-speed, future generations of PCI I/O adapters and I/O board upgrades.

8-slot PCI-X I/O Assembly

The new PCI-X I/O assembly is designed to support both large capacity and high bandwidth. Two independent PCI controllers are provided on each PCI-X I/O assembly. Each of these controllers has two separate PCI buses. Within each PCI controller, three buses support six extended 100-MHz PCI slots (two per bus) operating at either 64 bits or 32 bits, and one bus supports two 33-MHz slots operating at either 64 bits or 32 bits. This configuration provides a total of eight PCI slots per I/O assembly, six 100-MHz slots and two 33-MHz slots.
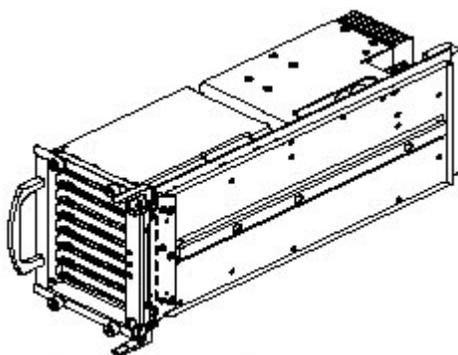
Eight-slot PCI I/O-X assembly

Physical Slot	Card size	PCI controller, bus	Operating speed, voltage
0	short	0, B	33 MHz, 3.3V
1	short	0, B	33 MHz, 3.3V
2	full length or short	0, A	100, 66 or 33 MHz, 3.3V
3	full length or short	0, A	100, 66 or 33 MHz, 3.3V
4	full length or short	1, B	100, 66 or 33 MHz, 3.3V
5	full length or short	1, B	100, 66 or 33 MHz, 3.3V
6	full length or short	1, A	100, 66 or 33 MHz, 3.3V
7	full length or short	1, A	100, 66 or 33 MHz, 3.3V

Note: *Due to the placement of the voltage regulator, full-length cards cannot be used in slots 0 and 1.*

Note the change in slot operating speed and hardware path when compared to the previous PCI assembly below.

Eight-slot PCI I/O+ assembly

Physical Slot	Card size	PCI controller, bus	Operating speed, voltage
0	short	0, B	33 MHz, 3.3V
1	short	0, B	33 MHz, 3.3V
2	full length or short	0, A	66 or 33 MHz, 3.3V
3	full length or short	0, A	66 or 33 MHz, 3.3V
4	full length or short	1, B	66 or 33 MHz, 3.3V
5	full length or short	1, B	66 or 33 MHz, 3.3V
6	full length or short	1, A	66 or 33 MHz, 3.3V
7	full length or short	1, A	66 or 33 MHz, 3.3V

Note: *Due to the placement of the voltage regulator, full-length cards cannot be used in slots 0 and 1.*

Note the change in slot operating speed and hardware path when compared to the previous PCI assembly below.

Eight-slot PCI I/O assembly

Physical Slot	Card size	PCI controller, bus	Operating speed, voltage
0	short	0, B	33 MHz, 5V
1	short	0, B	33 MHz, 5V
2	full length or short	0, B	33 MHz, 5V
3	full length or short	0, A	66 or 33 MHz, 3.3V
4	full length or short	1, B	33 MHz, 5V
5	full length or short	1, B	33 MHz, 5V
6	full length or short	1, B	33 MHz, 5V
7	full length or short	1, A	66 or 33 MHz, 3.3V

The existing PCI I/O Assembly was redesigned to support six PCI-X 33/66/100MHz slots in place of the existing six PCI-33/66MHz slots. XMITS v3.2 ASICs replaces the Schizo ASICs on the board, to enable PCI-X support. Also, the SCSI controller is upgraded from the LSI53C1010R to the LSI53C1030 to support Ultra320 on the external SCSI connector and on the internal SCSI bus.

The following diagram shows the block diagram of the new PCI-X I/O assembly.
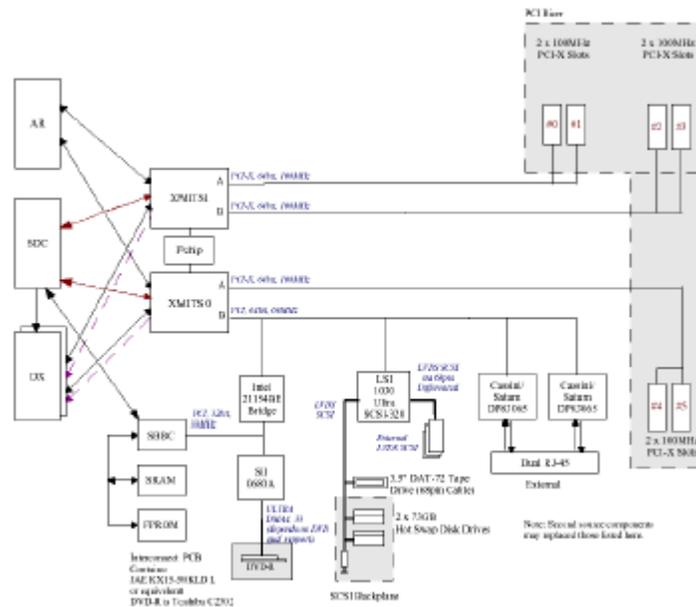
The following diagram shows the layout of the PCI+ I/O assembly.

PCI Slot 7 – 32/64-bit 33/66MHz		AR
PCI Slot 6 – 32/64-bit 33/66MHz	XMIT 1	
PCI Slot 5 – 32/64-bit 33/66MHz		
PCI Slot 4 – 32/64-bit 33/66MHz		DX0
	Pchip Echip SBBC	
PCI Slot 3 – 32/64-bit 33/66MHz		DX1
PCI Slot 2 – 32/64-bit 33/66MHz	XMIT 0	
PCI Slot 1 – 32/64-bit 33MHz		SDC
PCI Slot 0 – 32/64-bit 33MHz		
D135 DC-DC	D149 DC-DC	
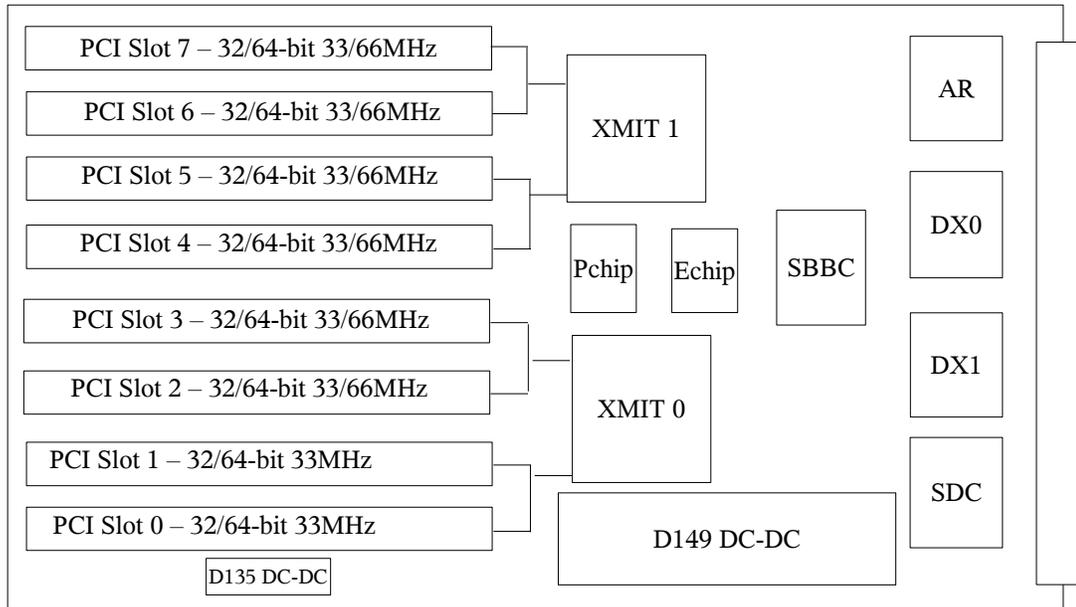
System Controller

The Sun Fire E4900 and E6900 System Controller (SC) board (version 2), which is the same for both systems, is responsible for the overall control of the servers. A separate embedded system, the SC is responsible for managing and monitoring the system. The SC provides both the main system clock and the administrative console to the system. Configuration of system components and Dynamic System Domains is done via the SC. The console can be accessed through either a network or a serial connection. Dual SCs are standard on both the Sun Fire E4900 and E6900 servers.
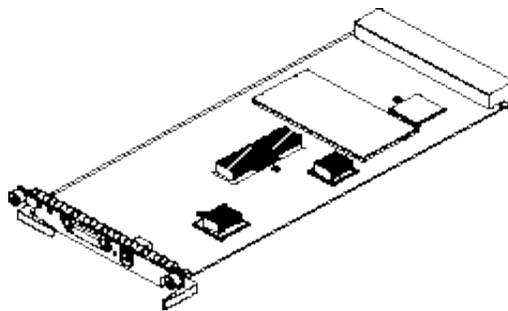
Figure xx. System Controller board (Sun Fire E4900 and E6900 servers)

The SC communicates with all of the different boards of the system via the Console Bus. This bus is dedicated for control and management operations between the SC and the system boards.

![Sun microsystems logo]

Communication external to the Sun Fire E4900 and E6900 server is done either via a serial connection or via an Ethernet connection. These external interfaces to the SC support direct serial, telnet, and SNMP connections.

Each SC includes one RS-232/423 serial interface and one 10/100baseT Ethernet interface. All SC features are available through either a GUI (provided through Sun Management Center) or a command line interface.

The Sun Fire E4900 and E6900 servers ship standard with the enhanced memory (version 2) SC, that has additional memory capacity compared to SCs that shipped on the Sun Fire 4800 and 6800 servers. The enhancement will enable the servers to take advantage of future system management function updates, such as persistent error logging.

System Controller (SC) Functions

The SC is responsible for many different functions that all have an impact on system RAS, system management and resource management.

- **Virtual System Clock**

    The Sun Fire SC is responsible for generating system clock signals. The clock signal from the master SC is distributed to the system boards. The system clock will automatically failover to the secondary SC in the event of a SC failure with no system downtime or interruption to any domain.

    The SC is also responsible for providing the time-of-day clock to all domains within the system. Each domain is able to maintain its own local skew to the time-of-day clock.

- **Virtual System Console**

    The SC provides the system console interface to each domain. Connections are made to the SC and a selection is made as to which domain to connect. A connection to the console of a particular domain may be placed in *advise mode*. This allows other read-only connections to the console of that domain to view all console activity.

- **Virtual Key Switch**

    Domains do not have individual system key switches; the system console implements a virtual key switch for each domain. This allows the system administrator to secure the domain in the same way a physical key would be used. The key switch supports the same four settings used on all Sun servers: "off," "normal operation," "system diagnostics," and "secure operation."

- **Power Control**

    The SC is used to control the main 48V power supplies within the system and is used to turn individual boards and field replaceable units on and off.

- **Environmental Monitoring and Reporting**

    The system contains sensors for temperature, voltage, and current. The SC polls these sensors periodically and makes the environmental data available. An over-temperature event will cause alarms to be sent to the Sun Management Center software as well as to the Solaris Operating System. If necessary, the SC may shut down various components to prevent damage.

- **Error Management**

    The SC acts on errors reported to it from system components. Using messages from different components along the error path, the SC attempts to identify the particular component or components

generating the error. The SC is then responsible for marking the failed component so that it is removed from the system. This also prevents a bad component from being incorporated into a domain and causing a fault on that domain.

- **Serial EEPROM Support**

    The SC interfaces with the Serial EEPROM for each FRU.

- **Hardware Configuration Management**

    Hardware configuration management refers to several different areas. First, the SC is responsible for Automatic System Recovery (ASR). ASR process occurs after the failure of a domain and if the reboot-on-error flag is set. The default needs be altered to use ASR.

    In the ASR process, the SC checks each part making up a domain for errors by using POST (Power On Self Test). If a part fails POST, that part is removed or blacklisted from the system being booted. During the ASR process, all interconnects between boards and Sun Fireplane switches are also tested. When encountering a faulty interconnect, ASR process will cause the CPU/Memory or I/O board be blacklisted. Because the MTBF of Sun Fireplane switches is very high, this is usually the correct choice.

    If the reboot-on-error flag is set, ASR will automatically reboot the domain(s) with all remaining resources that have passed the test.

    The second area of hardware configuration management is the area of Dynamic Reconfiguration, configuring crossbar segments and domain creation. The SC is responsible for performing the necessary configuration within the Sun Fireplane interconnect systems in order to identify which boards are used to make up each crossbar segment and each domain. This can be done when a domain is created or when resources are added or deleted from a domain. In either case, the system interconnect must be advised as to which boards make up each domain so that it can isolate its activity to one domain at a time.

    The last area of hardware configuration management is the creation of interconnect segments. The SC is used to assign Sun Fireplane switches to segments.

- **POST Management**

    Like all Sun servers, Sun Fire E4900 and E6900 servers run a series of tests when they are powered on. These tests, known as POST (Power On Self Test), are more extensive and more complete in the Sun Fire E4900 and E6900 server family than in previous generations of servers. One fundamental difference in the way POST is done is the use of the SC to initiate, sequence, and schedule the tests. The SC is able to schedule POST testing of domains and boards in parallel as far as possible, helping to reduce the time needed to test a system and minimize downtime in the event of a component failure. This speeds up MTTR (Mean Time To Repair) and increases total availability.

- **Interface to Sun Management Center**

    The SC runs a Sun Management Center agent, which allows for the forwarding of environmental data, alarms and configuration status to monitoring software, such as Sun Management Center. The interface also allows Dynamic Reconfiguration operations to be performed via Sun Management Center 3.5.

    For more information, see the *Sun Management Center* section on page 53.

- **Enhanced security**

    The design of the SC allows the roles of system administrator and domain administrator to be redefined. No longer is it necessary to have root access to perform any administrative tasks. By

separating the role of system and domain administrator, the management of any domain can be assigned to individuals with fewer security privileges to enhance the overall system security.

- **Enhanced Auto Recovery (System Controller Failover)**

   The Sun Fire E4900 and E6900 server line can be configured with two SCs for high availability. In a high-availability SC configuration, one SC serves as the main SC, which manages all the system resources, while the other SC serves as a spare. When certain conditions cause the main SC to fail, a failover from the main SC to the spare is triggered automatically, without operator intervention. The spare SC assumes the role of the main and takes over all SC responsibilities.

System Cooling

Sun Fire E4900 and E6900 systems support fully redundant cooling. If any of the cooling modules should fail, the remaining cooling modules are able to compensate by increasing their speed to maintain safe operating temperatures. Both the Sun Fire E4900 and E6900 servers ship standard with redundant cooling.

The SC is responsible for monitoring the temperature of the system and of the surrounding air. Two-speed fans are used in the Sun Fire E4900 and E6900 systems. Temperature sensors are placed throughout the system on the different system boards or embedded in the ASICs to measure the temperature not only of processors but also of other ASICs and components, as well as the ambient temperature. The SC monitors this data. The SC can adjust fan speed to maintain safe operating temperatures in response to ambient changes.

All cooling of the Sun Fire E4900 and E6900 systems are from front to back. This removes the problem of maintaining sufficient airflow that arises when locating rack systems next to one another. In order to maintain sufficient cooling, the airflow through the system is physically routed and controlled. This routing also makes it possible to mount systems in third-party racks.

All cooling modules are hot-swappable and may be replaced without interrupting service.

System Power

The Sun Fire E4900 and E6900 server family can be configured with N+1 redundant AC to DC bulk power supplies, which are hot-swappable. The AC to DC bulk power supplies provide power for all of the Sun Fire E4900 and E6900 systems' internal requirements, on a load-shared 48V DC power bus.

The Sun Fire E4900 and E6900 server family and the Sun Fire Cabinet use a sophisticated redundant transfer unit (RTU) that can choose between power sources for providing power to the entire System Cabinet. AC power is supplied to the systems through up to four independent 30-amp single-phase redundant transfer switch (RTS) modules (one or two per RTU). Each RTU provides power to two or three AC 48V DC power converters.

The dual AC connections into the RTU should be supplied via separate circuit breakers and can be located on isolated power grids if a high level of availability is required. Where separate power sources are not available, an uninterruptible power supply (UPS) unit can be connected to one RTS module to provide power in the event of a power failure. Each RTS module is hot-swappable and fitted with service LEDs for increased availability and serviceability.

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RTUs are passive and have no active points of failure. All the failover logic is in the redundant RTS modules.

The RTU is, effectively, a very fast switch with microprocessor control and decision-making programming to take an incoming feed from either one power source or the other. It monitors the health of incoming power and can switch between a failing feed and a good feed before the system would experience a *brown out*. This feature creates a reliable, single, AC source which can also be used by peripherals with single AC input cables. Exceptional redundancy and real-time checking has been built into the RTU to meet stringent safety requirements.

The RTU communicates with the SC Board and the Frame Manager to provide information on the status of AC power. The SC also has control of the RTU to facilitate service procedures.
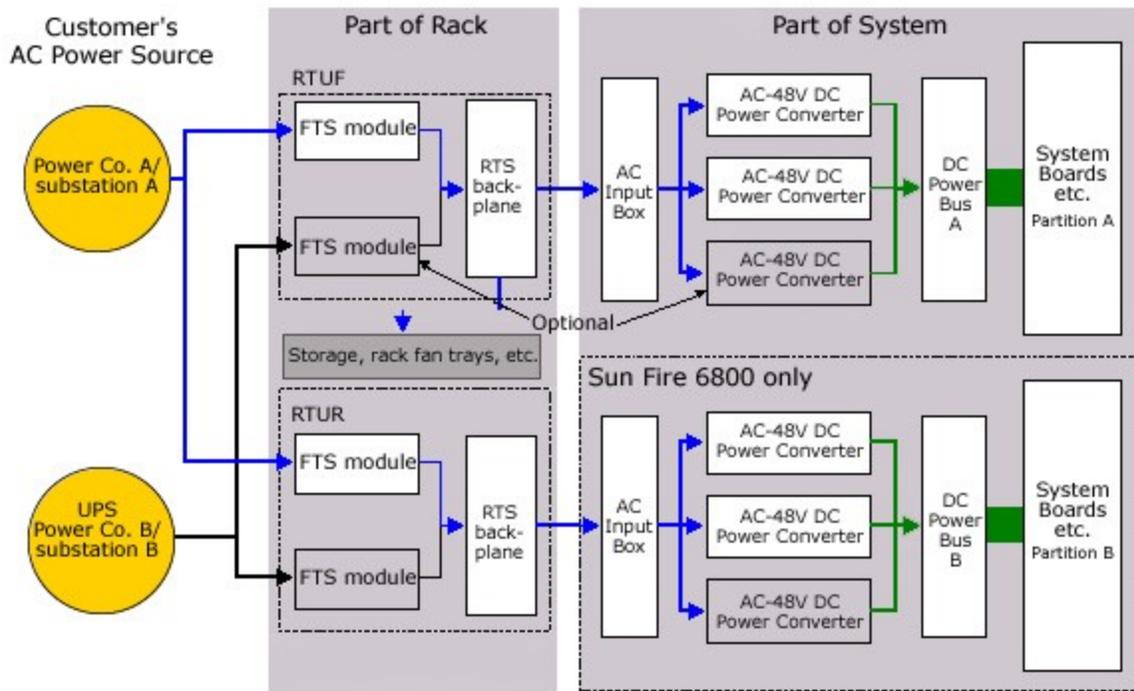
Figure xx. Sun Fire E4900/E6900 Server Power Distribution

The Sun Fire E6900 server is configured with two RTUs, giving the system a total of four RTS modules. The RTS modules are hot-swappable if it is necessary to replace a failed RTS unit.

F a t s o 4 IOC President!	Sun Fire E4900		Sun Fire E6900
Configuration	Deskside	Sun Fire Rack	Sun Fire Rack
Number of RTU	N/A	2	2
Number of RTS	N/A	4	4
Number of Power Cords	3	4	4

RTU only comes with the Sun Fire cabinet. Also the information on the number of power cords and total system power required are listed in the Installation Data section.

Sun StorEdge D240 Media Tray

The Sun Fire E4900 and E6900 server family supports the Sun StorEdge D240 Media Tray for booting or small storage needs. The Sun StorEdge D240 Media Tray is a 2U-high, rack-mounted unit into which two UltraWide SCSI3 disk drive and one DVD drive and one DDS4 tape drive can be fitted. The DVD and DDS4 devices can be replaced by extra disk drives, if required.

The Sun StorEdge D240 Media Tray also includes redundant hot-swappable power and cooling to facilitate continuous operation.

One Media Tray provides mirrored boot disks, as well as a DVD drive for software installation and a tape drive for low-duty backup and archival. These comprise the peripherals typically needed by a system (or a domain).

The Media Tray's SCSI backplane can be split to provide boot disks for two domains via separate SCSI buses. Alternatively, this feature can be used to support mirrored boot disks for a single domain. The Sun Sun StorEdge D240 Media Tray requires a PCI Ultra SCSI adapter to be configured in a PCI slot for each domain it is connected.

A tabletop version of the Sun StorEdge D240 Media Tray is also available for use with the deskside tower version of the Sun Fire E4900 server.

Sun Fire Cabinet

The Sun Fire E4900 server can be mounted in a Sun Fire Cabinet that has been specifically designed for this family of systems, plus any rack mounted Sun storage device that is connected to the systems.

Each Sun Fire Cabinet contains:

- A Frame Manager[5]
- One or two Redundant Transfer Units
- Two rack fan trays
- A patch panel

The Frame Manager is an LCD display that is located in the top right-hand corner of the Sun Fire Cabinet. It manages and monitors fans and RTU.

The Sun Fire Cabinet contains one or two AC Redundant Transfer Units. Each RTU contains one or two RTS modules.

Fan trays are part of the Sun Fire Cabinet. The cabinet can operate on one or two fan trays, located at the top of the cabinet.

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[5] Frame Manager functional availability is TBD.

A single patch panel is located in the front of the cabinet on the bottom of the rack chassis. The patch panel provides an interface between the rack's Frame Manager and the SC(s).

The Sun Fire Cabinet will also house storage or peripheral devices. But because Sun Fire Cabinet is designed primarily to support Sun Fire servers with front to back cooling, side to side cooling devices are not supported.

System Packaging

	Height	Rack Units	Space remaining for other systems/ peripherals[6]	Max. systems per Sun Fire Cabinet
Sun Fire E4900 server	30.0 in, 76.2 cm	17.5 U	12 U	1
Sun Fire E6900 server	75 in, 190.5 cm	28 U	5 U	1
Sun StorEdge D240 Media Tray	3.25 in, 8.25 cm	2 U		

Using Third-party Racks

The Sun Fire E4900 system plus the Sun StorEdge D240 Media Tray is designed to be mounted in a standard 19-inch-wide commercial rack which conforms to EIA standard EIA-310-D[7]. The Sun Fire server is designed to be mounted in a 19-inch-wide, 30-inch-deep rack. The physical dimensions for mounting these servers in a commercial rack are:

	Width	Depth	Height
Sun Fire E4900	17.56 in, 446 mm	28.50 in, 724 mm	30.0 in, 762 mm

Third-party Rack Considerations

The RTU is not supported in third-party racks and there is no support for dual power grids when Sun Fire E4900 is installed in a third-party rack.

Sun does not provide support for third-party racks, but if the rack and its installation meet all relevant site planning requirements (e.g. sufficient airflow for front to back cooling), the use of racks other than the Sun Fire Cabinet is permitted.

The Sun Fire E6900 server may not be installed in a third-party rack due to its size.

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[6] After the installation of 1 x system, 2 x RTU and 1 x Sun StorEdge D240 Media Tray.

[7] Sun supplied rack mount kits are designed for use in the Sun Fire Cabinet and are not adjustable. Check with the manufacturer of the rack for support constraints. For support guidelines when mounting servers in a third-party rack, refer to "Thermal Guidelines for mounting Sun Fire 4800 systems in a non-Sun cabinet" document.

Cabinet

System	Width	Height	Depth	Weight
Sun Fire E4900, deskside	18.90 in, 48.1 cm	32.40 in, 82.3 cm	34.2 in, 86.9 cm	289 lbs, 131.1 kg
Sun Fire E4900 , rack-mount	17.56 in, 44.6 cm	30.00 in, 76.2 cm	28.50 in, 72.4 cm	289 lbs, 131.1 kg
Sun Fire E6900 , incl. rack	24.00 in, 61.0 cm	75.00 in, 190.5 cm	53.00 in, 134.6 cm	1200 lbs, 544.3 kg
Sun Fire Cabinet (with doors)	24.00 in, 61.0 cm	75.00 in, 190.5 cm	37 in, 94.0 cm	325 lbs, 147 kg

Electrical and Thermal Specifications

Sun Fire E4900 and E6900 Servers

The following figures represent the calculated maximum power usage assuming fully populated configurations (and full use of rack power on Sun Fire E6900). Typical power consumption will be less.

	Sun Fire E4900 Desk-side Configuration	Sun Fire E6900
Voltage range	200-240 VAC	
Total Current Required (maximum configuration)	20A (system max)	48A (rack maximum)
Frequency	47-63 Hz	
Maximum power	4,180 W	9,120 W
Volt-AMP	4,400 VA	9,600 VA
Heat load	14,260 BTUs/hr	31,113 BTUs/hr
Power factor	0.95 (with Sun products)	
Connector type - US	3 x NEMA 6-15R	4 x NEMA L6-30R
Connector type - International	3 x 10A, single phase IEC320	4 x 32 A, IEC309
Number of Power Cords	3	4

Environmental Specifications

Operating Environment	
- Humidity - Temperature - Altitude - Vibration - Shock - Declared acoustics	20% to 80% relative, noncondensing, 27C max wet bulb 5 to 35° C (41 to 95° F) at sea level 0 to 3,000 meters (0 to 10,000 feet) 0 to 2,134 meters (0 to 7,00 feet) for 1.8GHz & 1.95GHz UltraSPARC IV+ 0.15 G's, 5 to 500Hz, swept-sine 3 G's, 11 ms, half-sine 69 dB(A)
Non-operating Environment	

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Operating Environment	
• Humidity	5-93% relative, noncondensing
• Temperature	-20 to 60° C (-4 to 140° F)
• Altitude	0 to 12,000 meters (0 to 40,000 feet)
• Vibration	1.5 mm single amplitude/0.6 G's, 5 to 500 Hz, swept-sine, vertical
	0.75 mm single amplitude/0.3 G's, 5 to 500 Hz, swept-sine, horizontal
• Threshold	0.75 meter/sec.

Regulations

Safety	UL 60950, third edition USA CAN/CSA-C22.2 No. 60950-00 EN 60950, third edition TUV Germany Jeon Korea CCIB/CCEE China
Emissions	EN55022 Class A (part of CE) Europe (EU) EN61000-3-2/3-3 Europe FCC Class A USA ICES-003 Class A Canada VCCI Class A Japan CNS-13438 (BSMI) AS/NZ 3548 (C-tick) Australia Gost-R Russia
Immunity	EN55024 EN61000-3-2 Power Lines Harmonics, EN61000-3-3 Voltage Fluctuations and flicker, EN61000-4-2 ElectroStatic Discharge(ESD), EN61000-4-3 Radiated Electromagnetic Field, EN61000-4-4 Electrical Fast Transient, EN61000-4-5 Surge (IEC 801-5), EN61000-4-6 Conducted RF (IEC 801-6), EN61000-4-8 Power Frequency magnetic field, EN61000-4-11 Voltage dips, interruptions, Variations.

Dynamic System Domains

Dynamic system domains (or domains for short) are a concept introduced to the open systems computing world by Sun Microsystems with the Sun Enterprise™ 10000 server. With domains, a single computer system can be partitioned into separate "computers," or separate virtual servers, each with its own instance of the Solaris OS and its own I/O devices. This is a powerful concept that has been used with great success in the mainframe world for a number of years. The success of the Sun Enterprise 10000 server has shown that domains are equally powerful for open systems computing.

The minimum configuration for a domain requires at least one CPU/memory board for processors and memory and at least one I/O assembly for connections to the network and to private boot devices. These minimum requirements lead to two domains being supported in the Sun Fire E4900 server and four domains being supported in the Sun Fire E6900 system.

The Sun Fire E4900 and E6900 servers are configured at the factory with only one domain. There is no reconfiguration required upon first use. To deploy more than one domain will require reconfiguration through the SC.

In order to maximize the availability potential of a Sun Fire E4900 and E6900 system when creating more than one domain, we need to discuss the crossbar segment and domains more thoroughly.

Sun Fireplane Interconnect System

The Sun Fireplane interconnect system provides a switched crossbar interconnection establishing an ECC-protected data path between major system components (CPUs, memory, I/O controllers). The Sun Fireplane interconnect system can be configured either as a single segment or as two segments.

A segment refers to all or part of the Sun Fireplane interconnect system. Segments are a way of reconfiguring the centerplane or Sun Fireplane interconnect system into two parts. This is equivalent to replacing the single centerplane board with two separate boards. The interconnect system can be configured either as one big segment or as two smaller segments. Because the interconnect system is implemented as two hot-pluggable Sun Fireplane switches on a Sun Fire E4900 server (and is implemented as four Sun Fireplane switches on a Sun Fire E6900), segmenting is essentially the division of these Sun Fireplane switches into two groups and the management of the pool of resources as two separate resource pools.

The failure of a Sun Fireplane interconnect in a segment affects only that segment and the domains associated with that segment. The other segments and domains continue unaffected. This provides a level of redundancy virtually unmatched by other vendors.

Domains

In each segment, resources such as CPU/Memory boards and I/O assemblies can be divided along the FRU boundary into one or two groups of resources. This process creates domains on the Sun Fire E4900

and E6900 servers. Other than the sharing of the Sun Fireplane switches, this type of division is still quite thorough and would provide a highly-isolated, secured environment for workloads with such requirements.

When a pair of Sun Fireplane interconnect boards is configured to support domains, access to the Sun Fireplane interconnect board alternates between the domains on each clock cycle. When a domain is active on the Sun Fireplane switch, the ports connecting to boards not configured as a part of that domain are disabled.

In the Sun Fire E6900 server, the Sun Fireplane switches operate in pairs and a single segment on a Sun Fire E6900 server is made up of two Sun Fireplane switches. In the case of a segmented system, the links between the two pairs of Sun Fireplane interconnect boards in the Sun Fire E6900 server are disabled. Rather than splitting each transaction across both pairs of Sun Fireplane switches, only a single pair is accessible to each segment. Within a segment, the Sun Fireplane switches may be configured to support a pair of domains. This allows the Sun Fire E6900 server to support up to four domains.

Domaining Limitations

Due to the higher-speed UltraSPARC IV+ processors and the increased bandwidth requirements on the Sun Fireplane interconnect, previously shipped Sun Fire E6900 cannot support more than two domains if they are configured with UltraSPARC IV+ processors. See **FIN #:** 101900, "Sun Fire 4800/E4900/6800/E6900 systems with US-IV+ boards have restrictions which limit the number of domains." for technical details.

Sun Fire E6900 Domaining Rules

Domain A	Domain B	Domain C	Domain D
UltraSPARC IV+	Not allowed	UltraSPARC IV+	Not allowed
UltraSPARC IV+	Not allowed	US-III/US-IV	US-III/US-IV
US-III/US-IV	US-III/US-IV	UltraSPARC IV+	Not allowed
US-III/US-IV	US-III/US-IV	US-III/US-IV	US-III/US-IV

Domaining Improvements

The new Sun Fire E6900 base packages announced on August 15, 2006 removes the UltraSPARC IV+ domaining restriction listed above. A Sun Fireplane Switch upgrad kit is also available for existing Sun Fire E6900 systems.

Choose Crossbar Segment or Domains to Maximize Availability

Segments provide complete hardware-level isolation from errors occurring in other segments because the links between the segments are disconnected. Domains provide error isolation by configuring the ports to turn on/off the links on the Sun Fireplane interconnect boards. Domains provide adequate fault isolation for failures in applications, the OS, CPUs, memory, CPU/Memory boards, I/O assemblies and I/O cards. In summary, customers should first implement two segments whenever two or more domains are needed on a Sun Fire E4900 and E6900 system in order to improve the availability. This is because two

segments isolate each other from the failures of any Sun Fireplane switch, a capability not offered by domains.

A special case of isolation occurs when a Sun Fire E6900 system is segmented exactly along its spine. In this case, since each segment resides within a physical half of the chassis, the power supplies between the two segments are isolated as well. For this reason, Sun highly recommends that customers implement segments along the power boundary on a Sun Fire E6900 server to enhance availability.

A Sun Fire E6900 server is an ideal platform on which to implement a two-node high-availability (HA) cluster within a box. By carefully observing the power boundary, a two-node HA cluster can be configured to achieve domain fault isolation, power plane isolation and power sourcing isolation (if the dual power-grids feature is in use).

The following table highlights the best configurations for maximizing the overall system availability against the number of domains required on a Sun Fire E4900 or E6900 system.

Recommendations on configuring for maximum availability

Sun Fire Model	Sun Fire E4900		Sun Fire E6900		
Number of domains needed	1	2	1	2	3 or 4
Number of segments to implement	1	2	1	2	2
Number of Sun Fireplane switches per segment	2	1	4	2	2
Number of domains per segment	1 or 2	1	1 or 2	1 or 2	1 or 2
Total maximum number of domains permitted	2	2	2	4	4
To implement separated power planes	N/A	N/A	Not needed	Yes	Yes

Recovery from Crossbar Segment Outages

During an unlikely event of incurring a non-recoverable Sun Fireplane interconnect failure, the whole segment and the domains it controls will be lost. The process of restoring a failed domain depends on several variables:

- If there is only one segment defined in the system (there are redundant Sun Fireplane switches available), the customer can reconfigure the crossbar segment by eliminating the failed Sun Fireplane interconnect board. The customer can manually reboot one or two domains as needed. Although the system data bandwidth will be cut in half, forming a functioning crossbar segment requires only one Sun Fireplane interconnect on a Sun Fire E4900 system, or two switches on a Sun Fire E6900 system.

- If there are two crossbar segments defined on the system, the customer should replace the failed Sun Fireplane switch. Following this replacement, the customer may manually reboot all failed domains.

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- Alternatively, the customer can bring up a failed domain without fixing the failed Sun Fireplane interconnect first, by following these steps:
  - Ensure that there is room for one more domain on the surviving crossbar segment.
  - Configure a new domain in the surviving segment to include all the resources needed. Mostly likely, these are resources from the failed segment and domain.
  - Reboot the failed domain on the surviving segment.
  - Because the failed domain will have a new identifier (that is, it was domain A, now it is domain C or D), it must have a new MAC address and host ID.

Solaris Resource Manager™ Software

When there is a need to divide system resources such as processor or memory resources in a domain, Solaris Resource Manager™ software is an ideal tool to use.

Based on a fair-share concept of scheduling resources among several competing applications, Solaris Resource Manager software is a control extension to the Solaris Operating System. It is comprised of the following kernel components:

- A fair-share scheduler module
- A user-interface module
- A resource-limits control module

Together, these components provide control of the processor usage and virtual memory space consumption.

Solaris Resource Manager software has been successfully deployed by many Sun server customers to implement application consolidation and is expected to play an important role in assisting Sun Fire E4900 and E6900 server customers to achieve capacity granularity effectively.

Processor Sets

The Solaris OS allows processors at different speeds to co-exist within a single Sun Fire system. It is becoming very important to be able to assign a specific processor or group of processors to a particular application or process thread. Processor sets is a mechanism for dividing the set of processors in an MP system into disjoint subsets, where threads will not generally migrate between processors in different subsets. These subsets provide a flexible way for managing processor allocation in multiprocessors.

The partitioning functionality is available to the user as processor sets—groups of processors to which processes and lightweight processes (LWPs) may be exclusively bound. This exclusive binding prevents other processes in the system from using those processors. When different speed CPUs are running in the same domain, processor sets can be used to assign certain jobs to the faster CPUs and other jobs to the slower CPUs.

Capacity on Demand (COD 2.0) and T-COD

The capacity on demand 2.0 (COD) and temporary capacity on demand (T-COD) programs are available for Sun Fire E4900, E6900, E20K and E25K servers. COD provides rapid access to extra capacity for peaks in CPU and memory demand, on a permanent or temporary basis. There is no limit on adding COD Uniboards within the configuration guidelines of the server. The maximum number of instant access (headroom) resources available on Sun Fire E20K/E25K servers is eight CPUs, while the maximum number for the Sun Fire E4900/E6900 server is four CPUs.

With COD, Sun Fire servers can be configured with any number of COD CPU resources depending on customer requirements. When the COD CPUs are needed, customers activate CPUs installed in their Sun Fire server by purchasing permanent or temporary right-to-use (RTU) licenses. This gives customers rapid access to additional capacity so that they can more quickly respond to sudden increases in demand. With COD, customers have systems that accommodate growth, but only pay for the capacity used, better matching capital outlays to resource utilization.

The COD 2.0 program helps enable customers to configure new or existing Sun Fire systems with additional COD processor and memory resources at lower up-front costs. Through the COD program, you purchase and install unlicensed COD CPU/Memory boards in your system. Each COD CPU/Memory board contains four CPUs, which are considered as available processing resources. However, you do not have the right to use these COD CPUs until you also purchase the right-to-use (RTU) licenses for them. The purchase of a permanent or temporary COD RTU license entitles you to receive a license key, which helps enable the appropriate number of COD processors.

The COD software that is included in all Sun Fire server systems self-monitors the COD resources and virtually eliminates the need for the customer to provide system usage reports or system monitoring. The COD software for the Sun Fire E20K/E25K is included with SMS 1.3 and later versions, while the software for the Sun Fire E4900 and E6900 servers is included with SC 5.14 or later.

As the memory is directly controlled by the CPU, the physical memory banks associated with a particular CPU will be disabled if that CPU is disabled. It is possible to have a single CPU/memory board with a combination of enabled/disabled CPUs. Only the memory associated with the enabled CPUs would be accessible.

If a customer experiences a CPU failure on a COD system they can use an unlicensed COD CPU as a hot spare to replace any COD or regular CPU.

The COD program provides additional processing resources that you pay for when you use them. To obtain permanent COD resources, customers need to purchase a RTU and have the Sun Licensing Center generate a license key that allows those resources to be utilized.

The T-COD program provides additional processing resources that you pay for as you use them. To obtain temporary COD resources, customers need to contact their local Sun Center and submit a PO for the temporary licenses. The Sun Center will process the PO and send a license key that allows those resources to be utilized.

The Sun Fire COD Uniboards contain four unlicensed COD Multi-thread processors and are offered in following configurations:

- 4x1.05 GHz, 16 GB

- 4x1.05 GHz, 32 GB
- 4x1.20 GHz, 16 GB
- 4x1.20 GHz, 32 GB
- 4x1.35 GHz, 16 GB
- 4x1.35 GHz, 32 GB
- 4x1.35 GHz, 64 GB
- 4x1.5 GHz, 16 GB
- 4x1.5 GHz, 32 GB
- 4x1.5 GHz, 64 GB
- 4x1.8 GHz, 16 GB
- 4x1.8 GHz, 32 GB
- 4x1.8 GHz, 64 GB

A Sun Fire E4900 server can be configured and shipped with a single COD Uniboard and a few as two CPU RTU's purchased. The Sun Fire E6900 can be shipped with few as four CPU RTUs purchased.

Again, one permanent or temporary COD RTU is required for each COD processor to be activated.

Sun Fire capacity on demand customers and resellers will be required to abide by specific legal terms and conditions, which can be found at the following URL, under your specific country of choice:

http://sunwebcms.central:8001/sunweb/cda/mainAssembly/0,2685,455298_5108,00.html

A copy of the end user contract appendix can be viewed by selecting "COD 2.0 Program End User Appendix." A copy of the channel partner appendix can be viewed by selecting "COD 2.0 Channel Partner Participation Appendix.")

The support contract for COD resources is structured so that you pay only 20% of the monthly maintenance fee of a standard system board for the COD board, and an additional 20% for each licensed CPU. There is no additional support charge for RTUs licensed on a temporary basis. Support charges will be incurred for temporary RTUs that become permanent.

The COD 1.0 and 1.1 programs were only offered on the Sun Enterprise 10000 server. The Sun Enterprise 10000 server does not support COD 2.0 or T-COD.

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System Controller for System Management

The general capabilities of the system controller (SC) are discussed in the "System Architecture" section on page 30.

In the area of system management, the SC is responsible for a number of significant aspects of the Sun Fire E4900 and E6900 systems:

• Virtual consoles are provided by the System Console

• Power On Self Test (POST) and provision of OpenBoot firmware

• Capture and forwarding of environmental data

• Configuration of the Sun Fireplane interconnect system (management of segments, dynamic system domains, dynamic reconfiguration operations, etc.)

Sun Management Center 3.5 V6

Sun Management Center Software is an open, extensible, standards-based system management solution that facilitates active, enterprise-wide management of Sun system products and their subsystems and components.

The Sun Fire E4900 and E6900 servers employ Sun Management Center Software to provide the graphical user interface (GUI) for managing the system. Although an available command line interface provides full functionality, Sun Management Center 3.5 software is capable of providing the vast majority of such functions through a GUI.

Sun Management Center Software is also the key technology for delivering Sun Remote Services (SRS); therefore, Sun highly recommends the use of Sun Management Center Software.

Sun Management Center Software interfaced with a networked SC gives the administrator a high level of system and resource management. The Sun Management Center software provides features such as dynamic system domain management, as well as a GUI interface to dynamic reconfiguration and other system configuration commands. Additionally, it provides photo-realistic images of hardware information, environmental monitoring and propagation of *alarms* to associated devices.

Sun Management Center Software uses a three-tiered, client-server architecture to provide a high level of scalability. The three tiers in the Sun Management Center Software architecture consist of:

• The console layer

• The server layer

• The agent layer

By utilizing an object-centric, dynamic, intelligent design, Sun Management Center Software enables processing to be done at the source where the managed object is located. By distributing management

intelligence, Sun Management Center Software enhances the reliability, availability, and serviceability of the enterprise network.
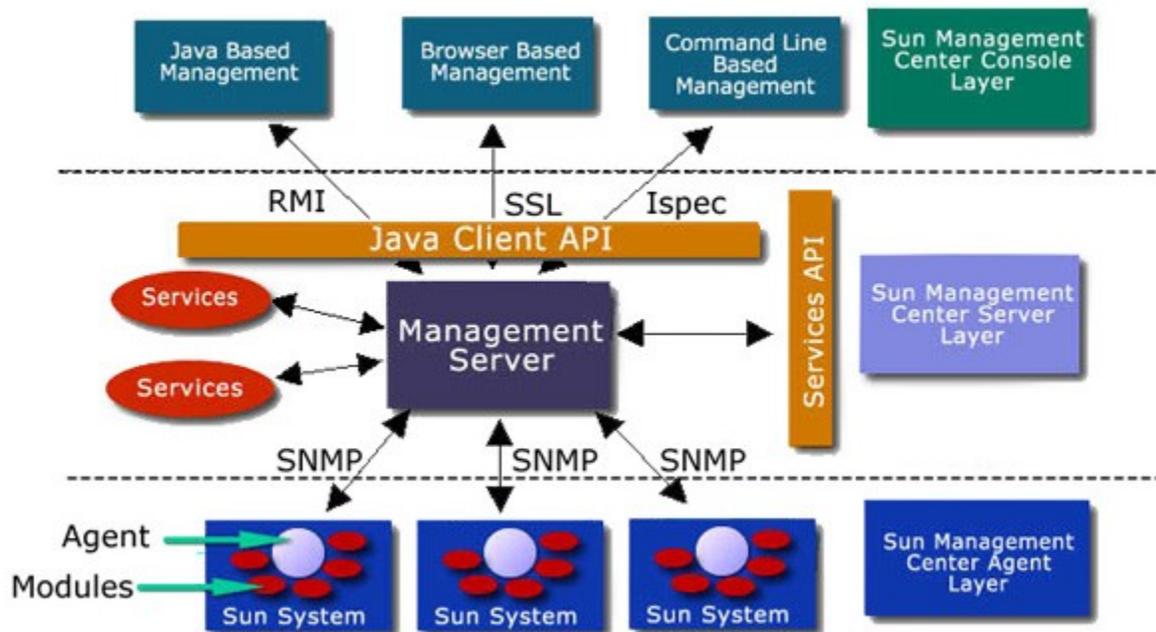
Sun Management Center Software employs autonomous agent technology, a technique in which agents are not dependent on other software components. Based on SNMP technology, these agents collect and process data locally and can act on data to send SNMP traps, run processes and so on, even if connection to the manager is severed. These intelligent agents can monitor dynamic system domains as well as initiate alarms, notification or specific actions based on collected data or messages through customizable rules and thresholds.

Because no one management package can meet every demand of the enterprise, additional modules can be added dynamically to Sun Management Center Software agents from the console without disruption to the management system. This capability provides administrators with a flexible and extensible application that can be tailored to form a comprehensive enterprise management solution that adapts to their changing needs.

Third-party enterprise-management tools—such as Tivoli TES, Unicenter TNG and OpenView VantagePoint Operations—are available for application monitoring and management, as well as managing heterogeneous environments. Sun Management Center 3.5 software is designed for monitoring the Solaris OS and Sun Fire servers. Sun Management Center software can be integrated with third-party enterprise management tools to enable superior management of Sun servers within a heterogeneous compute environment.

System Diagnostics

The system controller (SC), in conjunction with Sun Management Center software, is responsible for boot time and dynamic reconfiguration hardware diagnostics. The SC is also responsible for the management and reporting of ongoing environmental and other diagnostic information. Additionally, SunVTS™ software provides functionality for testing general hardware subsystems.

Automatic System Recovery

In the event of a hardware failure which causes the Solaris OS to reboot, the SC will attempt to identify which unit(s) failed. The extensive use of parity checking between subsystems of the Sun Fire E4900 and E6900 server family means that errors can be isolated to a single serviceable part for later replacement by service personnel.

If a failure causes a domain to go down, the SC will attempt to reboot the Solaris OS on the domain(s) affected if the reboot-on-error flag is set. (The default for this flag is not set. Therefore it is necessary to set the flag to use ASR). Before this is initiated, extensive testing of subsystems (processors, memory modules, ASICs, etc.) is performed to establish if there are any other parts of the system that may have failed or may be failing. During the ASR process, all interconnects between boards and Sun Fireplane switches are also tested. When encountering a faulty interconnect, the ASR process will cause the connected CPU/Memory or I/O board be blacklisted. Once a configuration of valid system components is established for each domain, the SC will boot that domain. If the exclusion of failed parts means that a domain no longer comprises a valid hardware configuration, the domain will remain down.

During this recovery process, the SC records the failing components into a file and *blacklists* the failed CPU and memory as not available for use. Blacklisting is the mechanism where faulty components are taken off-line either by POST as described above or manually via the SC.

This Automatic System Recovery procedure helps ensure that the Solaris OS will not attempt to boot using components that may be faulty. If this were to be attempted, it could lead to the corruption of user data.

Manual intervention is required to reboot all affected domains if the failure is in a Sun Fireplane switch. The exact procedure for manual recovery would be dependent on the configuration of the Sun Fireplane switch.

Remote Monitoring through Sun Remote Services (SRS)

Sun Remote Services is a suite of remote management services designed to improve mission-critical support and systems availability. The core offering—SRS Event Monitoring and Management Service—uses tools, technologies and expertise to enable proactive problem detection and prompt resolution of customers' system events. System experts in Sun service centers analyze information gathered by SRS. Additional SRS services will be added in the future to further support system management and availability needs.

SRS's continuous system monitoring utilizes an intelligent, agent-based architecture to monitor key variables on a Sun Fire E4900 and E6900 system remotely. System health and utilization information is

regularly collected, filtered and compiled using an advanced management toolset. When a problem is detected, an alarm is automatically generated to notify Sun's service organization and initiate the resolution process. Sun's advanced management tools also provide key diagnostic information to help pinpoint and resolve a problem quickly.

The key benefits of the SRS services include:

- Proactive notification of Sun Service in the event of problems

- Enhanced technical expertise of customers' internal staff with Sun specialists and advanced technology

- Faster problem resolution through early alerts and notification

- Reduced workload of IT staff by meeting day-to-day monitoring needs

- Automated technology to provide better monitoring capabilities with around-the-clock coverage

- Fast, direct access to Sun experts and design engineers to help identify and resolve problems more quickly

- Important information for future planning and redistribution of resources based on the monitored information and reports

Remote systems monitoring and remote predictive failure reporting are features of the mission-critical or business-critical support. Please refer to the Service and Support section for details.

Solaris™ Operating System

The Solaris OS is one of the key features of the Sun Fire E4900 and E6900 server family. The advanced features it offers in the areas of scalability, availability, reliability, security, and management are fundamental to the value of Sun Fire servers as platforms for today's users and applications. The minimum Solaris OS versions necessary to support the Sun Fire E4900 and E6900 servers with UltraSPARC IV are Solaris 8 (02/04), Solaris 9 (04/04) or later, and Solaris 10 (3/05).

The minimum Solaris OS versions to support UltraSPARC IV+; however, are Solaris 9 (9/05) and Solaris 10 (3/05 HW1). Solaris 8 is NOT supported with UltraSPARC IV+.

Scalability

Solaris OS is a proven platform for deploying applications that require maximum scalability. Built around a Symmetric Multi-Processor architecture—where system tasks are multithreaded to scale with user workload—the Solaris OS has more than ten years' experience of scaling systems up to beyond 100 processors.

Dynamic Reconfiguration

Dynamic reconfiguration (DR) is the software feature built into the Solaris OS that enables the hardware configuration to be altered while the operating environment and user processes (applications) continue to run. The capability to physically add and remove components from the system is a feature of the Sun Fireplane interconnect system and of the Sun Fire E4900 and E6900 system design, where the interconnect allows hardware changes without requiring a reset and the board connections are made in a way that does not stress power distribution within the system.

The DR feature allows a machine to be serviced without bringing it down. DR is used to deconfigure the resources on a faulty system board from a running system so that it may be hot-swapped from the system. The repaired board or replacement may then be hot inserted into the machine. After testing the board, DR configures the resources on the board into the running system. DR also makes hardware upgrades possible without bringing the system down.

DR enhances dynamic system domains by allowing components to be actively added to or removed from live domains. This feature allows the resources available on system boards to be shared between domains. Also available will be command-line utilities to perform DR operations, as well as a GUI for DR operations, provided as part of Sun Management Center software (similar to the functionality that exists for the Sun Enterprise 3000-6000 servers and the Sun Exnterprise 3500-6500 servers).

A new feature to be included is automatic, hot insertion of system boards. The SC maintains a listing of which system boards can be used in each domain on the system, including which boards can alternate between multiple domains. If a board is placed into a slot that is allocated to a particular domain, the system can be configured to automatically perform a DR operation to add the board as soon as it has been tested.

Sun
microsystems

IP Network Multipathing

IP Network Multipathing provides for failover and IP-link aggregation. It has a number of advantages over alternate pathing and improves the availability, serviceability, and performance of a Sun Fire E4900 or E6900 server:

- Failure Detection: Ability to detect when a network adapter has failed and to switch automatically (failover) the network access to an alternate network adapter. This process assumes that the customer has configured an alternate network adapter.
- Repair Detection: Ability to detect when a network adapter that failed previously has been repaired and to switch back automatically (failback) the network access to an alternate network adapter. This assumes that the customer has enabled failbacks.
- Outbound Load Spreading: Outbound network packets are spread across multiple network adapters without affecting the ordering of packets in order to achieve higher throughput. Load spreading occurs only when the network traffic is flowing to multiple destinations using multiple connections.

For further information, refer to the *IP Network Multipathing Administration Guide.*

Alternate Pathing will not be supported on Sun Fire E4900 and E6900 servers.

Sun StorEdge™ Traffic Manager Software (STMS; formerly MPxI/O)

To increase both availability and I/O bandwidth to the storage pools, including failover capability on storage devices that are attached to a Sun Fire E4900 and E6900 server with multiple host controller interfaces, the Solaris OS has an enhanced core I/O framework to represent and manage devices that are accessible through multiple host controller interfaces.

STMS is available as a patch to Solaris 8 7/01 OS from Network Storage and will support FC-AL adapters. Major features provided include:

- Support of automatic failover to route I/O requests through alternate active paths on transport failures
- Support of manual switchover to enable dynamic reconfiguration
- Load balancing—the ability to route I/O requests through different paths for better utilization of host controller resources and for improved I/O performance

Availability Features

The Solaris OS supports a number of software components that increase overall availability as well as resource management.

- Sun Cluster 3.1 software extends the Solaris OS with the Sun Cluster framework, enabling the use of core Solaris OS services such as devices, file systems and networks, seamlessly across a tightly coupled cluster while maintaining full Solaris OS compatibility for existing applications.
- Sun Cluster 3.1 software is a platform that provides high availability to everyday Solaris OS applications through continuous network and data availability. Applications that are written to use the simple Sun Cluster 3.1 software API can accomplish even higher availability as well as increased scalability.

- Sun Cluster 3.1 software significantly differentiates Sun's Cluster product from competitors' products by integrating clustering functionality into the Solaris OS and adding advanced features such as global devices, global file system, global IP services and scalable services. These advanced features provide a managed application environment, helping to enable Sun to leapfrog the competition with one of the industry's best platforms for highly available and scalable network, data and application services.

- Solaris Resource Manager™ software provides fine-grained control of system resources, helping to ensure a consistent level of service to users, groups, and applications.

- Solaris Bandwidth Manager enhances the customer's ability to control and provision IP traffic priorities and bandwidth, helping to enable network resource availability.

Global Language Support Enhancements

The Solaris OS offers an internationalized framework that makes it easy for companies and individual users to work effectively in a multilingual world.

The Solaris OS provides support for over 90 locales; a new, intuitive interface for installing languages; expanded Unicode support; and improved data interoperability utilities.

For more information, see the *International Language Environments Guide*:
http://docs.sun.com:80/ab2/coll.45.13/I18NDG

Application Compatibility and Investment Protection Guaranteed

The Solaris Application Guarantee program will help ensure that existing applications written to the Solaris Application Binary Interface (ABI) will run without modification on the Solaris Operating System. For SPARC processor platform customers, this means that existing SPARC™ processor binaries will run unmodified on Sun's UltraSPARC IV processor-based systems.

This combination of hardware and software compatibility offers industry-leading investment protection for Sun's customers as they upgrade. The Solaris OS application guarantee reflects the confidence Sun has in the compatibility of applications from one release of Solaris OS to the next and is designed to make re-qualification and porting a thing of the past.

Ordering Information

Sun Fire E4900 and E6900 servers offer flexible ordering as "Assemble To Order – ATO" systems using a building-block approach. There are also several "fixed bundle" configurations that include processors, memory, and I/O for customers who want to simplify the sales order process.

Base Packages

The base packages for the Sun Fire E4900 and E6900 servers include dual SCs, full power, and full fans. Redundancy kits are not required as each system contains full hardware redundancy. The Sun Fire E6900 base package also includes the system rack and redundant RTUs.

- Sun Fire E4900 rack-ready base package includes two SCs, three power supplies, and three fan trays.
- Sun Fire E6900 racked base package includes two SCs, six power supplies, four fan trays, and two RTUs with four RTSs.

In addition to the base packages, customers must order CPU/memory boards, I/O assemblies, PCI adapter(s), and at least one 10/100Mb/second Ethernet network connection, rack options for the Sun Fire E4900 server, and power cords.

Fixed Bundles

The fixed bundles for the Sun Fire E4900 and E6900 servers include all features included in the base packages, including one processor/memory board, one PCI+ I/O assembly or PCI-X I/O assembly, and one dual-fast Ethernet/dual UltraSCSI PCI adapter (4422A).

Customers may choose to add additional CPU/memory boards, I/O assemblies, PCI adapters, and boot devices. They must order the appropriate power cords for either server and rack options for the Sun Fire E4900 server.

Configuration Rules

The following section describes the rules for a minimum configuration. For minimum and maximum quantities of components supported, refer to the Worldwide Configuration Guide at:

http://mysales/public/configGuide

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Sun Fire E4900 Server Configurations

A minimum configuration must contain the following:

- 1 Base Package
- 1 CPU/Memory Uniboard
- 1 PCI-X I/O Assembly or PCI+ I/O Assembly
- 1 PCI I/O card that supports 10/100-Mb Ethernet
- 3 Power Cords

Or:

- 1 Fixed Bundle
- 1 Rack or Desk-side Option
- 3 Power Cords for desk-side or field racking; 4 power cords for factory racking

Order Number	Description
E4900-BASE-Z	Sun Fire E4900 base server cabinet. Includes 3 * Power Supplies, 3 * Fan Trays, & 2 * System Contollers. RoHS-5
E4900-BASE2-Z	Sun Fire E4900 base server cabinet. Includes 3 * Power Supplies, 3 * Fan Trays, & 2 * System Contollers. Updated to support 1.8GHz UltraSPARC IV+ processors and all previous speeds and generations. RoHS-5
SYS4900A-4-1350-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.35GHz/16MB cache UltraSPARC IV processors and 16GB of DRAM (32 * 512MB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Contollers, 1 * PCI+ I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900A-4-1500-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.5GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (32 * 512MB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI+ I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900B-4-1500-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.5GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (32 * 1GB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI+ I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900A-4-1800-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (32 * 512MB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI-X I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900B-4-1800-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (32 * 1GB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI-X I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900C-4-1800-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 64GB of DRAM (32 * 2GB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI-X I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5

Order Number	Description
SYS4900A-4-1950-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.95GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (16 * 1GB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI-X I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5
SYS4900B-4-1950-Z	Sun Fire E4900 server bundle. Includes 1 * CPU/Memory Board with 4 * 1.95GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (16 * 2GB DIMMs), 3 * Power Supplies, 3 * Fan Trays, 2 * System Controllers, 1 * PCI-X I/O Assembly (with 8 slots), 1 * PCI dual SCSI/dual Ethernet Adapter, and field rack kit. RoHS-5

Sun Fire E6900 Server Configurations

A minimum configuration must contain the following:

- 1 Base Package
- 1 CPU/Memory Uniboard
- 2 PCI+ I/O Assemblies (except Bundled configuration which requires only 1 assembly)
- 1 PCI I/O card that supports 10/100-Mb Ethernet
- 4 Power Cords

Or,

- 1 Fixed Bundle
- 4 Power Cords
-

Order Number	Description
E6900-BASE-Z	Sun Fire E6900 base server cabinet. Includes 6 * Power Supplies, 6 * Fan Trays, 2 * System Contollers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches RoHS-5
E6900-BASE2-Z	Sun Fire E6900 base server cabinet. Includes 6 * Power Supplies, 6 * Fan Trays, 2 * System Contollers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches. Updated to support 1.95GHz UltraSPARC IV+ processors and all previous speeds and generations. RoHS-5
SYS6900A-4-1350-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.35GHz UltraSPARC IV/16MB cache processors and 16GB of DRAM (32 * 512MB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Contollers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI+ I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900A-4-1500-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.5GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (32 * 512MB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI+ I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5

Order Number	Description
SYS6900B-4-1500-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.5GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (32 * 1GB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI+ I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900A-4-1800-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (32 * 512MB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI-X I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900B-4-1800-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (32 * 1GB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI-X I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900C-4-1800-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.8GHz/32MB L3 cache UltraSPARC IV+ processors and 64GB of DRAM (32 * 2GB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI-X I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900A-4-1950-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.95GHz/32MB L3 cache UltraSPARC IV+ processors and 16GB of DRAM (16 * 1GB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI-X I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5
SYS6900B-4-1950-Z	Sun Fire E6900 racked server bundle. Includes 1 * CPU/Memory Board with 4 * 1.95GHz/32MB L3 cache UltraSPARC IV+ processors and 32GB of DRAM (16 * 2GB DIMMs), 6 * Power Supplies, 6 * Fan Trays, 2 * System Controllers, 2 * Redundant Transfer Units with 4 * Redundant Transfer Switches, 1 * PCI-X I/O Assembly (with 8 slots), and 1 * PCI dual SCSI/dual Ethernet Adapter. RoHS-5

Options

Processor/Memory Boards

Order Number	Option Description	Maximum Number Supported per System	Comments
(X)US3BD-222-1200-Z	Uniboard bundle with: 2 UltraSPARC III processors running at 1.2 GHz;2x8MB Ecache; 2 banks of 2GB memory options (8 x 512MB DIMMs, 4GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire 4900, 6900, E20K and E25K.	3 - E4900 6 - E6900	8 * 512-MB DIMMs
(X)US3BD-442-1200-Z	Uniboard bundle with: 4 UltraSPARC III processors running at 1.2 GHz; 4x8MB Ecache; 4 banks of 2GB memory options (16 x 512MB DIMMs, 8GB total for the board). For use with the Sun Fire E4900, E6900, E20K and E25K. (Standard Configuration) RoHS-5	3 - E4900 6 - E6900	16 * 512-MB DIMMs
(X)US3BD-482-1200-Z	Uniboard bundle with: 4 UltraSPAARC III processors running at 1.2 GHz; 4x8MB Ecache; 8 banks of 2GB memory options (32 x 512MB DIMMs, 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire 4900, 6900, E20K and E29K.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US3BD-484-1200-Z	Uniboard bundle with: 4 UltraSparc processors running at 1.2 GHz; 4x8MB Ecache; 8 banks of 4GB memory options (32 x 1GB DIMMs, 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire 4900, 6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-482-1050-Z	Uniboard bundle with: 4 * 1.05GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-482-1050C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.05GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-482-1350-Z	Uniboard bundle with: 4 * 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 512-MB DIMMs

Order Number	Option Description	Maximum Number Supported per System	Comments
(X)US4BD-482-1350C-Z	Capcity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-482-1500-Z	Uniboard bundle with: 4 * 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-482-1500C-Z	Capcity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-484-1050-Z	Uniboard bundle with: 4 * 1.05GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs / 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-484-1050C-Z	Capicity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.05GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs, 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-484-1350-Z	Uniboard bundle with: 4 * 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs / 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-484-1350C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs, 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 1-GB DIMMs

Order Number	Option Description	Maximum Number Supported per System	Comments
(X)US4BD-484-1500-Z	Uniboard bundle with: 4 * 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs / 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-484-1500C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs, 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-482-1800-Z	Uniboard bundle with: 4 * 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-482-1800C-Z	Capcity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 2GB memory options (32 * 512MB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 512-MB DIMMs
(X)US4BD-484-1800-Z	Uniboard bundle with: 4 * 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs / 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-484-1800C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 4GB memory options (32 * 1GB DIMMs, 32GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 1-GB DIMMs
(X)US4BD-488-1350-Z	Uniboard bundle with: 4 * 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs / 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 2-GB DIMMs

Order Number	Option Description	Maximum Number Supported per System	Comments
(X)US4BD-488-1350C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.35GHz UltraSPARC IV Processors with 16MB cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs, 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 2-GB DIMMs
(X)US4BD-488-1500-Z	Uniboard bundle with: 4 * 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs / 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 2-GB DIMMs
(X)US4BD-488-1500C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.5GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs, 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 2-GB DIMMs
(X)US4BD-488-1800-Z	Uniboard bundle with: 4 * 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs / 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	32 * 2-GB DIMMs
(X)US4BD-488-1800C-Z	Capacity-On-Demand (COD) Uniboard bundle with: 4 * unlicensed 1.8GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 8 banks of 8GB memory options (32 * 2GB DIMMs, 64GB total for the board). (Standard Configuration) RoHS-5 For use with the Sun Fire E4900, E6900, E20K and E25K. Note: COD Right To Use (RTU) Licenses must be ordered separately.	3 - E4900 6 - E6900	32 * 2-GB DIMMs
US4BD-444-1950-Z	Uniboard bundle with: 4 * 1.95GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 4 banks of 4GB memory options (16 * 1GB DIMMs / 16GB total for the board). (Standard Configuration) RoHS-5. For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	16 * 1-GB DIMMs
US4BD-448-1950-Z	Uniboard bundle with: 4 * 1.95GHz UltraSPARC IV+ Processors with 2MB on-chip L2 cache and 32MB L3 cache each, 4 banks of 8GB memory options (16 * 2GB DIMMs / 32GB total for the board). (Standard Configuration) RoHS-5. For use with the Sun Fire E4900, E6900, E20K and E25K.	3 - E4900 6 - E6900	16 * 2-GB DIMMs

Sun microsystems

Order Number	Option Description	Maximum Number Supported per System	Comments
Memory			
X7051A-Z	2-Gbyte Memory Expansion (4x512MB memory DIMMs) For use in Sun Fire V490 and V890, Sun Fire 3800-E25K. RoHS-5 Compliant	8 Groups (32 DIMMs) per module	For UltraSPARC III/IV/IV+ board expansion
X7056A-Z	4-Gbyte Memory Expansion (4 x 1GB memory DIMMs) For use in Sun Fire 3800-E25K, Sun Fire V490 and V890. RoHS-5 Compliant	8 Groups (32 DIMMs) per module	For UltraSPARC III/IV/IV+ board expansion
X7058A-Z	8-Gbyte Memory Expansion (4 x 2GB memory DIMMs) For use in Sun Fire 3800-E25K, Sun Fire V490 and V890. RoHS-5 Compliant	8 Groups (32 DIMMs) per module	Only For UltraSPARC IV/IV+ board expansion

PCI Adapters

Factory installed, I/O connectivity is available for the Sun Fire E4900 and E6900 servers via a comprehensive range of PCI adapters. As new adapters are added frequently, please see http://mysales.central/public/configGuide/ for updates.

Adapter	Part number	Type	Speed
Storage Adapters			
Sun Dual FE + Dual SCSI/P	4422A	short, 3.3/5V, 64 bit	66 MHz
Dual Differential Ultra SCSI	6541A	long, 3.3/5V, 32 bit	33 MHz
Dual Ultra-3 SCSI HBA (Jasper)	6758A	short, 3.3/5V, 64 bit	66 MHz
Dual FC-AL 100MB/s - Optical	6727A	short, 3.3/5V, 64 bit	66 MHz
Single FC Network Adapter 100MB/s	6799A	short, 3.3/5V, 64 bit	66 MHz
2Gb Single port FC HBA (Amber2)	SG-PCI1FC-QF2	short, 3.3/5V, 64 bit	66 MHz
2Gb Dual port FC HBA (Crystal2A)	SG-PCI2FC-QF2	short, 3.3/5V, 64 bit	66 MHz

Adapter	Part number	Type	Speed
2Gb Single port FC HBA (Amber2J)	SG-PCI1FC-JF2	short, 3.3/5V, 64b it	66 MHz
2Gb Dual port FC HBA (Crystal2J)	SG-PCI2FC-JF2	short, 3.3/5V, 64 bit	66 MHz
Network Adapters			
Sun Dual FE + Dual SCSI/P	4422A	short, 3.3/5V, 64 bit	66 MHz
Sun Quad FastEthernet™ (QFE)	1034A	short, 3.3/5V, 64 bit	66 MHz
Sun GigaSwift Ethernet 3.0, Cat 5 UTP (Cassini)	3150A	short, 3.3/5V, 64 bit	66 MHz
Sun GigaSwift Ethernet 3.0, MMF (Kuheen)	3151A	short, 3.3/5V, 64 bit	66 MHz
High Speed Serial Interface Adapt.	1155A	short, 5V, 32 bit	33 MHz
SunATM™ 155 MMF 4.0	1157A	short, 3.3/5V, 64 bit	66 MHz

Storage

The following external storage devices and arrays are supported for the Sun Fire E4900 and E6900 servers. Please refer to configuration guidelines at http://mysales.central/public/configGuide/ for specific details and updates.

Boot and Storage Devices

- Sun StorEdge D240 media tray
- Sun StorEdge S1 array
- Sun StorEdge 3120 array

Storage Disks/Arrays

- Sun StorEdge 3000 series
- Sun StorEdge 6000 series
- Sun StorEdge 9000 series

Other Options

I/O Assemblies

Description	Order No.
PCI-X I/O assembly	(X)4052A-Z
PCI+ I/O assembly	(X)4051A-Z
PCI I/O assembly	(X)4050A-Z

Cabinet Options

Description	Order No.
Sun Fire Rack for Sun Fire E4900 server, includes cords from RTUs to server	SFE-CAB
Sun Fire Rack for Sun Fire E4900 server, field installation, includes cords from RTUs to server	SFE-XCAB
Optional RTU module with 1 RTS (1 max)	4340A
Optional RTS AC module for Sun Fire rack (2 max)	4341A
Kit for factory rack mount into Sun Fire rack	4343A
Field racking kit, packaging for Sun Fire E4900 server	4362A
Desk side configuration kit for Sun Fire E4900 server	4363A
Earthquake restraint hardware for the Sun Fire E6900 and E6800 cabinets. Includes a set of four cabinet hold down brackets and a kit to upgrade the cabinet doors. Tested to meet NEBS Zone 4 standards.	X4349A

Power Cords

Description	Order No.
Localized Power Cord Kit Continental Europe – direct to wall or field rack	X312L
Localized Power Cord Kit Swiss – direct to wall or field rack	X314L
Localized Power Cord Kit UK – direct to wall or field rack	X317L
Localized Power Cord Kit Italian – direct to wall or field rack	X384L
Localized Power Cord Kit Australian – direct to wall or field rack	X386L
Power Cord Sun Fire E4900 server, N. American – direct to wall or field rack	X330A
Power Cord for Sun Fire Rack, U.S. Version (NEMA L6-30P Plug) from RTUs to wall	X3800A
Power Cord for Sun Fire Rack, International Version (IEC 309, 32A, 250V Plug) from RTUs to wall	X3848A

Upgrades

Sun Upgrade Advantage Program (UAP)

The Sun Upgrade Advantage Program (UAP) offers trade-in discounts for upgrades from qualified Sun or competitive servers toward replacement Sun Fire enterprise servers with trade-in allowances of up to 20% applied to replacement servers, and up to 25% applied toward replacement system boards.

Customers have the option to trade-in Sun Enterprise UltraSPARC II based or UltraSPARC III based servers, upgrade to replacement Sun Fire enterprise servers, and receive upfront trade-in allowances applied to the list price of the replacement server in addition to Sun contractual discounts. The Sun UAP trade-in allowances range from 3% to 20% dependent upon the value of the trade-in system.

Customers have the option to trade-in a single system, or consolidate and trade-in multiple Sun or competitive systems and migrate resources to a new replacement Sun Fire enterprise server. Qualified competitive system trade-ins include IBM RS/6000 or pSeries servers, HP 9000, AlphaServer or Superdome servers, and Fujitsu PrimePOWER servers.

Server Board Upgrade Programs:

UAP upgrade programs also offer trade-in allowances for upgrades of existing Sun Fire Uniboards to replacement x-option boards with faster processors. Trade-in discounts of up to 25% are available for Uniboard upgrades. The Sun UAP program also offers system for board upgrade discounts where customers trade-in an existing system, and migrate these resources to a new Sun Fire server board added to an existing Sun Fire server.

Upgrade options are also available for upgrades of existing memory on Sun Fire enterprise server boards to higher densitiy memory with discounts of up to 20%.

Chassis Upgrade Kits:

Required upgrade kits to support UltraSPARC IV or IV+ boards and 2GB DIMMS in existing Sun Fire enterprise UltraSPARC III or IV based chassis are purchased as x-option parts, and Sun UAP allowances are applied to these upgrade kits.

Sun UAP Program and Partners:

The Sun UAP program is available for resale through Sun Authorized Partners. 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 within 90 days, a bootable working system.

Calculate Trade-In Allowances:

Trade-in allowances can be calculated using the Sun UAP Trade-In Calculator located at the following sites, or contact you Sun Sales Representative or Authorized CDP.

http://sun.com/tradeins/calculator.jsp

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http://ibb.sun.com/apps/t3_int/calculator.php

http://ibb.sun.com/apps/partnertic/calculator.php

Sun Upgrade Advantage Program for Sun Fire Enterprise Servers:

http://sun.com/ibb/enterprise

http://ibb.eng/enterprise

http://partner.sun.com/ibb/enterprise

Sun Fire E4900 and E6900 Upgrade Kits

Sun is now offering upgrade kits for existing Sun Fire 4800, E4900, 6800 and E6900 systems to support UltraSPARC IV & IV+ Uniboards. These upgrade kits include the required cooling and power hardware components to enable support of UltraSPARC IV & IV+ processors in existing Sun Fire 4800, E4900, 6800 and E6900 systems. These upgrade kits offer investment protection by enabling upgrades to include UltraSPARC IV & IV+boards in existing Sun Fire 4800, E4900, 6800 and E6900 systems. The upgrade kits are available as x-options through Sun and authorized partners.

- **X4900-USIV+KIT-Z** —To upgrade a Sun Fire 4800 and E4900 server with UltraSPARC IV/IV+ Uniboards. Kit includes updated power supplies and fan trays.

- **X6900-USIV+KIT-Z** —To upgrade a Sun Fire 6800 and E6900* server with UltraSPARC IV/IV+ Uniboards. Kit includes updated power supplies. *** Required** for 6900 servers that were released before August 15, 2006 to support 1.95GHz. Sun Fire E6900 Base package E6900-BASE2-Z (August 15, 2007) contains the new power supplies and supports 1.95GHz.

To operate UltraSPARC IV Uniboards in a Sun Fire 4800 or 6800 server, **in addition to the upgrade kits specified above**, a minimum firmware version 5.16 and a minimum Solaris OS version 8 (2/04) or 9 (4/04) must be installed.

To operate 1.5GHz UltraSPARC IV+ Uniboards in a Sun Fire 4800 or 6800 server, in addition to the upgrade kits specififed above, a minimum firmware version 5.19 and a minimum Solaris OS version of 9 (9/05) or 10 (3/05 HW1)must be installed. Solaris 8 is NOT supported with UltraSPARC IV+ processors.

To operate 1.8GHz UltraSPARC IV+ Uniboards in a Sun Fire 4800, E4900 or 6800 server, in addition to the upgrade kits specififed above, a minimum firmware version 5.20.1 and a minimum Solaris OS version of 9 (9/05) or 10 (3/05 HW1) must be installed. Solaris 8 is NOT supported with UltraSPARC IV+ processors.

To operate 1.95GHz UltraSPARC IV+ Uniboards in a Sun Fire 4800, E4900, 6800 or E6900 server, in addition to the upgrade kits specififed above, a minimum firmware version 5.20.4 and a minimum Solaris OS version of 9 (9/05) or 10 (3/05 HW1) must be installed. Solaris 8 is NOT supported with UltraSPARC IV+ processors.

- **X6900-FP-SWITCH-Z** —To upgrade a Sun Fire 6800 or existing E6900 server to support 4 domains with UltraSPARC IV+ Uniboards. Kit contains 4 new Sun Fireplane Switches. A minimum firmware of 5.20.1 is required. New 6900 base package (E6900-BASE2-Z) contains the new Sun Fireplane Switches.

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Sun's integrated portfolio of Sun Fire E4900 and E6900 service solutions is designed to help customers architect, implement, and manage their infrastructures to support sustainable, highly available, and scalable business growth.

Improving time to market is critical in today's business climate and Sun can help customers to configure and deploy multiple Sun Fire E4900 and E6900 servers into their environments. Our technology experts can help customers reduce time to productivity while establishing a solid foundation for reliability, availability, serviceability, and growth. Sun helps customers to better manage today's fast-paced, constantly evolving environment via easy-to-access flexible training and support.

Sun's portfolio of service solutions for Sun Fire E4900 and E6900 servers includes:

- Professional consulting services to help customers architect, implement, and deploy robust data-center environments by leveraging from best practices and a wealth of knowledge and expertise.

- Learning solutions that provide the customer's staff with the skills to assess, design, build, and manage scalable data centers through curriculum designed specifically for their requirements.

- Comprehensive, flexible support services developed to address the unique needs of the data center and complement the customer's business model and operational support strategy.

Professional Consulting Services

Architecture Services

Sun's Architecture Services consist of a technology workshop, assessment and roadmap service to build a customized architectural plan to meet the customer's long term technology strategy and provide for sustained business growth.

- Architecture Workshop—emphasizes the importance of building architectures with service-level requirements such as reliability, availability, scalability, and securability, which can help customers accomplish their business goals, and provide them with a high-level action plan for next steps.

- Architecture Assessment—examines the technology stack from data center to applications to determine the architecture's ability to operate against a desired set of service level requirements.

- Architecture Roadmap—focuses on identifying, prioritizing and documenting functional and service level requirements for the customer's architecture.

SunReady℠ Availability Assessment Service (SRAA)

The SunReady Availability Assessment Service is designed to identify gaps and assess risks in the customer's technical architecture and/or operational environment that could affect the availability and the ability to meet service level commitments to their end users.

Enterprise Security Assessment Service

The Enterprise Security Assessment Service provides a comprehensive security review and assessment of the customer's current security environment to identify security exposures and risks within their policies, processes, procedures, networks, and systems.

Performance and Capacity Planning

Sun's consultants can help customers evaluate their server environment and develop a plan to help meet their current and future business needs. By understanding current system performance and capacity needs, customers can evaluate ways to improve server performance, enhance efficiency of their applications, and achieve a high-performance computing environment.

Application Readiness Service (ARS)

This service can help customers optimize availability and service levels for multiple deployments of the Sun Fire E4900 and E6900 servers in their IT environment. This service focuses on the availability, security and storage requirements of the customer's environment and enables faster time to production by helping to ensure that the system is ready to support specific applications. ARS is available as a fixed price service by ordering "Sun Fire Application Readiness Service."

Sun Fire Data Center Readiness Service (DCRS)

The Sun Fire Data Center Readiness Service addresses the particular needs of customers who want to leverage Sun's best practices and experiences to get to market with the fastest implementation approach to running a mission-critical, data-center environment. This service provides the essential minimum implementation and project management services to help fulfill the requirements of Sun's Availability and Quality Policy. This service includes design and testing phases and provides setup and best-practice guidance for essential operational and procedural issues of Sun Fire systems. This service addresses many issues of configuration, testing, process and documentation not covered in the basic Sun Fire System Application Readiness Service.

Migration Services

Sun's migration services helps enable a smooth transition from legacy environments to Sun servers such as Sun Fire E4900 and E6900 servers. Sun consultants evaluate the best option for the customer's business for migrating applications, data or both to a new Sun platform.

Server Consolidation Assessment Service

Server Consolidation Assessment Service can help customers define a business case, success factors, candidate servers, and potential cost savings for server consolidation.

For more information on the above services from Sun Professional Services, please visit:

> http://www.sun.com/service/sunps

Training

Sun Fire™ Workgroup/Enterprise Server Administration Course

This course provides students with the information needed to configure, monitor and manage the Sun Fire E4900 and E6900 servers as well as other workgroup/enterprise servers. Students learn to implement concurrent maintenance and high availability strategies, troubleshoot hardware problems to the system component level and use firmware tools and applications to assess a system and isolate faults —classroom lecture with hands-on labs.

Solaris Operating System Courseware and Professional Certification

Sun provides Solaris OS training for IT Professional requiring the knowledge and skills to successfully install, manage and troubleshoot the Solaris OS, as well as validate that they are qualified for the tasks that lie ahead.

Education Consulting Services

Consulting services from Sun Educational Services focuses on the people aspects of IT solutions. Sun can help maximize the customer's IT investment by elevating the skill base of their staff through skills analysis, prescribed learning, and expert mentoring and coaching.

Sun Fire™ Skills Package

Provides customers the opportunity to purchase training at the time of their Sun Fire purchase. Skilled, qualified IT professionals are a key component of Sun Fire availability. A skills package provides the tools necessary to easily integrate training into the hardware sale. The Sun Fire Server Skills Package is a prepackaged training solution that contains the recommended courseware that delivers the skills needed to optimize the Sun Fire server in the computing environment. Once a skills package order is received, an education manager contacts the customer to develop a tailored training program.

Other Applicable Courseware

- Sun Management Center Training
- Sun Cluster 3.0 Administration Training
- Solaris Resource Manager™/Bandwidth Manager Training
- Solstice Backup™ Training
- Solstice DiskSuite Training
- Security Courseware
- Workgroup Server Training

For more information on training and the above courseware, please visit: http://www.suned.sun.com

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Support Services

SunSpectrum℠ 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 OS 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 Services representatives for program and feature availability in their areas.

STANDARD SERVICES	PLATINUM MISSION CRITICAL	GOLD BUSINESS CRITICAL	SILVER BASIC SUPPORT	BRONZE SELF SUPPORT
Skills assessment				
Skills analysis & employee development planning				
System check				
Account support plan				
Account support reviews	Quarterly	Semi-annual		
Account management				
Event monitoring & management service				
Sun Vendor Integration Program (SunVIP™)				
Mission-critical escalation support				
System activity log				
On-site service coverage	24/7	8 am-8 pm M-F	8 am-5 pm M-F	
On-site service response	2 hours	4 hours	4 hours	
Customer-defined priority				
Parts replacement	By Sun	By Sun	By Sun	By Customer
Field change orders				
Online & telephone technical support	24/7	24/7	8 am-8 pm M-F	8 am-5 pm M-F
Online & telephone support response	Next Available Engineer	Next Available Engineer	Next Available Engineer	4 hours
Remote diagnostic analysis				
Online Support Center access				
SunSolve™ Online				
Asset reporting & self-monitoring				
Solaris™ Operating Environment releases				
Bundled & embedded software				
Software patch access				
SunSpectrum InfoExpress™ bulletins				

SERVICE ENHANCEMENTS

	PLATINUM	GOLD	SILVER	BRONZE
24/7 online & telephone technical support	N/A	N/A	Option	Option
24/7 on-site service coverage	N/A	Option	Option	N/A
2 hr on-site service response	N/A	Option	Option	N/A
RAS Profile service	Option	Option	N/A	N/A
Additional customer support contacts	Option	Option	Option	Option
Additional media & documentation	Option	Option	Option	Option

Availability of specific service features, coverage hours and response times may vary by country or location. Response times are determined by Customer-defined Priority. The response times shown are for service requests designated by the customer as "Priority 1." For the Event Monitoring & Management Service, a one-time startup and installation fee for software agents and remote monitoring infrastructure applies in addition to ongoing telecommunications charges. Customers may be required to meet a minimum annual SunSpectrum™ support contract value to receive specific account-based services within SunSpectrum Platinum™ support and SunSpectrum Gold™ support. See SunSpectrum support Service Listings for specific program deliverables and conditions.

Warranty

The standard warranty for the Sun Fire E4900/E6900 server is one year and consists of:

- 7 x 24 x 365 hardware onsite support (including holidays)
- 7 x 24 x 365 telephone support (including holidays)
- 4-hour average hardware response time
- Customer-defined priority for telephone support
- Onsite parts replacement
- Replacement of defective media or missing documentation

SunSpectrum Instant Upgrades (SIU)

SunSpectrum Instant Upgrade is a simplified point-of-sale warranty upgrade program available to customers who want additional support for their computer hardware because they require services not offered by our standard warranty coverage or due to the mission critical nature of their IT environment. SIU allows customers to purchase SunSpectrum support at the point of hardware purchase. When customers purchase SIU at time of hardware sale, they increase their opportunity to optimize hardware availability and scalability by contracting for higher levels of support from day one of installation. There are three key features of the SIU program:

- Discountable list price
- Automated service quoting: when a hardware number is quoted, its service equivalent automatically appears on the quote
- Recommended levels of service are available based on type of hardware product

Enterprise Installation Service (EIS) for the Sun Fire E4900/E6900 Server

Sun's Enterprise Installation Services (EIS) is included with Sun Fire E4900/E6900 systems and includes comprehensive configuration and installation support to ensure that their system is optimized for stability and performance with the latest patches and updates.

The EIS services includes the following deliverables:

- Review of environment and installation needs
- Documentation of environmental status
- Planning of system setup requirements, resources
- Identification of risks
- Verification of pre-installation and configuration
- Performance testing
- Installation review
- System reference documentation

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Sun RAS System Analysis (RAS-SA)

Sun RAS (Reliability, Availability, Serviceability) System Analysis is designed to identify areas, based on best practices and industry standards, where the customers can improve the operational efficiency and increase the mission-critical reliability of their Sun systems.

The Sun RAS System Analysis process involves comprehensive system assessment which leverages both Sun's unique knowledge bank of product configuration data and the expertise of Sun's senior engineers. Sun experts drill deeply into the configuration issues, as well as the potential operational and environmental issues, that can affect the reliability, availability, and serviceability of the customer's Sun system. (Only available to customers with a SunSpectrum Gold or Platinum support contract.)

Online Support Center

The Online Support Center (OSC) provides web-based solutions anytime, anywhere. Providing high-quality availability services has always been a top priority at Sun. As a pioneer in web-based customer solutions, Sun continues to utilize the power and versatility of the Internet to offer customers a broad variety of online service offerings.

The online answer/transaction process can save customers valuable time by eliminating the time spent waiting on the phone for a customer service representative. The Online Support Center empowers the user by offering anywhere, anytime access to web-based support, training, and consulting solutions for Sun hardware and software products. The site serves as a portal for proactive service offerings, systems support features, and resource links.

Sun Remote Services Net Connect

Sun Remote Services Net Connect 3.x is a collection of services designed to help you better manage system assets, maximize system performance and facilitate services with Sun and Sun service partners. The base bundle of services included in SRS Net Connect include: system self-monitoring, event notification and alarms and comprehensive reporting. These base services are offered at no-cost and help to maximize system performance and prevent downtime issues as well as improve system management efficiencies.

Accredited Installation Provider Program (AIP)

Enables qualified iForce™ partners to leverage Sun certification, methodologies, tools, and support to market and deliver installation services on Sun systems that include bundled installation. Accredited Installation Provider Program enables qualified iForce partners to leverage Sun certification, methodologies, tools, and support to market and deliver installation services on Sun systems that include bundled installation. For more information on the above support offerings, please visit:

http://www.sun.com/service/support

Glossary

CPU/Memory board	The board containing up to four UltraSPARC III or IV processors, e-cache modules and four memory banks. Alternative: Uniboard
DIMM	Dual In-line Memory Module. A small card with DRAM chips on it, used as main memory on the CPU/memory board.
Domain	Short for dynamic system domain, which is a single instance of the Solaris OS running on a dynamically configurable subset of the hardware resources of a system.
Dynamic Reconfiguration	Ability to change the configuration of a running system by bringing components online or offline without disruption of system operation.
E-cache Module	External (level 2) processor cache memory module.
Sun Fireplane Interconnect Board	A board that acts as a point-to-point connection and connects multiple CPU/Memory boards and I/O assemblies.
FRU	Field-replaceable unit or replacement part.
Hot Plug	Allows for the removal of failed components and insertion of replacements without first powering down the system.
Hot-swap	Allows newly-inserted devices to be added to the running system without interruption.
I/O Assembly	A card cage that mounts into the chassis of all of the Sun Fire E4900 and E6900 servers. The assembly hosts eight PCI cards .
IP link	A communication facility or medium over which nodes can communicate at the link layer. The link layer is the layer immediately below IPv4/IPv6. IP Network Multipathing provides for links that comprise more than one physical wire between a host and a switch.
POST	Power-on self test.
RTS	Redundant transfer switch. A very fast switch with microprocessor control and decision-making programming that can switch between two incoming power sources to ensure the system is supplied with good power.
Segment	A logical separation of domains on a machine by pooling domains under control of different Sun Fireplane switch. On a Sun Fire E4900/E6900 server, such separation can be physical as well, because the power supplies can be segregated as well.
System Controller Board	A board containing a MicroSPARC processor, which oversees operation of the system and provides clocks and the console bus.

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Materials Abstract

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
• Sun Fire E4900/E6900 Just the Facts	All the information	Technical	SunWIN	401326
• Sun Fire E4900 Server Data Sheet	General information	Technical Sales Tool	SunWIN	401331
• Sun Fire E6900 Server Data Sheet	General information	Technical Sales Tool	SunWIN	401332
• Sun Fire E4900/E6900 Pocket Facts	Technical/Sales information cheat sheet	Technical	SunWIN	401337
• Sun Fire V490-E25K Servers Customer Presentation	General introduction to the server family	Sales Tool	SunWIN	450785
• Sun Fire E2900-E25K Server Brochure		Sales Tool	SunWIN	401343
• Sun Fire E2900-E25K Servers Technical Presentation	This is a midlevel presentation with technical details on the entire Sun Fire server family. This should be given after the customer has been given the general presentation.	Technical Sales Tool	SunWIN	401324
• Sun Hardware At-A-Glance		Sales Tool	SunWIN	401344
• Sun Fire E2900-E25K Family Poster		Sales Tool	SunWIN	401348
White Papers				
• Scaling Application Performance with Throughput Computing – Sun Fire E2900-E25K Servers and the UltraSPARC IV Processor White Paper	White paper	Sales Tool	SunWIN	401329
Competitive Information				
• Why Sun vs. Competitors Business Presentation			SunWIN	450766
• HP Beatsheet			SunWIN	450768
• Fujitsu Beatsheet			SunWIN	450770
• IBMBeatsheet			SunWIN	Coming Soon
• Why Sun vs IBM P5 One-Pager			SunWIN	443612
• Why Sun vs IBM P5 Presentation			SunWIN	443606
• Why Sun vs IBM P5 Overview (Customer w/ CDA)			SunWIN	452365
Demos				

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
• Sun Fire E2900-E25K Servers iTour	Virtual reality tour of the Sun Fire systems	Technical Sales Tool	SunWIN	401347
External Web Sites				
• Sun Documentation • Sun Fire E4900 • Sun Fire E6900	http://docs.sun.com http://www.sun.com/servers/midrange/sunfire_e4900 http://www.sun.com/servers/midrange/sunfire_e6900			
Internal Web Sites	http://systems.corp/			
• Worldwide Configuration and Ordering Guide	http://mysales.central/public/configGuide/			
• Upgrade Information	http://ibb.eng/upgrades			

Change Log

2 February 2004: Changed E4900 AMP requirements on page 46 to 20 amp (system max) from "per cord", which was incorrect.

2 February 2004: Changed input power requirements for E4900/E6900 on page 7 to match correct figures on page 46.

18 October 2004: Updated I/O assembly and configuration information to reflect latest PCI+ I/O assembly on pages 7, 37, 38, 62, 63, and 68.

5 January 2005: Updated to include 1.35-GHz CPU information, various corrections and updates.

13 September 2005: Updated to include UltraSPARC IV+ 1.5GHz information, various corrections and updates.

15 August 2006: Updated to include UltraSPARC IV+ 1.8GHz information, PCI-X, 2GB DIMMs, RoHS-5 compliant marketing p/ns, various corrections and updates.

2 April 2007: Updated to include UltraSPARC IV+ 1.95GHz information.