Sun Fire™ T2000 Server

Just the Facts

SunWIN token #456965

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Version 2.1

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Revision History

Template Version	Comments	Date	Author
1.0	Original Release	Dec 2005	Sara Muckstadt
1.2	T2000+ additions Removal of Full Protection Plans Addition of Sun System Packs Derating of altitude/temperature parameters	April 2006	Sara Muckstadt
1.3	Added to the Xoptions section: (1) RoHS compliant Hard Disk Drives (2) Power cords for 220V (3) X1236A-Z support (4) Monitor/keboard support with graphics card (5) Added RoHS version of PCI-cards for IB and Metor. Also added in Pyramid-E cards	June 2006	Sara Muckstadt
1.4	Added StorageTek 6140 and 6540 Added 4GB DIMMs	November 2006	Sara Muckstadt
1.5	T2000++ Enhancements for January 9, 2007. This includes new standard configuration offerings for 1.4GHz, 64GB memory, new Integrated Services implementation via ALW scheme and an upgraded SW pre-install stack.	January 2007	Sara Muckstadt
1.6	Added support for 146GB 2.5" SAS disk drive Xoption Added X1027A-Z and X4447A-Z Make tweaks to the following Options, starting on page 49: SG-(X)PCIE2SCSIL320Z should be U320Z, added X5544A-4, SGXPCI1SCSI-LM320-Z should be SGXpCI1SCSILM320-Z, X1235A has gone EOL, SG-(X)PCI1SCSI-LM320 has gone EOL Changed Physical Dimensions: Width and Depth	March 2007	Sara Muckstadt
1.7	Added support for PCI-E and PCI-X 8port SAS I/O HBA cards Deleted 512MB configs and memory option Added new 1GB configs Changed number of maximum supported chips of PCI-E networking interface adapter (X447A-Z) from 2 to 3.	November 2007	Sara Muckstadt Byron Magrane
1.8	Reviewed JTF and discovered that minor corrections needed to be made. Added new power cords.	January 2008	Byron Magrane
1.9	Add XVR-300 (X3000A) graphics support	July 2008	Sara Muckstadt
2.0	Updated PTO configurations in the Ordering Information sedtion Removed Sun System Packs	January 2009	Sara Muckstadt
2.1	Removed JES references	March 2009	Sara Muckstadt

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Positioning

Figure 1. Sun Fire™ T2000 server

Introduction

As organizations move from the information age into the “participation” age of network computing, they must deliver new services to larger user bases to remain competitive—grow revenue and profitability while reducing operational costs. Delivering new services and supporting larger numbers of users requires purchasing and deploying more IT infrastructure to increase throughput and performance. This need for IT growth presents major challenges to corporations. Research indicates that over 80 percent of datacenters are constrained by power, cooling, and space. Competitive Intel and RISC-based servers magnify the problem with increasing power and cooling requirements in addition to the increased administrative costs and added complexity

Servers based on Sun’s Chip Multithreaded (CMT) processors address these challenges by delivering breakthrough levels of computing throughput and price performance at very low power, heat, and space levels. These processors allow organizations to scale the infrastructure to support new users and services, while reigning back demands on power, space, and cooling, thereby helping to reduce operational costs and improve reliability.

The Sun Fire™ T2000 server is Sun’s first server to incorporate the UltraSPARC® T1 processor. This processor delivers up to 32 simultaneous execution threads and 64 GB of memory in a rack-optimized 2RU enclosure and draws less than 400W of power.

These features make the Sun Fire T2000 server the best platform for the delivery of transaction, web and database services on the planet, when measured by the new SWaP (Space, Watts, and Performance) metric.

The Sun Fire T2000 server also offers five PCI slots (three PCI-E and two PCI- X[1]), four integrated Gigabit Ethernet interfaces, and up to four SAS disks to support high levels of connectivity and expandability.

The Solaris™ 10 Operating System installed on this server provides a highly efficient and secure application environment. These capabilities, along with UltraSPARC processor-based binary compatibility, provide customers with unmatched agility, efficiency, and reduced risk.

The Sun Fire T2000 server is optimized to be a web server, Java™ 2 Enterprise Edition (J2EE™) application server, an enterprise application server (such as ERP, CRM, and SCM) and distributed databases. It is also a great platform for consolidated tier 1 workloads. Its efficient footprint, high performance, and low power needs result in significant cost savings to an organization:

- Purchase fewer servers to do the same job.
- Take up less floor space for the same performance.

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1 On older models, one PCI-X slot is occupied with a disk controller card

- Reduce power consumption.
- Reduce air conditioning needs.

The Sun Fire T2000 server also provides the kind of reliability and serviceability features that global Internet businesses demand, such as Sun's integrated advanced lights out manager (ALOM), hot-pluggable disk drives, support for Hardware RAID (mirroring and striping), redundant, hot-swappable power supplies, and advanced processor RAS features. all underpinned by the low component count of the UltraSPARC T1 architecture. This adds up to a platform that delivers levels of RAS exceeding competitive platforms.

The Sun Fire T2000 server gives customers the flexibility to scale their processing needs without wasting precious space, making it an ideal server for service providers, including ISPs and ASPs, the financial services sector, telco and government datacenters, or anyone that requires a maximized performance and performance per watt for each square foot of floor space. In addition, many target customers choose to scale horizontally, requiring the flexibility of attaching external storage via PCI expansion, and demand that our products help minimize single points of failure by supplying enhanced server management software and tools. The Sun Fire T2000 server is intended for web, application, and database tier workloads where throughput, power, space and cost are primary purchasing drivers.

Key Messages

- The Sun Fire T2000 is the first eco-responsible platform designed and engineered to address the challenges of today's datacenter. Newer models of this server comply with the Restriction of Hazardous Substances (RoHS) directive 2002/95/EC.H.
- The Sun Fire T2000 server is the only breakthrough design delivering the highest performance with the lowest energy consumption and the greatest space efficiency.
- This makes the Sun Fire T2000 the best platform for the delivery of transaction and web services on the planet, when measured by the new SWaP (Space, Watts, and Performance) metric.

The unique benefits of the Sun Fire T2000 server are delivered through the following capabilities:

- The Chip Multithreaded (CMT) design provides 32 threads per each Sun Fire T2000 server, which greatly increases performance with less power in a smaller footprint compared to previous products.
- Optimized for network workloads, UltraSPARC T1 processor-based servers deliver up to three times the performance of competitive systems, five times the performance per watt, and nine times better SWaP, enabling customers to handle growing user, data, and transaction loads.
- New high-end RAS features are designed into the processor, including memory Chipkill support, memory address parity protection, soft error rates, and redundancy (through core sparing and eFUSE).
- The Sun Fire T2000 server is able to handle compute- and data-intensive applications with multithreaded capabilities and large amounts (64 GB) of memory.

UltraSPARC T1 processor—CoolThreads™technology lowers power costs.

Sun Fire T2000 server's "CoolThreads™ technology" requires significantly less power than competitive processors making them substantially less expensive to Operate and packing more capacity into existing datacenter facilities.

- UltraSPARC T1 processor is the clear performance per watt leader allowing these systems to run cooler and more efficiently while delivering high output.

- UltraSPARC T1 processor uses as little as 70 watts per processor—the wattage needed to power a light bulb—compared with competitive processors that require about the same amount of power ***per thread***.
- Power cost reductions from UltraSPARC T1 processor-based systems can save enterprises millions of dollars annually.

More performance, less space.

The Sun Fire T2000 server provides higher compute density yielding greater performance in less space, easing the space limitations that many datacenters are currently experiencing.

- According to Sun's analysis, companies using UltraSPARC T1 processor-based systems can experience up to a 7:1 reduction in the number of servers.
- The Sun Fire T2000 server provides up to 32 compute threads in a single processor as compared to one thread per each x86 processor (or two with hyper-threading), packing high throughput into a small footprint.
  - The Sun Fire T2000 server delivers up to five times more performance per rack compared to competitive servers
  - An UltraSPARC T1 multicore processor with eight active cores uses only 68 percent of the power of a Xeon dual processor with nearly seven times the processing power. The cost savings over the lifetime of a large compute farm installation is millions of dollars.

Greater application efficiency and security.

The Sun Fire T2000 servers come with the Solaris 10 Operating System, which provides an efficient and secure application environment, while further increasing performance and utilization.

- The Solaris 10 OS multithreaded design takes full advantage of the Sun Fire T2000 server's CMT architecture, boosting throughput and efficiency.
- Solaris Containers run multiple applications providing up to five times the industry-standard utilization.
- The Solaris 10 OS protects against both malicious external attacks and data access violations from the inside. The Process Rights Management component provides fine-grained control over the rights given to users and processes.
- UltraSPARC T1 processor-based systems provide full binary compatibility, which make it easy for customers to run and move their applications across UltraSPARC/Solaris 10 OS-based servers.

Key Product Features, Functions, and Benefits

Feature	Function	Benefit
• UltraSPARC T1 processor equipped with up to 8 four-way multithreaded cores	• Support for 32 simultaneous threads, with eight threads executed per clock cycle	• Radically higher throughput for multiple, single thread applications or multithreaded applications
• Cores connected through a 134 GB/sec. crossbar switch	• Very fast communication between cores	• Higher performance through low latency

Feature	Function	Benefit
• High-bandwidth four-way shared 3-MB Level-2 cache	• Optimum sized cache for multithreaded processors	• Reduces processor cost and complexity, ensuring a balance is achieved between high throughput and low cost/complexity
• Four on-chip DDR2 channels delivering 25.6 GB/sec. processor to memory bandwidth	• Direct access from processor to memory, with minimum contention for memory	• High throughput with low memory latency and low power
• Typical processor power consumption of 72 watts, delivering 32 simultaneous threads	• Keeps the performance to power ratio very low while reducing heat dissipation	• Helps reduce cost, improve reliability, and ensure customers can grow within current data center power and thermal limitations
• SPARC® v9 implementation	• Standard SPARC processor implementation, delivering binary compatibility with previous generation of Sun systems and Solaris software	• Customers investments in existing software assets and skills are preserved
• Up to 64GB memory	• Support for larger workloads	• Enhanced performance and throughput, growth and investment protection. Customers have the ability to deploy and host larger workloads supporting more users and more transactions and improving on response times.
• ECC and parity protection on caches, TLBs, and register files	• Maintenance of data integrity across on-chip memories	• Mainframe class processor RAS with features unique to volume processors, enhancing system uptime
• Hardware RAID support provided by the onboard disk controller	• Supports either two-disk RAID 1 (Integrated Mirror) volumes, or two-, three-, or four-disk RAID 0 (Integrated Stripe) volumes	• Provides data redundancy and increased performance at no additional cost.
• Chipkill and DRAM sparing	• Chipkill is used to detect failing DRAM; DRAM channel is then mapped away from failing DRAM through sparing	• Extreme levels of main memory reliability and availability, enhancing system uptime by allowing the system to keep running in the event of a memory DRAM failure
• Space efficient, rack-optimized 2RU design	• Offers high compute density, providing maximum value per rack unit	• Up to 32 threads in a dense, rack-optimized enclosure enables customers to maximize throughput power in their data center

Feature	Function	Benefit
• Two hot-swappable, redundant, high efficiency 450W power supplies	• Replacing earlier models with 550W supplies, these new power supplies reduce nominal power consumption by over !5% - from 325W to 275W.	• Lower operating costs, higher compute capacity and improved performance per watt.
• Four onboard 10/100/1000-Mbps Ethernet ports	• Exceptional I/O performance and increased network reliability by providing redundancy	• Increases network efficiency, flexibility, and availability
• Integrated controllers for SAS disks, three PCI-E, two PCI-X, four USB, and one serial port	• Integration and connectivity	• Cost-effective means to provide network and storage connectivity. Allows for fast deployment into an IT environment
• Restriction of Hazardous Substances (RoHS) compliance	• RoHS Directive 2002/95/EC will be enforced in the European Community beginning July 1, 2006. It restricts theuse of certain haazardous substances in electrical and electronic equipment. Sun Fire T2000 server will be RoHS-5 compliant, taking the leaded solder exemption.	• Delivers on Sun's strategy to meet both legislative and customer needs in the development of products that minimize ecological and environmental impacts. Ensures the continued supply of products that continue to meet customer requirements by adding breakthrough levels of performance and capacity, while reducing space, power and heat overheads.
• Solaris 10 11/06 Operating System pre-installed	• With features such as Solaris Containers, predictive self-healing, Solaris Dynamic Tracing and support for the latest UltraSPARC platforms, Solaris 10 OS sets entirely new standards for performance, efficiency, availability and security	• Innovations in the Solaris 10 OS save customers significant and measurable time and money when deploying, operating, and managing their IT infrastructure
• Legacy application support and Solaris Binary Compatibility Guarantee	• Software applications written to the Solaris ABI can run on new UltraSPARC T1 CPU-based systems with no modification required.	• No need to migrate OS or to port applications to take advantage of new hardware features, providing unrivaled investment protection
• Rack-optimized system with support for most industry standard four-post racks	• Installation and serviceability	• Ease integration and deployment into production environments while enabling customers to preserve their investments in existing datacenter environments
• Sun Customer Ready	• For factory-configured, pre-	• Simplification and speed of system

Feature	Function	Benefit
Systems (CRS) program	racked, custom Sun Fire T2000 servers, refer to the CRS program website: `http://www.sun.com/crs`	deployment
• SunSpectrum℠ Instant Upgrades available for the Sun Fire T2000 servers	• Provides essential services, support, system administration resources and Solaris OS updates in one package.	• Lower cost, higher productivity and improved system uptime; peace of mind that all service needs will be handled painlessly. One stop shop for all customer needs

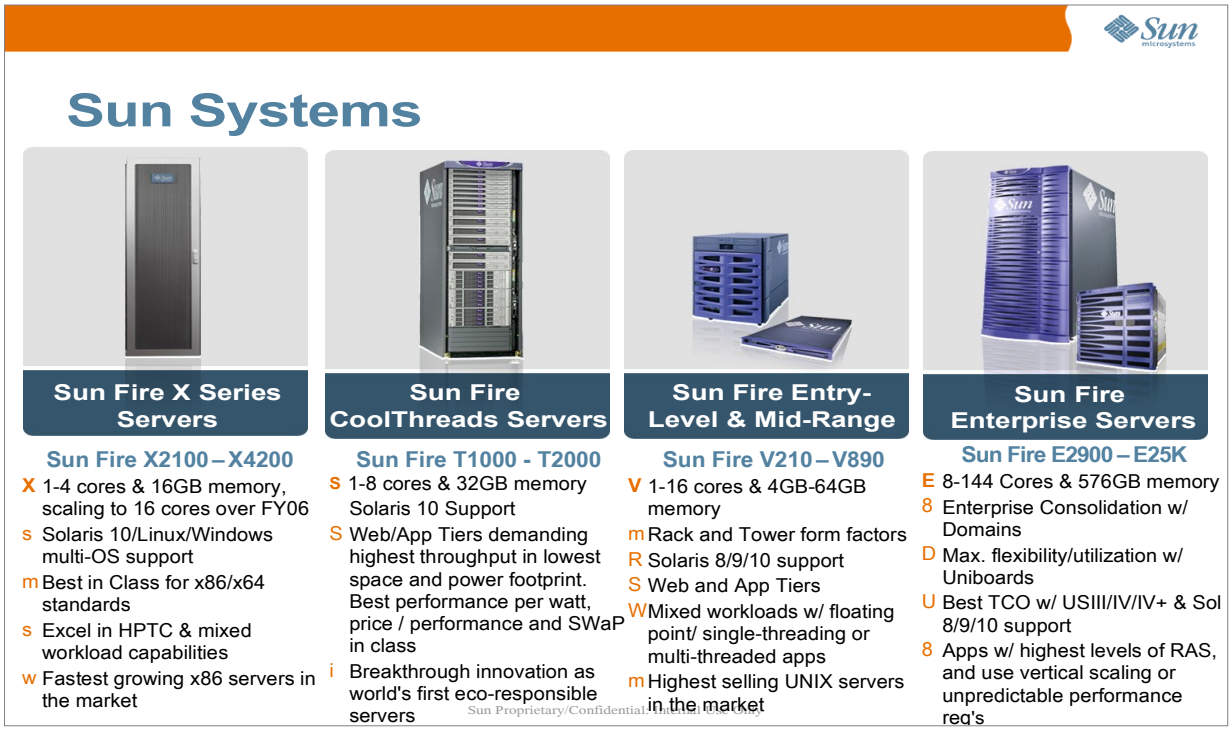
Product Family Placement

This product is a new entry in the SPARC processor-based,server marketplace.

- The Sun Fire T2000 server is Sun's first server to incorporate the UltraSPARC T1 processor.
- The UltraSPARC T1 processors represent Sun's first generation of CMT products, and are designed to be complimentary to Sun's existing line of UltraSPARC IIIi, UltraSPARC IV, and Opteron processor-based servers.

Overall platform positioning can be summarized as follows:

- **Sun Fire CoolThreads servers** for mission-critical, web, application, and database tier workloads, including Java and other thread-rich environments
- **Sun Fire x64 servers** for FP performance and compute-intensive workloads and for environments that are already standardized on x64 or Linux/Windows-based applications
- **Sun Fire V210 to V440 server** for massive infrastructure build out with the world's best selling UNIX® platforms
- **Sun Fire V490 to E25K servers** for workload consolidation and highly scalable, mission-critical workloads



Feature Comparison of UltraSPARC T1-based Servers

Feature	Sun Fire T2000 Server	Sun Fire T1000 Server
CPUs	4 to 8 cores, 1.0 & 1.2-GHz UltraSPARC T1 processors	6 or 8 cores, 1.0-GHz UltraSPARC T1 processors
Threads	32 max.	32 max.
Max. memory	64 GB	32 GB
Max. internal disk drives	Four 73-GB or 146-GBSFF SAS disks with support for HW RAID (0+1)	One 250-GB SATA disks or 2 x 73GB SAS disks
I/O	Slimline DVD/CD-RW Four USB 1.1 ports	N/A
PCI	Three PCI-E slots, low profile *Two PCI-X slots, low profile *(On older models, one PCI-X slot is occupied with a disk controller.)*	One PCI-E slot, low profile
Ethernet	Four on-board Gigabit ports	Four on-board Gigabit ports
Power supplies	Two 450W hot-swap (N+1) (redundant)	One 300W
Nominal Power	275W *(Earlier models containing 550W power supplies have a typical operating power of 325W)*	180W
Fans	Redundant cooling fans	Single fan tray assembly
Target use	OLTP, CRM, ERP, database,	Web server, portal server, network

Feature	Sun Fire T2000 Server	Sun Fire T1000 Server
	collaboration, and J2EE custom applications	server, security server, and J2EE custom applications
Form factor	2 RU	1 RU
Solaris OS version	Solaris 10 11/06 or later	Solaris 10 11/06 or later

Select the Sun Fire T2000 server when:	Select the Sun Fire T1000 server when:

• Customer demands best levels of throughput and expandability
  ◦ More memory, I/O, and internal disk
  ◦ Higher frequency processor
• Customer demands high levels of system RAS to deliver high uptime
  ◦ Redundant power, cooling, and disks
• Typical workloads
  ◦ Demanding mid-tier app server deployments or web tier consolidation projects requiring maximum uptime with future growth and integration into diverse environments
  ◦ Databases
	• Customer needs very high throughput but has significant power, cooling, and space constraints
	  ◦ 32 thread UltraSPARC T1 processor in 1RU, low power package
	• Customer demands very high levels of price/performance with lowest acquisition price
	  ◦ Lower redundancy and expandability
	• Typical workloads
	  ◦ Compute node within massively horizontally scaled environment, typically access/presentation tier of low-end app layer of web services environment

Feature Comparison with Other UltraSPARC CPU-based Servers

Feature	Sun Fire T2000	Sun Fire V210	Sun Fire V240	Sun Fire V440	Sun Fire V490
CPUs	**4 to 8 core 1.0/1.2 GHz UltraSPARC T1 CPUs**	Up to two 1.34-GHz UltraSPARC IIIi CPUs	Up to two 1.34/1.5-GHz UltraSPARC IIIi CPUs	Up to four 1.28/1.59-GHz UltraSPARC III CPUs	Two/four UltraSPARC IV CPUs (with CMT)
Threads	**32 max.**	1 per CPU (2 max.)		1 per CPU (4 max.)	2 per CPU (8 max.)
Max. memory	**64 GB**	8 GB		32 GB	
Max. internal disk drives	**Up to four 73 GB or 146GB SFF SAS**	Two 73/146 GB Ultra160SCSI	Four 73/146 GB Ultra160SCSI	Four 146 GB Ultra320SCSI	Two 73 GB FC-AL
Removable media	**Slimline DVD-R/CD-RW**	Slimline ATAPI DVD-ROM (opt)		Slimline ATAPI DVD-ROM	Slimline ATAPI DVD-ROM
Interfaces	**Four USB 1.1 ports**	Two USB 1.0, one SCSI port		Four USB, one SCSI, one RJ 45	Two USB 1.0
PCI slots	**Three PCI-E slots, two PCI-X slots** *(on earlier models, one PCI-X slot is occupied with a disk controller card)*	One 33/66 MHz full-length PCI 2.2 slots	Three PCI 2.2 slots	Six PCI 2.2 full-length slots	Six PCI slots

Feature	Sun Fire T2000	Sun Fire V210	Sun Fire V240	Sun Fire V440	Sun Fire V490
Ethernet	**Four on-board Gigabit ports**	Four Gigabit ports		Two Gigabit ports, plus one 10BASE-T	Two Gigabit ports
Target workloads	**Web, application, and database tier dominated by performance, power, and space considerations**	Infrastructure build out and mixed UNIX workloads on part of the world's best selling family of UNIX/RISC servers			Workload consolidation and scalable enterprise apps; best investment protection through mixed-speed CPU support
Form factor	**2 RU**	1 RU	2 RU	4RU	5 RU
Solaris OS version	**Solaris 10 11/06 or later**	Solaris 8 or later			

Feature Comparison with Sun's x64 Opteron-based Servers

Feature	Sun Fire T2000	Sun Fire V20z	Sun Fire X2100	Sun Fire X4100	Sun Fire X4200
CPUs	**4 to 8 core 1.0/1.2 GHz UltraSPARC T1 CPU**	Up to two single-core or dual-core 2.0/2.6-GHz AMD Opteron 200-series processors	Single-core or dual-core AMD Opteron 100-series processor	Up to two single-core or dual-core 2.0/2.8-GHz AMD Opteron 200-series processors	
Threads	**32 max.**	4 max.	2 max.	4 max.	
Max. memory	**64 GB**	16 GB	4 GB	16 GB	
Max. internal disk drives	**Up to four 73-GB or 146-GB SFF SAS HDDs**	Up to two Ultra320 SCSI HDDs	Up to two 3.5 inch SATA HDDs		Up to four 3.5 inch SATA HDDs
Removable media	**Slimline DVD-R/ CD-RW**	One CD-ROM/ floppy (std) Slimline DVD (opt)	One EIDE DVD-ROM drive		
PCI	**Three PCI-E slots, two PCI-X slots** *(on earlier models, one PCI-X slot is occupied with a disk controller card).*	Two 64-bit PCI-X slots	One PCI-E slot for low-profile cards	Two PCI-E slots for low-profile cards	Five internal MD2w 64-bit PCI-X slots
Ethernet	**Four on-board Gigabit ports**	Two integrated Gigabit ports		Four integrated Gigabit ports	
Reliability features	**Low component count, hot-swappable power supplies and fans, hot-pluggable hard disk drives,**	Dual redundant fans	Hot-swappable drives	Hot-swappable drives, on-board RAID 0, 1	ALOM, redundant, hot-swappable drives and power supplies

Feature	Sun Fire T2000	Sun Fire V20z	Sun Fire X2100	Sun Fire X4100	Sun Fire X4200
	environmental monitoring, ASR				
Target workloads	**Web, application and datasbase tier dominated by performance, power, and space considerations**	FP and compute-intensive workloads and for environments that are already standardized on x64 or Linux/Windows based applications			
Form factor	**2 RU**	1 RU			2 RU
Solaris OS version	**Solaris 10 11/06 or later**	Solaris 10, Red Hat Linux, SuSE Linux, Microsoft Windows Server 2003			

Selection Criteria

- **Sun Fire T2000 servers excel in these areas:**
  - Customers demanding the lowest cost, highest transaction throughput for Web and Application tier workloads by delivering the best Java, web, and app performance of any class of server with a radical breakthrough in performance, married to eco-responsibility
  - Customer are constrained by data center power, space or cooling. Processor-to-processor, the Sun Fire T2000 server delivers three to six times the performance at approximately half the power and space of Xeon based platforms, and can extend the useful life of data center facilities
  - Customer architecting distributed applications and searching for the optimal balance of performance, watts and space efficiency. The Sun Fire T2000 server delivers the best SWaP on the planet!
- **Sun Fire T2000 servers are optimized for:**
  - Web and application tier workloads, especially Java environments
  - Database environments
  - New web services deployments and SOA infrastructure implementations
  - Existing Sun/Solaris OS customers looking for breakthrough performance increases while maintaining the consistency offered through the Solaris OS/SPARC architecture
  - IBM, Dell, and HP x86/RISC customers dealing with the power and space issues of inefficient server sprawl, making it a great web tier consolidation platform
- **Sun Fire x64 servers excel in these areas:**
  - Customers running high performance technical computing workloads. The Sun Fire x64 Servers are capable of running floating point and compute intensive applications up to 1.5 times faster than Xeon-based servers
  - Customers requiring application flexibility and protection of asset investments, delivered through full Solaris binary compatibility, with support of Linux or Windows based applications and VMware virtualization
  - Customers have committed to x64 platforms or Linux/Windows as their standard, then Sun Fire x64 Servers are the fastest, most reliable x64 servers in the market and require only half the power of Xeon servers, making then the most energy efficient x64 based server

- **Sun Fire x64 servers are optimized for:**
  - HPTC/Compute environments demanding cost-effective, high performance floating point performance
  - Web services and application server deployments, especially where x64 is the standard or O/S choice is required
  - Customers standardizing on one platform infrastructure for mixed workloads, including single thread, multi-thread and FP applications.
  - Excellent platform choice for distributed database instances, typical in cluster environments
  - Existing Sun/Solaris OS/SPARC customers looking to standardize on x64 platforms
  - IBM and Dell Xeon/Itanium customers looking for a lower cost, lower power alternative
  - Xeon customers looking to consolidate their infrastructure

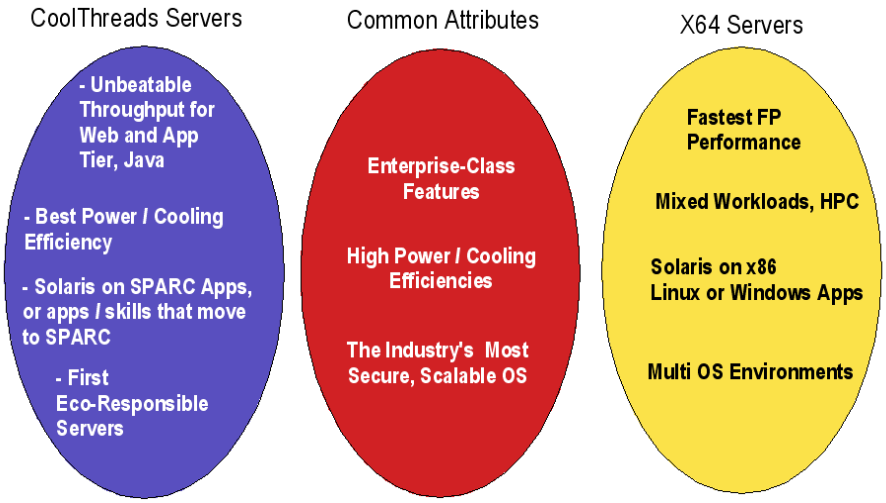


Figure 2. Server selection criteria

Positioning Comparison with Other UltraSPARC Servers

Feature	UltraSPARC T1 CPU-based Servers	UltraSPARC IIIi CPU-based Servers	UltraSPARC IV+ CPU-based Servers
Selection criteria	Optimum performance, power, and space balance	Optimum price, feature, flexibility balance	Highest levels of scalability
Target use	Multithreaded application specialist	Mixed workload performance	Highest overall performance on widest variety of applications
RAS	Superior RAS	Good RAS	Highest-level RAS; best application separation
Flexibility	Supports PCI-E and PCI-X cards	Support for legacy accessories and devices	Broadest support for legacy and new devices

Availability

The Sun Fire T2000 server reached General Availability on December 12, 2005. Enhancements to this award winning server are included in an April 28, 2006 General Availability of new standard configurations. Enhancements include RoHS compliance, 2nd PCI-X slot availability, more efficient power supplies, Solaris 10 11/06 pre-install, and new Category F pricing, just to name a few.

On January 9, 2007, additional enhancements were made to the Sun Fire T2000 server. New features included 1.4GHz configurations, more 1.2GHz configurations, 64GB memory, and the latest Solaris 10 11/06 preinstall.

Throughout 2007 and 2008, select Sun Fire T2000 server standard configurations have transitioned off of all price lists. The latest is the 8core 1.4GHz 64GB configuration, which announced EOL on January 13, 2009.

Target Users

There is a large variety of target users for the Sun Fire T2000 server. Look for users that run applications that require Java code, highly threaded integer applications (less than 2 percent floating point operations), application workloads, and mid-sized databases with moderate I/O requirements.

- The Sun Fire T2000 server delivers breakthrough performance with the greatest power and space efficiency for web and application workloads.
- The Sun Fire T2000 server is able to handle integer-based compute- and data-intensive applications with multithreaded capabilities and large amounts (64 GB) of memory.
- Typical applications include:
  - Web Serving
  - Streaming Media
  - Security Applications
  - Java Application Servers & Virtual Machines
  - OLTP Databases
  - ERP, CRM, SCM
  - Network Infrastructure
  - SOA and Business Integration platforms
  - Consolidated web and application tier infrastructure
- Target users include:
  - Those running large datacenters where throughput, power, cooling and space are key issues
  - Multiple single-threaded integer-based applications consolidated using processor sets or Solaris Containers
  - Small databases or nodes within a database cluster

Target Markets

The Sun Fire T2000 server is targeted for web and application server workloads. Typical organizations include financial services, ASPs, ISPs, telcos, and government agencies. Just about any organization that matches the appropriate IDC categories listed below is a target.

Number of Processing Cores	Appropriate Markets/Applications
4 Cores	• Proxy caching • Email service • Batch processing • Streaming media • Web serving
8 Cores	• Java application servers and Java Virtual Machines • ERP, CRM, OLTP • Data warehouses and marts • Data analysis and mining • Application development • Networking • Security • Systems management

Selling Highlights

Market Value Proposition

The Sun Fire™ T2000 server delivers breakthrough throughput with dramatic space and power efficiency to meet the increasing demands of the networked enterprise infrastructure using Sun's Chip Multithreaded (CMT) processor architecture. The Sun Fire T2000 server's high compute density and low power consumption address datacenter space, power, and cooling constraints. And with the Solaris™ 10 Operating System, this server provides a highly efficient and secure application environment. These capabilities, along with UltraSPARC® processor-based server binary compatibility, provide customers with unmatched agility, efficiency, and reduced risk.

- The Sun Fire T2000 server delivers the leading performance with the greatest power and space efficiency.
- The Sun Fire T2000 server is the best platform on the planet for the delivery of transaction and web services as measured by the SWaP metric.

The SWaP Metric

The Sun Fire T2000 delivers leading performance across a range of web and application tier benchmarks. Traditional system to system performance benchmarks are valuable to many customers as a way of comparing one system to another, but are limited when it comes to understanding the power and density attributes of the systems being compared. With data center space and power becoming such key issues for many customers, delivering the required level of throughput in a fixed space and power envelope is critical.

For this reason, Sun has developed the SWaP (Space, Watts, and Performance) metric, which is designed to provide a simple and transparent measure of overall server efficiency. SWaP is calculated using the following formula:

SWaP = Performance / (Space * Power Consumption)

- **Performance** is measured by industry-standard, audited benchmarks (such as SPECjappServer2004 and SPECweb2005).
- **Space** refers to the height of the server, measured in rack units (RUs).
- **Power** is measured by watts used by the system. This is either measured during actual benchmark runs or is taken from vendors site planning guides.

An example of SWaP, based on an comparing the Sun Fire T2000 server to a four-processor Xeon-based server running an application tier benchmark is shown in the table below.

Feature	Sun Fire T2000 Server	Four Processor Xeon Server	Sun Fire T2000 Advantage
Space (RU)	2	3	**33%**
Watts	300	975	**69%**
Performance (application tier benchmark)	5300	5120	**4%**
Performance/watt	17.667	5.251	**3.4 times**

Feature	Sun Fire T2000 Server	Four Processor Xeon Server	Sun Fire T2000 Advantage
SWaP	8.8	1.8	**4.8 times**

In this example, the Sun Fire T2000 server outperforms the quad processor Xeon-based server by 4 percent on an application tier benchmark, but requires only 31 percent of the power. This equates to a performance per watt advantage of 3.4 times the Xeon-based server.

When comparing fully populated racks, the Sun Fire T2000 server delivers nearly 60 percent more throughput at 53 percent less power.

When computing SWaP, the Sun Fire T2000 server demonstrates an efficiency rating of five times the quad processor Xeon server, resulting in a significantly lower TCO and less datacenter complexity.

For the latest SWaP comparisons, refer to the Sun Fire T2000 server sales presentation.

Selling Strategies

The Sun Fire T2000 server delivers breakthrough throughput with dramatic space and power efficiency and, with the Solaris 10 OS, provides a highly efficient and secure application environment.

This powerful value proposition enables the Sun Fire T2000 server to drive an effective Retain-Develop-Acquire selling strategy.

Retain

The first stage of selling strategies is to propose the Sun Fire T2000 server into installed base accounts to counter competitive threats and in new design win opportunities. The installed base of Sun UltraSPARC I to UltraSPARC III platforms provides a huge opportunity to migrate your customer base to the latest SPARC®/Solaris 10 platform.

Use the sales collateral and success stories developed to support the Sun Fire T2000 server, coupled with local iForce™ Centers and loaner schemes to seed the account and prove the benefits of CMT.

Develop

As your installed base accounts qualify the Sun Fire T2000 server and measure the benefits delivered by CMT technology, propose the platform as a consolidated solution to address the web and application tier sprawl created by Xeon-based servers running Windows and Linux.

Use the consolidation tools and migration guides created as part of the Consolidation Growth Target program.

Acquire

As the benefits of CMT are proven through the sales collateral discussed above and actual account wins, propose the Sun Fire T2000 server into current non-Sun accounts running competitive UNIX® or Linux solutions.

Applications

Web and application tier workloads make **excellent candidates** for the Sun Fire T2000 server. These are characterized by:

- High-throughput applications
- Multithreaded applications with a few highly threaded processes
- Multiprocess applications that are often single threaded and communicate through shared memory
- Single-threaded applications that can be consolidated using Solaris OS processor sets or Solaris Containers

Poor candidates for the Sun Fire T2000 server include:

- Single-threaded, long-running batch applications, for which the primary performance metric is elapsed time.
- HPC floating-point intensive applications
- Applications with a high-number of VIS™ instructions

Compatibility

Because the Sun Fire T2000 server runs the Solaris 10 Operating System, it runs the same applications as all other Solaris OS-based UltraSPARC servers that have been qualified for the Solaris 10 OS.

Enabling Technology

The New and Innovative UltraSPARC® T1 CMT Processor

The UltraSPARC® T1 multi-core, multi-thread processor is the first chip that fully implements Sun's Throughput Computing Initiative. Each of the eight on-board processor cores can fully support four threads, resulting in 32 threads total. Each core has an instruction cache and a data cache as well as fully associated instruction and data TLBs. The eight cores are connected through a crossbar to an on-chip unified Level 2 cache.

Some of the other important features of this chip are:

- SPARC® V9 implementation
- All cores connected through a 134 GB/sec. crossbar switch
- JBus interface with 3.1 GB/sec. peak effective bandwidth
- Four DDR2 channels (25.6 GB/sec. total) for faster access to memory
- Extensive built-in RAS features including ECC protection of register files, Chipkill, memory sparing soft error rates and rate detection, and extensive parity/retry protection of caches

It is the UltraSPARC T1 chip that makes the Sun Fire™ T2000 server an exceptional server. This chip provides large amount of compute performance and protection in a small footprint with a greatly reduced need for power.

System Architecture

Overview

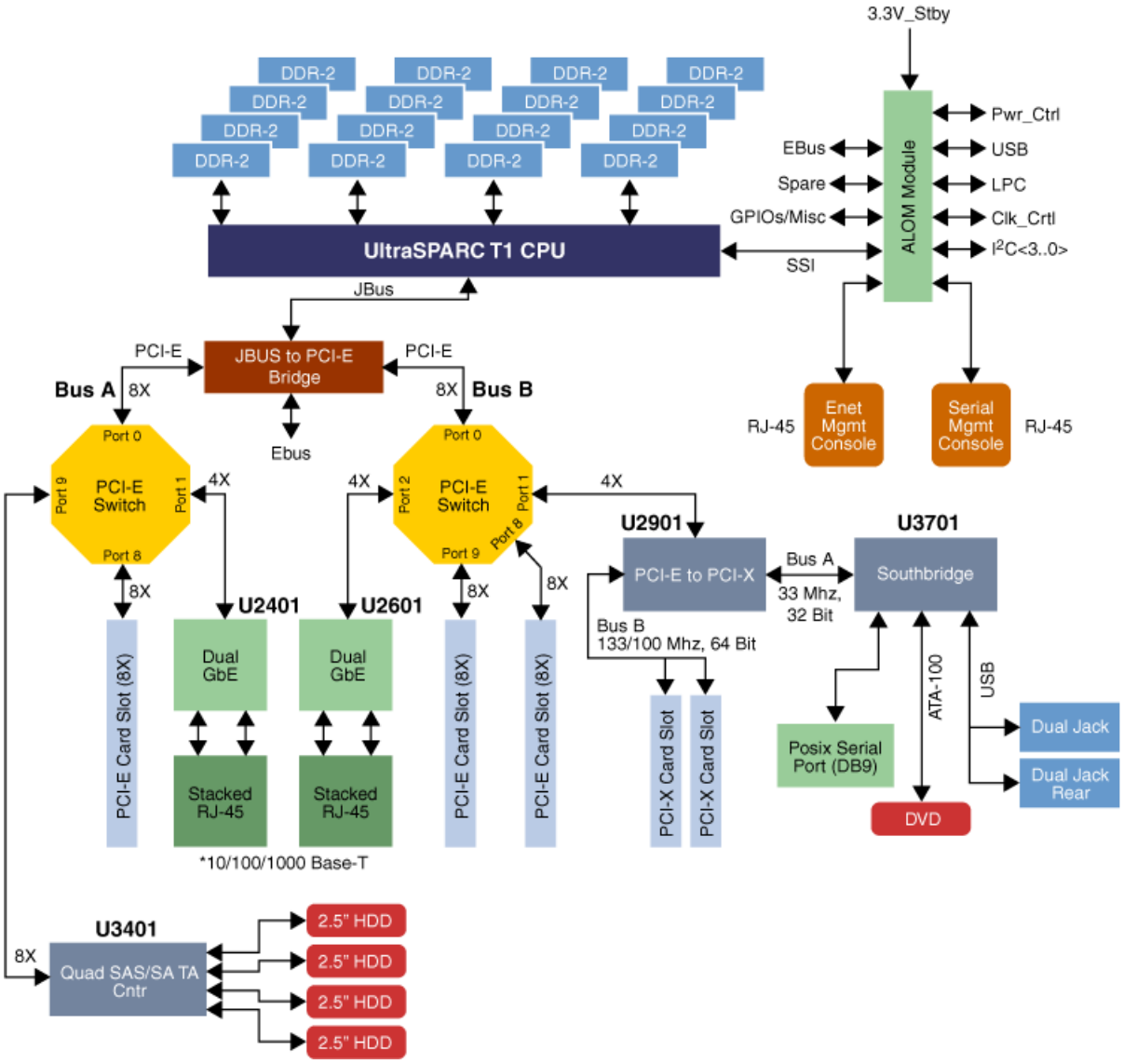


Figure 3. Sun Fire™ T2000 server block diagram

The Sun Fire™ T2000 server comes with the following major components:

- The UltraSPARC® T1 multicore processor with four, six, or eight cores
- Up to 64 GB of DDR2 SDRAM memory in 16 available memory slots
- Four on-board Gigabit Ethernet ports

- Three PCI-E (Express) slots and two PCI-X slots[2]
- Up to four SAS disk drives

System Board

The Sun Fire T2000 system board contains all of the logic components for the system. This includes the UltraSPARC T1 processors and all DIMMs, the I/O bridge ASIC and the I/O subsystem, and the service processor subsystem. The system board contains the rear-panel I/O connectors for both the host system and the service processor.

The UltraSPARC T1 Multicore Processor

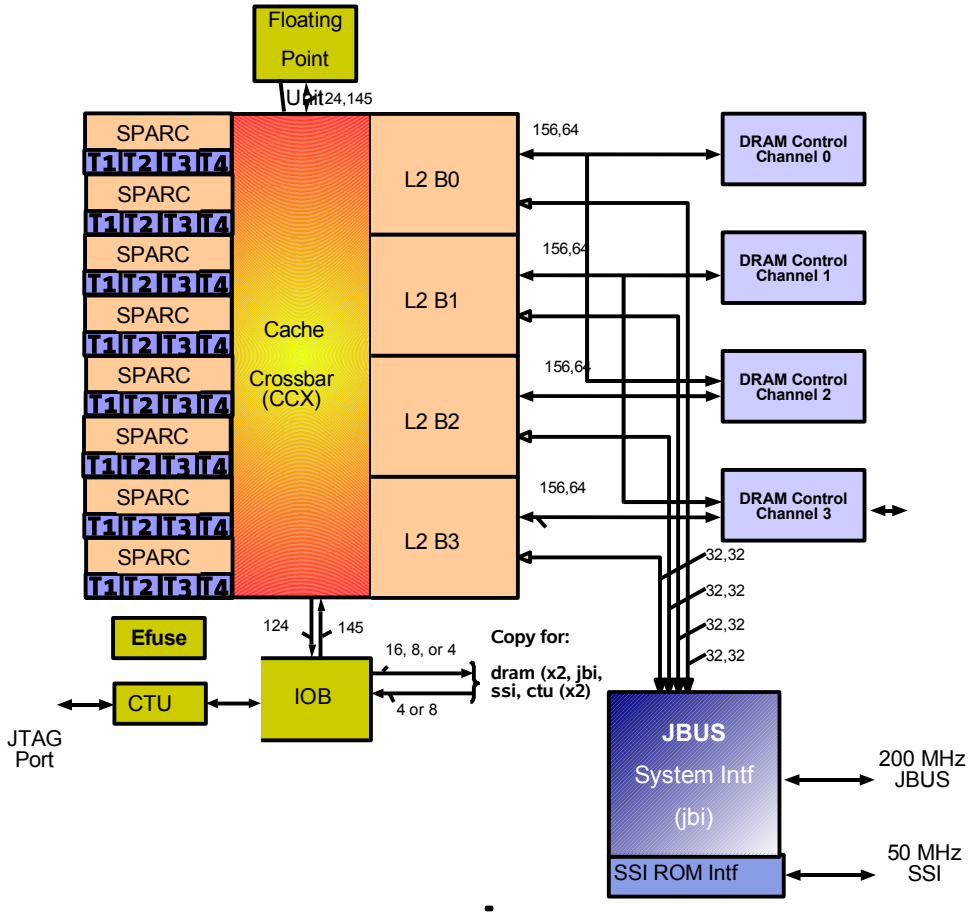


Figure 4. The UltraSPARC T1 Multicore Processor Block Diagram

The UltraSPARC T1 multicore processor is the basis of the Sun Fire T2000 server. The UltraSPARC T1 processor is based on Chip Multithreaded (CMT) technology that is optimized for highly threaded transactional processing. The UltraSPARC T1 processor improves throughput while using less power and dissipating less heat than conventional processor designs.

[2] On older models, one of the PCI-X slots is occupied by the disk controller.

Depending on the model purchased, the processor has four, six, or eight UltraSPARC cores. Each core equates to a 64-bit execution pipeline capable of running four threads. The result is that the 8-core processor handles up to 32 threads concurrently.

Additional processor components, such as L1 cache, L2 cache, memory access crossbar, DDR2 memory controllers, and a JBus I/O interface have been carefully tuned for optimal performance.

Chip Multithreaded (CMT) Processor Design

The Chip Multithreaded (CMT) processor design is designed to deliver many benefits, including the ability to effectively translate the expanded transistor budgets made available by each new generation of semiconductor process technology into higher levels of throughput performance. This design provides a dramatic overall improvement in system reliability, availability, and serviceability (RAS). The CMT processor design represents a fundamental shift in the way in which SMP systems are built, internalizing much of the communication that formerly occurred between processors to within a chip. The resulting reduction in part count, combined with enhanced processor RAS features, deliver a highly favorable overall impact on system reliability, availability, and serviceability.

CPU Highlights

- SPARC® V9 architecture
- On-chip Level 2 cache
- Public key encryption support (RSA)
- 48-bit virtual, 40-bit physical address space
- 1.0 to 1.2-GHz frequency (1.4GHz has been transitioned as of January 13, 2009)

Cache Highlights

- 16-KB primary instruction cache per core
- 8-KB primary data cache per core
- 3-MB unified level 2 cache with ECC

Integration Highlights

- Eight cores, four threads per core
- Four 144-bit DDR2-533 SDRAM interfaces
  - Quad error correct, octal error detect
  - Chipkill ECC
  - Optional 2-channel operation mode
- JBus interface
  - 3.1 GB/sec. peak effective bandwidth
  - 128-bit address/data bus
  - 150 to 200-MHz operation

On-chip Memory Controller

Each of the UltraSPARC T1 DDR2 memory controllers has a 16-byte wide (128 data bits plus 16 ECC check bits) data interface. Two basic memory configurations are supported, with either two or four DIMMs per controller. All DIMMs must have identical capacity. The Sun Fire T2000 server uses all four of the UltraSPARC T1 DDR2 memory controllers, with a maximum memory configuration of 16 DIMMs. DIMM sizes of 1 GB, 2 GB, and 4GB are supported resulting in a maximum capacity of 64 GB per processor. DIMMs must be installed eight at a time (with one pair on each controller), yielding an 8-DIMM configuration or a 16-DIMM configuration.

I/O Subsystem

The UltraSPARC T1 processor contains a JBus controller and interfaces to an I/O ASIC to translate between the JBus and an industry-standard I/O bus. The I/O ASIC that performs this function in the Sun Fire T2000 server contains two PCI Express (PCI-E) root complexes, each providing one PCI-E link, with each link having a maximum port width of eight lanes (x8). The two PCI-E interfaces operate independently and each supports link widths of one, two, four, or eight lanes. The JBus runs at 200 MHz while the PCI-E links run at 2.5 GHz. The x8 PCI-E expansion slots are connected to port A or B of the I/O ASIC through a PCI-E switch. Full link speed and link width (x8) are supported in each slot. The PCI-X slots are connected to port B of the I/O ASIC through a PCI-E switch and PCI-E to a PCI-X bridge. Port A devices share bandwidth with on-board SAS/SATA and dual Gigabit Ethernet devices. Port B slots share bandwidth with an on-board dual Gigabit device. Refer to the Sun Fire T2000 server block diagram on page 19 for more details.

Expansion Slots

The Sun Fire T2000 server is well equipped with both legacy PCI-X slots, and the more current PCI-E high-speed slots. These slots can accommodate low-profile PCI cards that adhere to the MD2 physical specifications.

- **PCI-Express Slots**

  PCI-Express (PCI-E) is a high speed, point-to-point dual simplex chip interconnect. It is designed as the next-generation system bus interconnect, replacing the aging PCI bus. PCI-E operates at 2.5 GHz and supports lane widths of x1, x4, and x8 in the Sun Fire T2000 server.

  Three x8 PCI-E slots are provided. Each slot can also accommodate x1 or x4 cards. Most cards, including InfiniBand cards, currently do not require more than a x4 slot for full bandwidth operation. Graphics cards are the only currently available device that can come close to requiring the full x16 operation that PCI-E can offer. These larger slots are usually provided specifically for graphics cards in high-end 3D visualization-oriented workstations.

- **PCI-X Slots**

  Two PCI-X slots are provided on the Sun Fire T2000 server to allow customers who need older PCI or PCI-X I/O cards to continue using the older generation of cards. Note that one slot is occupied by a disk controller on initial shipments. New models of the Sun Fire T2000 server offer two free PCI-X slots for customer selection and installation of optional expansion cards.

  The provided slots are both 133 MHz, 64 bit wide, 3.3V providing the highest speed available for the older cards that are available in PCI-X configurations.

Internal Hard Disk I/O Subsystem

The Sun Fire T2000 server supports up to four hard disk drives, controlled by an LSI SAS1064 controller providing four ports of SAS connectivity to disk drives at bandwidths of 3 Gb/sec. full duplex for each disk.

Disks are 73-GB or 146-GB, 10000-rpm SAS disks, 2.5-inch small form factor server grade, and are certified for 24x7 operation. Due to the small physical size of these drives and the high spindle speeds, access times to disk are extremely good. All disks are hot-pluggable.

A benefit of using small disks is that they allow designers to maximize the air intake area at the front of the server to improve airflow, further increasing environmental margins and server reliability.

Hardware RAID (striping and mirroring) is supported on the Sun Fire T2000 server. RAID technology allows for the construction of a logical volume, made up of several physical disks, to provide data redundancy, increased performance, or both. The Sun Fire T2000 server onboard disk controller supports the following RAID configurations:

- Integrated Stripe, or IS volumes (RAID 0)
- Integrated Mirror, or IM volumes (RAID 1)

As of February 13, 2006, you must have the following patches installed on the Sun Fire T2000 server before you create RAID volumes:

- 119850-13 or greater
- 122165-01 or greater

Patches are available from http://www.sun.com/sunsolve

Power Supplies

The Sun Fire T2000 server is equipped with a dual redundant hot-swappable power supply system. One power supply is sufficient to run a fully populated server, however for maximum protection against power supply failures, Sun recommends that both power supplies be installed in the system at all times.

The power supplies are rated at 450 watts each. In normal operation, the power supplies share the power demands of the system equally between the pair. Please note that earlier models of the Sun Fire T2000 server contained 550W power supplies.

Refer to the Specifications section for more information on power ratings.

Front and Back Panel Features

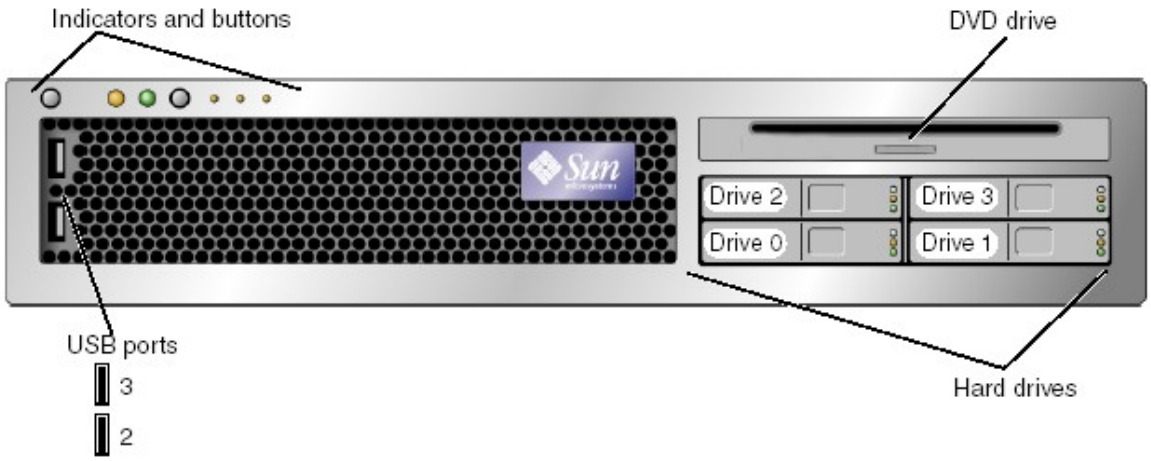


Figure 5. Sun Fire T2000 server front panel features

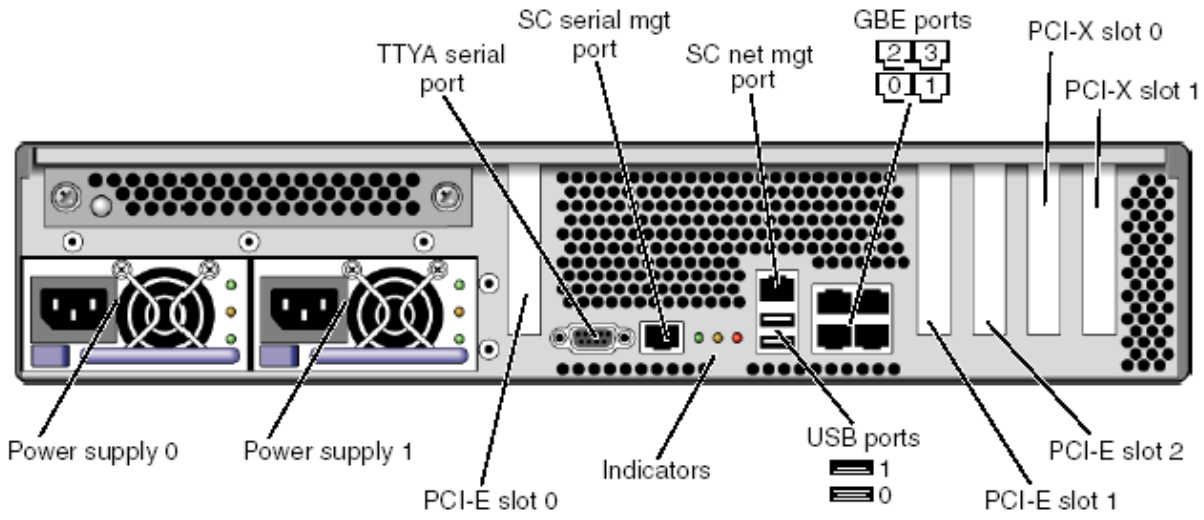


Figure 6. Sun Fire T2000 server rear panel features

Connectivity

Networking

The Sun Fire T2000 server includes four on-board auto-negotiating Gigabit Ethernet ports, implemented with two dual-ported controllers. These ports are all capable of providing simultaneous full bandwidth operation, with no shared bandwidth limitations. Each of the four Ethernet RJ45 connectors is associated with two LEDs.

A fifth 10/100BASE-T port is available on the back panel for a remote management connection (part of the ALOM controller). Use Telnet to connect to ALOM through this Ethernet connection.

USB Ports

The Sun Fire T2000 server comes with four USB 1.1 ports. Two of the ports are located on the left of the front panel of the server and are associated with one USB controller. The second two ports are located on the right side of the rear of the panel and are associated with a second USB controller.

Reliability, Availability, and Serviceability (RAS)

Reliability, availability, and serviceability (RAS) are aspects of a system's design that affect its ability to operate continuously and to minimize the time necessary to service the system. Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity. System availability refers to the ability of a system to recover to an operational state after a failure, with minimal impact. Serviceability relates to the time it takes to restore a system to service following a system failure. Together, reliability, availability, and serviceability features provide for near continuous system operation.

To deliver high levels of reliability, availability, and serviceability, the Sun Fire™ T2000 server offers the following features:

- A processor with extensive RAS features
- Up to four hot-pluggable hard drives
- Hardware RAID (0 + 1) striping and mirroring
- Two redundant, hot-swappable power supplies
- Three redundant hot-swappable fan units and one blower unit
- Environmental monitoring
- Error detection and correction for improved data integrity
- Easy access for most component replacements

The UltraSPARC® T1 Processor RAS Features

The UltraSPARC® T1 chip comes with a host of new RAS features built into it, including:

- Extensive ECC on the chip
- Memory Chipkill support
- Memory DRAM sparing/reconfiguration
- Memory address parity protection
- A memory hardware scrubber and an L2 cache scrubber
- Soft error rates and soft error rate detection
- DRAM channel deconfiguration
- Redundancy (cache RAM row/column sparing, core sparing, and eFUSE)

The UltraSPARC T1 multicore processor provides parity protection on its internal cache memories, including tag parity and data parity on the D-cache and I-cache. The internal 3-MB L2 cache has parity protection on the tags and ECC protection on the data.

DIMMs employ error-correcting code (ECC) to ensure high levels of data integrity. The system reports and logs correctable ECC errors. Such errors are corrected as soon as they are detected.

The Chip Multithreaded (CMT) processor design effectively translates the expanded transistor budgets made available by each new generation of semiconductor process technology into higher levels of throughput performance. This design provides a dramatic overall improvement in system RAS, because

the CMT processor design represents a fundamental shift in the way in which SMP systems are built, internalizing much of the communication that formerly occurred between processors to within a chip. The resulting reduction in part count, combined with enhanced processor RAS features, deliver a highly favorable overall impact on system reliability, availability, and serviceability.

In addition to the RAS benefits of the CMT design approach, the processor implements numerous state-of-the-art RAS features to help ensure a system continues to operate, avoid or shorten downtime, and diagnose and fix a broken system. The UltraSPARC T1 processor's RAS highlights include:

- Protection of on-chip memories
- Main memory reliability and availability
- Power and thermal reliability

CMT System Reliability

When the very high reliability of a UltraSPARC T1 processor is combined with the fact that one CMT processor replaces many processors in an equivalent SMP system, system level reliability can increase dramatically with CMT designs. This effect is already visible in systems based on the first generation of Sun's CMT processors, the UltraSPARC IV processor generation. For the same level of delivered throughput performance, there is less to go wrong in an UltraSPARC IV system than in an UltraSPARC III system, because the former system is built with just half the number of processor boards (and processor chips) as the latter. Assuming the individual components in two different system are similar in terms of their reliability, on average, the system with the fewer parts can be expected to suffer proportionally fewer failures, corresponding to the difference in their respective part counts.

In this generation of processors, where one UltraSPARC T1 processor replaces many processors in an equivalent SMP system, the system level reliability effects will be dramatic. As shown in the figure below, the associated conversion of interchip communication in a traditional SMP system is simplified to intrachip communication in a UltraSPARC T1 system.

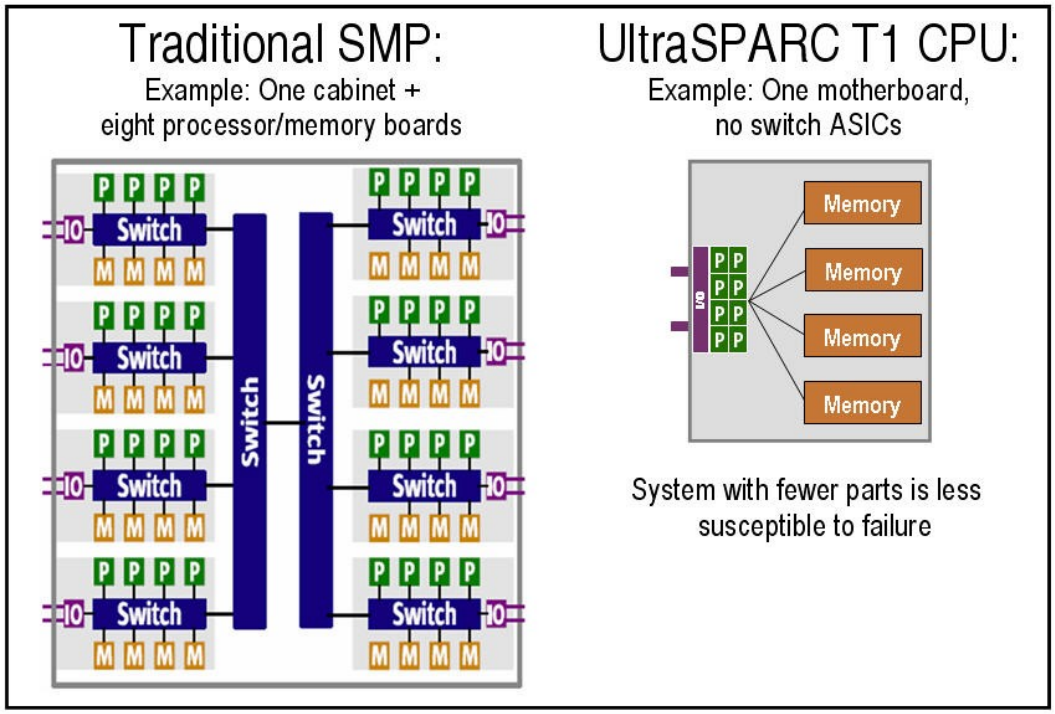


Figure 6. Traditional SMP vs. UltraSPARC T1 CPU design

In this figure, the traditional SMP server is housed in a refrigerator-sized cabinet and consists of eight processor/memory boards, each with four processors, memory, and an I/O interface. Each board has switch ASICs to connect the on board components, and the cabinet has another set of switch ASICs to connect one group of four boards to the other group of four boards. In contrast, the UltraSPARC T1 system offers a much more integrated and tightly coupled solution than the traditional SMP by shrinking the eight cell boards into a single chip. Without any need for switch ASICs, the whole system now fits on one motherboard, and has many fewer parts and pins to fail. Moreover, maintaining and servicing the boards was reduced from eight boards to one board.

Protection of On-Chip Memories

As semiconductor technology continues to enable increasing chip densities, the processor has become more susceptible to soft error rates. A soft error is a “glitch” in a semiconductor device. These glitches are random, usually not catastrophic, and normally do not destroy the device. Soft errors are caused by charged particles or radiation, and are transient. Many systems can tolerate some level of soft errors. Contemporary CPUs like the UltraSPARC T1 processor, which are manufactured on cutting-edge process technology, are especially prone to these soft errors. With this problem in mind, Sun systematically designed the UltraSPARC T1 processor with the appropriate level of protection of its on-chip memories. In general, the UltraSPARC T1 processor protects memory arrays with either single error correction/double error detection (SEC/DED) or parity protection. Redundant arrays are protected with parity, while non-redundant arrays are protected with Error Correcting Code (ECC).

The table below lists the UltraSPARC T1 processor’s on-chip memories and its corresponding protection mechanism.

Memory Array	Protection
Integer Register File	ECC
Floating Point Register File	ECC
L1 Instruction Cache - Data	Parity/retry
L1 Instruction Cache - Tag	Parity/retry
Instruction TLB	Parity/retry
Data TLB	Parity/retry
L1 Data Cache - Data	Parity/retry
L1 Data Cache - Tag	Parity/retry
L2 Cache - Data	ECC
L2 Cache - Tag	ECC

A notable feature in this schema is the ECC protection of the integer and floating point register files, an extensive level of protection only matched by mainframe-class processors. While processor designs have mainly focused on protecting the datapath, caches, and main memories, the register file has largely been neglected. Because the register file is accessed very frequently, which increases the probability of errors, protecting the register files is critically important. In addition, protecting the register file prevents errors in the register file from quickly spreading to different parts of the system, and prevents an application from crash or silent data corruption.

Main Memory Reliability and Availability

The UltraSPARC T1 processor protects main memory using several mechanisms. “Chipkill” technology is used to withstand multi-bit memory errors within a DRAM device, including a failure that causes incorrect data on all data bits of the device.

Standard ECC memory is a proven industry standard technology that has had a considerably positive impact on server reliability. ECC memory is able to detect and correct single bit memory errors, which make up the vast majority of memory errors. However the increase of memory capacity, the density of memory on a single DIMM, and the increase in speed of the memory subsystem have significantly increased the risks of multi-bit memory errors that cannot be corrected by standard ECC memory and result in the system hanging. To address this issue, designers implemented Chipkill technology to correct multi-bit memory errors, and in doing so, increases system availability considerably.

The UltraSPARC T1 processor’s Chipkill mechanism uses Galois Field instead of Hamming in its Chipkill implementation. The Galois Field algorithm provides higher bandwidth than Hamming Chipkill (21.33 vs. 10.66 GB/sec.) can correct any error contained within a single memory nibble (4 bits), and detect any uncorrectable errors contained within any two nibbles. When writing data to the DIMM, data is written in the form of a checksum appended to the data. If a single nibble memory error occurs, then the data is immediately recovered by recalculating the data from the checksum information. This procedure allows the system to correct not only the single bit errors that standard ECC memory can correct but also 2, 3, and 4-bit errors and even a whole DRAM chip failure. To illustrate the effectiveness of Chipkill technology, the table below shows the results of an analysis[3] comparing server outages due to memory failures of parity, ECC, and Chipkill-equipped servers over three years.

[3] From “A Whitepaper on the Benefits of Chipkill-Correct ECC for PC Server Main Memory,” Timothy J. Dell, IBM, November 1997, http://www-1.ibm.com/servers/eserver/ pseries/campaigns/chipkill.pdf

Memory Size	Protection	Number of Outages Over 3 years
32 MB	Parity	700 outages per 10,000 servers
1 GB	ECC	900 outages per 10,000 servers
4 GB	Chipkill	6 outages per 10,000 servers

Despite using larger size memories, which increases the likelihood of systems to crash due to a memory error, the Chipkill-equipped server fails at a rate of about two orders of magnitude less than the ECC-protected subsystem.

In conjunction with Chipkill, DRAM sparing is implemented in the UltraSPARC T1 processor to improve main memory availability. Where Chipkill detects a failed DRAM chip, DRAM sparing reconfigures a DRAM channel to map out the failed chip, effectively replacing it with a corrected DRAM chip. This technique restores the capability of correcting any random single-nibble error and allows the system to run with minor impaired memory error protection until the DIMM can be replaced.

Hot-Swappable Components

Sun Fire T2000 server's hardware is designed to support hot-swapping of the fan units and power supplies. By using the proper software commands, you can install or remove these components while the system is running. Hot-swap technology significantly increases the system's serviceability and availability by providing the ability to replace fan units and power supplies without service disruption.

Power Supply Redundancy

The Sun Fire T2000 server features two hot-swappable power supplies enabling the system to continue operating if one of the power supplies fail or if one power source fails.

The Sun Fire T2000 server also has a single hot-swappable blower unit that works in conjunction with the power supply fans to provide cooling for the internal disk drives. If the blower unit fails, the power supply unit fans provide enough cooling to keep the disk subsystem running.

Fan Redundancy

The Sun Fire T2000 server features three hot-swappable system fans. The fans enable the system to continue operating with adequate cooling in the event that one of the fans fails.

Hot-Pluggable Components

The Sun Fire T2000 server supports up to four hot-pluggable internal disk drives.

Environmental Monitoring

The Sun Fire T2000 server has an environmental monitoring subsystem designed to protect the server and its component against extreme temperatures, lack of adequate airflow, power supply failures, and hardware faults.

Temperature sensors are located throughout the system to monitor the ambient temperature of the system and internal components. The server's software and hardware ensure that the temperatures within the enclosure do not exceed safe operational ranges.

All error and warning messages are sent to the system controller system console and are logged in the ALOM console log file. Required LEDs remain lit after an automatic system shutdown occurs, to aid in problem diagnosis.

The power subsystem is monitored in a similar fashion by monitoring power supplies and reporting any fault in the front and rear panel LEDs.

Fault Management and Predictive Self Healing

The Sun Fire T2000 server features the latest fault management technologies. With the Solaris™ 10 OS, Sun introduced a new architecture for building and deploying systems and services capable of predictive self-healing. Self-healing technology enables Sun systems to accurately predict component failures and to mitigate many serious problems before they actually occur. This technology is incorporated into both the hardware and software of the Sun Fire T2000 server.

Predictive Self Healing

Predictive Self Healing is an innovative capability in the Solaris 10 OS that automatically diagnoses, isolates, and recovers from many hardware and application faults. As a result, business-critical applications and essential system services can continue uninterrupted in the event of software failures, major hardware component failures, and even software misconfiguration problems.

Solaris Fault Manager: The Solaris Fault Manager facility collects data relating to hardware and software errors. It automatically and silently detects and diagnoses the underlying problem, with an extensible set of agents automatically responding by taking the faulty component offline. Easy-to-understand diagnostic messages link to articles in Sun's knowledge base that clearly guide administrators through corrective tasks that require human intervention. The open design of the Solaris Fault Manager facility also permits administrators and field personnel to observe the activities of the diagnostic system. With Solaris Fault Manager, the overall time from a fault condition to automated diagnosis to any necessary human intervention is greatly reduced, increasing your application uptime.

Solaris Service Manager: The Solaris Service Manager facility creates a standardized control mechanism for application services by turning them into first-class objects that administrators can observe and manage in a uniform way. These services can then be automatically restarted if they are accidentally terminated by an administrator, if they are aborted as the result of a software programming error, or if they are interrupted by an underlying hardware problem. In addition, the Solaris Service Manager software reduces system boot time by as much as 75 percent by starting services in parallel according to their dependencies. An "undo" feature helps safeguard against human errors by permitting easy change rollback. Solaris Service Manager is also simple to deploy; developers can convert most existing applications to take full advantage of Solaris Service Manager features just by adding a simple XML file to each application.

Specific Sun Fire T2000 Server Capabilities

- **CPU Offline** takes a core offline that has been deemed faulty. "Offlined" CPUs are stored in the resource cache and stay offline on reboot unless the processor has been replaced, in which case the CPU is cleared from the resource cache (`/var/fm/fmd/rsrc`). Note that CPU offlining on the Sun Fire T2000 server is a post-RR deliverable.
- **Memory Page Retirement** retires pages of memory that have been marked faulty. Pages are stored in resource cache and stay retired on reboot unless the DIMM has been replaced, in which case affected pages are cleared from the resource cache (`/var/fm/fmd/rsrc`).

- **I/O Retirement** currently logs errors and faults.
- **fmlog** logs faults to `/var/adm/messages*`.

Automatic System Recovery

The system provides for automatic system recovery (ASR) from failures in CPU core/threads, memory modules, or PCI cards. The ASR functionality allows the system to resume operation after experiencing certain nonfatal hardware faults or failures. When ASR is enabled, the system's firmware diagnostics automatically detect failed hardware components. An auto-configuring capability designed into the system firmware enables the system to unconfigure failed components and to restore system operation. As long as the system is capable of operating without the failed component, the ASR features enable the system to reboot automatically, without operator intervention.

Software

Operating System Requirements

The Sun Fire™ T2000 server requires Solaris™ 10 11/06 Operating System or later. The minimum OS that can be used is Solaris 10 1/06, but it is recommended to always use the latest Solaris 10 release.

Software Provided

The following software comes with the Sun Fire T2000 server:

- Solaris 10 Operating System
- SunVTS™ software
- Sun Studio 11
- CoollTuner
- GCC
- SPOT, BIT, ATS

Solaris 10 Operating System

With the introduction of the Solaris 10 Operating System, Sun provides new functionality to deliver optimal utilization, relentless availability, unparalleled security, and extreme performance for both vertically scaled and horizontally scaled environments. Key features of the Solaris 10 OS include:

- Solaris 10 OS runs on a broad range of SPARC® and x86-based systems and compatibility with existing applications is guaranteed.
- Solaris Containers (formerly N1 Grid Containers) enable as much as a four times increase in system utilization by making it possible to efficiently and securely support thousands of applications per system with no performance hit.
- Predictive self-healing technologies provide new levels of application availability.
- Process rights management enables precise control of system privileges, significantly reducing exposure to system intrusion and limiting unauthorized access to administrative functions, sensitive data, and other critical system elements.
- DTrace provides “always on” rapid evaluation and resolution of system problems and bottlenecks, reducing downtime and yielding dramatic performance improvements.

The Solaris 10 OS has specific features for Throughput Computing. One of the most attractive features of systems based on the UltraSPARC® T1 processor is that they appear as a familiar SMP system to the Solaris OS and the applications it supports. The Solaris 10 OS has incorporated many features to improve application performance on CMT architectures:

- **CMT awareness:** The Solaris 10 OS is aware of the UltraSPARC T1 processor hierarchy so that the scheduler can effectively balance the load across all the available pipelines. Even though it exposes each of the up to 32 individual strands as a logical processor, the Solaris OS understands the correlation between strands and cores.

- **Fine-granularity manageability:** The Solaris 10 OS has the ability to enable or disable individual processors. In the case of the UltraSPARC T1 processor, this ability extends to enabling or disabling individual hardware strands. In addition, standard Solaris OS features such as processor sets provide the ability to define a group of processors (or strands), and schedule processes or LWPs on them.
- **Binding interfaces:** The Solaris OS allows considerable flexibility in that processes and individual LWPs can be bound to either a processor or a processor set, if required or desired.
- **Solaris Containers:** Solaris Containers provide fine-grained partitioning, virtualization, and allocation of resources within a given Solaris instance. For example, the resources of a single UltraSPARC T1 processor can be easily partitioned into multiple containers, with each securely supporting a separate web or application server.
- **The Hypervisor and the sun4v kernel sub-architecture:** The UltraSPARC T1 processor features a new Hypervisor and identifies itself through the Solaris OS as the sun4v kernel subarchitecture. Because the sun4v kernel subarchitecture is new, applications that query for the system details should recognize sun4v as a valid architecture, fully compatible with sun4u.

System Management

ALOM

Sun's advanced lights out manager (ALOM) is a system controller that enables an administrator to remotely manage and administer a Sun™ server.

The ALOM software comes preinstalled on the Sun Fire™ T2000 server. Therefore ALOM works as soon as you install and power on the server. The administrator can then customize ALOM to work with a particular installation.

ALOM enables the administrator to monitor and control a server, either over a network or by using a dedicated serial port for connection to a terminal or terminal server. ALOM provides a command-line interface that an administrator can use to remotely administer geographically distributed or physically inaccessible machines.

In addition, ALOM enables the administrator to run diagnostics remotely (such as power-on self-test), that would otherwise require physical proximity to the server's serial port. The administrator can also configure ALOM to send email alerts of hardware failures, hardware warnings, and other events related to the server or to ALOM.

The ALOM circuitry runs independently of the server, using the server's standby power. Therefore, ALOM firmware and software continue to function when the server operating system goes offline or when the server is powered off.

ALOM monitors many components. The list below shows some of the components that ALOM can monitor on the server.

Component Monitored	What ALOM Reveals
Disk drives	Whether each slot has a drive present, whether it can be removed, and whether it reports OK status
Fans	Whether a fan is present, fan speed, and whether the fans report OK status
CPUs	The temperature measured at the CPU, and any thermal warning or failure conditions
Power supplies	Whether each bay has a power supply present, and whether it reports OK status
System enclosure temperature	System ambient temperature, as well as any enclosure thermal warning or failure conditions
Current	Status of current sensors
Voltages	Status of voltage rails
Server front/rear panel	Status of LEDs

Sun Management Center Software

Sun Management Center software is an element management system for monitoring and managing the Sun environment. It integrates with the leading enterprise management systems to provide customers with a unified management infrastructure. The base package is free and provides hardware monitoring.

Advanced applications (add-ons) extend the monitoring capability of the base package, Sun Management Center software provides:

- Agents for managing Solaris™ OS/SPARC®, Solaris x86, and Linux operating systems
- In-depth hardware and software diagnostics
- Aggregate CPU utilization reporting
- Event and alarm management for thousands of attributes
- Corrective action automation through scripts triggered by alarm thresholds
- Secure management controls for remote dynamic reconfiguration
- The ability to customize modules with a powerful, easy-to-use GUI

Sun Management Center software version 3.6 will support the Sun Fire T2000 server. This version will be available near the end of calendar year 2005.

Solaris 10 Operating System

The Solaris 10 Operating System dramatically improves the way system administrators and developers can identify the reasons for suboptimal system and application performance. Solaris Dynamic Tracing (DTrace) technology makes it possible to delve deeply into today's complex systems to troubleshoot systemic problems in real time. Additional Solaris OS features provides enhanced system insight, enabling you to quickly identify and resolve hardware problems, as well as streamline and automate patch management. Some of its capabilities include:

- Real-time troubleshooting of systemic problems
- New tools for low-level system debugging
- System hardware testing and analysis
- Fine-grained project accounting
- Enhanced patch analysis and delivery tools
- Existing applications benefit from Solaris 10 OS enhancements without modification

Specifications

Physical Specifications

Description	U.S.	International
Height	3.5 inches (2 RU)	89 mm
Width	16.7 inches	425 mm
Depth	24.4 inches	621 mm
Weight, approximate (without PCI cards or rack mounts)	40lb.	18 kg

Clearance for Service Access

Description	Specification
Clearance, front of system	36 inches (91 cm)
Clearance, rear of system	36 inches (91 cm)

Environment Specifications

These are the environmental specifications for the Sun Fire™ T2000 server.

Specification	Operating	Non-Operating
Temperature **Sea Level to 3000 ft (900m)**	5 to 35°C (at sea level)	-40 to 60°C
Above 3000 ft (900m)	Decrease maximum temperature as altitude increases, 1.6°F/1000 ft (1°C/300m)	-40 to 60°C
Relative Humidity	20 to 80% RH, non-condensing, 27°C wet bulb, IEC 60068-2-3&56	98% RH 38°C, non-condensing, IEC 60068-2-3&56
Altitude	0-3,000 meters (0-10,000 feet) IEC 60068-2-13	0 - 12,000 meters (0-40,000 feet) IEC 60068-2-13
Vibration	0.2 Gs, Swept sine 5-500-5Hz, 1 octave/min, all axes, IEC 60068-2-13	1.0 Gs, Swept sine 5-500-5Hz, 1 octave/min, all axes, IEC 60068-2-13
Shock	5 Gs peak 11 milliseconds, half-sine pulse, IEC 60068-2-27	30 Gs peak 11 milliseconds, half-sine pulse, IEC 60068-2-27

Power Source Requirements

The Sun Fire T2000 server has two autoranging power supplies. To ensure redundant operation of the power supplies, the two power cords should be connected to separate AC circuits.

These are the electrical limits and ranges for the Sun Fire T2000 server utilizing 450W power supplies.

Description	Specification
Operating input voltage range	100 to 240 VAC, 50 to 60 Hz
Maximum operating input current	4.5 A at 100 to 120 VAC 2.25 A at 200 to 240 VAC
Maximum heat dissipation	1,535 BTU/hr.
Nominal Power	275W

Note: Earlier models utilizing 550W supplies have different specifications. Nominal power for these is 325W.

A power calculator iexists for the Sun Fire T2000 server, enabling customers to calculate the power of the components in their systems, providing them with an estimated overall total for different configurations. See:

http://www.sun.com/servers/coolthreads/t2000/calc/index.jsp

Acoustic Noise Emissions

These are the acoustic noise emissions of a Sun Fire T2000 server. Declared noise emissions are in accordance with ISO 9296 standards.

Description	Mode	Specification
LwAd (1 B = 10 dB)	Operating acoustic noise Idling acoustic noise	7.7 B 7.7 B
LpAm (bystander positions)	Operating acoustic noise Idling acoustic noise	62 dB 62 dB

Agency Compliance Specifications

The Sun Fire T2000 server complies with the following specifications.

Category	Relevant Standards	
Safety	UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all country deviations, IEC825-1, 2, CFR21 part 1040, CNS14336, GB4943	
Ergonomics	EK1-ITB-2000	
RFI/EMC	EN55022 Class A 47 CFR 15B Class A ICES-003 Class A VCCI Class A AS/NZ 3548 Class A CNS 13438 Class A	KSC 5858 Class A GB9254 Class A EN61000-3-2 GB17625.1 EN61000-3-3
Immunity	EN55024 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4	IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11
Telecommunications	EN 300 386	
Regulatory Markings (pending)	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, MIC, UL/cUL, UL/DEMKO/GS, UL/S-mark, CCC	

Ordering Information

Standard Configurations – Preconfigured Systems

The Sun Fire T2000 server can be ordered using the configuration part numbers listed in this section. All servers ship with one UltraSPARC® T1 processor with four, six or eight cores. The processors in the Sun Fire T2000 run at 1.0 Ghz or 1.2GHz with a 3-MB L2 cache. The model type of the server determines the number of processor cores. Each processor core has four threads.

Two power cords specific to the environment or geography must be ordered as a separate line item.

All base configurations include:

- 2 RU packaging
- Four 1-Gigabit Ethernet ports
- Three PCI-E slots
- Two PCI-X slots; *Note: On older models, one slot may contain the SAS I/O card for the internal disk drives*
- One rackmount kit with cable management arm
- Pre-loaded with Solaris™ 10 Operating System
  Also includes Sun Studio 11, CoolTuner, GCC, SPOT, BIT, ATS
- One Slimline slot loaded DVD drive
- Four USB 1.1 ports
- One 9-pin serial port
- Advanced lights out manager (ALOM) with dedicated 100BASE-T Ethernet port
- Three N+1 redundant hot-plug fans
- Two 450W (N+1) hot-swappable power supplies

Note: Earlier models utilized 550W power supplies.

Part Number	Standard Configuration Description
T20Z104A-08GA2G-2	Sun Fire T2000 Server, 4 core 1.0GHz UltraSPARC T1 processor, 8GB DDR2 memory (8 * 1GB DIMMs), 2 * 73GB 2.5" 10K rpm SAS hard disk drives, 1 DVD-RO/CD-RW slimline drive, 2 (N+1) power supplies, 4 10/100/1000 ethernet ports, 1 serial port, 3 PCI-E slots, 2 PCI-X slots, Solaris 10 pre-installed. RoHS-5 compliant (Standard Configuration)
T20Z108A-08GA2G-2	Sun Fire T2000 Server, 8 core 1.0GHz UltraSPARC T1 processor, 8GB DDR2 memory (8 * 1GB DIMMs), 2 * 73GB 2.5" 10K rpm SAS hard disk drives, 1 DVD-RO/CD-RW slimline drive, 2 (N+1) power supplies, 4 10/100/1000 ethernet ports, 1 serial port, 3 PCI-E slots, 2 PCI-X slots, Solaris 10 pre-installed. RoHS-5 compliant (Standard Configuration)
T20Z108B-16GA2G	Sun Fire T2000 Server, 8 core 1.2GHz UltraSPARC T1 processor, 16GB DDR2 memory (16 * 1GB DIMMs), 2 * 73GB 2.5" 10K rpm SAS hard disk drives, 1 DVD-RO/CD-RW slimline drive, 2 (N+1) power supplies, 4 10/100/1000 ethernet ports, 1 serial port, 3 PCI-E slots, 2 PCI-X slots, Solaris 10 pre-installed. RoHS-5 compliant (Standard Configuration)
T20Z108B-32GA2G	Sun Fire T2000 Server, 8 core 1.2GHz UltraSPARC T1 processor, 32GB DDR2 memory (16 * 2GB DIMMs), 2 * 73GB 2.5" 10K rpm SAS hard disk drives, 1 DVD-RO/CD-RW slimline drive, 2 (N+1) power supplies, 4 10/100/1000 ethernet ports, 1 serial port, 3 PCI-E slots, 2 PCI-X slots, Solaris 10 pre-installed. RoHS-5 compliant (Standard Configuration)

Power Cord Kits

The Sun Fire T2000 server comes standard with two power supplies. A no-charge power cord kit option must be ordered for each power supply. Available power cord kits include:

Part Number	Description
X311L	AC Power Cord U.S./Asia AC Power Cord U.S./Asia
X312E	AC Power Cord China
X312F	AC Power Cord Argentina
X312G	AC Power Cord Korea
X312L	AC Power Cord Continental Europe
X314L	AC Power Cord Switzerland
X317L	AC Power Cord U.K
X332T	AC Power Cord INTL
X333A-25-10-IL	AC Power Cord Israel
X333A-25-15-JP	AC Power Cord, Japan, 2.5m, PSE 5-15
X333F-25-15-JP	AC Power Cord, Japan, 2.5m, PSE 6-15
X340L	AC Power Cord N.A./Asia
X384L	AC Power Cord Italy
X383L	AC Power Cord Denmark
X386L	AC Power Cord Australia
X9237-1-A	AC Power Cord Jumper, 1.0m
X9238-1-A	AC Power Cord Jumper, 2.5m

Assemble-to-Order Configurations (ATO)

Assemble-to-Order (ATO) configurations are not available. The listed configurations and upgrades greatly reduce the need for custom configurations.

Options

The following options are supported by the Sun Fire™ T2000 server. Options that include an (X) in the part number indicate that the part can be ordered as a field-installable part or for factory integration. For example, X7800A is the field installable option, while part number 7800A, with the (X) removed, is used only when the part will be installed at the factory (ie Assemble-to-Order).

Part Number	Option Description	Maximum Number Supported	Comments
Memory			Must be the same DIMM type in all banks
(X)7801A	2-GB memory expansion kit (2 x 1 GB)	8	
(X)7802A	4-GB memory expansion kit (2 x 2 GB)	8	
(X)7803A	8-GB memory expansion kit (2 x 4 GB)	8	
Internal Storage Devices			
(X) RA-SS2CD-73G10K	73-GB, 10000-rpm, 2.5-inch SAS disk drive, for factory integration only (CRS)	4	EOL on April 4 LOD on July 7, 2006
(X) RA-SS2CD-73G10KZ	73-GB, 10000-rpm, 2.5-inch SAS disk drive, for factory integration only (CRS) – RoHS-6 compliant	4	
RA-SS2CD-146G10KZ	146-GB, 10K RPM 2.5" SAS disk drive, for factory integration only (CRS) RoHS-6	4	
Racks			
SR900-36N	Sun Rack 900 - 36N (alloy)		
SR900-38	Sun Rack 900 - 38 (alloy)		
SR1000-38	Sun Rack 1000 - 38 (alloy)		
SR1000-42	Sun Rack 1000 - 42 (alloy)		
SG-XARY030A	Sun StorEdge™ 72-inch expansion cabinet Sun Fire™ cabinet		EOL 1/10/06
Special Power Cord Kits			
X320A	Power Cord Sun Fire 3800-4810 server, Sun Fire V490 server, Sun Fire V890 server, Direct to wall, N. American, RoHS-6 530-1351-xx, IEC 320 C13 to NEMA 6-15, 10A/250V, 2.0M, Black	2	Order if you want to use 208-240VAC power on a T2000.
X321L	Localized Power Cord Kit North American/Asian Sun Fire V1280 server only Contains 4 AC power cords This Product is Hazard Class Y, RoHS compliant. 180-2023-xx, IEC 320 C13 to NEMA 6-15P, 10A/ 250V, 4.0M, Black	2	Order if you want to use 208-240VAC power on a T2000. ** Note that this Xoption gives you 4 power cords per kit.

Part Number	Option Description	Maximum Number Supported	Comments
			You only need 2 power cords on a T2000.
X340L	Power cord kit for Sun Fire 490 & Sun Fire V890 servers, North American (NEMA L6-20 20A twist lock plug, #12/3 SJT cord and an IEC320 C13 equipment connector). Quantity 1 AC power cord. This Product is Hazard Class Y, RoHS compliant.	2	Order if you want to use 208-240VAC power on a T2000.
PCI-E Cards: Networking Interfaces			
(X)7280A-2	**Dual port GigE UTP low-profile**	**3**	
(X)7281A-2	Dual port GigE MMF low-profile	3	
(X)1027A-Z	Sun PCI-E Dual 10 GigE Fiber XFP Low profile Adapter. Requires fiber transceiver. RoHS-6 compliant Card	2	Requires X5558A or X5560A-Z
(X)6000A	Sun Crypto Accelerator 6000	2	
(X)4447A-Z	Sun x8 PCI express Quad Gigabit Ethernet UTP low profile adapter, LP bracket on board, Std bracket included, RoHS-6 compliant. The card is developed by Sun	3	
PCI-E Cards: Graphical Interfaces			
(X)3777	XVR-200 Graphics Accelerator 2D x1	1	EOL May 24, 2008
(X)3000A	XVR-300 2D Graphics Frame Buffer. 24-bit color, high resolution 2D graphics accelerator. PCI Express x8 interface and dual DVI-I. RoHS-6.	2	
PCI-E Communications Interfaces			
(X)1236A-Z	Dual Port (4x) Infiniband host channel adapter (includes short bracket and regular bracket) RoHS-5		
PCI-E Cards: Storage Interfaces			
SG-(X)PCIE1FC-QF4	**Single port 4Gb FC (includes standard and low-profile brackets) SUMMIT**	**3**	
SG-(X)PCIE2FC-QF4	Dual port 4Gb FC (includes standard and low-profile brackets) SUMMIT	3	
SG-(X)PCIE1FC-EM4	Single port, Emulex, 4Gb FC (includes standard and low-profile brackets) SUMMIT-E	3	
SG-(X)PCIE2FC-EM4	Dual port, Emulex, 4Gb FC (includes standard and low-profile brackets) SUMMIT-E	3	
SG-(X)PCIE2SCSIU320Z	Dual channel Ultra320 differential SCSI HBA	3	

Part Number	Option Description	Maximum Number Supported	Comments
	(includes standard and low-profile brackets) RoHS-6 version. RHEA		
SG-XPCIE8SAS-E-Z	Sun StorageTek (TM) PCIe SAS Host Bus Adapter, 8 port, RoHS 6 compliant	3	
PCI-X Cards: Networking Interfaces			
(X)5544A	10 GbE FC (133 MHz) single port low-profile. Board requires MMF or SMF transceiver: X5558A or third party.	2	Only one supported on older models. EOL 12/6/05
(X)5544A-4	10 GbE FC (133 MHz) single port low-profile RoHS Version. Board requires MMF or SMF transceiver: X5558A or third party.	2	Only one supported on older models
(X)1235A	Dual port 4x IB host channel adapter, low-profile	2	Only one supported on older models. EOL 12/6/05
(X)1333A-4	Dual port 4x IB host channel adapter, low-profile RoHS version	2	Only one supported on older models
PCI-X Cards: Storage Interfaces			
SG-(X)PCI1FC-QF4	Single port 4Gb FC (includes standard and low-profile brackets) PYRAMID	2	Only one supported on older models
SG-(X)PCI2FC-QF4	Dual port 4Gb FC (includes standard and low-profile brackets) PYRAMID	2	Only one supported on older models
SG-(X)PCI1FC-EM4-Z	Single port 4Gb FC (includes standard and low-profile brackets) PYRAMID-E	2	Only one supported on older models
SG-(X)PCI2FC-EM4-Z	Dual port 4Gb FC (includes standard and low-profile brackets) PYRAMID-E	2	Only one supported on older models
SG-(X)PCI1FC-EM2	Single port 2Gb FC (includes standard and low-profile brackets) RAINBOW	2	Only one supported on older models
SG-(X)PCI2FC-EM2	Dual port 2Gb FC (includes standard and low-profile brackets) RAINBOW	2	Only one supported on older models
SG-(X)PCI1FC-QL2	Single port 2Gb FC (includes standard and low-profile brackets) AMBER-2A	2	Only one supported on older models
SG-(X)PCI2FC-QF2-Z	Dual port 2Gb FC CRYSTAL-2A	2	Only one supported on older models
SG-(X)PCI1SCSI-LM320	Single port Ultra320 SCSI (includes standard and	2	Only one

Part Number	Option Description	Maximum Number Supported	Comments
	low-profile brackets) METEOR.		supported on older models. EOL 1/10/06
SGXPCI1SCSILM320-Z	Single port Ultra320 SCSI (includes standard and low-profile brackets) RoHS-6 version	2	Only one supported on older models
SG-XPCI8SAS-E-Z	Sun StorageTek (TM) PCI-X SAS Host Bus Adapter, Eight Port, RoHS 6 compliant	2	
PCI Cards:Networking			
(X)4150A	GbE for Cat 5 copper PCI	1	EOL: 12/6/05
(X)4150A-2	GbE for Cat 5 copper PCI	1	
(X)4151A	GbE for Fiber PCI	1	EOL: 12/6/05
(X)4151A-2	GbE for Fiber PCI	1	
Monitors Supported	X7200A 20" LCD Flat Panel Color Monitor (Sakura,RoHS) DVI-D / HD15 X7202A 19" LCD Flat Panel Color Monitor (Cedar,RoHS) DVI-D / HD15 X7203A 24" LCD Color Monitor (Kenari,RoHS) DVI-D / HD15 X7201A 17" Flat CRT Color Monitor(Olympia,RoHS) HD15 only **Legacy Monitors that should be supported for up to 5 years** X7198A 19" LCD Flat Panel Color Monitor (Cedar) DVI-D / HD15 X7199A 21" Flat CRT Color Monitor (Phobos) 5xBNC / HD15 Samsung PN21MS 0122201-00 X7197A 24" LCD Color Monitor (Doragi) DVI-D / HD15 Samsung AI24P0 X7144A 19" LCD Flat Panel Color Monitor (Aspen) DVI-D / HD15 Samsung GH19PS X7149 22" FD Premium Color Monitor(Callisto) HD15 / HD15 NEC/Mitsubishi C22BW711 0231583-04 X7147 17" Flat CRT Color Monitor(Olympia) HD15 only Samsung PN17JO 0031679-11 X7137A 18.1" FPD Color Monitor(Digimon) DVI-I / HD15 Samsung GH18PS X7134A 24" FPD Color Monitor(Arirang) DVI-D / 13W3 Samsung AI24P0 X7145A 24" FD Premium Color Monitor(Hercules) 13W3 / HD15 Sony GDM-FW9010 0031790-08 X7146A 21" FD Premium Color Monitor(Xena) 13W3 / HD15 Sony GDM-5510 0031790-15		
Keyboards Supported	X3731A Type 7 U.S./Canada Universal Country Kit. RoHS-6 X3732A Type 7 French Country Kit. RoHS-6 X3733A Type 7 German Country Kit. RoHS-6		

Part Number	Option Description	Maximum Number Supported	Comments
	X3734A Type 7 Swiss-French Country Kit. X3735A Type 7 Swiss-German Country Kit. X3736A Type 7 Swedish Country Kit. RoHS-6 X3737A Type 7 U.K. Country Kit. RoHS-6 X3738A Type 7 UNIX Country Kit. RoHS-6 X3754A Type 7 Taiwanese Country Kit. RoHS-6 X3755A Type 7 Korean Country Kit. RoHS-6 X3756A Type 7 Japanese Country Kit. RoHS-6 X3758A Type 7 U.K. UNIX Country Kit. RoHS-6 X3759A Type 7 European UNIX Country Kit. RoHS-6 X3760A Type 7 Norwegian Country Kit. RoHS-6 X3761A Type 7 Portuguese Country Kit. RoHS-6 X3762A Type 7 Spanish Country Kit. RoHS-6 X3763A Type 7 Danish Country Kit. RoHS-6 X3764A Type 7 Italian Country Kit. RoHS-6 X3765A Type 7 Dutch/Netherlands Country Kit. RoHS-6 X3766A Type 7 Australian Country Kit. RoHS-6 X3767A Type 7 Finnish Country Kit. RoHS-6 X3782A Type 7 Chinese Country Kit. RoHS-6 X3783A Type 7 European UNIX Country Kit. No power cords included. RoHS-6 X3785A Type 7 Russian Country Kit. RoHS-6 X3787A Type 7 Turkish-Q Country Kit. RoHS-6 X3790A Type 7 Belgian Country Kit. RoHS-6 X3791A Type 7 Arabic Country Kit. RoHS-6		
External Storage Devices	Sun StorageTek A5200 array Sun StorageTek D240 Media Tray Sun StorageTek S1 array Sun StorageTek T3 series Sun StorageTek 3120 array Sun StorageTek 3310 array Sun StorageTek 3320 array Sun StorageTek 3510 array Sun StorageTek 3511 array Sun StorageTek 3910 array Sun StorageTek 3960 array Sun StorageTek 5210 NAS Sun StorageTek 6120 array Sun StorageTek 6130 array Sun StorageTek 6140 array Sun StorageTek 6320 array Sun StorageTek 6540 array Sun StorageTek 6920 system		
External Tape Devices	Sun StorageTek DAT 72 tape drive Sun StorageTek tape drives, including SDLT 600, SDLT 320, LTO 1, LTO 2, and LTO 3 Sun StorageTek C2 autoloader		

Part Number	Option Description	Maximum Number Supported	Comments
	Sun StorageTek C4 tape library Sun StorageTek L100 tape library Sun StorageTek L180 tape library Sun StorageTek L25 tape library Sun StorageTek L500 tape library Sun StorageTek L700 tape library Sun StorageTek L7 autoloader Sun StorageTek L8 autoloader		
Switches	 Sun StorEdge 2 Gb Network FC Switch-64 Sun StorEdge 2 Gb Network FC Switch-16 Sun StorEdge 2 Gb Network FC Switch-8 Brocade SilkWorm 48000 256-port Director Brocade SilkWorm 24000 128-port Director Brocade SilkWorm 4100 Enterprise Fabric switch QLogic SanBox 5200 Stackable FC SAN switch		

Upgrades

Upgrade Paths

Sun Fire™ T2000 servers are eligible for the Sun™ Upgrade Advantage Program (UAP). Through this program customers can trade-up their current Sun or non-Sun severs for a new Sun Fire T2000 server and receive a trade-in allowance that is applied as a percentage off of the list price on the new Sun Fire T2000 server. Customers can trade-in their old systems in on a 1 for 1 server basis or consolidate many servers.

Sun Upgrade Allowance Program (Sun UAP)

Since August 29, 2000, Sun has offered customers a simple, flexible, and easy-to-understand way of ordering server, storage or Desktop upgrades. The Sun UAP program has a new percentage-based upgrades model. This new model simplifies the upgrades process by providing a trade-in value as a percentage allowance. This percentage allowance can then be applied to the list price of a regular Sun system configuration.

Under the Sun UAP program, allowance codes or part numbers have been created and the percentage allowance is built into this part number (see below). These allowance codes replace the previous UG/CU marketing codes used for all desktop upgrades.

Allowance codes can be found in the Sun Pricebook starting with the September 2000 version. Note that allowance codes apply to configured systems.

Allowance Code Numbering Scheme

Below is an example allowance code, along with a breakdown of the components.

Allowance code = ALW-10-S-B-T20

- **ALW** = Upgrade identifier (All allowance codes start with ALW.)
- **10** = Allowance percentage – Percentage is applied to the list price of a standard marketing part number. “10” means 10% off of list price, “08” means 8% off of list price, and so on.

  (Note: Any other discounts such as volume discounts should also be taken off the list price and not the net of the above.)
- **T** = Desktop upgrades, S for server upgrades, and D for storage upgrades.
- **B** = Indicates the residue group—a way of grouping system in the Sun installed base. The letters A through X are reserved for Sun systems. The letter Z is used for competitive systems.
- **T20** = Identifies the product family that the customer is purchasing.
- **P2 (if there is a promotion)** = Promotion code—used for tracking corporate sponsored and other types of promotions.

How to Determine the Right Allowance Code

Scenario: My customer has a Sun Fire 280R server and would like to upgrade to a Sun Fire T2000 server. What allowance part number should I select?

1. From left hand column select the platform the **customer has.**
2. The correct allowance part number appears in the right column. The correct number for the Sun Fire 280R server is **ALW-10-S-B-T20**. This part number is applied to the list price of the standard marketing part number. In this case it is a 10% allowance for the old Sun Fire 280R server.

Entry Level Server Upgrade and Allowance Matrix

UPGRADE TO: **FROM:**	**Sun Fire T2000 Server**
Sun Fire V100, V120, Netra 120 **Sun Enterprise™ 250, 220R** **Netra™ 1120, 1125**	**ALW-05-S-B-T20**
Sun Fire V210, V240, V250 **Sun Enterprise 450, 420R, 280R, V440, XX00**	**ALW-10-S-B-T20**
3 to 5-year old competitive systems	**ALW-05-S-Z1-T20**
Less than 3 year old non-Sun systems	**ALW-10-S-Z1-T20**

Upgrade Ordering Notes

The ALW code is applied the the system part number. Applying the allowance code will calculate the trade-in allowance percentage off of the list price of the new Sun Fire T2000 server. This trade-in allowance is used in addition to the customers VEU discount. For a complete list of eligible trade-in products you can go to http://www.sun.com/ibb. The customer must order an RMA kit with each upgrade and the customer will be required to trade-in their old servers within ninety days of shipment of the new server. The allowance codes are not applicable to products in CAT D.

Service and Support

Warranty

The Sun Fire™ T2000 server features a 1 year warranty providing a next business day response time with replacement parts delivered on-site or via parts exchange as applicable for all components designated as Customer Replaceable Units (See table below for Sun Fire T2000 server CRUs).

- Duration: 1 year
- HW coverage hours: Business hours
- HW response times: Next business day
- Delivery Method: Next business day on-site or parts exchange for Customer Replaceable Units (CRUs)
- HW phone coverage: Business hours
- HW phone response time: 8 hours
- Operating system support: 90-day Warranty provided for installation telephone support and defective media replacement only.

Description	FRU/CRU	Part No.
Cable arm kit, Sun Fire T2000 server	C	370-7668
Assy, DDR2, DIMM, 2 GB	C	F370-6209-01
Power supply, type A203 (AC)	C	F300-1757-01
PCI cards	C	
FRU assembly blower tray	C	F541-0645-01
Rail kit, Galaxy	C	F370-7669-01
Assembly, DDR2, DIMM, 512 MB	C	F370-6207-01
Assembly, fan, CPU, Sun Fire T2000 server	C	F541-0275-01
Assembly, DDR2, DIMM, 1 GB	C	F370-6208-01
Assembly, disk, 73 GB, SFF, SAS, NEMO	C	F541-0323-01

Sun Service Plans

Sun Global Customer Services offers a full range of services to assist customers who deploy the Sun Fire T2000 servers. Whether it is architecture services, implementation services, or services to help customers manage the servers once released to production, Sun has the right services during every phase of the project's life cycle.

Sun provides a service plan to meet every customers needs: the SunSpectrum℠ Service Plan for full system support ranging from basic to mission critical service levels and the Sun Software Service Plan.

- SunSpectrum Service Plans: Get integrated hardware and software support.
- Sun Software Service Plans: For fundamental software services such as technical phone or web-based support and software maintenance (updates and upgrades), Sun offers two levels of service for production system software.

Why the Warranty Isn't Enough

While computer system warranties provide business customers with some assurance of product quality, they do not provide many essential system services or operating system support. In addition, warranties provide default repair times and coverage hours which may not suit customer needs. It's just that a warranty and a Service Plan are two very different things with two very different objectives. Break/fix is no way to live - make sure your customers have service plan coverage on all their active Sun systems. For more information go to `http://www.sun.com/comparewarranty`.

SunSpectrum Service Plans

SunSpectrum service plans provide integrated hardware and Solaris™ Operating System support for Sun systems as well as comprehensive storage system support. For each Sun system, customers can choose the service plan that best fits their needs. Customers benefit from lower SunSpectrum Instant Upgrade (SIU) pricing when purchasing support at time of system sale.

More information is available at `http://www.sun.com/service/support/sunspectrum`.

SunSpectrum service plan highlights include:

- Integrated whole-system support
- All the essentials for one great price
- Priority service
- No "per incident" limits
- Includes Solaris™ Operating System releases and updates
- Resources for proactive system management
- A choice of four simple plans
- Proven return on investment[4]

[4]Based on Total Economic Impact Study by Forrester Research. This study is available at: sun.com/service/support/sunspectrum

SunSpectrum Service Plans

Features	Platinum Service Plan Mission-critical Systems	Gold Service Plan Business-critical Systems	Silver Service Plan Basic System Support	Bronze Service Plan Self-Maintenance Support
Telephone and Online Technical Support	24/7 Live transfer	24/7 Live transfer	8-8, M-F Live transfer	8-5, M-F 4hr response
One-stop Interoperability Assistance	Yes	Yes	No	No
Hardware Service Coverage	24/7 2hr On-site Service	8-8, M-F 4hr On-site Service	8-5, M-F 4hr On-site Service	Replacement parts 2nd business day
Solaris™ Releases	Yes	Yes	Yes	Yes
On-demand Solaris™ Updates	Yes	Yes	Yes	Yes
Online System Admin Resources	Yes	Yes	Yes	Yes
Support Notification Services	Yes	Yes	Yes	Yes
SunSpectrum℠ eLearning Library	Yes	Yes	Yes	Yes
System Health Check Subscription	Yes	No	No	No
Additional Services for Qualifying Sites	Customer sites meeting an annual SunSpectrum contract minimum (approximately $160,000 USD) can receive additional services including the creation of a personalized support plan, periodic support reviews, patch assessments and educational services. For local qualification criteria, visit sun.com/service/support/localinfo.html			

- Availability of specific features, coverage hours and response times may vary by location or product.
- Response times are determined by customer-defined priority. The response times shown are for service requests designated by the customer as "Priority 1."
- To receive the best support, Sun recommends that customers install Sun Net Connect software on SPARC®-based systems. This software creates a secure, customer-controlled link to the Sun Solution Center which helps enable expedited Solaris OS troubleshooting, remote diagnostics, and a number of customer-enabled alerting and reporting functions.

Warranty Upgrade to SunSpectrum Service

The following table includes the part numbers and descriptions for the warranty upgrades to SunSpectrum programs for the Sun Fire T2000 servers.

Part Number	Description
Eight Core Server Upgrades	
W9D-T2000-8-1P	1-year upgrade to SunSpectrum Platinum℠ program for Sun Fire T2000 8-core server
W9D-T2000-8-24-1G	1-year upgrade to SunSpectrum Gold℠ program 24x7 for Sun Fire T2000 8-core server
W9D-T2000-8-1G	1-year upgrade to SunSpectrum Gold for Sun Fire T2000 8-core server
W9D-T2000-8-1S	1-year upgrade to SunSpectrum Silver℠ program for Sun Fire T2000 8-core server
W9D-T2000-8-2P	2-year upgrade to SunSpectrum Platinum for Sun Fire T2000 8-core server
W9D-T2000-8-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 8-core server
W9D-T2000-8-2G	2-year upgrade to SunSpectrum Gold for Sun Fire T2000 8-core server
W9D-T2000-8-2S	2-year upgrade to SunSpectrum Silver for Sun Fire T2000 8-core server
W9D-T2000-8-3P	3-year upgrade to SunSpectrum Platinum for Sun Fire T2000 8-core server
W9D-T2000-8-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 8-core server
W9D-T2000-8-3G	3-year upgrade to SunSpectrum Gold for Sun Fire T2000 8-core server

Part Number	Description
W9D-T2000-8-3S	3-year upgrade to SunSpectrum Silver for Sun Fire T2000 8-core server
Six Core Server Upgrades	
W9D-T2000-6-1P	1-year upgrade to SunSpectrum Platinum for Sun Fire T2000 6-core server
W9D-T2000-6-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 6-core server
W9D-T2000-6-1G	1-year upgrade to SunSpectrum Gold for Sun Fire T2000 6-core server
W9D-T2000-6-1S	1-year upgrade to SunSpectrum Silver for Sun Fire T2000 6-core server
W9D-T2000-6-2P	2-year upgrade to SunSpectrum Platinum for Sun Fire T2000 6-core server
W9D-T2000-6-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 6-core server
W9D-T2000-6-2G	2-year upgrade to SunSpectrum Gold for Sun Fire T2000 6-core server
W9D-T2000-6-2S	2-year upgrade to SunSpectrum Silver for Sun Fire T2000 6-core server
W9D-T2000-6-3P	3-year upgrade to SunSpectrum Platinum for Sun Fire T2000 6-core server
W9D-T2000-6-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 6-core server
W9D-T2000-6-3G	3-year upgrade to SunSpectrum Gold for Sun Fire T2000 6-core server
W9D-T2000-6-3S	3-year upgrade to SunSpectrum Silver for Sun Fire T2000 6-core server
Four Core Server Upgrades	
W9D-T2000-4-1P	1-year upgrade to SunSpectrum Platinum for Sun Fire T2000 4-core server
W9D-T2000-4-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 4-core server
W9D-T2000-4-1G	1-year upgrade to SunSpectrum Gold for Sun Fire T2000 4-core server
W9D-T2000-4-1S	1-year upgrade to SunSpectrum Silver for Sun Fire T2000 4-core server
W9D-T2000-4-2P	2-year upgrade to SunSpectrum Platinum for Sun Fire T2000 4-core server
W9D-T2000-4-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 4-core server
W9D-T2000-4-2G	2-year upgrade to SunSpectrum Gold for Sun Fire T2000 4-core server
W9D-T2000-4-2S	2-year upgrade to SunSpectrum Silver for Sun Fire T2000 4-core server
W9D-T2000-4-3P	3-year upgrade to SunSpectrum Platinum for Sun Fire T2000 4-core server
W9D-T2000-4-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun Fire T2000 4-core server
W9D-T2000-4-3G	3-year upgrade to SunSpectrum Gold for Sun Fire T2000 4-core server
W9D-T2000-4-3S	3-year upgrade to SunSpectrum Silver for Sun Fire T2000 4-core server

Sun Software Support Services

Sun Software Standard Support

The Sun Software Standard Support offering provides customers with a comprehensive support plan. Features include:

- Extended local business hours (M-F, 12 hours) for telephone and online support
- Four business hour response on Priority 1 (Urgent) requests
- Two authorized contacts
- Online incident submission and tracking

- Software updates and patches
- Access to online self-solve resources

Sun Software Premium Support

The Sun Software Premium Support offering is designed for critical environments where high availability is a priority and round-the-clock support is a customer requirement. In addition to all of the features of the Standard support level, this level of service offers:

- 24x7 coverage with live call transfer for Priority 1 (Urgent) requests
- Sun Vendor Integration Program (SunVIP℠ Program)
- Three authorized contacts per 8-hour shift

Optional Services

Both the Standard and Premium offerings give customers the option to purchase the following to enhance their service plans:

- Dedicated or Assigned Service Account Manager (SAM)
- Dedicated Technical Support Engineer (TSE)
- Additional authorized contacts

Post Warranty Support for Sun Fire T2000 Servers

The following services are available for post warranty support:

- SunSpectrum Platinum program
- SunSpectrum Gold program 24x7 Onsite
- SunSpectrum Gold program
- SunSpectrum Silver program

Installation Service for Sun T2000 Servers

Sun's exceptional support for server installation is also available for the Sun Fire T2000 server. This service can be purchased at the time of the server sale. Use the following part numbers to order the installation service.

Part Number	Description
EIS-WGS-E	Install Workgroup Server
ESI-WGS-E-AH	Install Workgroup Server-AH
EIS-WGS-5-E	Install 5 Workgroup Servers
ESI-WGS-5-E-AH	Install 5 Workgroup Servers-AH
EIS-WGS-10-E	Install 10 Workgroup Servers
ESI-WGS-10-E-AH	Install 10 Workgroup Servers - AH

For additional information about the server installation service see:

```
http://www.sun.com/service/support/install/entrylevel-server.html
http://sunweb.germany/EIS/Web/index.html
```

The 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.

For more information on the above support offerings, visit:

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

Education and Learning Solutions

A number of courses are available for learning more about the Sun Fire T2000 server, as listed below:

- For customer audiences – a package, the PK-VC-ES-5088, which includes the following courseware:
  - Sun Fire T2000 Administration – System Overview, Features and Architecture, WET-5088 (This course is pre-work for the live virtual classroom (LVC) courses listed below.)
  - Sun Fire T2000 Administration – System Overview, Features and Architecture Assessment, WGS-PREX-5088
  - Sun Fire T2000 System Overview (LVC 1) – Hardware Installation and Service Processor, VC-ES-346
  - Sun Fire T2000 System Overview (LVC 1) – Hardware Installation and Service Processor, WGS-PREX-346
  - Sun Fire T2000 System Overview (LVC 2) – Software Installation, Configuration, and Basic Tuning, VC-ES-347
  - Sun Fire T2000 System Overview (LVC 2) – Software Installation, Configuration, and Basic Tuning Assessment, WGS-PREX-347
  - Sun Fire T2000 System Overview (LVC 3) – Diagnostics and Troubleshooting, VC-ES-348
  - Sun Fire T2000 System Overview (LVC 3) – Diagnostics and Troubleshooting Assessment, WGS-PREX-348
- For Sun Services audiences:
  - Sun Fire T2000 Server Administration and Troubleshooting, WZT-SSG-5088
  - Sun Fire T2000 Server Administration and Troubleshooting Assessment, WXI-SSG-5088
  - Sun Fire T2000 Server Mobile Lab, IES-230
  - Sun Fire T2000 Server Remote Labs, no part number for this component, the remote lab is available through the WZT-SSG-5088 course.

The Web Learning Center's Web-based training is available for internal audiences (FEs, SSEs, Solution Center TSEs), to Partners (OEM FEs, Partner FEs), and to customer support engineers. The course content includes:

The course content includes information on installing, configuring, diagnosing, and repairing the Sun Fire T2000 server. After going through the complete training program, students should be able to:

- Describe the Sun Fire T2000 server
- Describe the system architecture
- Locate and describe major system components
- Perform FRU removal and replacement procedures
- Install and configure server-specific packages
- Troubleshoot server-related errors and problems

Prerequisites for these courses include either prior experience with maintaining Sun hardware or the completion of the following courses:

- Solaris Essentials for System Maintainers (SM-101)
- Solaris System Administration II
- SPARC Desktop System Maintenance (SM-210)

Solaris Operating System Courseware and Certification

Sun offers flexible training options for the Solaris Operating System ranging from individual courses to certifications. Sun provides students with the knowledge to successfully install, manage, and troubleshoot the Solaris Operating System.

Sun Server Skills Package

Sun Skills Packages are prepackaged training solutions which contain the recommended courseware that will deliver the skills needed to effectively manage and optimize the customer's Sun Fire T2000 servers in their computing environment. Once a skills package order has been received, an education manager will contact the customer to develop a tailored training program. Contact a local Sun Education representative for details on availability and pricing of these learning solutions.

Security Courseware

To ensure the data stored on a Sun server is implemented and maintained in a secure environment, Sun training helps enterprises understand how to develop and implement solid security strategies to protect their critical data. Sun's security courses listed below teach corporations how to deploy and manage Sun security products for maximum protection of the massive amounts of corporate data which will reside on their Sun server system.

Education Consulting Services

Education Consulting Services allows customers to make the most out of training and provide optimal return on total IT investment by assessing requirements, delivering solutions, and measuring results. And, customers can bridge the gap between training and organizational goals by aligning IT structure, people, and skills with business objectives. Sun's Education Consulting Services help companies change the way

learning takes place by creating custom training solutions that allow people to develop the right skills at the right time.

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

Professional Services

Architecture Services

Sun's Architecture Services assist customers in identifying new IT solutions from concept, design, and deployment that are built against the customer's long-term technology strategy and architected for sustained business growth.

Architecture Services are comprised of an architecture workshop, assessment, and roadmap services.

- Architecture Workshop emphasizes the importance of building architectures with service-level requirements such as reliability, availability, scalability, and security. It 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 datacenter 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 of the customer's architecture.

SunReady℠ Availability Assessment Service (SRAA)

The SunReady℠ Availability Assessment (SRAA) Service assesses the ability of a customer's IT infrastructure and organization to sustain appropriate access, performance, function, and service levels within limits and expectations defined by the customer and their end users. This service can be applied to a specific environment or business application. Sun's service consultants conduct a comprehensive review of the effectiveness of the customer's technical architecture and operational environment in meeting its availability goals for a particular application environment.

The SRAA helps customers determine their IT infrastructure's ability to meet its service level commitments to end users. It also prioritizes the gaps and risks to improve performance. The SRAA process includes the following:

- A gap analysis that details the IT infrastructure's ability to effectively and efficiently deliver the required service levels for the target application environment.
- A scorecard detailing the strengths and areas of risk followed by a recommended action plan. The scorecard is based upon the gap analysis conducted during the review.
- Recommendations and action plan from SRAA to identify and prioritize risk factors, set appropriate service level expectations for the target application environment, and justify future IT investment for the datacenter.

Performance and Capacity Planning Services

Sun's highly trained consultants can evaluate customers' server environments and develop a plan to help meet their current and future business needs. With the Sun Performance Analysis and Capacity Planning Services, customers can fully utilize their current assets. By understanding their current system performance and capacity needs, customers can become better informed when making future budgetary decisions related to hardware needs. These services cover server inventory and configuration,

performance assessment, resource consumption and future growth potential, system monitoring, and hardware alternatives to accommodate future needs.

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.

Storage Services

Sun's Storage Services can help customers to quickly determine storage issues that may be impacting their ability to meet Service Level Agreements or other goals. Sun can help customers improve total storage utilization across the enterprise as well as their ability to share data between applications.

Migration Services

Sun's migration services is focused on addressing two of the most critical business issues companies face today:

- Total cost of ownership
- Investment protection

Sun's singular focus on SPARC®/Solaris OS technology from single processor to large-scale datacenter environments offers customers a unique opportunity to improve the reliability, availability, scalability, and serviceability of their datacenters, and avoid the daunting prospect of a future "forklift upgrade."

Sun consultants can evaluate the best option for the customer's business for migrating applications, data or both to a new Sun platform.

Glossary

Chipkill	A technology developed by IBM for situations that demand high availability. It allows a system (usually CPU or motherboard) to detect problems with the computer's memory and selectively disable the problematic DIMMS.
CMT	Chip Multithreaded. A ground-breaking technology that speeds processing by dedicating silicon and threads to network tasks. Compute, packet processing, and switching tasks run concurrently, not sequentially as in single threaded systems, resulting in dramatic increases in performance and system utilization.
eFUSE	A technology that combines software algorithms and microscopic electrical fuses to produce chips that can regulate and adapt their own actions in response to changing conditions and system demands.
FC-AL	Fibre Channel arbitrated loop, a loop topology used with Fibre Channel.
PCI-E	Peripheral Component Interconnect Express. Formerly known as third-generation I/O, this implementation of the PCI computer bus that uses existing PCI programming concepts and communication standards, but bases it on a much faster serial communications system.
PCI-X	Peripheral Component Interconnect Extended. A computer bus technology that increases the speed that data can move within a computer from 66 MHz to 133 MHz.
SAS	Serial Attached SCSI. The successor to the original SCSI technology with the ability to address up to 16,256 devices per port. It also has a more reliable point-to-point serial connection at speeds of up to 3 Gbps.

Materials Abstract

All materials will be available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
• *Sun Fire™ T2000 Server, Just the Facts*	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	456965
• *Sun Fire Servers with CoolThreads Technology Customer Presentation (including technical content)*	Customer Presentation	Sales Tool	SunWIN, Reseller Web	456808
• *Sun Fire T2000 Server Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web, COMAC	456805
• *SWaP Datasheet*	Data Sheet	Sales Tool	SunWIN	457127
• *Sun Fire Servers with CoolThreads Technology Pocket Facts*	Pocket Facts	Sales Tool	SunWIN	456807
White Papers				
• *Throughput Computing Changing the Economics of the Datacenter with Revolutionary SPARC® Technology*	White Paper	Sales Tool	SunWIN	457125
• *CMT Platform*	White Paper	Sales Tool	SunWIN	456814
• *Developing Scalable Applications for the UltraSPARC T1 Processor: Reaping the Benefits of Chip Multithreading (CMT) Technology*	White Paper	Sales Tool	SunWIN	456815
Beat Sheets				
• *IBM Beatsheet: Beating IBM x346, p5_510 and e326 with the Sun Fire T2000 Server*	Competitive Beat Sheet	Sales Tool	SunWIN	456812
• *IBM Beatsheet: Beating IBM x366, p5_550 and OpenPOWER 720 with the Sun Fire T2000 Server*	Competitive Beat Sheet	Sales Tool	SunWIN	456813
• *HP Beatsheet: Beating HP 2RU Servers with the Sun Fire T2000 Server*	Competitive Beat Sheet	Sales Tool	SunWIN	456809
• *HP Beatsheet: Beating HP 4RU Servers with the Sun Fire T2000 Server*	Competitive Beat Sheet	Sales Tool	SunWIN	456810
• *Dell Beatsheet: Beating Dell with the Sun Fire T2000 Server*	Competitive Beat Sheet	Sales Tool	SunWIN	456811

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
External Web Sites • *General information on the Sun Fire T2000 server*	`www.sun.com/servers/coolthreads/sunfiret2000`			