Sun Fire™ V480 Server

Just the Facts

SunWIN token #333632

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Figure 1: Sun Fire™ V480 Server, front view

Introduction

Exceptional Processing Power in a Compact Footprint

The Sun Fire™ V480 server is the latest member of Sun's powerful line of servers for enterprise network computing based on the UltraSPARC™ processor technology. This next-generation workgroup server brings multiprocessing power, Fibre Channel disk drives, and the industry-standard Peripheral Component Interconnect (PCI) I/O bus to a highly modular, rack optimized 5RU (rack unit) design. A standard 72" height Sun StorEdge rack contains 36 usable rack units and may support up to seven(depending upon configuration) Sun Fire™ V480 servers.

The Sun Fire™ V480 server gives customers the flexibility to scale their processing needs without wasting precious space, making it an ideal server for service providers, financial institutions, compute-intensive environments, or anyone who needs strong processing power in a small footprint. Furthermore, Sun's commitment to high-performance computing means the Sun Fire™ V480 server delivers increasing levels of outstanding performance that users expect from Sun servers, while at the same time preserving 100 percent binary compatibility with application software.

The Sun Fire™ V480 Server may be configured with two or four processors running Solaris™ 8. Processors run at 900 MHz and must be added in pairs with 1 GB to 8 GB of local memory per processor. All memory is accessible by any processor. The Sun Fire™ V480 server supports up to 32 GB of main memory, two internal, 36-GB or 73-GB Fibre Channel hard drives, and six PCI slots connected to two high-performance PCI I/O busses. The Sun Fire™ V480 server is designed to satisfy any application or enterprise where compute density at an affordable price is a high priority.

The Sun Fireplane™ Interconnect is a 9.6 GB/s cross-bar switch which interconnects processors and local memory with the I/O subsystem. This interconnect/bus was designed to minimize latency and provide maximum throughput, regardless whether the workload is compute intensive, I/O intensive or a combination thereof.

The I/O subsystem throughput is based upon industry standard PCI buses and interface modules which provide up to 1.2 GB/s of I/O. On-board/integrated controllers include a Fibre Channel disk controller, two 10/100/1000 Mb/s Ethernet interfaces, an internal IDE bus for the DVD, a RJ-45 serial port and two USB ports.

The Remote System Control module provides remote power cycling, monitoring and administration capabilities independent of the Solaris operating environment. With the emphasis on availability and reliability through its feature set, the Sun Fire™ V480 Server is a prudent choice for many mission critical applications.

The Sun Fire V480 server continues Sun's drive to deliver industry-standard PCI I/O, enabling access to hundreds of expansion and networking options. In addition, two of the Sun Fire V480 server PCI slots are 66MHz, ideal for high-performance networking or connectivity to external storage. Some key applications are:

- E-mail services, web serving, Internet gateway, search engines, and encryption
- DNS, HTTP, and FTP services
- Financial services applications
- On-line transaction processing (OLTP) and electronic commerce (Netgravity, Broadvision, and Lawson)
- Simulation and compute farms\(EDA)

Product Family Placement

The Sun Fire™ V480 server is an advanced member of the current workgroup server product family, which scales from the low-cost, high-performance two-way Sun Fire™ 280R, Sun Enterprise™ 220R, and 250 servers, and up to the four-way Sun Enterprise 420R and Sun Enterprise™ 450 servers and finally the eight-way Sun Fire V880.
These systems have several things in common, including:

- The UltraSPARC processor family
- 100 percent binary compatibility from the low end to the high end
- Scalable from the low-end uniprocessor systems to the 106-way Sun Fire 15K server
- Modular, easy-to-swap components

Server	*Target Users and Markets*
Sun Enterprise 220R (2 processor UltraSPARC II)	The Sun Enterprise 220R (up to two 450 MHz UltraSPARC II microprocessors) is designed for customers who require a rackmountable solution at an affordable price. The target customers for this server are internet, application, and network service providers, along with financial services, compute farms, or any customer running demanding applications in space-constrained environments.
Sun Enterprise 250 (2 processor UltraSPARC II)	Designed for customers who are looking for the RAS features of a high end system, but in an affordable tower package that is also rackmountable. The Sun Enterprise Server 250 server is built to handle the most demanding business critical applications. With its Remote System Control, users can monitor the system 24x7 from anywhere they have access via a serial interface, network connection or a dial-up modem.
Sun Enterprise 420R (4 processor UltraSPARC II)	The Sun Enterprise 420R server is designed for customers who require a rack solution but also require growth up to four microprocessors. With up to four 450 MHz UltraSPARC II processors each with 4 MB of external cache, the Sun Enterprise 420R server offers exceptional processing power in a compact, flexible server package. The target customers for this server are internet, application, and network service providers, along with financial services, compute farms, or customers running demanding applications in space-constrained environments.
Sun Enterprise 450 (4 processor UltraSPARC II)	The Sun Enterprise 450 system's blend of computing power, storage capacity, disk I/O throughput, and network I/O performance make it perfect for front ending databases from Oracle, running email applications supporting hundreds and thousands of concurrent users, and many mission critical client server applications.
Sun Fire™ 280R Server (2 processor UltraSPARC III)	The Sun Fire™ 280R (up to two 750MHz, 900 MHz UltraSPARC III microprocessors) extends the capabilities and performance of the UltraSPARC II based, Sun Enterprise 220R. The target customers for this server remain the same, i.e. internet, application, network service providers, and financial services.
Sun Fire™ V480 Server (4 processor UltraSPARC III)	Designed to provide the ultimate compute density at an affordable price. With the 900 MHz UltraSPARC III processor with 8 MB of ECC-protected external (L2) cache and the Sun Fireplane™ Interconnect, the Sun Fire™ V480 server offers exceptional processing power in a compact (5RU) rack optimized server package. The target customers are internet, application, service providers, along with financial services, compute farms, or any customers running CPU demanding applications.
Sun Fire™ V880 Server (8 processor UltraSPARC III)	The Sun Fire V880 is a rackmountable tower that is the high-end workgroup server. This versatile, high performance and reliable server provides a growth path for today's E450 and E3500 customers who require more application scalability, higher performance, and built in availability and reliability components.

The following chart provides a comparison of the family of Sun Fire Servers.

	Sun Fire™ 280R	***Sun Fire™ V480***	***Sun Fire™ V880***
Product Positioning	Low-end Workgroup Server	Mid-size Workgroup Server	High-end Workgroup Server
Packaging	4 RU rack optimized, 27.25" Depth	5 RU rack optimized, 24" depth	Tower or rack mountable 17 R, 32.9" Depth
Typical Environment	Data Center	Data Center	Branch Office, Department or Data Center
CPUs	1 - 2	2 - 4	2 - 8
Memory (Max.)	8 GB	32 GB	32 GB
System Bus	4.8 GB/sec.	9.6 GB/sec.	9.6 GB/sec.
I/O bandwidth	1.2 GB/sec.	1.2 GB/sec.	1.2 GB/sec.
Internal Storage	146 GB	146 GB	436 GB with 36.4 GB drives
Removable Media	1 slot for a 5.25" rem. media device	DVD ROM only	3 slots for up to three 5.25" rem. media devices
PCI or cPCI slots: @66 MHz @33 MHz	4 (no cPCI) 1 3	6 (no cPCI) 2 4	9 (no cPCI) 2 7
Integrated Network	10/100 Ethernet	Two 10/100/1000 Ethernet	10/100 and 1 Gbit Ethernet
Input Power (110/240 VAC)	2 Power cords (N+1)	2 Power cords (N+1)	3 Power cords (N+1)
RAS Features	Hot swap disks, power supplies, RSC	Hot pluggable disks, hot swap power supplies, RSC, multipathing to storage and networks, LED indicators for power, fans, and disks	Hot pluggable disks, PCI slots, fans, hot swap power supplies, RSC, multipathing to storage and networks, LED indicators for power, fans, and disks
Warranty	3 year, on-site, 2nd day service	3 year, on-site, 2nd day service	3 year, on-site, 2nd day service
Minimum O/S	Solaris 8 1/01	Solaris 8 2/02	Solaris 8 7/01

Sun Fire™ V480 Server Key Features and Benefits

Features	Benefits
• Up to four 900 MHz UltraSPARC™ III processors, each with 8 MB of ECC-protected external (L2) cache and up to 8 GB of ECC (error correcting code) memory	• UltraSPARC™ III technology offers better scalability and enhanced performance as compared to previous generations of processors
• Space-efficient, rack-optimized 5RU and 24 inch depth enclosure	• This enclosure offers high compute density giving customers maximum value per rack unit.
• N+1 power, with separate power cords	• A fully configured system can operate on one power supply; the second power supply is for redundancy only. Enhances system availability by masking an individual AC circuit failure.
• Dual 10/100/1000 Mb/s Ethernet interfaces and up to 32GB of memory	• Excellent I/O performance and memory capacity makes the Sun Fire V480 server an excellent web, e-commerce, or EDA server.
• Multipathing to external storage and networks, optional	• Higher availability to data and networks as well as possibly higher bandwidth/throughput. Fewer disruptions for users means more effective processing.
• Sun Fireplane Interconnect operating at 9.6 GB/sec.	• High bandwidth interconnect ensures scalability with minimal contention and latency between processing and I/O subsystems
• 6 PCI slots (2 at 66 MHz, 64 bit wide and 4 at 33 MHz, 64 bit wide) across two PCI buses	• Allows users to configure systems according to their needs with additional network, storage, graphics adapters, etc. Eliminates contention among peripheral controllers thereby maximizing processing capabilities.
• Hot plug disks and hot swap power supplies	• On-line maintenance and repair enhances system availability
• Diagnostics and Security	• Front and back LED's for easy quick diagnosis of system state. Physical security preventing access to enclosed hardware and preventing initiation of applications from unauthorized users.
• Automatic System Recovery (ASR)	• Monitors key components and automatically configures around failed components. Enhances availability by restoring system to operation as quickly as possible. Minimizes the need for manual intervention.
• Remote System Control (RSC)	• Monitors and reports system and component status. Allows remote management via network, serial or modem connection. Reduces the overall cost of system management.
• SunCluster	• Enhances availability. Facilitates resource sharing.
• Solaris 8	• Provides full compatibility for binary applications across the UltraSPARC product line.

Key Messages

- Rack-optimized chassis design provides modularity for flexibility, maximum system growth, and expansion potential.
  – Offers the flexibility of starting with one dual CPU module and adding a second dual CPU module later as compute needs grow.
  – Provides memory capacity up to 32 GB maximum (16 slots per module using existing 1-GB DIMMs)
  – Supports 36-GB or 73-GB drive options (supports 10,000-rpm Fibre Channel disk drives).
  – Has expanded front-access capabilities: up to two hot-plug disk drives, power switch, 5.25-inch media bay for DVD ROM, up to two hot-swap power supplies
  – Allows for high I/O expansion with three long and three short, industry-standard PCI bus slots
- High-performance UltraSPARC™ III Processors
  – 64 bit SPARC™ architecture running at 900 MHz. Extensible to take advantages of extensions to the microprocessor family.
  – 8 MB of ECC-protected external (L2) cache per processor
  – Numerous on-chip caches for enhanced performance
  – Binary compatibility with previous SPARC™ processors, thereby providing ease of migration for existing applications
- Offers 2 or 4-way multiprocessing system based upon dual processor/memory modules
  – 9.6 GB/sec., Sun™ Fireplane Interconnect (system bus)
  – Large and multiple concurrent data accesses from memory, i.e. 512 data bits per access, ECC protected.
  – Integrated FC-AL disk subsystem with capacity for two 36 GB or 73 GB disks with optional, secondary FC loop for higher bandwidth and redundancy
- Integrated Controllers
  – Integrated FC-AL disk controller, two 10/100/1000 Mb/s Ethernet ports, RJ-45 serial and two USB ports
  – Saves PCI slots for user selectable controllers
  – Cost effective, familiar to those from the PC environment
- I/O Subsystem
  – 1.2 GB/sec. throughput capability
  – All I/O is distributed across four PCI busses. The PCI cards are distributed across two independent PCI buses to minimize contention among controllers and maximize processing capabilities
  – PCI based controllers provide industry standard, economical I/O adapters
- Solaris 8 Operating Environment
  – Utilizing the multiprocessor capabilities of the Sun Fire™ V480 server, a company can leverage the performance capabilities of Solaris Operating Environment's multithreaded application base.
  – As a result of Solaris 8 all previous applications developed and running on Solaris 2.6 and Solaris 7 can be run without recompiling.
  – Implementing Sun's UltraSPARC III processor, memory, and Fireplane Interconnect architecture, a company will notice the significant improvement in application performance and user productivity.
  – Solaris 8 supports superior Reliability/Availability/Serviceability (RAS) for secure, large-scale, e-commerce applications.
  – Binary compatibility with previous releases

Availability of Product

Volume shipments for the Sun Fire™ V480 Server are scheduled for Q2CY2002.

Target Users

The Sun Fire V480 server is a powerful four-way server that provides users the ability to horizontally scale their environment in a cost-effective manner. The Sun Fire V480 server is designed for users who require raw compute power and extensive RAS features.

The Sun Fire™ V480 Server was designed as a general purpose workgroup server capable of meeting the needs of a wide range of industry applications, users and environments. This two or four-way multiprocessor, combined with a 9.6 GB/sec. interconnect and 32GB of memory capability, insures scalability for compute-intensive applications. The integrated, Fibre Channel disk subsystem, two integrated 10/100/1000 Mb/s Ethernet ports and six available PCI slots provide 1.2 GB/sec. of I/O throughput that can satisfy I/O demanding applications such as EDA and web serving.

Target Industries

Target Markets	Applications
Financial Services • Insurance • Stock and commodity traders • Banking	• Equity trading, OLTP, on-line banking
Service Providers • Internet Service Providers • Network Providers • Portals • Commerce Providers • Application Service Providers	All aspects of internet capabilities including access, web hosting, and supporting on-line merchants and service providers, i.e. order processing, scheduling, call center tracking, etc.
Manufacturing • Discrete manufacturing • Process manufacturing	IT, Finance and Accounting, Human Resources, ERP/MRP solutions, Supply Chain management, Engineering, Sales & Marketing, Customer Service, and Electronic Commerce
Telecommunications and Internet Services	Internet HTTP, email, FTP, directory servers, and electronic commerce and message switching
Retail	In-store electronic retail systems, merchandising systems, inventory management, distribution, and electronic commerce, CRM
Government • City/municipal • State/provincial • Federal/national	Branch office systems, departmental servers, repositories for public works program documents and engineering plans, financial records
Healthcare • Hospitals and Clinics • HMOs and Managed Care Providers • Medical equipment OEMs	Satellite office servers, patient records, billing, claims processing, medical imaging systems, picture archival, and communications systems
Education	Registration and student records, financial aid administration, academic research
Scientific/Research/Analysis (Compute Farms) • EDA • MCAD	High performance applications, MCAD, EDA, CFD (computational fluid dynamics), simulation and modeling, statistical analysis, scientific research, departmental repositories

Target Applications

Applications	Key Features to Highlight
Database or Digital Media Management	• Outstanding storage connectivity with PCI card. • Exceptional network connectivity and I/O bandwidth
Distributed Database Access	• Outstanding network connectivity, computing power, network I/O performance, total system throughput • Reliability and availability features
Online Transaction Processing (OLTP)	• Balanced computational and I/O capacity • Storage I/O and Network I/O performance • Robust development environment • Scalable operating system
E-mail Web Mail Services Internet Gateway	• Connectivity with heterogeneous systems and networks • Exceptional scalable multithread performance • Exceptional total system throughput
Decision Support • Online analytical processing	• Scalable computing power • Storage connectivity and I/O performance
Groupware, Collaboration • Lotus™ Notes	• Enterprise networking and PC interoperability • Supports hundreds of UNIX or PC clients
Internet • Internet Providers • Application Service Providers	• Secure, reliable and cost effective • Sun is the leading internet provider, majority of the servers on the Internet are Sun servers
Inter-operability	• PC Netlink
Compute Intensive • ECAD • CFD • Simulations	• Compute density – 5RU, 24" depth rack based system • Large memory with low access latency • High system bandwidth • Scalability • Capable of 8GB of memory per processor

Market Value Proposition

- The chassis design with its low profile(5 RU) and shallow depth (24") provides maximum compute density, a company can better utilize its floor and rack space.
- Utilizing Solaris 8 previous applications developed and running on Solaris 2.6 and Solaris 7 can be run without recompiling.
- Allows for significant I/O expansion with three long and three short, industry-standard PCI bus slots
- As a result of Sun's I/O networking, a company will be able to have faster networking throughput that will increase application performance and user productivity.
- UltraSPARC III extends the processing capabilities beyond previous generations on an individual processor basis. As a result of the scalability and flexibility of the UltraSPARC™ architecture, a company can better protect its investment in hardware and software.
- The Sun Fireplane™ Interconnect insures scalability and minimal latency for applications and workloads across the range of 2 to 4-way multiprocessing systems.
- The integrated dual 10/100/1000 Mb/s Ethernet ports provide the most commonly used interfaces at the lowest cost without consuming valuable PCI slots.
- Hot pluggable/swappable components such as disks and power supplies help maximize system availability by allowing maintenance and upgrades to occur during normal operations.
- Remote System Control (RSC) offers sophisticated GUI and command line based remote monitoring, diagnosis and console access via network/Ethernet, serial port or modem connections.
- Automatic System Recovery (ASR) minimizes the impact of a hard failure by identifying and isolating failed components and automatically restoring service to users. (e.g. CPU module)
- The Sun Fire™ V480 Server is binary compatible with existing Sun servers.
- Supports Sun™ Cluster 3.0.

UltraSPARC™ III Microprocessors

The Sun Fire™ V480 server is based upon Sun's third generation of 64-bit microprocessor and the SPARC™ V9 UltraSPARC™ architecture. This architecture will enable the performance of future microprocessors with operating frequencies in excess of 1 GHz to scale proportionately.

Some of the more prominent features of the UltraSPARC III microprocessors which provide enhanced performance and scalability include:

- High clock rate with minimal latencies

- A deep pipeline
  Generally the deeper the pipeline, the higher the penalty incurred from an incorrect branch prediction. Instructions being processed must be flushed, a new set of instructions must be accessed and started through the sequence of processing. The UltraSPARC III has a 90+% branch prediction rate using a 16K entry prediction RAM and branch correlation algorithm. In addition, there is a small amount of alternate path buffering. If a predicted branch is not taken, the buffering makes a few instructions immediately available, thereby minimizing the penalty.

- On-chip memory controller
  - Capable of handling numerous simultaneous accesses with out-of-order completion
  - The main memory bus is 512 bits wide and has a peak throughput of 3.2 GB/sec.

- On-chip L2 cache controller with on-chip tag RAM
  To reduce latency to the 8 Mbyte L2 (external) cache, both the L2 cache controller and tag RAM reside on the processor. Since the L2 tag RAM is operating at processor speeds and not the slower L2 cache speed, cache misses are detected earlier and memory fetch operations may be initiated sooner.

- 32 Kbyte, 4-way associative instruction cache

- 64 Kbyte, 4-way associative data cache

- Instruction prefetch into a 2 KB instruction prefetch buffer

- 4 instructions fetched per cycle

- 2 KB fully associative write cache
- This on-chip write cache eliminates up to 90% of the store activity to the L2 (external) cache. As a secondary benefit, cache coherency operations are accelerated for both the individual processor and the multiprocessor environment.

  Since the on-chip L2 cache tags and write cache are both on chip, all operations are managed at chip speed, no external operations are required. External processors need make a single inquiry for cache coherency.

- Arithmetic and floating point optimizations
  - Up to two floating point loads issued per cycle
  - Three floating point units (one add/subtract, one multiply, one divide)
  - Low latency floating point divider
  - Two graphics units (one ALU, one multiply)

- Address Translation Buffer
  These table entries enhance the efficiency of virtual to physical memory address translation. In the UltraSPARC III processor, the size of the address translation buffer has been geared for large databases such as Oracle™ and Sybase™, thereby offering an optimized database engine.

- Visual Instruction Set (VIS)
  The VIS is a set of extensions to the core instructions which accelerates multimedia, image processing, networking applications and Java™ performance. These instructions can also accelerate matrix operations typically found in intensive engineering applications.

Sun Fireplane™ Interconnect (System Bus)

The Sun Fireplane™ Interconnect (system bus) is a crossbar switch with four ports, one for each of the two dual processor/memory modules and two for the I/O subsystem, i.e. one for each PCI bridge chip. All ports may operate simultaneously. The total aggregate bandwidth is 9.6 GB/sec. of sustained throughput.

The system bus is located on the centerplane and on the CPU/memory module.

FC-AL Storage Controller

The Sun Fire V480 Server provides an internal storage subsystem with an integrated Fibre Channel Arbitrated Loop (FC-AL) controller supporting a maximum of two 1.0", 10,000 RPM, 36 or 73 GB disks.

Fibre Channel is an industry standard, high-speed, serial data transfer interface. In addition to strong performance characteristics, FC-AL provides powerful networking capabilities that allow switches and hubs to enhance availability and bandwidth between systems and storage controllers.

FC-AL is also a high-reliability interconnect. The interface is robust enough to allow multiple devices to be removed from the loop at once without interruption to on-going services.

FC-AL has the following characteristics:

- Industry standard: FC-AL development effort is part of the ANSI/ISO accredited SCSI-3 standard, helping to avoid the creation of non-conforming, incompatible implementations.
- Broadly supported: All major system and storage vendors are implementing FC-AL, thereby insuring a wide variety of choices and inter-operability.
- Facilitates failover: Upon failure of a controller or FC loop, devices are capable of quickly disassociating from the failure and re-associating with an alternate controller available via a secondary FC loop. This features provides the capability of masking the outage from applications and users. Clearly, an alternate hardware route/path and optional software are generally required in order to provide complete transparency to users and applications.

On the Sun Fire™ V480 Server, a FC-AL controller is integrated on the centerplane. Multipathing to either the internal disks or external storage arrays may be provided by the inclusion of an optional PCI to FC-AL controller, cable, and software which masks the failure of an individual controller to the application. When both paths are operational, improved performance and throughput may also be possible.

Automatic System Recovery (ASR)

Upon a system failure, Automatic System Recovery attempts to identify and remove the failed component(s) of a system in order to restore service as quickly as possible and, to the extent possible.

The components that can be removed from a system via ASR include:

- A memory group (4 DIMMs)

  When a given bank is disabled or fails POST, that bank is not considered when the memory interleaving is calculated. In the highly unlikely event that both memory groups associated with an individual processor are disabled, the system will still attempt to boot. The processor with failed memory groups will still be able to access all available system memory.

- A dual-processor/memory module

  The failure of an individual processor will result in the removal of an entire dual-processor/memory module and the associated memory. Consequently, no recovery is possible with a two processor system. Further, this consideration would encourage relatively equal amounts of memory on all dual-processor/memory modules. Otherwise, the failure of a module with a disproportionate amount of memory would significantly diminish the total system memory capacity.

Remote System Control (RSC) and System Service Processor (SSP)

The Sun Fire™ V480 Server features a System Service Processor (SSP) and Remote System Control (RSC) software, enabling complete console access, monitoring and control from remote locations via any client device on the network, a serial line or modem.

The System Service Processor is a fully independent processor card that resides on the system I/O board. The SSP allows administrators to remotely query the status of the system, diagnose faults and initiate a system power on/off or reboot. Because it operates independently from the server, the SSP can constantly monitor a variety of conditions perform the following:

- View the server's front panel including key switch position and LEDs
- Run diagnostic tests and configure the server remotely
- Monitor and report errors including output from power-on self-test (POST) and OpenBoot Diagnostics
- Reboot, reset, power-on and power-off on demand
- Notify of server problems and enter detailed log entries of RSC events

The RSC card plugs into a dedicated slot on the system I/O board and includes integrated modem, serial and Ethernet interfaces; it does not occupy a PCI slot. The RSC firmware runs independently from the host. The RSC module uses standby power drawn from the host system. The RSC module is powered by an independent battery which operates for up to 30 minutes after a complete power failure.

The RSC hardware and software continue to run even when the server is off-line. It can send notification of hardware failures or other events to administrators via pager or e-mail.

The card provides three ports that are accessible through an opening in the rear panel of the system:

- 10 Mbps Ethernet port via an RJ45 unshielded twisted pair Ethernet (UTP) connector
- 56 Kbps modem port via an RJ11 connector
- EIA-232D serial port via an RJ45 connector

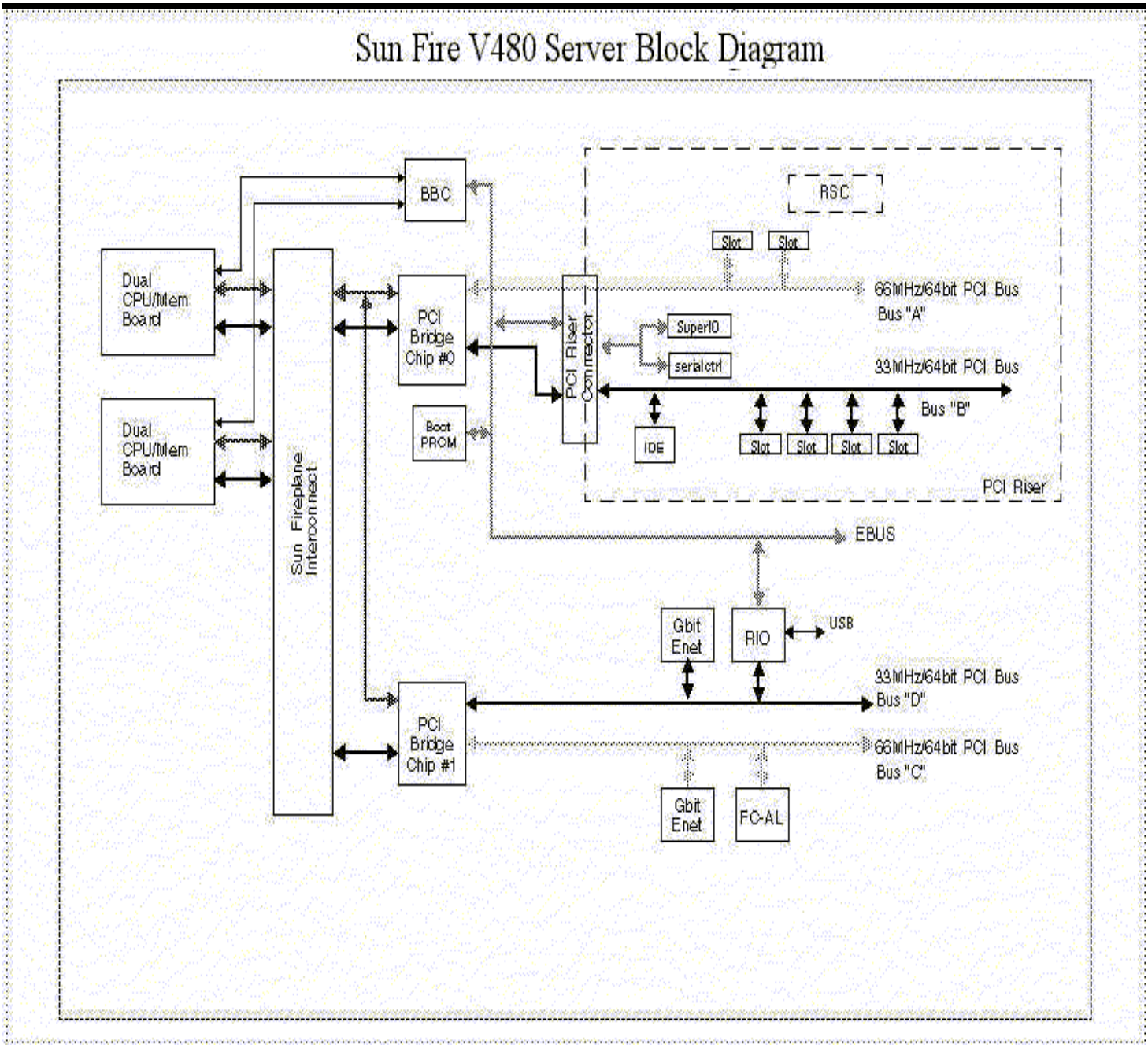


Figure 2: Sun Fire™ V480 Server, Block Diagram

Figure 3: System Components

Dual Processor/Memory Modules

The Sun Fire™ V480 server system is comprised of one or two dual-processor/memory modules which insert perpendicular to the motherboard, The minimum configuration consists of a single dual processor/memory module; the maximum configuration has two dual processor memory modules. Single processor configurations are not available, consequently, a system will always contain an even number of UltraSPARC III processors. The result will be either a two processor or a four processor system.

Each processor has an 8 MB external (L2) cache implemented with eight SRAM devices.

Memory Subsystem

Memory within the Sun Fire™ V480 Server is distributed across the dual CPU/memory modules with each processor controlling a portion of the total memory. In order to minimize latency, the memory controller is integrated on the processor chip. Latency to non-local memory is substantially less than that incurred by more traditional approaches which utilize a single, external memory controller for all accesses.

The main memory data bus provides 512 bits of data (64 bytes) and 64 bits of ECC in a single access. This size corresponds exactly to a full external cache block.

There are eight DIMM slots per processor; 16 slots per dual processor/memory module. The eight DIMM slots are arranged as two memory groups of four slots per processor. Each processor may have a different amount of memory. Configuration requirements state:

- DIMMs must be added in groups of four (no partially populated groups)
- All four DIMMs in any group must be of identical capacity
- The minimum memory configuration per dual processor/memory module is eight DIMMs, four in each memory subsystem (four per processor)

Memory interleaving is a function of the number of DIMMs and their capacity relative to the other memory groups on the dual processor/memory module. Interleaving is implemented on a 64 byte boundary to coincide with the width of the memory data bus. The level of interleaving is implemented as:

- 8 DIMMs 4-way if all DIMMs are identical;
  otherwise 2-way

- 12 DIMMs 4-way between any two groups configured identically
  2-way on each group, otherwise

- 16 DIMMs 8-way if all DIMMS are identical
  4-way between any two groups configured identically
  2-way on each group that does not match any other group.

If successive accesses alternate between two distinct logical groups, the sustainable bandwidth is 1.6 GB/sec. When the access pattern involves four logical groups, the sustainable bandwidth is 2.4 GB/sec.

The currently supported memory options are:

- 1 GB Memory Expansion (4 x 256 MB DIMMs)
- 2 GB Memory Expansion (4 x 512 MB DIMMs)
- 4 GB Memory Expansion (4 x 1 GB DIMMs),

The memory subsystem is capable of supporting up to 4 GB per memory group which would allow a total capacity of 32 GB with a 4-way system.

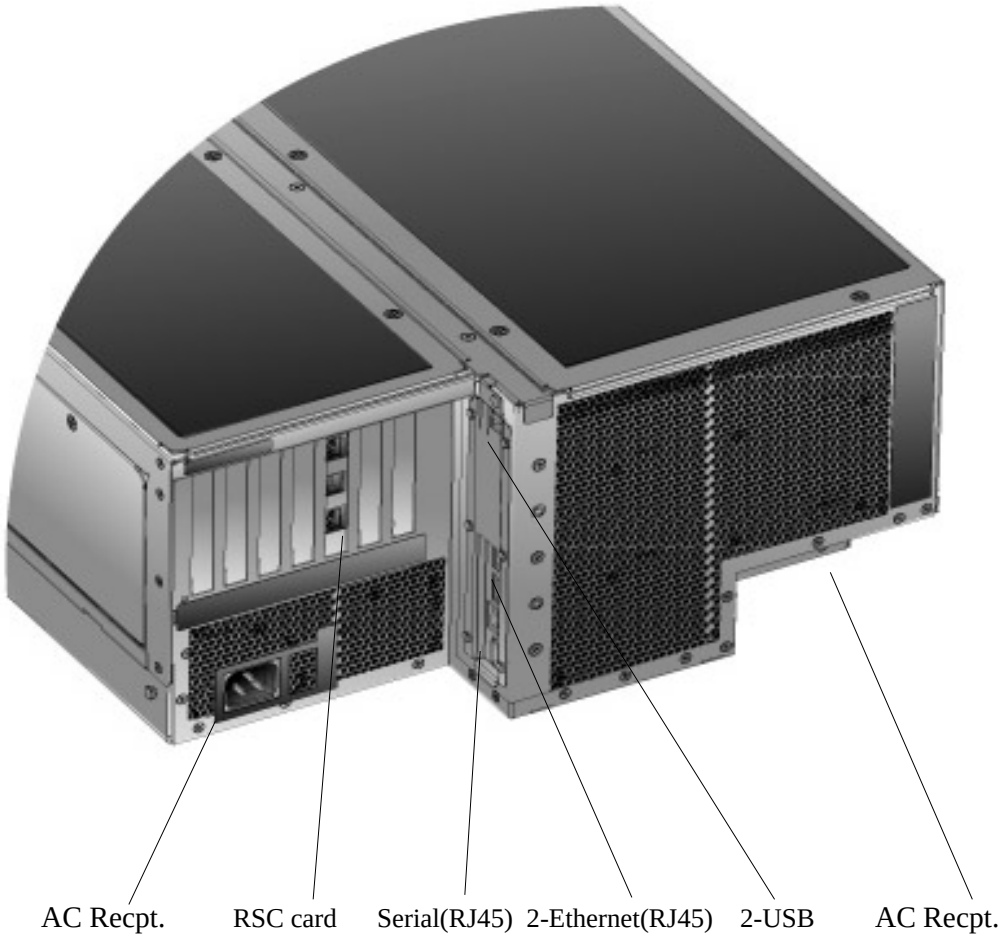


Figure 4: Chassis Rear View

I/O Subsystem Architecture

The I/O subsystem interfaces to the system bus via two PCI bridge chips, each of which controls one 66 MHz, 64 bit PCI bus and one 33 MHz, 64 bit PCI bus. One 66 MHz, 64 bit PCI bus is reserved for the integrated FC-AL and a Gbit Ethernet controller. PCI buses A and B are are connected to PCI Bridge #0; PCI buses C and D with PCI Bridge #1. (Please refer to Figure 2, Sun Fire™ V480 Server, Block Diagram.)

There are a total of six PCI slots available for user selected host bus adapters. Two slots operate at 66 MHz, 64 bits, 3.3 V; four at 33 MHz, 64 bits, 5 V. The two 66 MHz slots and one 33 MHz slot accept adapters, either 64 or 32 bits wide, and full length (12") cards. The other three 33 MHz slots accept short (7") cards.
However, if a 33 MHz adapter is inserted into either of the 66 MHz slots, it will cause that bus segment to operate at 33 MHz.
The DVD is connected via an integrated IDE controller from one of the 33 MHz PCI buses.
Sustainable throughput via the PCI bridge chip to the 66 MHz bus utilizing 64 bit wide adapters, dual masters and streaming DMA writes of at least 512 bytes in length is approx. 390 Mbytes/sec. Throughput utilizing a 33 MHz bus, dual masters and streaming DMA writes of at least 512 byes in length is approx. 252 Mbytes/sec. These figures assume no other traffic on the bus.

Figure 5: Internal Disk and Power supply Access

Internal Disk Subsystem

The internal disk subsystem is managed by an integrated Fibre Channel, Arbitrated Loop (FC-AL) disk controller and supports one or two, hot pluggable, FC-AL disks. The drives connect to a backplane which provides power, signal and data. The backplane comes with an embedded provision for an alternate, independent FC-AL loop in order to achieve a higher level of availability and potentially higher throughput to the internal disk storage. This alternate loop may be activated by the inclusion of the (X)6727A, PCI to dual FC-AL controller with an internal connector, the internal FC-AL cable - (X)9713A, and software product(s). A software product, such as Veritas™ Volume Manager with Dynamic Multipathing or Sun StorEdge Traffic Manager (MPxIO), a enhancement to Solaris 8, will mask the failure of a FC loop or controller from the application, thereby allowing uninterrupted processing. (The current release of Multipathing I/O will not provide support for the FC-AL loops upon which the boot device resides.)
The (X)6727A, PCI to dual FC-AL controller with an internal connector provides both an internal and an external connector for one loop and only an external connector for the alternate. Supported configurations preclude using both the internal and external connectors of the same loop simultaneously. In other words, the internal storage array may not be extended to include external storage. The second loop may be used independently from the usage of the first.
Currently supported disks include:

- 36 GB, 1.0", 10,000 RPM, FC-AL disk
- 73 GB, 1.0", 10,000 RPM, FC-AL disk

There are three LED status indicators associated with each hard drive:
green - Power/Activity
amber – Fault
blue - OK-to-Replace

Veritas Volume Manager Licensing

The licensing program by Veritas considers the Sun Fire V480 server as a workgroup server. The external storage to be connected to the Sun Fire V480 server may qualify it for a reduced license fee for management of the internal disks.

- A StorEdge T3 Array for the Enterprise (partner pair) includes a full Tier 2 license which is sufficient for the internal disks; no additional license is required.
  - The StorEdge Array for the Enterprise is the only storage subsystem that includes a Veritas Volume Manager Tier 2 server license. This license is sufficient to support either a workgroup or departmental server.
  - Each rack configuration ships with a single Veritas Volume Manager Tier 2 server license.

- A StorEdge A5x00 has a limited license for which an upgrade is sufficient
  - VSAS-9999-W9U9 - Upgrade to full Tier 1license on Solaris for Veritas Volume Manager to the limited license for Sun StorEdge A5X00 array

- The StorEdge T3 Array for the Workgroup, a one-array configuration, includes no license for Veritas Volume Manager.

- The StorEdge 3900 and StorEdge 6900 series products include no license for Veritas Volume Manager.

Figure 6: Control Panel

Control Panel

The control panel includes eight LED status indicators, a power button and two security keyswitches.
The same key is used for the front-panel keyswitch and for the top cover panel for access to the system internals.
Keyswitch / Pushbutton
A four-position keyswitch is provided at the front of the enclosure. The orientation of the keyswitch, and the layout and definitions of its positions, are the same as in The Sun Fire[tm] V880. The four positions and their definitions are:
OFF - system power is forced off immediately, and held off as long as the key is in this position
NORMAL - system power may be turned on or off
DIAG - like NORMAL, but diagnostics will be run after next reset
LOCKED - like NORMAL, but also inhibits: system power-on/power-off via the front-panel pushbutton, flash-update of the system firmware, and the sending of a "BREAK" from the system console.
Near the keyswitch is a momentary-contact pushbutton. The pushbutton is used to power-on and -off the system, as long as the keyswitch is in either the NORMAL or DIAG position.

Front / Rear Indicators

To enhance serviceability, the Sun Fire[tm] V480 server includes several LED status indicators located at the front and at the rear of the system. At the front and rear of the system are the three main indicators:
Green System Power - indicates that main power (48 VDC) is ON
Amber General Fault - indicates that the system hardware or software has detected a fault
White Locator - lit by software to help service personnel locate this system from among others during service procedures.
This set of three LEDs is also duplicated at the rear of the system.
The front of the system also has fault indicators for the fan trays:
amber FanTray1 Fault
amber FanTray2 Fault

At the rear of the system, each of the two Ethernet connectors includes two hardware status indicators. They are:
green - Link
amber - Activity
Each power supply includes several LED indicators. See "Power Distribution System" for more information. These status LEDs are also duplicated at the rear of the system, for each power supply.
There are also LED status indicators located on the front of ther system associated with each disk drive.

Power Distribution System

The required power is provided by 1184 watt (output) power supplies inserted into dedicated slots located at the front of the unit, along the bottom. A second power supply provides N+1 redundancy which will preclude a loss of server availability in the event of a failure of an individual power supply. The power supplies rated input power requirement is 1440 watts per supply.

Each power supply requires its own country specific, 15 Amp AC power cord. The sources of power may be on independent grids, thereby removing another potential point of failure for the system.

Each power supply provides a 48V DC output voltage. Point of load DC/DC converters regulate 48V to 3.3V, 5.0V, 12V, 1.8 V, and 1.5V. Output current is shared equally between each of the supplies via active current sharing circuitry.

Four front and rear panel LEDs on each power supply provide status information for each of the power supply bays. Each power supply has four LED status indicators:
green AC-Present
green DC-OK
amber Fault
blue OK-to-Replace

Environmental Monitoring and Control System

The environmental monitoring and control system protects the system against:

- Extreme temperatures
- Lack of adequate air flow
- Power supply problems

Monitoring and control capabilities reside at the operating system level as well as within the system's PROM firmware. Consequently, protection is assured even if the system is halted or unable to boot.

The EM&C system uses an industry standard I2C bus to monitor temperature sensors, fans, power supplies, status LEDs and the front panel keyswitch. Temperature sensors monitor ambient temperature of the system as well as that of each CPU.

The hardware and software components of the environmental monitoring and control system insure that the temperature remains within a predetermined range for safe operation. Failure to remain within that range will result in either a 'warning' or 'critical' condition with the appropriate error message sent to the system console, if present, an entry in the system log file and illumination of the system fault LED indicator on the front and rear status panel.

The system will also detect a failure of the cooling fans. In the event of a failure of any fan, the monitoring system generates an error message, activates the system fault LED indicator on the front status panel, and lights the appropriate fan fault LED.

A critical overtemperature condition will be followed by a graceful shutdown of the system.

The power subsystem is monitored in a similar manner. In the event of a problem with a power supply, an error message is displayed on the console, if present, a log file entry is made and illumination of the system fault LED indicator on the front status panel. LEDs at the front and back of each power supply will indicate the status and nature of the failure.

The Sun Fire™ V480 Server is intended to operate in a four post rack within a data center. The system is only 24" deep and will fit in Sun StorEdge cabinet and most third party 30", 32" or 36" depth four post cabinets. Data centers typically arrange equipment within racks for the most efficient use of floor space. Each Sun Fire™ V480 ships with a Four post rack kit and cable management arm.

An optional two post rack mount kit is also available, X9631A. The server is 5 rack units (RU) high and within a 36RU Sun StorEdge rack five fully populated(including PCI cards) Sun Fire™ V480 Servers may be installed. Each unit weights from 70 lbs. minimal configuration to 100 lbs. fully configured, approximately.

For servicing in a four post cabinet, slide the system forward from the rack. The two top panels open for access to the dual processor/memory modules or the I/O subsystem, including the PCI adapters. The majority of components are capable of being serviced without dismounting from the slides.

The Sun DeLorean Rack, SG-XARY030A, may be used. The Sun Serengeti Expansion Rack, SF-XCAB, may also be used. **(NOTE: SF-XCAB under review for fit and regulatory approval)**.

Other manufacturers of cabinets include, but are not limited to:

- Rittal (www.rittal.com),
- Pentair (www.pentair-ep.com),
- APW/Wrightline (www.wrightline.com)

All offer four post cabinets that are 78" (2,000 mm.) high and 32" or 36" (800 or 900 mm.) deep. None of these products have been tested and neither the companies nor the products are endorsed or supported by Sun.

Additional information may be found under:
http://workgroup.corp/sales/rackmount/rackmount_guidelines.html

Reliability, Availability, and Serviceability (RAS)

Reliability, availability and serviceability are three aspects of the design and quality of a system that contribute to continuous operation and consequently, minimize system downtime.

- Reliability

  Reliability refers to a system's ability to operate continuously without failures and to maintain data integrity. Reliability influences MTBF.

- Availability

  System availability measures the percentage of time that a system is accessible by users and is providing service.

- Serviceability

  Serviceability measures the time to restore a system to operation once a failure has occurred. Serviceability influences MTTR.

Various metrics may be applied in calculating RAS, including:

- MTBF - mean time between failures. MTBF measures system reliability and how often a system will fail. This measurement is influenced by quality, design, environmental considerations such as power and cooling and even operational errors, i.e. how well the hardware and software verifies the intention of staff.

MTTR - mean time to restore. MTTR is a measure of system maintainability and usually includes diagnostic and repair times only. Dispatch and response time of service personnel are typically not included in this calculation as this factor is dependent upon service contracts (SLAs), geographical conditions, etc. which can radically influence the measurement. Nevertheless, these times will ultimately influence availability.

Simplistically stated, Availability = MTBF / (MTBF + MTTR)

The Sun Fire™ V480 Server's reliability, availability and serviceability features include:

- Error correction and parity check for improved data integrity for memory and on internal data paths
- Internal error detection and diagnosis capability, including via an internal 'back door bus'
- Hot plug disks and hot swap power supplies.
- Easily accessible LED status indicators.
- Front panel LED display
- Remote System Control (RSC) for monitoring and administrative capability
- Automatic System Recovery (ASR) for isolation of failed components and automatic reboot capability
- Environmental monitoring and fault protection
- Watchdog timer

  This hardware device is continually reset as long as the operating system is running. In the event of a system hang, the timer will expire and force a reset/reboot. The timer must be enabled and the system rebooted in order to activate the device.

MTBF

Detailed information concerning MTBF and availability may obtained using RAStool at:

http://ram-server.eng/

Alternatively, a detailed analysis report is available at:

http://ramserver.eng/RAM/Ram_ToolSer/PROJECTS/DAKTARI/avail_analysis/daktari_availability_report.html

These documents will indicate that the system can provide extremely high levels of availability. It is important to note the method of analysis. For example, the system is fully operational without the RSC module which contains an industry standard modem. However, the characteristics of the modem do impact the overall system availability. Therefore, calculations are available with and without the RSC module included in the calculations.

MTTR

The vast majority of FRUs can be replaced in under 30 minutes by the average, trained service engineer. Those components requiring a longer time for replacement generally have a significantly higher MTBF.

The time for replacement does not include time for diagnosis.

Installation Data

Hardware Dimensions

	U.S.	Metric
Height • 5RU – Rack Based System	8.75"	222 mm
Width	17.5"	446 mm
Depth	24.0"	610 mm
Weight (minimum/maximum)	79/97 lbs.	35.83/44 kg.

Environment

All specifications below pertain to a fully configured system. All specifications apply to operation at 50Hz or 60Hz. Refers to total power input current required for both AC inlets when operating with dual power supplies or current required for a single AC inlet when operating with a single power supply.
Smaller configurations will consume less power.

Input

Nominal Frequencies 50-60 Hz

Nominal Voltage Range 100-240 VAC

Maximum Current AC RMS 10A @ 100-120 VAC

5A @ 200-240VAC

Maximum AC Power Consumption 1100W

Maximum Heat Dissipation 3751 BTU/hr

Standard Configuration Power Requirements: (Note: no PCI cards. running Sun VTS)

A37-WSPF2-04GQB, running SUNVTS:

Power at the following nominal line voltages:

120VAC, 60Hz: 479W

208VAC, 60Hz: 470W

230VAC, 50Hz: 468W

A37-WSPF4-16GQB, running SUNVTS:

Power at the following nominal line voltages:

120VAC, 60Hz: 744W

208VAC, 60Hz: 725W

230VAC, 50Hz: 720W

A37-WSPF4-32GQB, running SUNVTS:

Power at the following nominal line voltages:

120VAC, 60Hz: 768W

208VAC, 60Hz: 751W

230VAC, 50Hz: 749W

Temperature

	Fahrenheit	Celsius
Operating	41° - 95° F	5° - 35° C
Non-operating	-4° - 140° F	-20° - 60° C

Noise

In accordance with ISO 9296:

Operating acoustic noise	67 dB(A)
Idling acoustic noise	67 dB (A)

BTU/Heat-load Data

Voltage	Maximum Heat Dissaption w/PCI cards
100-120VAC	3038 BTU/hr
200-240VAC	2970 BTU/hr

Humidity (noncondensing)

Operating	20% - 80% noncondensing, 27° C max. wet bulb
Non-operating	5% - 95%

Regulatory

Meets or exceeds the following requirements

Safety	UL 60950, CSA C22.2 EN 60950 (from U.L.), TUV 60950, UL CB scheme IEC 950 (CE mark), GOST
RFI/EMI	Class A: Australia/New Zealand AS/NZ 3548, Industry Canada ICES-003, European Community EN55022/CISPR22, Japan VCCI, Taiwan CNS 13438, and US FCC 47CFR15.B.
Immunity	EN55024, i.e. EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11 IEC 61000-3-2 and IEC 61000-3-3
X-ray	U.S. DHHS 21CFR Subchapter J, PTB German X-ray Decree

System Requirements

The Sun Fire™ V480 Server requires Solaris™ 8 02/02 (SU 7) plus recommended patches, or later.

Licensing/Usage

Operating System Environment

The Sun Fire™ V480 Server qualifies under the *Free Solaris™ Binary License Program.* For only a nominal cost of media and shipping, the Solaris™ 8 operating environment may be used without paying a license fee on an unlimited number of computers with a capacity of eight or fewer CPUs.

Please refer to www.sun.com/software/solaris/binaries for more details and to register under this program.

Upgrades to Solaris 8 from Previous Versions

Solaris™ 8 2/02 (SU 7) or later is required for the Sun Fire™ V480. For customers who are running an earlier version of Solaris™, the *Solaris Application Guarantee Program* ensures that existing applications will run without modification on Solaris 8.

Please refer to www.sun.com/solaris/programs/guarantee for more details on this program.

Information in this section changes frequently please go to www.sun.com for the latest information.

System Administration

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

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

Management Function	Sun Management Tools	Standard or Licensed Separately
System installation, software installation	• Sun OpenBoot™ firmware • Solaris Web Start and Solaris Web Start Wizards™	• Standard • Standard
System configuration	• Solaris Management Console™ • Remote System Control (RSC)	• Standard • Standard
User administration	• Solaris Management Console • Remote System Control (RSC)	• Standard • Standard
Security management	• Sun Enterprise Authentication Mechanism™ • SunScreen™ Secure Net • SunScreen SPF-200	• Standard • Licensed separately • Licensed separately
Storage management	• Solstice DiskSuite™ • VERITAS Volume Manager • VERITAS File System • Sun StorEdge LibMON™ • VERITAS NetBackup • Sun StorEdge™ Instant Image	• Standard • Licensed separately • Licensed separately • Licensed separately • Licensed separately • Licensed separately
System monitoring	• Solaris Management Console • Sun Management Center (basic feature set) • Remote System Control (RSC)	• Standard • Standard • Standard
Tuning, resource, and performance management	• Solaris Resource Manager™	• Licensed separately
Fault detection and recovery	• ShowMe How™ • Power On Self Test (POST) • OpenBoot Diagnostics • SunVTS™ • Sun Management Center • Sun Cluster	• Standard • Standard • Standard • Standard • Standard • Licensed separately
Upgrade administration	• ShowMe How	• Standard
Management application development environments	• Sun Management Center Developers Environment • Solaris WBEM Services	• Licensed separately • Standard

OpenBoot Diagnostics

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

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

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

- PCI
- Ethernet
- Serial
- Keyboard/mouse

OBDiag displays detailed diagnostic and error messages on a system console, if one is attached to the system.

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

OpenBoot Firmware

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

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

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

Power On Self Test (POST)

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

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

POST displays detailed diagnostic and error messages on a local terminal, if one is attached to the system's serial port.

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

ShowMe How software is a documentation system that presents information in a highly understandable multimedia format. ShowMe How software is included in Solaris Easy Access Server package. Installation and service tutorials, as well as reference information provide users with comprehensive, easy-to-use instruction. The ShowMe How tool

streamlines installation and maintenance to help lower service costs and maximize system uptime. Some of the features of this CD-ROM distributed tool are:

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

Solaris Bandwidth Manager Software

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

Solaris Bandwidth Manager software enables customers to:

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

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

Solaris Management Console Software

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

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

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

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

- Centralized administration—current Solaris Operating Environment administration tools can be integrated and run from one location
- Centralized management—all servers on a network can be managed from a single console
- Single login—eliminates multiple logins into applications launched by Solaris Management Console software

- Instant access to administration tools by running existing Solaris Operating Environment administration tools found in Solaris Easy Access Server software

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

- DNS server configuration
- DNS client configuration
- Default router modification
- Change root password
- Network connection configuration
- Shutdown/restart computer

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

Solaris Resource Manager Software

Solaris Resource Manager 1.2 software helps you control costs and ensure that the enterprise applications your company depends on are allocated their share of available system resources. It redefines the traditional single application system model and offers a better solution by enabling you to consolidate multiple applications on a single UNIX® server or in a highly available Sun Cluster environment -- and deliver predictable service levels.

With Solaris Resource Manager software, you control server resources using methods similar to those found on expensive mainframes. Multiple users, groups, and applications can be guaranteed predictable service levels on a single server. By dynamically allocating unused CPU capacity to active users and applications, resource utilization is increased. And since you can set and enforce policies that control how resources are used, systems are easier to manage. Simply put, your enterprise makes the most of the resources it already has.

Ensures Service Availability

The challenge for IT managers today is to provide a consistent level of service to sites with large numbers of users. To accomplish this and keep costs under control you need the right tools. For example, power users, such as Wall Street traders, may occasionally need faster access to execute a complex query, while other users in the same environment have more consistent workloads. With Solaris Resource Manager software, you can allocate resources so that both groups get the responsiveness they need, when they need it.

Server Consolidation

Solaris Resource Manager achieves the long-sought goal of server consolidation. Enterprise Applications hosting multiple applications on a single system is simpler and more cost-effective than one application per system. For example, multiple ERP modules and database instances can be hosted on the same system that serves as a file and Web server. Web Site Hosting. Instead of purchasing large numbers of small servers, Internet service providers (or corporations that host their own Web sites) can locate hundreds of Web servers on a single, easy-to-maintain machine. By managing resources, each customer (or department) receives the resources that they have purchased.

Resource Utilization and Allocation

Traditionally, servers have been configured to handle average utilization of 20-30 percent, with peaks planned for 75 percent. Solaris Resource Manager, on the other hand, lets you make full use of your resources, reducing overall costs. Solaris Resource Manager software is based on the concept of the "fair-share scheduler", where CPU resources are based on shares. As users log in or out, it automatically recalculates the proportion of resources allocated to each active user. Compare that to percentage-based allocation schemes that require the system administrator to reallocate percentages every time a new user is added.

Solaris Resource Manager software can keep rogue processes from running wild and consuming all the available processing power and virtual memory. It also has the ability to vary resources based on previous usage. It remembers how long ago a particular user logged on and what resources were used, and can allocate fewer resources to a more active user, so that even low-priority users or applications receive enough resources.

Hierarchical Control

Control can be as deep or shallow as desired. For instance, you can allocate shares to a department and then divide those shares among the individual users within the department. In short, Solaris Resource Manager software gives you greater flexibility in mapping resources to groups and individuals as needed.

Policy-Based Administration

Solaris Resource Manager software lets you configure limits for fixed resources. It can control the number of processes, number of logins, and connect time. Once you set a policy, it is automatically enforced. You can easily update the configuration at any time. In fact, you can use scripts to vary allocation based on time of day.

Resource Usage Tracking

Solaris Resource Manager software provides detailed usage data that can be input through user-defined tools or scripts into resource accounting or capacity planning programs.

Complementary Controls

Solaris Resource Manager software complements the high availability features of Sun Cluster. By leveraging the power of the Solaris Operating Environment, Sun Cluster software delivers high availability in mission-critical environments, helping ensure that applications and services are available when needed. With Solaris Resource Manager software, more efficient utilization of resources helps provide predictable application performance in highly available Sun Cluster environments.

Solaris Resource Manager software augments Dynamic System Domains on the Sun Enterprise 10000 and Sun Fire[tm] servers. Domains offer the ability to provide separate instances of the OS for each application or set of applications. These domains can increase or decrease in capacity based on changes in processor load. With Solaris Resource Manager, resources can be even more finely tuned for each domain.

Solaris WBEM Services

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

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

Solaris Web Start Software

Solaris Web Start software, a key component of the Solaris Operating Environment, is an easy-to-use Java technology-based application that guides system administrators through the installation of both the Solaris Operating Environment and co-packaged application software. Solaris Web Start software makes installing the Solaris Operating Environment as simple as clicking a button. Solaris Web Start software offers the industry's first Web-based installation process, enabling all of the setup and administration to be done locally or remotely through a web browser. It also virtually eliminates the UNIX system administration normally associated with software installation and setup. As a result, Solaris Operating Environment and co-packaged software can be installed by less-experienced administrators, or administrators familiar with Microsoft Windows installations, safely and easily.

Solaris Web Start Wizards Software

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

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

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

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

Solstice CMIP Software

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

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

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

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

Solstice DiskSuite Software

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

- **Mirroring**

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

- **RAID 5**

  The RAID 5 feature in Solstice DiskSuite software provides highly available data storage at a lower cost by using less disk space than mirroring. Rather than having a single disk dedicated for parity, the parity information is distributed across all disks, thereby promoting relatively uniform usage of all disks associated with the logical unit.

- **Hot spare**

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

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

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

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

Other Solstice DiskSuite software features:

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

Sun Cluster Software

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

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

Key features of Sun Cluster software include support for Solaris 2.6 and 8 Operating Environment, up to four clustered nodes from Sun's entire line of servers, failover agents for key applications, and a unified clustering foundation for standard and parallel applications.

Highlights include the following:

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

The Sun Fire V480 server supports Sun Cluster 3.0 and includes support for the following storage arrays:

- Sun StorEdge T3
- Sun StorEdge A5100/A5200
- Sun StorEdge A1000
- Please refer to www.sun.com/software/cluster for additional information

Sun Enterprise Authentication Mechanism (SEAM) Software

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

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

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

- **Centralized authentication and management**

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

- **Strong encryption support**

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

- **Ease of use**

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

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

- **Higher availability**

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

- **Faster performance**

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

- **Multiple realms**

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

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

- **A more secure environment**

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

- **Interoperability**

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

- **Cost-effective**

Because Sun Enterprise Authentication Mechanism software is included in Solaris Easy Access Server software, it offers feature-rich security mechanisms with unlimited usage at a significantly lower cost than many third-party solutions available today. It requires fewer administrators because it is centrally managed, enabling customers to lower the cost of securing their enterprise.

- **Programmable security APIs**

  Sun Enterprise Authentication Mechanism software allows ISVs to secure their applications by Remote Procedure Call API (RPCSEC_GSS). This API is an implementation of the RPCSEC_GSS security protocol defined in Internet RFC 2203. When future security products from Sun or third-parties become available, these products can be easily plugged into the interface without requiring modifications to the application, enabling customers to adopt evolving security technologies quickly and easily. For example, if Sun developed a public-key security mechanism in the future, this mechanism would be easily accessible by any application that uses the RPCSEC-GSS interface.

Sun Management Center Software

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

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

With predictive failure reporting and comprehensive event and alarm management, Sun Management Center software warns customers of potential problems so they can solve them before they cause downtime. Sun Management Center software simplifies the management of their Sun environment, so customers can use their administration staff and technical resources more efficiently and help reduce the cost of delivering network services.

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

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

Sun Management Center software delivers everything administrators need to perform Remote System Configuration on systems with Dynamic Reconfiguration enabled, monitor performance, and isolate hardware and software faults—all through an easy-to-use Java technology interface. It provides:

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

- Standard interfaces and protocols, enabling integration with third-party management tools, including Tivoli, Computer Associates, and BMC
- A Java technology interface, providing heterogeneous GUI support, a common look and feel for all Sun Management Center applications, and the flexibility to manage the enterprise from any platform using Java technology

SunScreen Secure Net Software

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

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

SunScreen SPF-200 Software

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

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

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

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

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

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

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

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

VERITAS NetBackup Software

VERITAS NetBackup software provides high-performance, industrial-strength backup, archive, recovery and space management services for UNIX and PC clients in the large enterprise. With high-speed backup of large databases,

centralized management capabilities, mainframe-class media management, and support for high-end tape drives and robotics, VERITAS NetBackup software is specially geared for the large data center customer.

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

Sun StorEdge Instant Image Software

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

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

Sun StorEdge LibMON Software

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

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

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

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

VERITAS Volume Manager (VxVM) Software

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

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

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

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

Veritas Volume Manager software actively supports multiported disk arrays. It automatically recognizes multiple I/O paths to a particular disk device within the disk array. The dynamic multipathing (DMP) feature provides greater reliability by providing a path failover mechanism. In the event of a loss of one connection to a disk, the system continues to access the critical data over the alternate connection to the disk. The multipathing functionality also provides greater I/O throughput by balancing the I/O load uniformly across multiple I/O paths to the disk device.

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

SunVTS Software

The Sun Validation Test Suite, or SunVTS software, is an online diagnostics tool and system exerciser for verifying the configuration and functionality of Sun hardware controllers, devices, and platforms. SunVTS software is standard on the Solaris Supplemental CDROM.

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

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

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

VERITAS File System Software

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

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

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

Performance Benchmarks -Reference

Benchmark information will be provided as it becomes available.

Ordering Information

Standard Configurations – Preconfigured Systems

Standard configurations are a mean to offer popularly configured systems. These systems insure a functional base system via a single line item for the convenience of customers, sales, and operation/manufacturing.

Three Sun Fire™ V480 server Standard Configurations and three bundle configurations with the T3 will be offered.

Marketing Part Number	Configuration Description
A37-WSPF2-04GQB	Sun Fire V480 server with 2 CPUs at 900 Mhz Cu (1 processor/memory module), 4 GB memory implemented as 4 - X7053A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks Also includes: • A four post rackmount kit with cable management arm • DVD IDE drive • RSC module with modem • Two power supplies, providing N+1 redundancy • Two integrated 10/100/1000 Mb/s Ethernet ports • 1 RJ45 serial port • 2 USB ports, i.e. for optional keyboard and mouse • Solaris™ server license - Solaris™ 8 (2/02) or later • 3-year, second-day, on-site hardware warranty
A37-WSPF4-08GQB	Sun Fire V480 server with 4 CPUs at 900 MHz Cu (2 processor/memory modules), 8 GB memory implemented as 8 - X7053A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks Also includes: • A four post rackmount kit with cable management arm • DVD IDE drive • RSC module with modem • Two power supplies, providing N+1 redundancy • Two integrated 10/100/1000 Mb/s Ethernet ports • 1 RJ45 serial port • 2 USB ports, i.e. for optional keyboard and mouse • Solaris™ server license -Solaris™ 8 (2/02) or later • 3-year, second-day, on-site hardware warranty
A37-WSPF4-16GQB	Sun Fire V480 server with 4 CPUs at 900 MHz Cu (2 processor/memory modules), 16 GB memory implemented as 8 - X7051A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks Also includes: • A four post rackmount kit with cable management arm • DVD IDE drive • RSC module with modem • Two power supplies, providing N+1 redundancy • Two integrated 10/100/1000 Mb/s Ethernet ports • 1 RJ45 serial port • 2 USB ports, i.e. for optional keyboard and mouse • Solaris™ server license -Solaris™ 8 (2/02) or later • 3-year, second-day, on-site hardware warranty

A37-WSPF4-32GQB	Sun Fire V480 server with 4 CPUs at 900 Mhz Cu (2 processor/memory modules), 32 GB memory implemented as 8 - X7056A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks Also includes: • A four post rackmount kit with cable management arm. • DVD IDE drive • RSC module with modem • Two power supplies, providing N+1 redundancy • Two integrated 10/100/1000 Mb/s Ethernet ports • 1 RJ45 serial port • 2 USB ports, i.e. for optional keyboard and mouse • Solaris™ server license -Solaris™ 8 (2/02) or later • 3-year, second-day, on-site hardware warranty
	Bundle Configurations (Sun Fire V480 and T3)
A37-WSPF2-4-T3327	Sun Fire V480 server with 2 CPUs at 900 MHz Cu (1 processor/memory module), 4 GB memory implemented as 4 - X7053A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks and 327-GB Sun StorEdge T3 array for the workgroup, 9X36.4GB 10000-rpm FCAL drives, 1 RAID Controller, Includes Sun StorEdge Component Manager 2.2, X6799A PCI Adapter, rack rails for T3 and 5m fiber optic cable.
A37-WSPF4-16-T3660	Sun Fire V480 server with 4 CPUs at 900 MHz Cu (2 processor/memory modules), 16 GB memory implemented as 8 - X7051A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks and 660-GB Sun StorEdge T3 array for the workgroup, 9X72.8GB 10000-rpm FCAL drives, 1 RAID Controller, Includes Sun StorEdge Component Manager 2.2, X6799A PCI Adapter, rack rails for T3 and 5m fiber optic cable.
A37-WSPF4-32-T3660	Sun Fire V480 server with 4 CPUs at 900 MHz Cu (2 processor/memory modules), 32 GB memory implemented as 8 - X7056A options, 2 - 36 GB, 1.0", 10,000 RPM, FC-AL disks and 660-GB Sun StorEdge T3 array for the workgroup, 9X72.8GB 10000-rpm FCAL drives, 1 RAID Controller, Includes Sun StorEdge Component Manager 2.2, X6799A PCI Adapter, rack rails for T3 and 5m fiber optic cable.

The level and length of the warranty and repair response times associated with the products in this bundle varies. For details regarding the specific warranty for each Sun product, please refer to the Sun Warranty Web Page at:

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

Assemble to Order(ATO)

Assemble to order configurations are not available. The three preconfigured systems greatly reduce the requirement for custom configurations which generally command a premium in pricing.

Memory Configurations

Expandability to Processors and Memory

All systems fully utilize the available memory DIMM slots. Therefore, when one selects the:

- A37-WSPF2-04GQB - 2 processor, 4 GB, 2 disks system

the maximum system configuration that can be achieved is a 4 processor, 8 GB system. This configuration may be obtained by adding the (X)7028A option.

Processor/memory ugprades are possible to only the:

Configuration	***Description***	***Maximum Number of Additional X7028A Modules Possible***
A37-WSPF2-04GQB	2 processor, 4 GB, 2 disks	1

- Contact IBB for a memory upgrade/exchange program

It is encouraged that one carefully consider the growth potential, application and budget constraints when selecting the system. Classic applications such as database and CAE can generally take advantage of large memory and the fully configured system may be appropriate.

The maximum memory capacity for the Sun Fire V480 server is 32 GB.

Please refer to the guidelines for memory under the *Memory Subsystem* portion of the *System Architecture*.

Storage Configuration Guidelines

Host Bus Adapters

X6729A PCI to FC-AL Adapter

The X6729A is not supported with UltraSPARC III systems. This adapter utilizes the Qlogic 2100 series chip which as since been superseded by the Qlogic 2200 series. The IFP driver support for this device does not provide all of the features, especially failover capabilities, that are available with the leadville driver and the Qlogic 2200 implementation. Limited resources and emphasis on higher availability preclude maintaining both devices.

For similar reasons, the X2069A, combination Gigabit Ethernet and FC-AL controller, which utilizes the Qlogic 2100 series chip is also not supported on UltraSPARC III systems.

X6799A PCI to Single FC-AL Adapter

This adapter was originally introduced to provide connectivity to external FC-AL storage arrays for the Sun Fire 280R. This product is available for use on all currently available UltraSPARC II and III based systems. The product provides a single FC-AL loop and no internal connector. For applications with multiple external FC-AL storage arrays and/or loops, the X6727A is preferable as it will conserve PCI slots.

X6727A PCI to Dual FC-AL Adapter

The internal connector and external port 1 are physically on the same loop. Supported configurations preclude the use of both the internal connector and the associated external connector simultaneously. Consequently, if the internal connector is utilized to provide an alternate path to the internal storage array, the external connector should not be utilized. The external connector for the second FC loop may be utilized to connect to any supported FC-AL array independently of the usage of the first FC loop.

Storage Configurations and Support

Network Storage is responsible for defining and supporting the configurations of host bus adapters and external storage arrays in combination with drivers and storage management tools regardless whether the arrays utilize SCSI or FC technology. These same components will influence the functionality available for the internal storage array as well.

FC-AL loops

Supported configurations require that individual FC-AL loops are connected only to a single type of array. However, individual loops of a multi-loop controller i.e. X6727A, PCI to dual FC-AL controller, may be connected to different types of arrays provided that all arrays on any individual loop are the same.

The external HSSDC connector is on the same loop as the internal disks. At this time, Sun does not support arrays connected to the port.

Multipathing and Benefits

Multipathing provides two independent hardware connections to a disk or an array, whether internal or external. The primary objective is to maintain accessibility to data even in the event of a hardware failure of the controller or cabling, etc. Multipathing may offer higher throughput and bandwidth to the disk array, but generally this is considered as a secondary advantage.

Within a storage logical unit, RAID techniques may be applied for the purpose of masking the failure of an individual disk. Typically, RAID 5, striping with distributed parity, is more effective than RAID 1, mirroring or complete, duplicate copies.

Multipathing to the Internal Storage Array (with dual controllers)

The internal storage array is controlled via the embedded/integrated FC-AL controller, a Qlogic 2202 chip. The second path may be implemented via the X6727A, PCI to dual FC-AL controller and the internal cable kit. This cable connects the internal FC-AL port of the adapter to the secondary FC-AL loop connector on the disk backplane.

Multipathing to External Arrays (with dual controllers)

When implementing multipathing to external arrays with dual internal controllers, each path from the host must utilize the same interface, i.e. two X6727A or two X6799A. The X6799A, PCI to single FC-AL controller, is considered equivalent to the X6727A, PCI to dual FC-AL controller, as they are both implemented with the same Qlogic 2200 series chip. One may be substituted for,or mixed with the other, when implementing multipathing to an external array.

Software Requirements to Implement Multipathing

In order for multipathing to be transparent to applications, an intermediate software level is required to provide a layer of abstraction between the applications and the physical connectivity to the storage subsystem. This layer can mask the failure of an individual loop from the application and redirect the I/O over the alternate path. All applications referencing the abstraction layer pick up the failover capability without having to deploy specific code for path selection and recovery.

Important: Regardless whether multipathing to the internal array or an external array is desired, a software manager such as Veritas Volume Manager with Dynamic Multipathing is required. Failure to utilize a volume manager may result in the inadvertent corruption of the volume structure and/or content resulting from the unsynchronized access via two independent paths to the same physical device. To insure data integrity, Veritas Volume Manager with Dynamic Multipathing must be implemented for multipathing to the internal array. Failure to do so will render the configuration unsupported.

An unbundled enhancement after Solaris 8 7/01 referred to as Multiplexing I/O (MPxIO) will provide multipathing to external arrays, the Sun StorEdge A5x00 and Sun StorEdge T3 arrays via the X6799 or X6727 PCI adapters. However, this version will not offer support for the FC-AL loops upon which the boot device resides, i.e. most likely the internal storage array. That functionality is planned for a subsequent version until which time, Veritas Volume Manager with Dynamic Multipathing is required.

RAID Implementation

A PCI to FC-AL hardware RAID adapter is not available. While hardware RAID is an attractive enhancement that can boost overall I/O throughput and performance, there may be limitations with respect to availability. A PCI hardware RAID adapter can generally obtain higher performance than most other PCI adapters such as the X6727A, PCI to dual FC-AL loop adapter with an internal connector, or the X6799A, PCI to single FC-AL loop adapter, which provide basic storage connectivity only. The higher performance is achieved by an on-board cache, generally of at least 64 MB, which retains frequently referenced sectors of the disk, i.e. directory structure and bitmaps. Optional write-back caching can also enhance performance. (Write-back caching notifies an application of the completion of the write prematurely, i.e. while the data is still within the cache. In comparison, write-through caching performs the notification only upon the completion of the physical transfer to disk.)

Without synchronized caches between two independent RAID controllers, it is difficult to assure availability to data. (Disabling the cache would significantly compromise performance.) By comparison, external storage arrays such as the Sun StorEdge A3500 or Sun StorEdge T3 have relatively sophisticated designs which have common, and often mirrored internal caches, and dual internal controllers (microprocessors which implement the RAID structure) with error detection and transparent failover.

RAID may be implemented on the internal storage array by either Solstice Disk Suite or Veritas Volume Manager with Dynamic Multipathing. The Sun Fire V480 server requires a departmental, Tier 1 license for Veritas Volume Manager.

Solistic Disk Suite is licensed with Solaris and provides:

- RAID 0 - Striping
- RAID 1 - Mirroring
- RAID 1+0 - Mirroring plus Striping
- RAID 5 - Striping with Distributed Parity
- Dynamic File System Expansion
- UNIX File System Logging
- Hot Disk Sparing

Information is available under Solaris of which Solstice Disk Suite is a component.

Veritas Volume Manager with Dynamic Multipathing is licensed separately and provides:

- RAID 0 - Striping
- RAID 1 - Mirroring
- RAID 0+1 - Striping plus Mirroring
- RAID 1+0 - Mirroring plus Striping
- RAID 5 - Striping with Distributed Parity
- UNIX File System Logging provided separately by Veritas File System
- Hot Disk Sparing

SCSI Storage

External SCSI storage is available via PCI based adapters.

RAID Host Bus Adapters

The X6542A, SCSI H/W RAID adapter, is not available on the Sun Fire V480 Server.

USB Ports and Devices

The system contains two USB ports.

Supported USB devices are listed:
http://devi.eng/Solaris_IO/usb.html

Supported Options

Note: The prefix X indicates availability strictly as a field installable option.

Order Number	Option Description	Maximum Number Supported per System	Comments
Dual-processor/Memory Modules			
X7028A	900 MHz UltraSPARC III Cu 900 dual-processor/memory module, each processor with 8 MB external (L2) cache, 4GB (4-(X)7053A) of memory included.	2	
Memory			
X7053A	1 GB (4 DIMMs of 256 MB each)	4 Groups (16 DIMMs) per module	
X7051A	2 GB (4 DIMMs of 512 MB each)	4 Groups (16 DIMMs) per module	
X7056A	4 GB (4 DIMMs of 1 GB each)	4 Groups (16 DIMMs) per module	
Internal Storage Devices			
X6724A	36 GB, 1.0", 10,000 RPM, FC-AL	2	
X6805A	73 GB, 1.0", 10,000 RPM, FC-AL	2	
X9713A	Cable to connect X6727A to laternate loop B port	1	
External Storage Interfaces			
X6540A	Dual channel, single-ended UltraSCSI PCI host adapter	6	
X6541A	Dual-channel, differential UltraSCSI PCI host adapter	6	
X6758A	Dual-channel, Ultra3 SCSI PCI host adapter	6	
X6767A	FC-AL PCI Adapter - 2 Gbit	6	
X6768A	Dual FC-AL loop PCI Adapter - 2 Gbit	6	
X6799A	Single FC-AL loop PCI adapter, external connector only, Qlogic 2202 Chip	6	
X6727A	Dual FC-AL loop PCI adapter with optical interfaces, one internal connector. **NOTE:** Connect internal cable to Loop B of internal storage backplane for multi-pathing capability	6	
	NOTE: The (X)6729A - PCI to single FC-AL controller is not supported in UltraSPARC III systems		
Network Interfaces			
	PCI Serial Adapters		
X1155A	Sun HSI/P high-speed serial interface, PCI	4	
X2156A	Sun SAI/P serial asynchronous interface, PCI	6	

Mfg P/N: PCI52-0005	Mfg: Antares, Asychronous serial/modem, PCI	6	
	PCI Ethernet Adapters		
X1033A	10/100 Base T Fast Ethernet PCI Adapter	6	
X1034A	10/100 Base T Quad Fast Ethernet PCI Adapter	4	
X1141A	Gigabit Ethernet PCI Adapter	3	
X1150A	Sun Gigabit Ethernet-Cat5 (copper) PCI66 adapter	2	
X1151A	Sun Gigaswift Ethernet PCI adapter (Fiber)	2	
	PCI to ATM Adapters		
X1157A	Sun ATM-155/Multimode Fibre PCI66 bus adapter	4	
X1158A	Sun ATM-155/UTP 5.0 PCI66 bus adapter	4	
X1159A	Sun ATM-155/P622 Multimode Fibre 5.0 PCI66 bus adapter	3	
	PCI to Sonet Adapter		
X4810A	PCI to OC-48 Packet over Sonet Adapter	2	
	PCI Combination Adapters		
X1032A	PCI to 10/100 Base T plus Single-ended Ultra/Wide SCSI adapter	6	
X2222A	Dual Fast Ethernet + Dual SCSI PCI Adapter	2	
	Note: The (X)2069A Gigabit Ethernet plus FC-AL is not supported in UltraSPARC III systems		
	PCI Interoperability		
X2132A	Sun Pci Card	3	
	PCI Hardware Accelerator		
X1133A	Hardware Accelerator Card for SSL	3	
X6762A	SSi Accelerator Card	1	
PCI Video and Graphics Adapters			
X1089A	Sun Video Plus	4	
X3768A	PGX 64 color graphics PCI adapter frame buffer	4	
X3668A	PGX32 8-bit and 24-bit Color Frame Buffer	4	
X3685A	XVR-500 graphics PCI adapter	3	
Power Cords			
X311L	Power Cord Kit, U.S./Asia	2	
X312L	Power Cord Kit, Continental Europe	2	
X386L	Power Cord Kit, Australia	2	
X317L	Power Cord Kit, U.K.	2	
X314L	Power Cord Kit, Switzerland	2	
X384L	Power Cord Kit, Italy	2	
X383L	Power Cord Kit, Denmark	2	
530-3096-01	Power Cord Jumper, extends <u>any</u> geography specific power cord	2	
	Note: One power cord required per power supply. Two required per system.		
Other Options			
	Rackmount Kit		
X9631A	Two Post Rackmount kit	1	
	Video Monitors		

X7143A	17-inch entry color monitor		
X7134A	24.1-inch AM-TFT-LCD monitor		
X7137A	18.1" TFT LCD Color Monitor		
X7146A	21-inch color monitor, 19.8 inch v.a.		
X7145A	24-inch wide screen color monitor		
	Note: The following have been retired but are supported for PGX32 and PGX64. X1703A - 17-inch entry color monitor X7119A - 19-inch color monitor X7121A - 21-inch color monitor		
	Cables and Adapters		
X3872A	Video connector adapter, HD15F/13W3M		
X470A	Video adapter, 13W3F/HD15M		
X913A	Adapter for DDS-3 tape drive to convert from fast wide to narrow SCSI		
X3830A	4-meter SCSI cable, VHDC to 68-pin SCSI, for use with (X)6541A		
X3831A	10-meter SCSI cable, VHDC to 68-pin SCSI, for use with (X)6541A		
X973A	2-meter fibre-optic cable		
X9715A	5-meter fibre-optic cable		
X978A	15-meter fibre-optic cable		
	Racks		
SG-XARY030A	72-inch Sun StorEdge expansion cabinet (deLorean Rack) **Note:** Maximum of five fully populated Sun Fire V480 systems per rack		
SF-XCAB	Serengeti Expansion Rack **Note:** Maximum of five fully populated Sun Fire V480 systems per rack		

Additional PCI Adapters

Other PCI adapters, including those for ATM, FDDI and Token Ring are available from:

I/O Technologies Group, http://www.sun.com/io/

Unsupported PCI Adapters

The following is a partial listing of some of the recent PCI adapters that are not supported on the Sun Fire V480 server.

Part Number	***Description***	***Reason/Comments***
X6729A	PCI to single FC-AL	Retired, replaced by X6799A, X6727A
X2069A	FCAL plus 1 Gbit Ethernet	Uses older Qlogic 2100 series chip
X1152A/X1153A	PCI to FDDI	Retired, no longer produced
X1154A	PCI to Token Ring	Retired, no longer produced
X1156A	Serial interface	Retired, replaced by X2156A
X6542A	SCSI RAID Controller	Not supported, approaching retirement

External Options

The following external storage devices and arrays are supported. Please refer to Network Storage configuration guidelines for specific details.

Disk Arrays

- Sun StorEdge A1000/D1000
- Sun StorEdge A5200
- Sun StorEdge Multipack FC
- Sun StorEdge T3 enterprise array
- Sun StorEdge T3 workgroup array
- Sun StorEdge D2
- Sun StorEdge S1
- Sun StorEdge 3900
- Sun StorEdge 6900
- Sun StorEdge 9900

Workgroup Storage Configuration Matrix:

http://sundoc.central/SunWINPublicView.jsp?token=130674

Product Family Placement

Sun StorEdge D2 Array	Sun StorEdge A1000/D1000 Array	Sun StorEdge A5X00 Array	Sun StorEdge T3 Array for the Workgroup
			
Workgroup	Workgroup	Department to data center	Workgroup
Host-based software RAID	Controller-based RAID (A1000) Host-based RAID (D1000)	Host-based RAID	Controller-based RAID (single controller)
Solaris™ Operating Environment	Solaris Operating Environment	Solaris Operating Environment, Microsoft Windows NT	Solaris Operating Environment, Microsoft Windows NT, HP-UX, Linux, IBM AIX

Sun StorEdge D2 Array	Sun StorEdge A1000/D1000 Array	Sun StorEdge A5X00 Array	Sun StorEdge T3 Array for the Workgroup
When to sell • Price/performance • Bridges gap between Sun StorEdge MultiPack systems and higher end products • For apps requiring less than 436 GB in a single array • Performance and flexibility for price-sensitive customers	When to sell • Price/performance • Bridges gap between Sun StorEdge MultiPack systems and higher end products • For apps requiring less than 436 GB in a single array • Performance and flexibility for price-sensitive customers	When to sell • RAS + price/performance • Fibre Channel storage networking • Replaces SPARCstorage™ Array • High sequential performance • High-performance data warehousing and DSS • Campus-area remote mirroring • Flexible configurations (up to 500 m)	When to sell • One-array configurations • RAS + price/performance • Remote mirroring to 10 kilometers (using FC switches) • Enterprise-class redundancy and mission-critical availability features • High-performance data storage • High bandwidth for data capture, retrieval, and storage
When NOT to sell • Applications requiring more than 436 GB in a single array • Customer requires Fibre Channel today	When NOT to sell • Applications requiring more than 436 GB in a single array • Customer requires Fibre Channel today	When NOT to sell • Hardware RAID 5 required • Non-Solaris Operating Environment or Microsoft Windows NT host attach required	When NOT to sell • When mainframe or AS400 attachment is necessary

Tapes and Libraries

- Sun StorEdge 12 GB DDS-3Unipack
- Sun StorEdge DDS-3 Autoloader Flexipack
- Sun StorEdge 20 GB DDS-4 Unipack
- Sun StorEdge DLT 8000 Flexipack
- Sun StorEdge L9 tape autoloader
- Sun StorEdge L20 tape library family
- Sun StorEdge L180 tape library
- Sun StorEdge L700 tape library
- Sun StorEdge L5500 tape library
- Sun StorEdge L6000 tape library

Tape Library Calculator
http://rmqual.ebay/TLC/TLC.html

Tape Automation Products At-A-Glance
http://webhome.ebay/networkstorage/products/tape_automation/index.html

Sun Fire V480 Specific Options

The following options are specific to the Sun Fire V480 server.

Order Number	Option Description	Comments

X7028A	900 MHz dual-processor/memory module, each processor with 8 MB external (L2) cache and 4 GB of memory implemented as 4 - (X)7053A options (each consisting of 4 - 256 MB DIMMs)	All memory DIMM slots fully populated
X9713A	Cable to connect the internal connector of (X)6727A - PCI to dual FC-AL controller to the alternate/Loop B port of the internal storage array	
X9631A	Two post Rackmount kit	

Upgrades

Sun Upgrade Allowance Program

The Sun Fire V480 server is the third and newest member of Sun's powerful generation of workgroup servers for enterprise network computing based upon the UltraSPARC III microprocessor technology.

From branch office or data center, Sun provides upgrade solutions customers can count on to maximize their investment. The Sun Upgrade Allowance program allows customers to receive a fair trade-in allowance towards the purchase of a 4 way Sun Fire V480 server.

Sun UAP simplifies the upgrades process by providing a trade-in value as a percentage allowance. This percentage allowance is applied to the list price of a new 4 way Sun Fire V480 system configuration.

Upgrades to the Sun Fire V480 server are available as a full system swap. Customers can upgrade from an Ultra 5s, 10s, Enterprise 2, Enterprise 250, Enterprise 220R, Enterprise 450, Enterprise 420R and Sun Fire 280R to the new Sun Fire V480 server. However, components such as CPUs, memory and drives cannot migrate from UltraSPARC II systems. Sun Fire V480 uses UltraSPARC III technology. Memory components such as the 1GB and 2 GB memory options can migrate from UltraSPARC III systems like the Sun Fire 280R.

Systems being upgraded must be owned by, used by, and in the possession of the customer at least ninety (90) days prior to upgrading. To qualify for the upgrade allowance, customers must return within 60 days, a bootable working system.

Key Messages

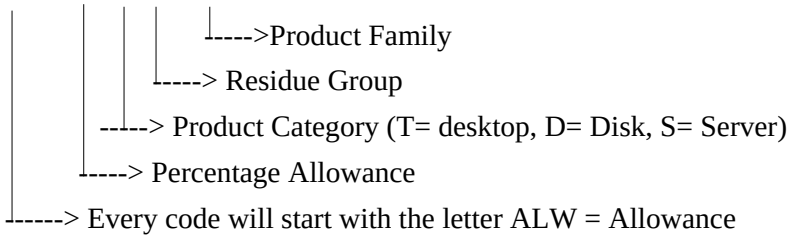
- The Sun Fire V480 Server is available in standard (fixed) configurations.
- The Sun Fire V480 Server provides a growth path for today's Enterprise 450, Enterprise 420R and Sun Fire 280R customers who require more application scalability, higher performance, and built in availability and reliability components.
- Hot pluggable and hot swappable components such as disks and power supplies help maximize system availability by allowing maintenance and upgrades to occur during normal operations.
- Existing investments in non-Sun hardware can be preserved by upgrading to Sun through competitive full-system upgrades.
- Multiple Sun or non-Sun hardware can be upgraded to a new Sun server by way of the server consolidation program.

How To Order

An allowance code is used when upgrading to a Sun Fire V480 server. Workgroup server Sun UAP product matrices containing standard upgrade allowance codes are included in the Sun Configuration guide. The Sun UAP matrices provide instructions for using codes.

Allowance Code Numbering Scheme

Standard Allowance Code ALW-13-S-L-A37



To determine the upgrade allowance value, apply the allowance code percentage to the list price of a 4 way Sun Fire V480 server. This allowance is in addition to any contracted discounts that the customer may be eligible for.

Customers will need to return a full functioning system within 60 days of receipt of the hardware. RMA kits (UG-RMA) must be ordered with each allowance code. UG-RMA kits provides customers instructions on where to return the used (residual) equipment. Customers will be billed for all non returned equipment.

Upgrade Paths

Sun Upgrade Allowance Program

	Upgrade From	Upgrade To	Allowance Code Part Number	Return
Sun Servers				
	Ultra 5s, 10s Enterprise 2, Enterprise 250, Enterprise 220R Enterprise 450, Enterprise 420R or Sun Fire 280R	Sun Fire V480 (4 way systems only)	See Worldwide Configuration Guide or Sun Win # 94711 for standard trade -in allowances	A full functioning system
Memory				
	1GB Memory Option (X)7053A (4 DIMMs of 256MB each)	2 GB Memory Option (X)7051A (4 DIMMs of 512MB each)	See Worldwide Configuration Guide or Sun Win # 108142 for standard trade-in allowances.	4 x 256 MB DIMMs
	1 GB Memory Option (X)7053A (4 DIMMs of 256 MB each)	4 GB Memory Option (X)7056A (4 DIMMs of 1GB each)	Same as above	4 x 256 MB DIMMs
	2 GB Memory Option (X)7051A (4 DIMMs of 512 MB each)	4GB Memory Option (X)7056A (4 DIMMs of 1GB each)	Same as above	4 x 512 MB DIMMs

Memory Configurations:

Please refer to details under the Section entitled *Ordering Information.*

Software Upgrade Ordering

Order Number	Title and Description
SNM-SM-2.2.3-P	Solstice Site Manager • 2.2.3 CD, Install Doc, User Guide, single system license. Right to manage for 100 nodes in the network Solstice Cooperative Consoles 1.1 Sender.
SNM-NM-2.2.3-P	Solstice SunNet Manager • 2.2.3 CD, Install Doc, User Guide, singe system license. Right to manage unlimited number of nodes in the network. Solstice Cooperative Consoles 1.1 Sender

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

FEATURE	SUNSPECTRUM PLATINUM[SM] Mission-critical Support	SUNSPECTRUM GOLD[SM] Business-critical Support	SUNSPECTRUM SILVER[SM] Systems Support	SUNSPECTRUM BRONZE[SM] Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Local customer support management	No	Yes	No	No
Personal technical account support	Yes	Yes	Option	No
SunStart[SM] installation service	Yes	No	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semiannual	No	No
Skills assessment	Yes	No	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday
Standard on-site coverage hours	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday	N/A
7-day/24-hour telephone coverage	Yes	Yes	Option	Option
7-day/24-hour on-site coverage	Yes	Option	Option	N/A
7-day/12-hour on-site coverage	No	Option	No	No
5-day/24-hour on-site coverage	No	Option	No	No
Coverage / Response Time (cont.)				
Customer-defined priority setting	Yes	Yes	Yes	Option
Note: Urgent (phone/on-site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A

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

Support Services:

As the Sun Fire V480 assumes a bigger role in the data center, there is an opportunity to enhance the level of service. Customers may upgrade the warranty on the Sun Fire V480 to SunSpectrum Platinum, Gold or Silver.

1. Workgroup server installation services are available under part number WGSERVER-INSTALL.

2. Workgroup server rack installation services are available under part number SERVER-INSTALL.

3. Sun StorEdge Array Hardware Installation
   - (Order both of the following part numbers for each Sun StorEdge hardware only installation event.)
     ARRAY-HW-INS-BASE2

   - Per tray charge (Order in quantities of total number of disk trays being installed.)
     ARRAY-HW-PER-TRAY

4. Sun StorEdge ArrayStart
   - (Order both of the following part numbers for each Sun StorEdge ArrayStart installation event.)
     ARRAY-INS-BAS2

   - Per tray charge (Order in quantities of total number of disk trays being installed.)
     ARRAY-INS-PER-TRAY

Warranty

The standard warranty for the Sun™ Fire V480 server is three year, second day on-site response. A 90 day software SunSpectrum program warranty is available.

Education

Kindly contact the local Sun representative.

100BASE-T	See Fast Ethernet.
Adapter	A host bus adapter or interface which plugs into a PCI slot to provide connectivity, i.e. to networks, storage, graphics or other I/O devices
ASR	Automatic System Recovery. A RAS feature that initiates a system reboot sequence that bypasses failed system components or a software failure.
Controller	A microprocessor based device which is dedicated to a specific task, esp. I/O and is embeddded within a host-bus adapter or external (storage) array. The term 'controller' is often used synonymously with host-bus adapter.
DIMM	Dual in-line memory module. A memory unit that is available in a range of capacities, such as 128 MB, 256 MB, 512 MB, or 1 GB.
DIMM group	A group of four DIMMs.
Dual-processor/memory module	The basic component of processing capability for the Sun Fire V480 server. Each module is comprised of exactly two UltraSPARC III+ microprocessors, a variable amount of memory depending upon the quantity and density of DIMMs selected, and the interconnect logic.
ECC	Error correcting code
Fast Ethernet	IEEE standard for 100-Mb/second Ethernet. This technology supports a data transfer rate of 100 megabits per second over special grades of twisted-pair wiring.
Fault resilience	Capability of a system to mask many individual errors, but not all. This approach generally requires redundancy of some components and additional software. An example would be the dual path capability and automatic failover for storage and networks. Another term for 'high availability'.
Fault tolerance	Capability of a system to mask any individual point of failure. This type of system is typically implemented with redundancy of components and synchronization of clock signals to maintain each unit in 'lock step' with it s counterpart.
FC-AL	Fibre Channel arbitrated loop. A loop topology used with Fibre.
I2C	A bus used for environmental monitoring.
High availability	Capability of a system to mask many individual points of failure or to significantly compensate for them. This type of system is built upon standard components with limited hardware and/or software components to minimize the impact of failures. Generally, this type of system is less costly than a fault tolerant system.
Host-bus adapter	Please see Adapter
Hot-plug	A component that can be electrically safe to remove or add while the system is still running. Typically, the system must be rebooted before the hot-plug component is configured.
Mirroring	Maintaining a redundant, logical copy of a disk volume for higher availability. Also known as volume shadowing or RAID 1.
Multipathing	A higher availability option which provides two independent paths to storage and/or networks. An intermediate software layer is generally required to mask the failure of one path from the application. When both paths are functional, higher bandwidth and throughput is possible as a secondary benefit beyond higher availability.
NFS	Sun's distributed computing file system, i.e. network file system
PCI	Peripheral component interconnect. An industry-standard for connecting peripherals such as disk drives, tape drives and other external devices.

Pre-configured System	Pre-configured systems that offer discounted prices in comparison to assemble-to-order (ATO) or custom configurations. It is also more convenient for both customers and sales as it assures that all necessary components for a functional system are included with a single line item on the order form.
PTO	Please see Pre-configured System
RAID	Redundant array of independent disks. A set of disk drives that appear to be a single logical disk drive to an application such as a database or file system. Different RAID levels provide different capacity, performance, high availability, data protection and cost per unit of storage.
RAS	Reliability, availability, and serviceability, Three aspects of the design of a system contributing to continuous operation and minimizing system downtime for services. Together reliability, availability, and serviceability provide for near continuous system operation.
RSC	Remote System Control. A remote monitoring and administration feature that allows systems administrators to access the system console from any host on the network, sends e-mail or pager notice of system faults and provides boot and run logs of system events.
Redundancy	Duplication for the purpose of achieving fault tolerance. Refers to duplication or addition of components.
SCSI	Small Computer Systems Interface. An ANSI standard for controlling peripheral devices by one or more host computers.
Standard Configuration	A subset of the Pre-configured Systems (PTOs) which offer accelerated delivery time
V9	Version 9 of the SPARC™ definition.
Volume shadowing	See Mirroring

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
Sun Fire™ V480 Server, Just The Facts	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	333632
Sun Fire™ V480 Server Customer Presentation	Customer Presentation	Sales Tool	SunWIN, Reseller Web	318986
Sun Fire™ V480 Server Data Sheet	Data Sheet	Sales Tool	SunWIN, Reseller Web	
Sun Fire™ V480 Configuration Guide	Configuration Guide	Sales Tool	SunWIN, Reseller Web	339717
References				
External Web Sites				
General Information on the Sun Fire™ V480 Server	http://www.sun.com/servers/entry/V480/index.html			
Features and Benefits of the Sun Fire™ V480 Server	http://www.sun.com/servers/entry/V480/features.html			
Specifications of the Sun Fire™ V480 Server	http://www.sun.com/servers/entry/V480/spec.html			
Internal Web Sites				
Internal Web Site for the Sun Fire™ V480 Server	http://vsp.east			

	Sun Fire V480	Compaq DL580-G2	Dell Power-Edge 6650	IBM x440	IBM P630	IBM x380
Size	5 RU	4 RU	4 RU	4 RU	5 RU	7 RU
Processor Specs.	UltraSPARC III Cu 900 MHz	P4 @1.4, 1.5, 1.6 Ghz Xeon	P4 @1.4, 1.5, 1.6 Ghz Xeon	P4 @ 2.4 GHz Xeon	64 bit power4 @ 1000 MHz	Itanium@ 800 Mhz
L1 (on chip) cache	32 KB instruction, 64 KB data	12 KB instruction, 8 KB data	12 KB instruction, 8 KB data	12 KB instruction, 8 KB data	64KB instruction, 32 KB data	32 KB instruction, 32 KB data
L2 cache	8 MB	256 KB	256 KB	256 KB	8 MB	4 MB
Maximum CPUs	4	4	4	4	4	4
Maximum Memory	32 GB	32 GB	16 GB	8 GB	32 GB	64 GB
System Bandwidth GB/sec.	9.6	3.2	3.2	3.2	8.0	2.1
PCI slots	6 2 @66 MHz 64 bit 4 @33 MHz 64 bit	6 6 PCI-X @100MHz 64 bit	8 7 PCI-X @100MHz 64 bit 1@33 MHz 32 bit	6 PCI-X	4	8
Internal Disk Controller	Integrated FC–AL Integrated Mulitipathing capability	Integrated Ultra3/160 SCSI	Integrated Ultra3/160 SCSI	Ultra 160 SCSI	Ultra3SCSI	Ultra 160 SCSI, external SCSI
Internal Disks	2 FC-AL	4	5	2	4	2

	Sun Fire V480	Compaq DL580-G2	Dell Power-Edge 6450	IBM x440	IBM P630	IBM x380
I/O Ports	FC-AL, 2 - 1 Gb NIC, 1 RJ45 serial, 2 USB	1serial, 1 network RJ-45, PS/2 mouse, keyboard, graphics, 2 USB	1serial, 2 network RJ-45, PS/2 mouse, keyboard, graphics, 2 USB	1serial, 1 parallel, 1 network RJ-45, mouse, keyboard, 2-USB., Video, SCSI	3 serial, 1 parallel,2 network keyboard, mouse, 1-external Ultra3SCSI	2 serial, 1 parallel, 1 network RJ-45, mouse, keyboard, 2-USB, graphics
High Availability Options	Hot plug disks & power, ASR, RSC, alternate path to storage	Hot plug disks & power, auto reboot, remote monitor	Hot plug disks & power, auto reboot, remote monitor	Hot plug disks & power, cooling, auto reboot, redundant cooling, Remote monitor	Hot plug disks, PCI, power, & cooling, auto reboot, redundant power, cooling	Hot plug disks & power, cooling, redundant cooling,
O/S	Solaris 8	Windows 2000, Linux	Windows 2000, Linux	Windows 2000, Linux	AIX 4.3.3, Linux	Windows 2002, Linux
Price: 2 CPUs, 4 GB, 2 disks with S/W	$22,995	$27,507	$23,791	$26,035	$25,960	$27,537
Price: 4 CPUs, 16 GB, 2 disks with S/W	$46,995	N/A	TBD		62,401	$78,807
Price: 4 CPUs, 32 GB, 2 disks with S/W	$99,995	N/A	N/A	N/A	N/A	$98,800

Notes:

- Competitive pricing based upon information available in Sept. 2002.
- All systems configured with two disks per system.
- IBM and Dell Intel pricing is via the web and considered non-discountable.
- Compaq pricing via the web.
- With software, Microsoft advanced server plus Internet Connector, = $5,995

4-way Xeon rack based systems:
Cherrystone Advantages:

- Platform SPARC/Solaris from smallest configuration to largest.
- Supports more memory, larger L2 Cache.
- Shallow chassis depth

Most 4-way xeon systems products are limited to 8GB of memory due to hardware constraints but the few that are capable have large OS costs to extend beyond the 8GB. Sparc and Solaris supports configurations from smallest to largest.

4-way Itanium rack based systems:

Cherrystone Advantages:

- Lower Pricing in all configurations.
- System chassis only 24" depth compared to 30" depth.
- Integrated Dual 10/100/1000 Mb/s Ethernet.
- Platform SPARC/Solaris from smallest configuration to largest.
- Large number of applications written on Solaris.

Itanium is still in its infancy and lacks the OS and application support compared to SPARC/Solaris.
The Itanium systems also require more power and cooling in a much larger footprint and at higher prices than Cherrystone. It will still be some time before the risks of changing h/w, OS, and Apps may even potentially be compelling.

IBM P630:

Cherrystone Advantages:

- Lower Pricing in all configurations
- Supports more memory, larger L2 Cache.
- Integrated Dual GB Ethernet.
- Platform SPARC/Solaris from smallest configuration to largest. IBM has over 10 Operating systems to support.
- Larger number of applications written on Solaris.

Against competitive UNIX systems we have significantly lower pricing in all configurations, larger memory capacity and a single US-III/Solaris architecture focus. We are currently the market share leader in the UNIX server space and Cherrystone with its memory capacity and two Gigabit Ethernet ports should continue to expand this lead.

Point - Counterpoint

This section provides anticipated comments and objections that may be encountered when presenting the Sun Fire V480 server.

- Clock speed of UltraSPARC III systems and Sun Fire V480 is relatively slow in comparison to others, i.e. 900MHz vs. 1.0+ GHz of Intel.

  Counterpoint

  Clock speed is not indicative of performance by itself. Cycles can be used very, very differently. Consider the very high levels of cache and pipelining from UltraSPARC III, the system interconnect is much faster than most comparable systems. (Refer to competitive charts.)
  UltraSPARC III will increase in speed to 1.5 GHz and beyond, refer to roadmap on public UltraSPARC, Sun Microelectronics web pages.
  http://www.sun.com/microelectronics/UltraSPARC-III/index.html
  Also, optimizations for Java code. VIS (virtualization instruction set) dramatically improves performance for graphics, matrix operations, etc. by a factor of 2 - 3.

  While Intel processors can provide speeds in excess of 1+ GHz today, these are predominantly for single processor systems. The servers depend upon the Xeon family which run at significantly slower speeds. The architecture require for multiprocessors is much more complex, i.e. to insure cache consistency.

  Please note that HP and IBM RISC systems, as well as Intel and AMD, have all experienced delays with the introduction of faster processors.

- UltraSPARC III is new and unproven.

  Counterpoint

  While UltraSPARC III Cu 900 is new, it is based upon the SPARC architecture which has step by step evolved over the last twelve years to provide additional functionality and performance. Consequently, UltraSPARC III Cu 900 represents an evolution and not a new, radical design.

  Sun is extremely sensitive and concerned that any new product, however slight the change, be completely transparent to the users. Sun has developed extensive regression tests within the qualification labs and then subjects products to internal and external beta test prior to product release.

  Finally, the Sun Fire V480 server is not the first offering of the UltraSPARC III chip. The product has been successfully used in Sun Blade workstations, the Sun Fire 280R and the Serengeti family.

- The licensing fees for the operating systems are relatively comparable.
  Counterpoint

  Windows 2000 Server supports:
  - Up to a 4-way SMP system
  - Up to 4 GB of memory
  - An unlimited number of internet connections
  - $1,995 license fee

  Windows 2000 Advanced Server supports:
  - Up to an 8-way SMP system
  - Up to 8 GB of memory
  - A two node cluster
  - An unlimited number of internet connections
  - $5,995 license fee

  Windows 2000 Data Center supports:
  - Up to a 32-way SMP system
  - Up to 64 GB of memory
  - A four node cluster
  - Available and licensed ONLY through OEMs

  Windows.NET (Future)
  - Up to a 32-way SMP system
  - Up to 64 GB of memory
  - A four node cluster

Where the Sun Fire V480 is the ideal solution

The continual shift from server local storage to external storage and toward small servers that are capable of handling large computing tasks, The following are a list of market requirements that the Cherrystone product was designed to achieve:

- Rack optimized to maximize CPU density per footprint.
- Overall system performance optimization
  - CPU - 900MHz w/8MB cache
  - Memory - up to 32 GB
  - I/O - 6 PCI slots
  - Networking – two 10/100/1000 Mb/s Etherent
- RAS features - Hot swappable power supplies and disks
  - RSC2
  - ASR

Excellent features and form factor for Data center customers.

Key Features to Highlight

High-performance CPU/IO system
Rackable (5RU), processor dense form-factor
High-memory capacity
Compact design (24 inch depth)
Reliability and serviceability
Availability of applications
Connectivity to external storage

Where the Sun Fire V480 is not the ideal solution

Where internal storage capacity is the highest priority and a requirement.
Scalability greater than 4 processors.
Domains - highest levels of availability.