Sun Fire™ V880 Server

Just the Facts

SunWIN token #134456

November 2002

Version 2.1

Notice: This document continues to be restricted to internal usage only because of references to internal web pages. With the removal of these references, selected sections of the document may be provided to customers and/or selling channels as required. Competitive information and relative positioning should always remain as internal documentation only. Alternatively, a reseller version is also posted.

Copyrights

Revision History

Revision 2.0 – June 2002

- Inclusion of 900 MHz systems and option
- IBB upgrades to 900 MHz dual procesor/memory modules and 4 GB memory option
- Memory options
  - Support for X7056A, 4 GB memory option, on 900 MHz systems
  - Retirement of X7050A, 512 MB memory option; only supported on 750 MHz systems
- 73 GB disks supported and X6756A backplane with six 73 GB drives on all systems
- Support for new PCI adapters
  - X6767A - PCI to 2 Gb single FC-AL
  - X6768A - PCI to 2 Gb dual FC-AL adapters
  - X3684A - Expert3D-lite graphics accelerator
  - X6785A - XVR-500 graphics accelerator
  - X6762A - High performance Crypto Accelerator 1000
  - X6758A - PCI to dual Ultra3SCSI adapter
- New disk arrays: StorEdge 3900, 6900 and S1
- New tape libraries: StorEge L5500 and L6000
- New console monitors supported
- Solaris 9 support
- Updates to Veritas Volume Manager Licensing
- Removal of IBB accelerated allowances, program ended on March 15, 2002
- Updates to Glossary

Revision 2.1 – November 2002

- New 8 processor, 32 GB, 6 – 73 GB disk configuration at 900 MHz, A30-WSF8-32GRF
- Detailed power and BTU information
- Changes to Veritas licensing polilcy with Veritas Volume Manager V3.5
  - Retirement of Veritas Volume Manager V3.1.1; last order date Dec. 15, 2002
- Support for X6805A – multisourced 73 GB, 1.0”, 10,000 RPM FC-AL drive
- Updates to competitive information
- Inclusion of V480 references
- Reduced number of PCI adapters supported per system
  - X1134A - 10/100 Base T Quad Fast Ethernet PCI Adapter
  - X1141A - Gigabit Ethernet PCI Adapter
  - X1150A - Gigabit Ethernet – Cat5 (copper) PCI66 MHz adapter
  - X1151A - Gigabit Ethernet (fibre)
  - X2222A - Dual SCSI and dual 1 Gbit Ethernet adapter
  - X6762A - High performance accelerator card for SSL
  - X6799A - PCI to single 1 Gb FC-AL
  - X6727A - PCI to dual 1 Gb FC-AL
  - X6767A - PCI to single 2 Gb FC-AL
  - X6768A - PCI to dual 2 Gb FC-AL
- Support for Sun StorEdge 3000/3300 series arrays
- Revisions to Upgrade Programs via IBB

Table of Contents

Sun Fire™ V880 Server Positioning

Figure 1: Sun Fire™ V880 Server, front view

Introduction

The Sun Fire™ V880 Server is a high-performance, reliable server for enterprise network computing based upon the UltraSPARC™ III microprocessor technology. This workgroup server was designed to be extremely flexible and scalable, capable of satisfying the needs of small to medium offices, branch and regional centers, departments as well as complementing data center operations.

The Sun Fire™ V880 Server may be configured as a two to eight-way multiprocessor running Solaris™ 8. As always, there is full compatibility for existing applications with earlier versions of Solaris™. Processors run at 750 MHz or 900 MHz and are added in pairs via a dual-processor/memory module. All memory is accessible by any processor as workgroup servers do not implement domains or partitions. Within a single system, all processors must run at the same speed, i.e. no mixed-speed configurations are allowed or supported. The firmware checks and precludes operation of mixed-speed systems.

The Sun™ Fireplane Interconnect is a 9.6 GB/sec. 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.

An internal storage array supports twelve Fibre Channel disks, each with a capacity of 36.4 GB or 73 GB for a total capacity of 876 GB. The I/O subsystem is based upon industry standard PCI buses and interface modules which provide up to 1.2 GB/sec. of sustained I/O. On-board/integrated controllers

include a Fibre Channel disk controller, 1 Gbit Ethernet, a separate 10/100 Ethernet and an internal SCSI bus for the DVD and removable media, a serial port (two via a splitter/Y-cable) and two USB ports.

The Sun Fire™ V880 Server is ideal for applications demanding more processing power, integrated storage, or expandability beyond that offered previously by UltraSPARC™ II based systems such as the Sun™ Enterprise 450 server or the E3500 server. This powerful server incorporates many key RAS features such as Automatic System Recovery (ASR), multipathing support to the storage subsystems and networks, hot-swap power supplies, cooling fans, internal disks and PCI slots. All systems are configured with redundant (N+1) power supplies and a redundant set of cooling fan trays.

The Remote System Control (RSC) module provides remote monitoring and administration capabilities independent of the Solaris operating environment. With the emphasis on availability and reliability, the Sun Fire™ V880 Server is a prudent choice for many mission critical applications.

Product Family Placement

The goals of the Sun Fire™ V880 Server were to build a highly scalable eight-way server incorporating the latest generation UltraSPARC™ processors, the Sun™ Fireplane Interconnect architecture and Solaris 8 and 9 operating system technology. It is one of the most flexible, highest performing, workgroup servers.

The following is a summary of the Sun Fire™ V880 Server within the Volume Server product family.

Server	*Target Users and Markets*
Sun Enterprise 220R (2 processor UltraSPARC II) **(Retired)**	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) **(Retired)**	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 and 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) **(Retired)**	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 Enterprise 280R (up to two 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, and network service providers, along with financial services, compute farms, or any customer running demanding applications in space-constrained environments.
Sun Fire™ V480 Server (4 processor UltraSPARC III)	The Sun Fire V480 server represents the UltraSPARC III rack-optimized server offering either two or four processors at 900 MHz. The target audience is service providers, financial services, compute farms, or any customer running demanding applications in space-constrained environments. Many components are in common with the Sun Fire V880 server.
Sun Fire™ V880 Server (8 processor UltraSPARC III)	The Sun Fire V880 is a rackmountable tower represents the high-end workgroup server. This versatile, high performance and reliable server provides a growth path for users of the earlier E450 and E3500 servers who require more application scalability, higher performance, and built in availability and reliability components. Unlike the E450, the Sun Fire V880 utilizes the new UltraSPARC III architecture, the Sun Fireplane Interconnect and some key RAS features. These RAS features include: - Remote System Control for remote monitoring and administration, - Automatic System Recovery for isolation and removal of failed components - Hot-swap power supplies, cooling fan trays, disk and PCI slots - Optional, multipathing support to the storage subsystems and networks,

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

	Sun Fire™ V880	***Sun Fire™3800***	***Sun Fire™ 4800***	***Sun Fire™ 4810***	***Sun Fire™ 6800***
Product Positioning	High-end Workgroup Server	Entry-level Enterprise Server	Enterprise Server	Enterprise Server	Enterprise Server
Packaging	Tower or rack mountable 17 RU	8.5 RU	Rack 32" high 17.5 RU	Rack 36" high, shallow depth, 19" wide 21 RU	Datacenter Rack 75" high 28 RU
Typical Environment	Branch Office, Department or Data Center	Data Center	Data Center	Data Center	Data Center
CPUs	2 - 8	2 - 8	Up to 12	Up to 12	Up to 24
Memory	64 GB	64 GB	96 GB	96 GB	192 GB
System Bus	9.6 GB/sec.	9.6 GB redundant	9.6 GB redundant	9.6 GB redundant	9.6 GB redundant
I/O bandwidth	1.2 GB/sec.	4.8 GB/sec.	4.8 GB/sec.	4.8 GB/sec.	9.6 GB/sec.
Internal Storage	874 GB	None	None	None	None
Removable Media	3 - 5.25" rem. media devices	None	None	None	None
PCI or cPCI slots: @66 MHz @33 MHz	9 (no cPCI) 2 7	No PCI 12 cPCI only 4 8	16 PCI or 8 cPCI	16 PCI or 8 cPCI	32 PCI or 16 cPCI
Domains	1 (No H/W for domains)	2	2	2	4
Integrated Network	10/100 and 1 Gbit Ethernet	None	None	None	None
Input Power (110/240 VAC)	2,200/2,400 W	2,820/3,060 W	3,920 W max.	4,020 W max.	8,040 W max.
RAS Features	Hot swap disks, PCI slots, fans, power supplies, RSC, multipathing to storage and networks, indicators for PCI cards	Full H/W Redundancy Sun™ Fire V880 capabilities plus: Redundant clocks, buses, system controllers, self diagnostics, service indicators on all FRUs	Full H/W Redundancy Sun™ Fire V880 capabilities plus: Redundant clocks, buses, system controllers, self diagnostics, service indicators on all FRUs	Full H/W Redundancy Sun™ Fire V880 capabilities plus: Redundant clocks, buses, system controllers, self diagnostics, service indicators on all FRUs	Full H/W Redundancy Sun™ Fire V880 capabilities plus: Redundant clocks, buses, system controllers, self diagnostics, service indicators on all FRUs
Warranty	3 year, 2nd business day service, on-site	1 year, same business day service, on-site	1 year, same business day service, on-site	1 year, same business day service, on-site	1 year, same business day service, on-site
Minimum O/S at 750 MHz (900 MHz processor based systems required a later version)	750 MHZ: Solaris 8 7/01 900 MHz: Solaris 8 10/01	Solaris 8 4/01	Solaris 8 4/01	Solaris 8 4/01	Solaris 8 4/01

Comparison Sun Fire 3800-6800 vs. Sun Fire V880

The above chart details many of the physical aspects which differentiate the Sun Fire V880 server from the Enterprise class systems. The following chart focuses on market segmentation relative to the management and operations staff.

Criteria	***Sun Fire™ 3800 - 6800***	***Sun Fire™ V880***
Focus	Top down, i.e. data center oriented	Bottom up, user or workgroup focus entering data center
Scope	Enterprise-wide	Workgroup, department, division or contributing to enterprise activity
Availability	99.9 - 99.99% - depending upon configuration, i.e. domains and Clustering	99.9+% - <9 hours/year
Storage	Centralized	Integrated/Adjacent
Backup	Centralized via network	Individual system basis
Consistency in organization	Key to manageability and availability	Willingness/ability to explore alternatives
Price Consideration	Priority 2 or 3 after predicable response and availability	Priority 1 or 2, extremely cost sensitive
Response time expected	Critical, Service Level Agreements (SLAs), Domains guarantee dedicated resources to particular applications	More latitude, domains not required
Management	Centralized	Likely more distributed
Upgrades/security	Planned activity	Less formally structured

Key Features and Benefits

Features	Benefits
• Up to eight 900 MHz UltraSPARC™ III processors, each with 8 MB external (L2) cache and up to 8 GB of ECC (error correcting code) memory per processor	• UltraSPARC™ III technology offers better scalability and enhanced performance as compared to previous generations of processors
• Integrated FC-AL storage subsystem	• Provides flexible configurations and in-cabinet upgrades. Reduces the cost of storage.
• Integrated 1 Gbit and 10/100 Ethernet, FC-AL disk controller, serial and USB ports	• Reduces the cost of the most commonly required I/O interfaces and optimizes the use of PCI slots
• Multipathing to 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 as well as ability to participate in a data center environment at a lower cost.
• Six port Sun Fireplane Interconnect operating at 9.6 GB/sec.	• High bandwidth interconnect insures scalability with minimal contention and latency between processing and I/O subsystems
• 9 PCI slots, 2 at 66 MHz, 64 bit wide and 7 at 33 MHz, 64 bit wide across three PCI buses	• Allows users to configure systems according to their needs with additional network, storage, graphics adapters, etc. Helps eliminate contention among peripheral controllers thereby maximizing processing capabilities.
• Hot swap disks, PCI slots, power supplies and cooling fan trays	• On-line maintenance and repair enhances system availability
• N+1 power supplies with separate power cords.	• Enhances system availability by masking an individual failure. Precludes failure of an entire power grid from affecting system availability.
• Automatic System Recovery (ASR) monitors key components and automatically configures around failed components	• Enhances availability by restoring system to operation as quickly as possible. Potentially reduces 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.
• Sun™ Cluster support	• Enhances availability. Facilitates incremental growth with full utilization of previous investments. Facilitates resource sharing.
• Solaris 8 and 9	• Provides full compatibility for binary applications across the UltraSPARC product line. Offers users the most flexible, feature rich, resilient operating system.

Key Messages

- 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 external (L2) cache
  - 8 GB of ECC memory per processor
  - Numerous on-chip caches for enhanced performance
  - Binary compatibility with previous SPARC™ processors, thereby providing ease of migration for existing applications
- Scalability and Performance
  - Offers 2, 4, 6 or 8-way multiprocessing system based upon dual processor/memory modules
  - 9.6 GB/sec., six-port, 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 twelve 36.4 or 73 GB disks with optional, secondary FC loop for higher availability and bandwidth
- Integrated Controllers
  - Integrated FC-AL disk controller, 1 Gbit Ethernet (fibre), 10/100 Ethernet (copper), internal SCSI for DVD and optional removable media devices, serial and USB ports
  - Saves PCI slots for user selectable controllers
  - Cost effective, familiar to those migrating/expanding from the PC environment
- I/O Subsystem
  - 1.2 GB/sec. throughput capability
  - Integrated controllers and user selectable PCI cards distributed across four independent PCI buses to minimize contention among controllers and maximize processing capabilities
  - PCI based controllers provide industry standard, economical I/O adapters
- Operating Environment
  - Ideal for branch/remote offices,departments or data center operations
  - Rackmountable with optional kit
  - Helps eliminate/reduce the need for external storage arrays
  - Many features for higher levels of availability and ease of management, including Automatic System Recovery (ASR), hot swap power supplies, disks and PCI slots, and Remote System Control (RSC).
  - Sun Management Center

Availability of Product

Volume shipments for the Sun™ Fire V880 Server at 750 MHz began in the Fall 2001. Volume shipments of the server at 900 MHz began in the Spring 2002.

Target Users

The Sun Fire™ V880 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 to eight-way multiprocessor, combined with a 9.6 GB/sec. Interconnect, insures scalability for compute-intensive applications.

The integrated, Fibre Channel disk subsystem, two integrated Ethernet controllers and nine available PCI slots provide 1.2 GB/sec. of I/O throughput can satisfy I/O demanding applications such as database and web serving.

Target Industries

Target Markets	Applications
Financial Services • Insurance • Stock and commodity traders • Banking	Branch to regional office servers, electronic commerce, customer management (CMS) and electronic commerce. Complementing data center operations by isolating particular applications.
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, repositories for data from research

Target Markets	Applications
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	• Storage capacity (437 GB internal, over 1 TB external) • Outstanding storage performance • 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
Transaction Processing (TP)	• 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 capacity and storage 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 a leading internet provider, majority of the servers on the Internet are Sun servers
Inter-operability	• PC Netlink
Compute Intensive • ECAD • CFD • Simulations	• Large memory with low access latency • High system bandwidth • High performance storage subsystem, multiple FC loops • Scalability • Multiple processors efficiently manages independent streams for faster job completion

Selling Highlights

Market Value Proposition

- UltraSPARC™ III extends the processing capabilities beyond previous generations on an individual processor basis.
- The 2 to 8-way multiprocessing capability extends the upper limits of workgroup servers, thereby providing significant economies in comparison to traditional mainframe and enterprise class environments that do not require the highest levels of availability.
- The Sun™ Fireplane Interconnect helps insure scalability and minimal latency for applications and workloads across the range of 2 to 8-way multiprocessing systems.
- The integrated I/O controllers provide the most commonly used interfaces at low cost without consuming valuable PCI slots.
- The integrated storage subsystem offers an intelligent, high performance disk array without the need for incremental cabinetry, power and environmental considerations.
- Hot swappable components such as disks, power supplies, fans and PCI slots help maximize system availability by allowing maintenance and upgrades to occur during normal operations. (Hot swap of a PCI card also requires support by the Solaris device driver.)
- Remote System Control (RSC) offers sophisticated GUI-based remote monitoring, diagnosis and console access via network/Ethernet, serial port or modem connections. RSC facilitates remote and/or centralized management of systems, thereby encouraging faster and more convenient response.
- Automatic System Recovery (ASR) helps minimize the impact of a hard failure by identifying and isolating failed components and automatically restoring service to users.

Applications

Please refer to the Section entitled *Target Industries* above and the associated chart.

Compatibility

The Sun Fire™ V880 Server is fully compatible with existing Sun servers and may coexist in networks and/or within a Sun™ Cluster.

UltraSPARC™ III Microprocessors

The Sun Fire™ V880 server is based upon Sun's second generation of 64-bit microprocessor and the SPARC™ V9 UltraSPARC™ architecture. This architecture will help enable the performance of future microprocessors with speeds in excess of 1 GHz to scale proportionately. The 750 MHz and 900 MHz microprocessors are built by a 0.18 micron CMOS process utilizing seven metal layers and providing over sixteen million transistors.

Some of the more prominent features of the UltraSPARC III microprocessors which may 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 Gbytes/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

- 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. By comparison, Intel™ based processors have a much smaller translation buffer.

- 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 six ports, one for each of the four 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 theoretical, total aggregate bandwidth is 9.6 GB/sec. of throughput. The actual throughput will vary according to the applications, potential for concurrency of I/O and memory access, cache effectiveness, etc.

The system bus is located on the motherboard.

FC-AL Storage Controller

The Sun Fire V880 Server provides an internal storage subsystem with an integrated Fibre Channel Arbitrated Loop (FC-AL) controller supporting a maximum of twelve 1.0", 10,000 RPM, 36.4 or 73 GB disks. (The storage backplane for the first six drives is standard on all configured systems. The second disk backplane and six additional FC-AL disks is included only with the high-end configurations as noted in the section entitled *Ordering Information*. It is optional for the other configurations.

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 software are required in order to provide complete transparency to users and applications.

On the Sun Fire™ V880 Server, a FC-AL controller is integrated on the motherboard. Multipathing to either the internal disks or external storage arrays may be provided by the inclusion of an optional PCI to FC-AL controller 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 availble 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 consideraton 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.

- A PCI bridge inteface

  The result would be the loss of two PCI buses, one 66 MHz bus and one 33 MHz bus. Please refer to Figure 2, *Sun Fire V880 Server, Block Diagram*.

- A PCI bus controller, thereby disabling all slots on that PCI bus

- A PCI slot

  This action identifies a failed slot in comparison to a failed PCI adapter. A failed PCI adapter can obviously be replaced, especially if the adapter offers hot-swap capability. In comparison, a failed slot cannot support any PCI adapter.

- An individual PCI adapter (host bus adapter)

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

The Sun Fire™ V880 Server features a Remote System Control (RSC) module and software that helps enable complete console access, monitoring and control from remote locations via any client device on the network, a serial line or modem.

RSC functionality may also be referred to as a System Service Processor (SSP), a System Control (SC) or possibly a Lights Out Management (LOM) feature. It should be emphasized that different systems and implementations may apply the generic term, System Service Processor, for different purposes. For example, within an enterprise environment, an SSP may be the element of control by which domains are implemented and managed. Within a workgroup server environment, an SSP monitors and controls a single entity.

RSC is a completely independent processor card that 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, RSC can constantly monitor a variety of conditions and 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
- Provide notification of server problems and enter detailed log entries of RSC events

The RSC module inserts into a dedicated slot on the system I/O board and includes integrated PCMCIA modem, serial and Ethernet interfaces; it does not occupy a PCI slot. The RSC firmware runs independently from the host and 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, e-mail or the GUI.

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 twisted pair Ethernet (TPE) connector
- 56 Kbps modem port via an RJ11 connector
- EIA-232D serial port via an RJ45 connector

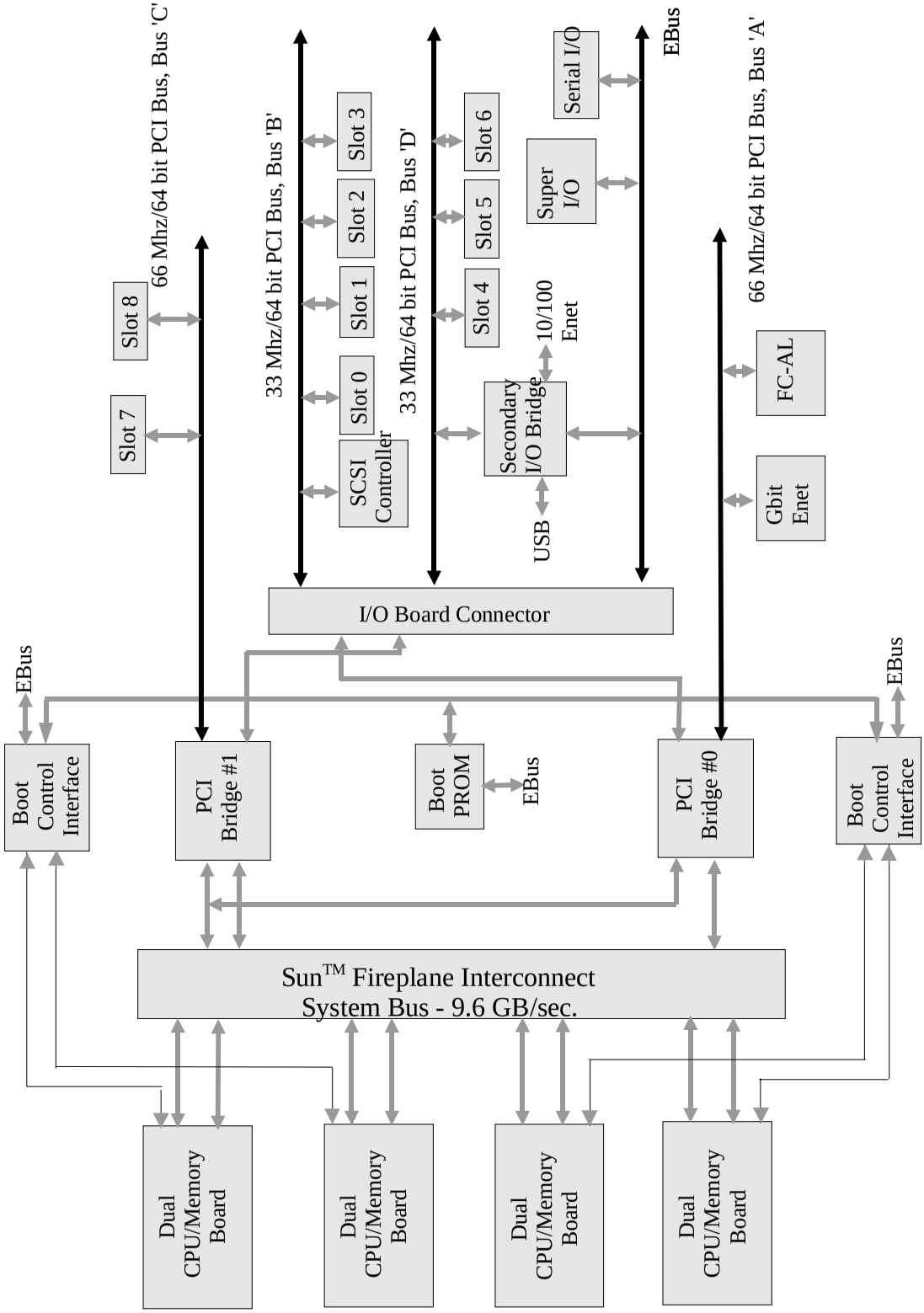


Figure 2, Sun Fire™ V880 Server, Block Diagram

Dual Processor/Memory Modules

Figure 3: Sun Fire™ V880 Server, right, side view with four dual-processor/memory modules

The Sun Fire™ V880 server system is comprised of one or more dual-processor/memory modules which mount perpendicular to the motherboard, the alternate side of which is reserved for the I/O subsystem. The minimum configuration consists of a single dual processor/memory module; the maximum configuration has four. Single processor modules are not available, consequently, a system will always contain an even number of UltraSPARC III processors.

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

Memory Subsystem

Memory within the Sun Fire™ V880 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. Access to the memory associated with the alternate processor on the same dual processor/memory module incurs a minimal latency penalty. 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 36 bit of ECC in a single access. This size corresponds in size exactly to a full external cache block.

There are eight DIMM slots per processor organized as two memory groups of four slots. 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 16 DIMMs are identical;
  otherwise, 4-way between any two groups configured identically;
  otherwise, 2-way within any group that doesn't 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.

In the event of a system failure resulting from an individual DIMM, Automatic System Recovery will attempt to identify and bypass only the failed component. In this event, memory interleaving for the associated dual processor/memory module is disabled.

The currently supported memory options per processor are:

- 0.5 GB Memory Option (4 x 128 MB DIMMs),
  - Supported only on the 750 MHz CPU/memory module
  - This memory option, (X)7050A, been retired
- 1.0 GB Memory Option (4 x 256 MB DIMMs)
- 2.0 GB Memory Option (4 x 512 MB DIMMs)
- 4.0 GB Memory Option (4 x 1 GB DIMMs)
  - Supported only on the 900 MHz CPU/memory module

I/O Subsystem Architecture

Figure 4: Sun Fire™ V880 Server, left, side view
9 PCI slots with RSC module at the very base

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 Gbit Ethernet controllers. 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 V880 Server, Block Diagram.)

There are a total of nine PCI slots available for user selected host bus adapters, all of which are hot pluggable. Two slots operate at 66 MHz, 64 bits, 3.3 V; seven at 33 MHz, 64 bits, 5 V. All slots accept adapters, either 64 or 32 bits wide, and either full length (12") or 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. During a hot plug operation, a 33 MHz adapter cannot be connected to a 66 MHz slot.

The DVD and removable media device(s) are connected via an integrated SCSI controller from one of the 33 MHz PCI buses. The serial I/O ports interface via an integrated controller to the other 33 MHz PCI bus.

Maximum theoretical 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.

Internal Disk Subsystem

Figure : Sun Fire™ V880 Server, front view
12 FC-AL disk drives

The internal disk subsystem is managed by an integrated fibre channel, arbitrated loop (FC-AL) disk controller and will support one to twelve, hot pluggable, FC-AL disks arranged as two groups of six drives. The drives connect to a backplane which provides power, signal and data. The first storage backplane supporting the first six drives is standard; the second backplane is an option on all but the high-end configuration where it is included.

The storage backplanes are supported only in a serial configuration where all twelve drives are on the same FC loop(s). The backplanes may not be used as independent entities, i.e. separate loop(s) for each backplane. The considerations which encourage using the disk backplanes together, and not separately include:

- Extremely high MTBF of the disk backplane
- Usage of additional PCI cards/slots and the associated cost if the backplanes were to be used independently
- Potential for lower overall reliability with additional components when the backplanes are used independently
- Total effective storage available to customers
- Additional qualification and support considerations

The backplanes come 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 X6727A, PCI to dual FC-AL controller with an internal connector, the X6755, internal FC-AL cable and software product(s). A software product, such

as Veritas™ Volume Manager (with Dynamic Multipathing) Version 3.1.1 or a future version of StorEdge Traffic Manager Software will mask the failure of a FC loop or controller from the application, thereby allowing uninterrupted processing. However, StorEdge Traffic Manager Software does not currently provide support for the FC-AL loops upon which the boot devices reside.

The X6727A, 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:

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

Veritas Volume Manager Licensing

The licensing program for Veritas Volume Mnager V3.1.1 classifies the Sun Fire V880 server as a workgroup, Tier 1 server. The external storage to be connected to the Sun Fire V880 server may qualify it for a reduced license fee for management of the internal storage array.

Under Veritas Volume Manager V3.1.1

- A StorEdge T3 Array for the Enterprise (partner pair) includes a full Tier 2 license which is sufficient for the internal storage array; 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.
- Veritas Volume Manager V3.1.1 will be retired in December 2002

Under Veritas Volume Manager V3.5

- The introduction of Veritas Volume Manager V3.5 in September 2002 employs a new license structure with the Sun Fire V880 server classified in Tier 1C, license only order number VVMGS-999-1C99.
  - Media and documentation for Solaris can be ordered separately, VXVMS-350-9999
- StorEdge T3 Array for the Enterprise (partner pair) includes a full Tier 2B license which is sufficient for the internal storage array; no additional license is required.

- The StorEdge T3 Array for the Enterprise is the only storage subsystem that includes a Veritas Volume Manager Tier 2 server license.
    - Each rack configuration ships with a single Veritas Volume Manager Tier 2B server license.

- A StorEdge A5x00 has a limited license for which an upgrade is sufficient
    - VSSAS-999-1C99 – Upgrade to a Tier 1C license

Control Panel

The control panel includes nine LED status indicators, a power button and a security keyswitch. At the top of the status and control panel, three general status LEDs provide a snapshot of the system status. Below the power button and security keyswitch, a graphical display provide six LED icons to indicate specific fault conditions and locations.

The power button is recessed to preclude inadvertent shutdown of the system. The operation of the power button may disabled by the security keyswitch.

The four position security keyswitch controls the power on modes of the system and prevents unauthorized users from powering off the system, reprogramming the system firmware and performing CPU/memory or PCI hot-plug operations.

Power Distribution System

The required power is provided by two power supplies each accepting 1,500 watts input and providing 1,100/1,200 watts output. The power supples are located at very bottom, rear of the system cabinet. A third power supply is included with all configurations, thereby providing N+1 redundancy. With this N+1 redundant configuration, a failure of any one power supply

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

Each power supply provides a total of five DC output voltages (3.3V, 5.0V, 12V, 42 V, and 5.0V standby). Output current is shared equally between each of the supplies via active current sharing circuitry.

Three LEDs on the rear of each power supply provide status information for each of the power supply bays.

Environmental Monitoring and Control (EM&C) System

The environmental monitoring and control (EM&C) system protects the system against:

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

Monitoring and control capabilities resides 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 I^2C bus to monitor and control temperature sensors, fans, power supplies, status LEDs and the front panel keyswitch. Temperature sensors monitor ambient temperature throughout the system as well as that of each CPU.

The hardware and software components of the EM&C 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 to the system console, if present, an entry in the system log file and illumination of the system and thermal fault LED indicators on the front status panel.

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

The EM&C system will also detect a failure of the cooling fans. All system configurations include a redundant set of cooling fan trays.

In the event of a failure of any fan, the monitoring system generates an error message, activates the system fault and thermal fault LEDs on the status and control panel, lights the appropriate fan fault LED inside the cabinet, and activates the appropriate secondary fan tray.

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 the system fault and power fault LED indicators are activated on the status and control panel. LEDs on the back of each power supply will indicate the status and nature of the failure.

System Rackmounting Kit

The Sun Fire™ V880 Server is intended to operate either in a remote/branch office or within a data center. In a branch/remote office, it is anticipated that the system will reside on the floor. Data centers typically arrange equipment within racks for the most efficient use of floor space.

An optional rack mount kit is available, X9628A. The casters from the system need not be removed when mounting it within a rack. The server is 17 rack units (RU) high, including the kit itself. Within a standard 72" high rack, the Sun Fire™ V880 Servers may be mounted two high. Each server weights from 194 lbs. minimal configuration to 288 lbs. fully configured, approximately. To facilitate rack mounting, heavier components such as the power supplies may be removed.

When a single Sun Fire V880 is mounted within a rack, it should occupy the lowest position for weight considerations. The remainder of the rack may be used for storage arrays, other systems, etc. with an air flow from front to rear as with the Sun Fire V880 server. A spacing of one RU is required between the server and other components. However, if storage arrays are included within the same rack as system(s), then an air baffle is required to partition the rack. As most storage arrays cool from side to side, the air baffle will preclude the exhaust from the storage arrays being used as the source of cooling for the system(s).

A stabilizer/extender foot is provided on all industry standard racks. For safety considerations, prior to servicing, the extender must be positioned forward to prevent the entire rack from tilting forward as the center of gravity changes. Then, the rackmount tray and system may be extended forward from the rack and the side panels opened for access to either the dual processor/memory modules on the right side or the I/O subsystem, including PCI adapters, on the left.

The Sun StorEdge Expansion cabinet SG-XARY030A is an appropriate Sun provided rack and provides sufficient space for mounting two servers. There is an optional front door for this rack, X9818A which should be installed for EMI considerations with two Sun Fire V880 servers within the rack.

The Sun Fire Expansion rack SF-XCAB can accommodate only a single Sun Fire V880 server. As with the Sun Fire 3800 server, an X4347A Sun Fire Cabinet Expander kit is required to add sufficient dept to allow the rear door to close. The rackmount kit includes an optional set of mounting brackets which accommodate the 31.5" (80.01 cm.) rail-to-rail dept of the Sun Fire Expansion Rack.

Third party racks that comply with EIA-310-D-1992 Standard and are 34" (86.36 cm.) to 36" (91.44 cm.) depth rail-to-rail may be considered. The rackmount kit has adjustable extenders which can accommodate rail-to-rail depths of 32" (81.28 cm.) to 36" (91.44 cm.) only. Sufficient space for cable management must be allowed. Therefore, third party cabinets with a total, externally measured depth of 36" and possibly as much as 39" may be required. Front doors to cabinets must provide at least 60% open area and rear doors at least 63% open area to allow the system to cool properly.

NOTE: One is advised to evaluate carefully all aspects and dimensions of the intended rack including:

- Rail-to-rail depth,
- Space for cable management,
- Protrusions mounted on doors, etc. which might interfere with systems and/or cables,
- Compatibility for front to back air flow requirements,
- Open space sufficient to allow proper, unrestricted air flow,
- Sabilizer/extender foot for servicing considerations

Third-party products are neither tested, endorsed nor recommended.

Additional information may be found under:

- http://vsp.eng/entry/fire/rackmount/
- http://hf.eng/reports/hf02/rack/rack-idhf02-04a.html.htm
- http://onestop.eng/storage/rack.shtml
- http://cpre-amer.east/vsp/wgs/products/daktari/rack/rack_mount.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™ V880 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 pluggable disks, power supplies, fans and PCI slots
- Easily accessible LED status indicator, especially for PCI cards
- Front panel LED display
- Remote System Console (RSC) for monitoring and administrative capability
- Automatic System Recovery (ASR) for isolation of failed components and automatic reboot capability
- Environmental monitoring and fault protection
- RAID capability for disks

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 • with castors - deskside **NOTE:** Rackmounting does not require the removal of the casters	 28.1" 17 RU	 714 mm 17 RU
Width	18.9"	480 mm
Depth	32.9"	836 mm
Weight (minimum/maximum)	194/288 lbs.	88/131 kg.

Note: All measurements and weights should be considered as approximate.

Environment

Power and BTU Requirements/Measurements

	U.S.	International

Operating
• 2 power supplies required, 3 (maximum) provides N+1, hot-pluggable redundancy
• Amperage requirements
  • 14.8 Amp/power cord at 100 VAC
  • 12.3 Amp/power cord at 120 VAC
  • 6.15 Amp/power cord at 240 VAC
• 1.48KVA per power supply; (3.5KVA) 3.5KW sustained power draw per system
	1500 W input; 1100W output @ 120 VAC per supply	1500 W input; 1100W output @ 240 VAC per supply

Tolerance	47 - 63 Hz	47 - 63 Hz

Configuration	***750 MHz***		***900 MHz***	
	Power	***BTUs/hour***	***Power***	***BTUs/hour***
Base Configuration 2 processors (1 module) 4 GB (16 – 256 MB DIMMs) 6 – 36.4 GB disk drives DVDrom RSC module PCI graphics card 3 power supply	795 Watts	2,713 BTU/hour	840 Watts	2,867 BTU/hour

Configuration	*750 MHz*		*900 MHz*	
	Power	***BTUs/hour***	***Power***	***BTUs/hour***
Maximum Configuration 8 processors at (4 modules) 16 GB (64 – 256 MB DIMMs) 12 – 36.4 GB disk drives DVDrom RSC module PCI graphics card 3 power supply	1,683 Watts	5,744 BTU/hour	1,923 Watts	6,563 BTU/hour
Additive (all figures in input watts) 750 MHz module with 4 GB of memory 900 MHz module, 4 GB memory 900 MHz module, 16 GB memory 36.4 GB or 73 GB disk drive PCI load (15 Watts, output)	 240 Watts N/A N/A 28 Watts 20 Watts	 819 BTU/hour N/A N/A 96 BTU/hour 69 BTU/hour	 N/A 305 Watts 330 Watts 28 Watts 20 Watts	 N/A 1,041 BTU/hr. 1,126 BTU/hr. 96 BTU/hour 69 BTU/hour
Maximum possible power draw	2,880 Watts	9,829 BTU/hr.	2,880 Watts	9,829 BTU/hr.

Note: All measurements running SunVTS. BTU data will vary according to application(s) running and memory reference patterns.

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 (at prompt)	76 dB(A)

Humidity (noncondensing)

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

Regulatory

Safety	UL/CSA-60950, EN60950, IEC950 CB Scheme with all country deviations, IEC825-1, 2, and CFR21 part 1040
Ergonomics	EK1-ITB-2000
RFI/EMI	EN55022/CISPR22 Class A, FCC CFR47 Part 15 Class A, EN61000-3-2, EN61000-3-3
Immunity	EN55024
X-ray (for monitors)	DHHS 21 Subchapter J; PTB German X-ray Decree
Regulatory Markings	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, EK, UL/cUL, TUV-GS

Requirements and Configuration

System Requirements

The Sun Fire™ V880 Server requires Solaris™ 8 7/01 or later for systems with 750 MHz processors. Solaris 8 10/01 with all patches or Solaris 8 2/02 is required for systems with 900 MHz processors.

It is always encouraged that all recommended patches be applied.

Upgrades/Upgrading Systems to 900 MHz

Upgrading a system to 900 MHz from 750 MHz requires the following:

- A minimal level of Solaris 8 10/01 with patches or later
- Verifying the appropriate version of OBP is installed
- Verifying other related components such as DPM code is installed
- Replacement of all dual-processor/memory modules, generally via an IBB upgrade
    - Moving memory DIMMs from the original 750 MHz module(s) to the 900 MHz modules

Failure to complete the upgrades to the operating system and/or firmware prior to installation of the 900 MHz dual-processor/memory modules may preclude the system from booting completely.

Detailed instructions and minimal levels may be found in the *Sun Fire V880 Server Product Notes*, Document 806-6593. All documentation may be found under URL:

http://www.sun.com/products-n-solutions/hardware/docs/Servers/Workgroup_Servers/Sun_Fire_V880/index.html

Note: All dual-processorr/memory modules within a system must be upgraded simultaneously. Systems containing modules designated to run at different speeds are not support and will be detected by the firmware.

Licensing/Usage

Operating System Environment

The Sun Fire™ V880 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

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.

System Management

System Administration

Built into the Solaris™ 8 Operating Environment are systems management and security features that will help deliver the computing environment demanded by these customers. Sun also offers unbundled system 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™ • Solaris Bandwidth Manager • Sun Bandwidth Allocator	• Licensed separately • Licensed separately • Licensed separately

Management Function	Sun Management Tools	Standard or 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 Service	• Licensed separately • Standard • 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
- Tape drive
- Disk drives
- Any option card that contains on-board self-test capabilities

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

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

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

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

OpenBoot Firmware

The OpenBoot firmware is stored in the boot programmable read-only memory (PROM) of the system. It is executed immediately after the customer turns on the system. The primary task of the OpenBoot

firmware is to boot the operating system from either a mass storage device or from a network. The firmware also provides extensive features for testing hardware and software interactively.

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

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

Power On Self Test (POST)

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

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

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

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

ShowMe How software is a documentation system that presents information in a highly understandable multimedia format. 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. And customers can prioritize traffic, preventing a small number of applications or users from consuming all available bandwidth.

Solaris Bandwidth Manager software helps enable 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 helps enable 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 makes it easy for administrators to configure and administer Solaris Operating Environment systems. Based on Java™ technology, Solaris Management Console software can launch a UNIX® application on a 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 helps enable 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 helps enable 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 virtually 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 helps eliminate 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.

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

The Sun Fire V880 server features a System Service Processor (SSP) and Remote System Control (RSC) software, enabling access, monitoring, and control of the server from a remote location, using any client device on the network.

The System Service Processor is a fully independent processor card that resides on the system motherboard. Configured to allow communications with a variety of client devices through an Ethernet 10BASE-T interface, a serial line or a PCMCIA-compatible on-board modem, 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 of the server, the SSP can constantly monitor for a variety of conditions including:

- Remote console functions available through Ethernet, serial port or modem
- View of the server's front panel including keyswitch position and LEDs
- Ability to run diagnostic tests and and to configure the server from a remote console
- Remote system monitoring and error reporting, including output from power-on self-test (POST) and OpenBoot Diagnostics
- Remote server reboot, reset, power-on and power-off on demand
- Ability to monitor drive and fan status, and CPU temperatures without needing an administrator near the managed server
- Remote event notification of server problem and a detailed log of RSC events
- RSC battery backup allows RSC to operate for up to 30 minutes after a complete power failure

The Remote System Control firmware runs independently of the host and uses standby power drawn from the host system. The System Service Processor includes a battery that provides approximately 30 minutes of power in the event of a power failure. This allows RSC hardware and software to continue to be effective even when the server operating system goes off-line, and can send notification of hardware failures or other events to administrators via pager or e-mail.

Solaris Resource Manager Software

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

Solaris Resource Manager software includes the following features:

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

Solaris WBEM Services

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

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

Solaris Web Start Software

Solaris Web Start software, a key component of the Solaris Operating Environment, is an easy-to-use Java technology-based application that guides system administrators through the installation of both the Solaris Operating Environment and 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 Backup Software

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

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

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

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

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

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

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

Solstice CMIP Software

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

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

Solstice CMIP software helps enable 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 allows Solstice DiskSuite software to use multiple, independent data paths in the case of failure. However, Solstice DiskSuite is not sufficient for the implementation of multipathing.
- 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 Bandwidth Allocator Software

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

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

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

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

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

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

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

Sun Bandwidth Allocator software provides the following functions:

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

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

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

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

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

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

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

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

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

Sun Cluster Software

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

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

Key features of Sun Cluster software include support for Solaris 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 V880 server supports Sun Cluster 3.0 and includes support for the following storage arrays:

- Sun StorEdge A1000
- Sun StorEdge A5100/A5200
- Sun StorEdge T3

Please refer to www.sun.com/software/cluster for more details.

Sun Enterprise Authentication Mechanism (SEAM) Software

Sun Enterprise Authentication Mechanism (SEAM) 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 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 helps to enable 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 helps enable 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, allows the enterprise to preserve data privacy and data integrity by helping to eliminate 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, helping to enable 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 helps to enable 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 helps to enable multiple administrators with different responsibilities to manage the environment.

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

Sun Management Center software allows administrators to obtain configuration data, 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
- A single event model, enabling information to be shared with multiple consoles or users with ease
- Multiple system support, enabling administrators to monitor and manage all Solaris Operating Environment systems remotely
- Predictive failure analysis, enabling administrators to predict potential failures before they occur
- Health monitoring, along with suggested steps for problem resolution, resulting in simplified administration
- Logical element grouping, enabling Sun systems to be grouped by geographical location, server role, administrative responsibility, among others.
- A comprehensive topology map, providing a high-level view of all the objects that are being managed, along with hierarchies
- Automatic discovery of Sun systems, including IP address, subnet address, hostnames, and more
- Event and alarm management, providing administrators with the information they need when they need it
- Enterprise-wide security measures, such as authentication, data integrity, and access control lists for management of data and active management functions
- Standard interfaces and protocols, enabling integration with third-party management tools, including Tivoli, Computer Associates, and BMC
- A Java technology interface, providing heterogeneous GUI support, a common look and feel for all Sun Management Center applications, and the flexibility to manage the enterprise from any platform using Java technology

SunScreen Secure Net Software

SunScreen Secure Net software is a bundled solution which includes SunScreen EFS™ and SunScreen SKIP software. It helps to enable 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 among 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 Version 3.1.1 or later 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.

Please refer to the section entitled *Veritas Volume Manager Licensing* for applicability to the Sun Fire V880 server.

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

Performance information may be found at:

http://systems.corp/SAE/

and includes:

- World Record ECperf Borland/Oracle8i
- World Record Performance and price/performance on Lotus Webmail
- Consolidation of three major applications on one eight-way Sun Fire V880 server
- Delivered I/O and Networking Bandwidth

Ordering Information

Standard Configurations - Pre-configured Systems

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

These configurations include:

- System cabinet on casters, a rackmount kit is available as a separately orderable item
- Integrated FC-AL disk controller
- One fibre channel disk backplane capable of supporting a maximum of six internal disk drives. (The second optional disk backplane may be ordered separately with an additional six internal drives where it is not included with the base system.)
- Internal only SCSI bus for the DVD and removable media bays
- DVD SCSI drive
- RSC module with PCMCIA modem
- Three power supplies providing N+1 redundancy (two power supplies are required)
- Redundant set of cooling fan trays
- External Gbit Ethernet (fibre)
- 10/100 Ethernet (copper)
- one serial port (two may be effected via a Y/splitter cable)
- 2 USB ports, i.e. for optional keyboard and mouse

Solaris™ 8 must be entered on the order as a separate line item.

Assemble to Order Configurations (ATO)

Assemble-to-order configurations are not available. The listed configurations and upgrades greatly reduce the need for custom configurations which generally command a premium in pricing.

Order Number	Description
750 MHz Systems	
2 Processors with 4 GB of Memory Entry Configuration	
A30-WRF2-04GQF	2 CPUs at 750 MHz (1 processor/memory module), 4 GB memory implemented as 4 - X7053A options, 6 - 36.4 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
4 Processors with 8 GB of Memory Mid-range Configuration	
A30-WRF4-08GQF	4 CPUs at 750 MHz (2 processor/memory modules), 8 GB memory implemented as 8 - X7053A options, 6 - 36.4 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
8 Processor Systems with 32 GB of Memory High-end Configuration	
A30-WRF8-32GQM	8 CPUs at 750 MHz (4 processor/memory modules), 32 GB memory implemented as 16 - X7051A options, Second disk backplane, 12 - 36.4 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
900 MHz Systems	
2 Processors with 4 GB of Memory Entry Configuration	
A30-WSF2-04GRF	2 CPUs at 900 MHz (1 processor/memory module), 4 GB memory implemented as 4 - X7053A options, 6 - 73 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
4 Processors with 8 GB of Memory Mid-range Configuration	
A30-WSF4-08GRF	4 CPUs at 900 MHz (2 processor/memory modules), 8 GB memory implemented as 8 - X7053A options, 6 - 73 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
8 Processor Systems with 16 GB of Memory High-end Configuration	
A30-WSF8-16GRF	8 CPUs at 900 MHz (4 processor/memory modules), 16 GB memory implemented as 16 - X7053A options, 6 - 73 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
8 Processor Systems with 32 GB of Memory High-end Configuration	

Order Number	Description
A30-WSF8-32GRF	8 CPUs at 900 MHz (4 processor/memory modules), 32 GB memory implemented as 16 - X7051A options, 6 - 73 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays
8 Processor Systems with 64 GB of Memory High-end Configuration	
A30-WSF8-64GRM	8 CPUs at 900 MHz (4 processor/memory modules), 64 GB memory implemented as 16 - X7056A options, Second disk backplane, 12 - 73 GB, 1.0", 10,000 RPM, FC-AL disks, 3 (N+1 redundant) power supplies and redundant cooling fan trays

Memory Configurations

Implementations

All systems, with the exception of

- The 8-way with 32 GB at 750 MHz,
- The 8-way with 32 GB at 900 MHz and
- The 8-way with 64 GB at 900 MHz

are implemented with the (X)7053A memory option, each option consisting of four 256 MB DIMMs.

The (X)7051A and (X07056A memory options are required to achieve memory capacities greater than 2 GB per processor. The (X)7051A is used exclusively with the 8-way with 32 GB systems. The (X)7056A memory option offering 4 GB of memory is not supported on 750 MHz systems but is used for the 8-way at 900 MHz with 64 GB of memory.

Expandability to Processors and Memory

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

- A30-WRF2-04GQF - 2 processor at 750 MHz, 4 GB, 6 disk system, or
- A30-WRF4-08GQF - 4 processor at 750 MHz, 8 GB, 6 disk system, or
- A30-WSF2-04GRF - 2 processors at 900 MHz, 4 GB, 6 disk system, or
- A30-WSF4-08GRF - 4 processors at 900 MHz, 8 GB, 6 disk system

then, the maximum system configuration that can be achieved is an 8 processor, 16 GB system. This configuration may be obtained by adding

- (X)7047A options to the 750 MHz systems or
- (X)7028A options to the 900 MHz system

Processor/memory ugprades are possible to:

Configuration	*Description*	*Maximum Number of Additional Modules Possible*
A30-WRF2-04GQF	2 processors at 750 MHz, 4 GB, 6 disks	3 - X7047A modules
A30-WRF4-08GQF	4 processors at 750 MHz, 8 GB, 6 disks	2 - X7047A modules
A30-WSF2-08GRF	2 processors at 900 MHz, 4 GB, 6 disks	3 - X7028A modules
A30-WSF4-08GRF	4 processors at 900 MHz, 8 GB, 6 disks	2 - X7028A modules

With the addition of the X7047A or X7028A option, the resultant configurations are:

- 4 processors, 8 GB of memory, 6 disks
- 6 processors, 12 GB of memory, 6 disks
- 8 processors, 16 GB of memory, 6 disks

Observe that it is not possible to achieve a system with greater than 16 GB of memory when starting with any of the systems listed above and using the X7047A or X7028A upgrades. In order to achieve memory capacities greater than 16 GB, one must either:

- Start with a fully configured A30-WRF8-32GQM, 8 processor at 750 MHz, 32 GB, 12 disk configuration, or
- Start with a fully configured A30-WSF8-32GQF, 8 processor at 900 MHz, 32 GB, 6 disk configuration, or
- Start with a fully configured A30-WSF8-64GRM, 8 processor at 900 MHz, 64 GB, 12 disk configuration, or
- Contact IBB for a memory upgrade/exchange program. Please refer to the Section entitled *Upgrades*.

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

The maximum memory capacity for the 750 MHz based systems is 32 GB; the maximum memory capacity for the 900 MHz based systems is 64 GB.

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

Storage Configuration Guidelines

Usage of internal storage backplanes

The storage backplanes may be only used in series, not independently.

One of the most effective, highest capacity utilizations of the internal storage with error detection and correction can be achieved by using a dual-loop/multipathing solution. This configuration allows as many as nine unique disks of data and system content when implemented as:

- RAID 1 or mirror copies of the system disk
- Two logical volumes utilizing RAID 5, each with five physical members, i.e. each with the equivalent of four disks for data and one for distributed parity.

Host Bus Adapters

(X)6729A PCI to FC-AL Adapter

The (X)6729A is not supported with UltraSPARC III systems as it has recently been retired. This adapter utilizes the Qlogic 2100 series chip which has been superseded by the Qlogic 2200 series. The IFP driver support for this device does not provide all of the features, especially failover capabilities.

For similar reasons, the (X)2069A, combination Gigabit Ethernet and FC-AL controller, which utilizes the Qlogic 2100 series chip is also not supported on UltraSPARC III systems.

(X)6799A PCI to Single FC-AL Adapter

This adapter was 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 connected 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 internal array of the Sun Fire V880 is similar, but not considered equivalent, to the Sun StorEdge A5x00 Array.

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.

When implementing multipathing to an external array, one should utilize two independent PCI adapters. Otherwise, a failure in the single PCI adapter would likely render both paths inoperable.

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 X6755A cable kit. This cable connects the internal FC-AL port of the adapter to the secondary FC-AL loop connector on the disk backplane.

Note: The X6767A and the X6768A cannot be used to implement multipathing to the internal storage array as these host bus adapters do not provide the required internal connector.

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 Software Version 3.1.1 or later must be implemented for multipathing to the internal array.

StorEdge Traffic Manager Software provides multipathing to external arrays such as the Sun StorEdge A5x00 and Sun StorEdge T3 arrays via the X6799 or X6727 PCI adapters. However, the current version does not support the FC-AL loops upon which the boot device resides.

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 often obtain higher performance than 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) Version 3.1.1 or later . The Sun Fire V880 server requires a workgroup, Tier 1 license for Veritas Volume Manager.

Solstice 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 Software Version 3.1.1 or later 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

Please refer to the section entitled *Veritas Volume Manager Licensing* for applicability to the Sun Fire V880 server.

Note: With the expected introduction of Veritas Volume Manager V3.5 in September, the license structure will change. The Sun Fire V880 server will be classified in Tier 1C.

SCSI Storage

External SCSI storage is available via PCI based adapters.

RAID Host Bus Adapters

The (X)6542A, SCSI H/W RAID adapter, is not available on the Sun Fire V880 Server.

USB Ports and Devices

Supported USB devices are listed:
file:/net/hagar.eng/export/www/docs/proj/usb/Mod.supported_devices

Options

Order Number	Option Description	Maximum Number Supported per System	Comments
Dual-processor/Memory Module			
X7047A	750 MHz dual-processor/memory module, each processor with 8 MB external (L2) cache. 4 GB of total memory (2 GB per processor) implemented as 4 - (X)7053A options (each consisting of 4 - 256 MB DIMMs) **Note:** All modules within a single system must operate at the same processor speed.	4	All memory DIMM slots fully populated Mixed speed systems not supported.
X7028A	900 MHz dual-processor/memory module, each processor with 8 MB external (L2) cache. 4 GB of total memory (2 GB per processor) implemented as 4 - (X)7053A options (each consisting of 4 - 256 MB DIMMs) **Note:** All modules within a single system must operate at the same processor speed.	4	All memory DIMM slots fully populated Mixed speed systems not supported.
Mfg. Part Number 501-6334	Field Replaceable Unit (FRU), i.e. for self maintenance customers: 900 MHz dual-processor/memory module, each processor with 8 MB external (L2) cache. No memory included.	N/A	N/A
Memory			
X7050A	512 MB (4 DIMMs of 128 MB each) **Note:** Supported only on 750 MHz based processor modules. **Note:** This memory option has been retired.	4 Groups (16 DIMMs) per module	See memory configuration requirements
X7053A	1 GB (4 DIMMs of 256 MB each)	4 Groups (16 DIMMs) per module	See memory configuration requirements
X7051A	2 GB (4 DIMMs of 512 MB each)	4 Groups (16 DIMMs) per module	See memory configuration requirements
X7056A	4 GB (4 DIMMs of 1 GB each) **Note:** Supported only on 900 MHz based processor modules.	4 Groups (16 DIMMs) per module	See memory configuration requirements
Internal Storage Expansion			
X6751A	Second storage backplane to accommodate an additional six internal FC-AL disks with 6 - 36.4 GB, 1.0", 10,000 RPM FC-AL disk drives.	1	For 750 or 900 MHz systems with only 6 disks
X6755A	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	1	

X6756A	Second storage backplane to accommodate an additional six internal FC-AL disks with 6 - 73 GB, 1.0", 10,000 RPM FC-AL disk drives.	1	For 750 or 900 MHz systems with only 6 disks
Mfg. Part Numbers 501-5993 530-2662 530-2863 530-2621 230-1697 Non-FRU component	Field Replaceable Units (FRUs), i.e. for self maintenance customers: FC-AL disk backplane FC-AL cable 35 cm. Base/expansion cable FC-AL cable, 15 cm. Three nylon washers to insulate screws from contact with FC-AL disk backplane; required to be non-conducting material	N/A	N/A
Internal Storage Devices			
X6724A	36.4 GB, 1.0", 10,000 RPM, FC-AL disk drive	12	
X6742A	73 GB, 1.0", 10,000 RPM, FC-AL disk drive	12	
X6805A	73 GB, 1.0”, 10,000 RPM, FC-AL, multi-sourced disk drive	12	
Internal Removable Storage Devices			
X6283A	12 GB 4mm DDS-3 Tape Drive **Note:** Requires X913A fast wide to narrow SCSI adapter	2	
X6295A	20 GB 4 mm DDS-4 Tape Drive	2	
X6168A	Half-height SCSI DVD Drive	3	
External Storage Interfaces			
X6540A	PCI to dual channel, single-ended UltraSCSI host adapter	9	
X6541A	PCI to dual-channel, differential UltraSCSI host adapter	9	
X6758A	PCI to dual Ultra3SCSI differential host adapter	9	
X6799A	PCI single 1 Gbit FC-AL adapter with one external connector only	6	
X6727A	PCI to dual 1 Gbit FC-AL adapter with optical interfaces, one internal connector. **Note:** Required for multipathing to the internal storage array **Note:** Multipathing also requires X6755A cable to connect internal connector of X6727A to Loop B connector of the FC-AL backplane	6	
X6767A	PCI to single 2 Gbit FC-AL adapter **Note:** Does not support multipathing	4	
X6768A	PCI to dual 2 Gbit FC-AL adapter **Note:** Does not support multipathing	4	
	Note: The (X)6729A - PCI to single FC-AL controller is not supported in UltraSPARC III systems and has been retired.		

Network Interfaces			
	PCI Serial Adapters		
X1155A	Sun HSI/P high-speed serial interface, PCI	7	
X2156A	Asynchronous serial interface	9	
	PCI Ethernet Adapters		
X1033A	10/100 Base T Fast Ethernet PCI Adapter	4	
X1034A	10/100 Base T Quad Fast Ethernet PCI Adapter	4	
X1141A	Gigabit Ethernet PCI Adapter	4	
X1150A	Sun Gigabit Ethernet-Cat5 (copper) PCI66 adapter	4	
X1151A	Gigabit Ethernet (fibre)	4	
	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	4	
	PCI to Synchronous Optical Network		
X4810A	PCI to OC48/Sonet Adapter **Note:** Must be placed within 66 MHz PCI slots for network performance considerations	2	Restricted to 66 MHz PCI slots
	PCI Combination Adapters		
X1032A	PCI to 10/100 Base T plus Single-ended Ultra/Wide SCSI adapter	9	
X2222A	PCI to dual SCSI and dual 1 Gbit Ethernet adapter	4	
	Note: The (X)2069A Gigabit Ethernet plus FC-AL is not supported in UltraSPARC III systems		
PCI Hardware Accelerator			
X1133A	Hardware accelerator card for SSL	9	Retired, but supported
X6762A	High performance accelerator card for SSL	4	
PCI Video and Graphics Adapters			
X1089A	Sun Video Plus	7	
X3668A	PGX 32 8/24-bit color graphics frame buffer	4	
X3768A	PGX 64 color graphics frame buffer	4	
X3684A	Expert3D-Lite Graphics Accelerator **Note:** Please refer to note at the end of this section *PCI Video and Graphics Adapters.*	4	If installed in a 66 MHz slot, the other 66 MHz slot must remain empty.

X3685A	XVR-500 high resolution 2D and 3D Graphics Accelerator, 24-bit color, w/ 32MB graphics memory and 16 MB texture memory **Note:** Please refer to note at the end of this section *PCI Video and Graphics Adapters.*	4	No limitations on PCI slot placement
	Note: The X3684A and X3685A graphics accelerators require the 501-5142-12 or higher I/O board and are supported only within factory shipped 900 MHz based processor systems, i.e. not on upgraded 750 MHz systems. Please contact Sun Enterprise Services for details.		
Power Cords			
X311L	Power Cord Kit, U.S./Asia	3	
X312L	Power Cord Kit, Continental Europe	3	
X386L	Power Cord Kit, Australia	3	
X317L	Power Cord Kit, U.K.	3	
X314L	Power Cord Kit, Switzerland	3	
X384L	Power Cord Kit, Italy	3	
X383L	Power Cord Kit, Denmark	3	
530-3096-01	Power Cord Jumper, extends any geography specific power cord	3	
	Note: One power cord required per power supply, i.e. three per system		To be ordered as a separate line item for each system
Other Options			
	Rackmount Kit		
X9628A	Rackmount kit for Sun Fire Expansion rack, StorEdge Expansion rack and appropriate EIA-310-D-1992 compliant racks		Max. of two systems per rack
	Video Monitors		
X7143A	17-inch entry color monitor, 0.28 mm. dot pitch		
X7137A	18.1 TFT LCD, 20-inch CRT equiv., 1280x1024		
X7146A	21-inch color monitor, .24mm. Dot pitch, 19.8 inch v.a.		
X7134A	24.1-inch :CD 1920x1200 **Note:** Requires X3684A or X3685A for 1920x1080 resolution		For higher end graphics, not as a general console.
	Note: The following have been retired but are supported with PGX64 or PGX32. X7103A - 17-inch entry color monitor X7119A - 19-inch color monitor X7121A - 21-inch color monitor X7124A – 24-inch wide screen color monitor X7126A – 21-inch color monitor, 19.8 inch v.a. X7127A - 19-inch color monitor, 18.1”TFT LCD		Please review product details and requirements.

	Cables and Adapters		
X3872A	Video connector adapter, HD15F/13W3M		
X470A	Video adapter, 13W3F/HD15M		
X985A	Serial port Y/splitter cable		
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 high Sun StorEdge Expansion cabinet **Note:** Maximum of two Sun Fire V880 systems per rack. When a single system is placed within a rack, it should be at the lowest position in the rack.		Optional front door X9818A
SF-XCAB	Sun Fire Expansion Rack **Note:** Only one Sun Fire V880 server per rack. When a single system is placed within a rack, it should be at the lowest position in the rack for stability. **Note:** Alternate mounting brackets are included wiith X9628A rackmount kit		Requires X4347A Sun Fire Expansion kit to allow rear door of cabinet to close

Additional PCI Host Bus Adapters

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

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

Unsupported PCI Host Bus Adapters

Fairly recent PCI adapters that are not supported on the Sun Fire V880 server. This list should not be considered as all-inclusive.

Part Number	*Description*	*Reason/Comments*
X6729A	PCI to single FC-AL	Retired, replaced by X6799A and X6727A
X2069A	FC-AL plus 1 Gbit Ethernet	Uses older Qlogic 2100 series FC-AL interface 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	Retired, not supported
X2132A	SunPCi (provides Windows™ inter-operability)	The hot swap PCI slots were designed to the PCI industry spec. of a max. of 25 watts each. The X2132A exceeds this limit. Sun Fire V480 supports X2132A.

External Storage Options

Please refer to configuration guidelines for specific details for these supported external storage devices.

Disk Arrays

- Sun StorEdge Multipacks, both SCSI and FC
- Sun StorEdge A1000
- Sun StorEdge D1000
- Sun StorEdge D2
- Sun StorEdge 3000/3300 series
- Sun StorEdge 3900 series
- Sun StorEdge A5100/A5200
- Sun StorEdge S1
- Sun StorEdge T3
- Sun StorEdge 6900 series
- Sun StorEdge 9900 series
- Sun StorEdge A3500, both SCSI and FC

Tapes and Libraries

- Sun StorEdge 12 GB DDS-3Unipack

- Sun StorEdge DDS3 Flexipack
- 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

Sun Fire V880 Specific Options

The following options are specific to the Sun Fire V880 server.

Order Number	Option Description	Comments
X7047A	750 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) **NOTE:** No mixing of CPU modules running at different speeds within one system.	All memory DIMM slots fully populated
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) **NOTE:** No mixing of CPU modules running at different speeds within one system.	All memory DIMM slots fully populated
X6751A	Second disk storage backplane with 6 - 36.4 GB, 1.0", 10,000 RPM FC-AL disk drives and required cables	Applicable to any 750 or 900 MHz processor based configuration shipping with only six disks. **Recommendation:** Contact Sun Enterprise Services for the installation.
X6756A	Second disk storage backplane with 6 - 73 GB, 1.0", 10,000 RPM FC-AL disk drives and required cables	Applicable to any 750 or 900 MHz processor based configuration shipping with only six disks. **Recommendation:** Contact Sun Enterprise Services for the installation.
X6755A	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	
X9628A	Rackmount kit	Two Sun Fire V880 systems per StorEdge Expansion rack; only one per Sun Fire Expansion rack. With a single system within a rack, it should occupy the lowest position.
X913A	Adapter for DDS-3 tape drive to convert from fast wide to narrow SCSI	When installed within the removable media bay(s)

Upgrades

Sun Upgrade Allowance Program

The Sun Fire V880 server is the second 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 trade-in allowance towards the purchase of a new Sun Fire V880.

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 4 CPU or more Sun Fire V880 system configuration.

Upgrades to the Sun Fire V880 server are available as a full system swap. No components migrate such as CPUs, memory and drives from older UltraSparc II systems. Sun Fire V880 uses UltraSPARC III technology. Customers can upgrade from an Enterprise 450, Enterprise 420R and Enterprise 3500 to the new Sun Fire V880 server.

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 90 days, a bootable working system.

Key Messages

- The Sun Fire V880 Server is available as either an assemble-to-order system or standard (fixed) configuration.
- The Sun Fire V880 Server provides a growth path for today's Enterprise 450, Enterprise 420R and Enterprise 3500 customers who require more application scalability, higher performance, and built in availability and reliability components.
- Hot swappable components such as disks, power supplies, fans, PCI cards and processor/memory modules (future) 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.

How To Order

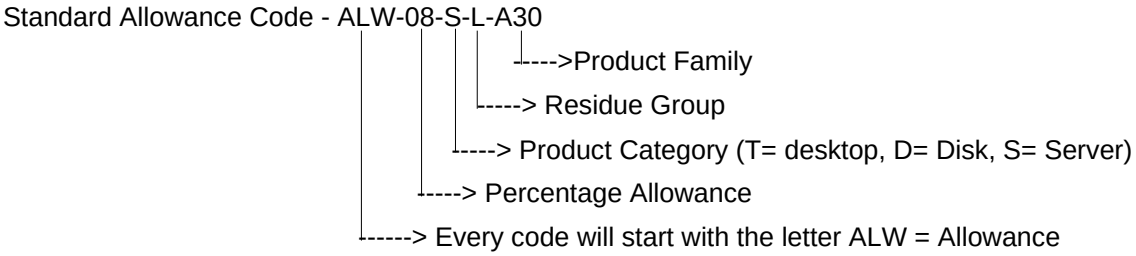
An allowance code is used when upgrading to Sun Fire V880 server. Workgroup server Sun UAP product matrices containing standard upgrade allowance codes are included in the Sun Configuration guide as well as on http://ibb.eng/upgrades or SunWin#94711. The Sun UAP matrices provide instructions for using codes.

Server Consolidation Trade-in Program

The Server Consolidation Trade-in Program enables customers to trade-in many older Sun servers or competitive servers either for a new Sun Server or to enrich an existing Sun Workgroup, Netra or Enterprise server configuration with additional system boards, memory and CPU modules at a reduced price. The Enterprise Server Consolidation Upgrade Allowance Matrix can be found at the following:

http://ibb.eng/upgrades or Sun Win #96194

Allowance Code Numbering Scheme



To determine the upgrade allowance value, apply the allowance code percentage to the list price of the Sun Fire V880 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 90 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				
	Enterprise 450 or an Enterprise 420R	Sun Fire V880 - 4 or more CPUs Only	See Worldwide Configuration Guide or Sun Win # 94711 for standard allowances. If using consolidation, see Sun Win#96194 for consolidation allowances.	A complete bootable Enterprise 450 or 420R system
	Enterprise E3500	Sun Fire V880 - 4 or more CPUs Only	See Worldwide Configuration Guide or Sun Win # 94711 for standard allowances. If using consolidation, see Sun Win#96194 for consolidation allowances	A complete bootable Enterprise E3500 system

Upgrade Allowance Program for Memory, CPU and Storage Upgrades

Memory Upgrades

Determining memory upgrade trade-in allowances is achieved by knowing exactly how much memory your system has and how much more density is needed. The trade-in allowance is applied to the list price of the X-Option along with the customers VEU discount, i.e. Customer has 4GB of memory and want to upgrade to 8GB. Allowance Code is ALW-20-WS-2XMEM, take 20% plus customer VEU of 20% equals 40% off the list price of the memory X-option. Note: All customers VEU discounts vary. See Component Matrix below as memory, CPU and disk drive trade-in allowances can change at any time.

Memory, CPU and Storage Upgrades trade-in allowances can be found on the Component Migration and Allowance Matrix on Sun Win #108142 or at http://ibb.eng/upgrades

Examples of Memory Upgrades

1.

Customer has 2 processors with 4 GB of memory in their Sun Fire V880	Customer wants to upgrade to 8 GB of memory increasing their density 2x		
Upgrade From:	**Upgrade To:**	**Standard Allowance Code Part Number**	**Customer Returns**
1 GB memory option (4 DIMMS of 256 MB each) X7053A	2 GB memory option (4 DIMMS of 512 MB each (Order Qty 4 of X7051A)	Refer to Components Matrix on Sun Win #108142 or go to: http://ibb.eng/upgrades/ for trade-in allowance. Order RMA kit Part Number UG-RMA for the return of the memory.	(16) 256MB DIMMS

2.

Customer has 4 processors with 8 GB of memory in their Sun Fire V880	Customer wants to upgrade to 16 GB of memory increasing their density 2x		
Upgrade From:	**Upgrade To:**	**Standard Allowance Code Part Number**	**Customer Returns**
1 GB memory option (4 DIMMS of 256 MB each)	2 GB memory option (4 DIMMS of 512MB each (Order Qty 8 of X7051A)	Refer to Components Matrix on Sun Win #108142 or go to: http://ibb.eng/upgrades/ for trade-in allowance. Order RMA kit Part Number UG-RMA for the return of the memory.	(32) 256MB DIMMS

3.

Customer has 2 processors with 4 GB of memory in their Sun Fire V880	Customer wants to upgrade to 16 GB of memory increasing their density 4x		
Upgrade From:	**Upgrade To:**	**Standard Allowance Code Part Number**	**Customer Returns**
1 GB memory option (4 DIMMS of 256 MB each)	4 GB memory option (4 DIMMS of 1 GB each (Order Qty 4 of X7056A)	Refer to Components Matrix on Sun Win #108142 or go to: http://ibb.eng/upgrades/ for trade-in allowance Order RMA kit Part Number UG-RMA for the return of the memory.	(16) 256MB DIMMS

4.

Customer has 6 processors with 8 GB of memory in their Sun Fire V880	Customer wants to upgrade to 32GB of memory increasing their density 4x. In order to increase memory to 32 GB, customer will need to increase to 8 processors		
Upgrade From:	**Upgrade To:**	**Standard Allowance Code Part Number**	**Customer Returns**
1 GB memory option (4 DIMMS of 256 MB each)	2 GB memory option (4 DIMMS of 512 MB each (Order Qty 16 of X7051A)	Refer to Components Matrix on Sun Win #108142 or go to: http://ibb.eng/upgrades/ for trade-in allowance Order RMA kit Part Number UG-RMA for the return of the memory.	(16) 256MB DIMMS

Please NOTE that trade-in allowances are only given if a component is being traded-in for a new component. (Example: If a customer has a 6 processor system with 6 GB of memory (with 256MB DIMMS) and wants to upgrade to 12 GB of memory, a trade-in allowance is NOT applicable because they still have room for more 256 MB DIMMS to achieve 12GB of memory.)

900MHz CPU Upgrades

Two part numbers are available to upgrade from 750MHz to 900MHz:

1. X7028A 2x900MHz with 4GB memory, (256MB Dimms)

List Price	**Trade-in ALW%**
$23,000	ALW-25-S-1XMOD or 25%

Note: The trade-in allowance is in addition to customers Value End User Agreement.

**Always check the configuration guide and price book as list pricing can change at any time.

2. UG Part Number UG-750-900-2-VX80 - 2x900MHz CPU/Mem Board with NO Memory

List Price	VEU % (example)	Net Price
$11,000	20%	$8,800

Note: Trade-in allowances cannot be applied as list price has already been discounted. The customer Value End User Agreement discount can only be applied to the list price. This discount will vary for all customers.

**Always check the configuration guide and price book as list pricing can change at any time.

900MHz CPU Upgrade Examples

Upgrade From:	Upgrade To:	Upgrade Part Number to Order	Customer Returns
2 x750MHz, 4GB Memory	2x900 Mhz, 4GB Memory	UG-750-900-2-VX80 RMA Kit included in P/N	2x750 CPU Module and keeps memory.
2x750MHz, 4GB Memory	4x900MHz, 8GB Memory	X7028A and UG-750-900-2-VX80 RMA Kit included in P/N	2x750 CPU Module and keeps memory
4x750MHz, 8GB Memory	4x900MHz, 8GB Memory	Qty 2 UG-750-900-2-VX80 RMA Kit included in P/N	4x750 CPU Module and keeps memory
4x750MHz, 8GB Memory	8x900MHz, 16GB Memory	Qty 2 X7028A Qty 2 UG-750-900-2-VX80 RMA Kit included in P/N	4x750 CPU Module and keeps memory
8x750MHz, 32GB Memory	8x900MHz, 64GB Memory	Qty 4 UG-750-900-2-VX80 Qty 16 X7056A (memory) and apply ALW-20-WS-2XMEM off each memory X-option in addition to customer VEU discount. Note: Check component matrix as memory allowances may change at any time.	8x750 CPU Module and **Returns 32GB Memory**

Storage Upgrades

Upgrade From:	Upgrade To:	Upgrade Part Number to Order	Customer Returns
6-36GB Drives	6-73GB Drives	ALW-10-D-X-2XGB Note: Check component matrix as disk drive allowances may change at any time. Order RMA kit Part Number UG-RMA for the return of the drives being upgraded.	6-36 Drives

For upgrade related sales opportunities, please refer to: http://ibb.eng/org

Memory Configurations

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

Service and Support

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

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

FEATURE	SUNSPECTRUM PLATINUM[SM] Mission-critical Support	SUNSPECTRUM GOLD[SM] Business-critical Support	SUNSPECTRUM SILVER[SM] Systems Support	SUNSPECTRUM BRONZE[SM] Self Support
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
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

FEATURE	SUNSPECTRUM PLATINUM℠ Mission-critical Support	SUNSPECTRUM GOLD℠ Business-critical Support	SUNSPECTRUM SILVER℠ Systems Support	SUNSPECTRUM BRONZE℠ Self Support
SunSolve EarlyNotifier℠ Service	Yes	Yes	Yes	Yes

Warranty

The standard warranty for the Sun™ Fire V880 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.

Professional Services

Kindly contact the local Sun representative.

Glossary

100BASE-T	Please 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
Alternate pathing	Please see Multipathing, sometimes used synonymously with multipathing.
ASR	Automatic System Recovery. A RAS feature that initiates a system reboot sequence that bypasses failed system components or a software failure.
Availability	A measurement of the percentage of time that a system is accessible by users and is providing service.
Controller	A microprocessor based device which is dedicated to a specific task, esp. I/O and is embedded 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 V880 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.
Dual pathing	Please see Multipathing, sometimes used synonymously with multipathing.
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.
Lights Out Management	Please see Remote System Control.
LOM	Lights Out Management. Please see Remote System Control.
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.
Remote System Control	An independent processor which provides remote management and control of a system via a serial line, modem or Ethernet connection.
Reliability	Ability of a system to operate continuously without failures and to maintain data integrity. Reliability influences MTBF.
SC	System Control. Please see Remote System Control
SCSI	Small Computer Systems Interface. An ANSI standard for controlling peripheral devices by one or more host computers.

Serviceability	A measurement of the time to restore a system to operation once a failure has occurred. Serviceability influences MTTR.
SONET	Synchronous Optical Network/OC48, a networking standard providing up to 2.4 Gbits/sec. of line speed over a distance of 2 km. with single mode fibre
SSP	System Service Processor. Please see Remote System Control
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

Materials Abstract

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
Sun Fire™ V880 Server, Just The Facts	Reference Guide (this document)	Training Sales Tool	SunWIN	134456
Sun Fire™ V880 Server Customer Presentation	Customer Presentation	Sales Tool	SunWIN	317121
Sun Fire™ V880 Server Data Sheet	Data Sheet	Sales Tool	SunWIN	315996
Sun Fire V880 Server Technical Specification		Sales Tool	SunWIN	316000
References				
Veritas Volume Manager Software Version 3.1.1	Reference Guide	Sales Tool	SunWIN	67745
White Papers				
Sun Fire Servers: Harnessing the Net Effect for Business Advantage	White paper	Sales Tool	SunWIN	131492
Sun Fire V880 Server Architecture	White paper	Sales Tool	SunWIN	315994
Monitor and Managing Workgroup Servers with Remote System Control	White paper	Sales Tool	SunWIN	307642
Beat Sheets				
Beating the IBM xSeries 8-way rack with the Sun Fire V880 Server	Beat Sheet	Sales Tool	SunWIN	316009
Beating the IBM pSeries 6-way tower with the Sun Fire V880 Server	Beat Sheet	Sales Tool	SunWIN	316011
Beating the Compaq ML750 with Sun Fire V880 Server	Beat Sheet	Sales Tool	SunWIN	316013
External Web Sites				
General Information on the Sun Fire™ V880 Server	http://www.sun.com/servers/workgroup/V880/index.html			
Features and Benefits of the Sun Fire™ V880 Server	http://www.sun.com/servers/workgroup/V880/features.html			
Specifications of the Sun Fire™ V880 Server	http://www.sun.com/servers/workgroup/V880/spec.html			
Information on Sun's Investment Protection Solutions	http://www.sun.com/ibb/upgrades/index.html			

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Internal Web Sites				
Internal Web Site for the Sun Fire™ V880 Server	http://workgroup.corp/servers/V880.html **To Be Provided**			
Information on upgrading to Sun Fire V880 Server - Workgroup Servers Migration and Allowance Matrix	http://ibb.eng/upgrades/			
Server Consolidation Upgrade Program	http://ibb.eng/upgrades/			

Competitive Information

	Sun Fire V880	HP Proliant DL 760	Dell Power-Edge 8450	HP Lxr 8500, model P3454AV	HP 9000 rp8400	HP 9000 rp5470	IBM x440	IBM eServer pSeries 660 6M1
Size	17 RU	14 RU	7 RU	7 RU	10 RU	7 RU	8 RU	18 RU with I/O drawer and PCI expansion (8 + 5 + 5)
Processor Specs.	Ultra SPARC III Cu @ 900 MHz	P3 @ 900 MHz	P3 @900 MHz	P3 @ 900 MHz	PA RISC 8700 @ 750MHz	PA RISC 8700 @ 750 MHz	P3 @ 900 MHz	RS64 III (PowerPC) @ 750 MHz
L1 (on chip) cache	32 KB instruction, 64 KB data	16 KB instruction, 16 KB data	16 KB instruction, 16 KB data	16 KB instruction, 16 KB data	750 KB instruction, 1.5 MB data	750 KB instruction, 1.5 MB data	16 KB instruction, 16 KB data	128 KB instruction, 128 KB data
L2 cache	8 MB	2 MB on chip	2 MB on chip	2 MB on chip	0 MB	0 MB	2 MB on chip	8 MB
Maximum CPUs	8	8	8	8	16	4	8	8
Maximum Memory	64 GB (with 8 way)	16 GB (32 GB is expected)	64 GB	32 GB	64 GB	64 GB future	32 GB	32 GB
System Bandwidth GB/sec.	9.6	2.4	2.4	2.4	4.3	4.3	2.4	8.0
PCI slots	9 2 @66 MHz 64 bit 7 @33 MHz 64 bit	11 2 @66 MHz, 64 bit 8 @33 MHz, 64 bit 1 @33 MHz, 32 bit	10 4 @66 MHz 6 @33 MHz	10 4 @66 MHz 6 @33 MHz	16 12@66 MHz, 64 bit	10 6 @66 MHz, 64 bit 4 @33 MHz, 64 bit	12 4 @66 MHz, 64 bit 8 @33 MHz, 64 bit	14 10 @66Mhz 4 @33 MHz
Internal Disk Controller	Integrated FC	Dual wide Ultra3 SCSI	Dual integrated Ultra2/LVD SCSI	Dual channel Ultra2 SCSI, 1 internal, 1 external	Ultra2 SCSI	Ultra2 SCSI	Ultra2 SCSI	SCSI-2 F/W
Internal Disks	12 FC-AL	2 Ultra2 SCSI	2	2	4	4	2	2 optional
I/O Ports	FC-AL, 10/100 NIC, 1 Gb NIC, 2 serial, 2 USB	2 serial, 1 parallel, network RJ-45, mouse, keyboard, graphics	2 serial, 1 parallel, 2 USB, mouse, keyboard, graphics, video	2 serial, parallel, video, console	2 serial, 2 USB, 1 parallel, mouse, keyboard, video, 2 LVD SCSI (1 internal, 1 external)	3 serial, 2 10/100/1K network, Ultra3SCSI	2 serial, 1 parallel, 2 USB, mouse, keyboard, video	10/100 NIC, 4 serial, 1 parallel, keyboard, mouse

	Sun Fire V880	HP Proliant DL 760	Dell Power-Edge 8450	HP Lxr 8500, model P3454AV	HP 9000 rp8400	HP 9000 rp5470	IBM x440	IBM eServer pSeries 660 6M1
High Availability Options	Hot plug PCI slots, disks, fans, and power supplies, ASR, RSC, alternate path to storage and networks	ASR-2 (Automatic server recovery), PCI hot plug, redundant fans, redundant power (not standard), hot plug dual port 10/100 TX NIC, hot plug disk, internal RAID	Hot plug disks, ECC memory, hot plug/redundant power and cooling, internal RAID	N+1 Power supply, ECC mem., hot swap fans, PCI cards and disks, ASR (auto server restart), internal monitoring sensors, de-allocation of failed CPU on boot, internal RAID, remote control card	6 redund. hot swap power and fans, hot plug internal disks, hot plug PCI, dynam. CPU alloc. /dealloc., partitions	Redundant hot swap power and fans, hot plug internal disks, hot plug PCI, ECC memory	Hot swap and redundant fans, power supplies, predictive failure, CPU, memory, disks	Hot plug PCI, ECC on L2 cache, ECC memory, dynamic CPU de-allocation
O/S	Solaris 8	Windows/ NT, Windows 2000, Linux	Windows/ NT, Windows 2000, Linux	Windows/ NT, Windows 2000, Linux	HP-UX 11i (64 bit)	HP-UX 11i (64 bit), Linux	Windows 2000, Linux	AIX 5.1 or 4.3.3

Notes:

- Xeon 900 MHz processors, 2 MB on-chip (L2) cache
- IBM pSeries 680 offers 6 - 24 processors, more closely matched with the Sun Fire 3800 - 6800 servers.

Update this chart only	**Sun Fire V880**	**HP Proliant DL 760**	**Dell Power-Edge 8450**	**Fujitsu Prime-Power 650**	**IBM x440**	**IBM eServer pSeries 660 6M1**
Size	17 RU	7 RU	7 RU	8 RU	4 RU (two SMP modules for 8-way)	18 RU with I/O drawer and PCI expansion (8 + 5 + 5)
Processor Specs.	Ultra SPARC III Cu @ 900 MHz	P3 @ 900 MHz	P3 @900 MHz	Sparc64 675/810 MHz	P4 @ 1.4/1.5/1.6 GHz	RS64 III (PowerPC) @ 750 MHz
L1 (on chip) cache	32 KB instruction, 64 KB data	16 KB instruction, 16 KB data	16 KB instruction, 16 KB data	128 KB instruction, 128 KB data		128 KB instruction, 128 KB data
L2 cache	8 MB	2 MB on chip	2 MB on chip	8 MB	256 KB l2,1 MB L3	8 MB
Maximum CPUs	8	8	8	8	8 (expands to 16)	8
Maximum Memory	64 GB (with 8 way)	16 GB (32 GB is expected)	64 GB	32 GB	64 GB	32 GB
System Bandwidth GB/sec.	9.6	2.4	2.4	13.8	3.2	8.0
PCI slots	9 - 2 @66 MHz 64 bit 7 @33 MHz 64 bit	11 - 2 @66 MHz, 64 bit 8 @33 MHz, 64 bit 1 @33 MHz, 32 bit or 8 PCI-X	10 4 @66 MHz 6 @33 MHz	8 - 2 @66 MHz, 6 @33 MHz, optional expansion disk-I/O box	6 PCI-X, 2 @133 MHz, 2 @100 MHz, 2 @66 MHz	14 10 @66Mhz 4 @33 MHz
Internal Disk Controller	Integrated FC	Dual wide Ultra3 SCSI	Dual integrated Ultra2/LVD SCSI	UltraWide SCSI	Ultra3 SCSI	Ultra2 SCSI
Internal Disks	12 FC-AL	4 Ultra2 SCSI	2	2	2	2 optional
I/O Ports	FC-AL, 10/100 NIC, 1 Gb NIC, 2 serial, 2 USB	SmartArray Disk, 2 10/100 NIC, 2 serial, 1 parallel, mouse, keyboard, graphics	Disk, 2 serial, 1 parallel, 2 USB, mouse, keyboard, graphics/ video	10/100 NIC, serial,	1 serial, 1 parallel, 3 USB, 1 Gb NIC, 2 sys. Mgmt. RS-485 mouse, keyboard, video	10/100 NIC, 4 serial, 1 parallel, keyboard, mouse

Update this chart only	**Sun Fire V880**	**HP Proliant DL 760**	**Dell Power-Edge 8450**	**Fujitsu Prime-Power 650**	**IBM x440**	**IBM eServer pSeries 660 6M1**
High Availability Options	Hot plug PCI slots, disks, fans, and power supplies, ASR, RSC, alternate path to storage and networks	ASR-2 (Automatic server recovery), PCI hot plug, redundant fans, redundant power (not standard), hot plug dual port 10/100 TX NIC, hot plug disk, internal RAID	Hot plug disks, ECC memory, hot plug/redundant power and cooling, internal RAID	Hot swap power supply, fan	Hot swap and redundant fans, power supplies, predictive failure, CPU, memory, disks, Active Memory (mirroring)	Hot plug PCI, power supplies, fans, Chipkill memory, ECC memory, dynamic CPU de-allocation
O/S	Solaris 8	Windows/ NT, Windows 2000, Linux	Windows/ NT, Windows 2000, Linux	Solaris	Windows/ NT, Windows 2000, Linux	AIX 5.1 or 4.3.3

Notes:

- Currently, only IBM offering Pentium IV servers at 1.4 – 1.6 Ghz
- Xeon 900 MHz processors, 2 MB on-chip (L2) cache
- IBM pSeries 680 offers 6 - 24 processors, more closely matched with the Sun Fire 3800 - 6800 servers.
- HP 9000 series is more closely matched with the Sun Fire 3800 – 6800 servers
- Microsoft Windows Datacenter O/S, approx. $60,000. Expected cost of Windows .Net in early 2003, $5,998

Point - Counterpoint

This section provides anticipated comments and objections that may be encountered when presenting the Sun Fire V880 server.

- Clock speed of UltraSPARC III systems and Sun Fire V880 is relatively slow in comparison to others, i.e. 900 MHz vs. 1.4 to 1.6 GHz of Intel Pentium IV and AMD.

  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 is expected to 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

  There are optimizations for Java code. VIS (virtualization instruction set) can offers improved performance for graphics, matrix operations, etc. by as much as a factor of two to three.

  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.

  Per *eWeek* of Sept. 2, 2002, Intel is discussing with business partners a future processor named Banias that will run at 1.4 to 1.6 GHz. It is expected to outerform mobile Pentium IV chips running at more than 2 GHz on benchmark tests. The article also references a lawsuit filed in Madison County, Illlinois claiming Pentium IV processors do not outperform older Pentium III processors as claimed by Intel.

  Similarly, AMD also claims that the Pentium IV accomplishes less per clock cycle than an Athlon XP or Pentium III processor.

- The Sun Fire V880 server doesn't scale

  Please refer to the benchmarks and the consolidation white paper for the Sun Fire V880 server at 900 MHz. These documents detail fully utilizing a Sun Fire V880 server for multiple, simultaneous applications.

  According to *Client Server News*, dated May 27-31, 2002, Compaq canceled their Foster eight way box claiming that the new 1.4GHz - 1.6GHz Foster MP chips from Intel don't offer enough performance to justify the move from 700/900MHz PIII Xeons in their current ProLiant DL760 eight way server. Compaq's "F8" chipset is said not to be able to support a 16-way or anything other than the Foster chip. Compaq had an eight way McKinley box code named Typhoon and a four way McKinley box code named Tornado, it is unclear the future of these given the HP merger.

Dell is not expected to ship an eight way Foster at this time, they feel their sweet spots are the 2 and 4-way servers and would need an 8-way chipset from ServerWorks to compete against the IBM x440 with the Summit chipset.

Serverworks not expected to have an eight way chipset design until end of this year beginning of next (2003).

Compaq's action along with Dell not shipping an eight way Foster MP, allows IBM the opportunity to take the leading edge in the 8-way Intel server space, with their IBM x440 Intel Xeon MP server. IBM states that they will start shipping a four quad 16-way version of the x440 in June or July. Intel is said to have used the Summit chipset to test both the Foster and McKinley chips. There is talk around town of IBM having a Summit II which will go to 32 way.

IBM x440 performance remains questionable. Eight way Intel-based server OS needs to be NUMA aware and Windows .NET has limited capabilities. Applications also need to be NUMA-aware. IBM x440 is said to run Windows as a single SMP configuration or can divide the 16-way into four physical partitions or up to 64 virtual partitions with little help from VMWARE.

There has been no TPC-C benchmark using eight Xeon MP processor configuration in a single server released by any vendor...proof point on performance issue of eight way Xeon MP server.

- UltraSPARC III is relatively new and unproven.

  Counterpoint

  UltraSPARC III 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 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.

  The Sun Fire V880 in the original offering of 750 MHz was extremely popular. There is a significant installed base. In addition, Sun Fire V880 server was not the first offering for the UltraSPARC III chip. The product was been successfully used in Sun Blade workstations, the Sun Fire 280R and the Sun Fire 3800-6800 servers.

- The form factor is not efficient relative to other rack mountable systems.

  Counterpoint

  The system was not intended to provide the most dense computing platform; the Sun Fire V480 addresses that requirement. Please remember that this system is intended for branch/remote offices as well as for complementing data centers. With that objective, there are numerous cost-effective features, such as the integrated storage subsystem and embedded I/O controllers.

- The I/O subsystem is relatively weak with only 9 PCI slots.

  Counterpoint

  Remember that there are several integrated I/O controllers including FC-AL, 10/100 Ethernet, 1 Gbit Ethernet, SCSI for DVD and removable media, and 2 USB and a serial port. The competitors may have a SCSI disk interface, but none have both FC-AL and the two

Ethernet/network interfaces. Those would easily require at least two additional 66 MHz PCI slots.

- The I/O subsystem is weak based upon the specified 1.2 GB/sec. bandwidth.

  Counterpoint

  There are numerous aspects when measuring a systems capabilities. If we examine the Compaq implementation, then we will see that in an 8-way system, there are two groups of four processors. Each group of four must share only 800 MB of bandwidth. With the next generation of systems, we anticipate that this figure will likely increase by a factor of four. Still, four processors sharing 3.2 GB/sec. is significantly less than under the Sun implementation, i.e. 4 processors sharing 4.8 GB/sec. in addition to advantages of the local memory in comparison to Compaq's centralized memory scheme.

  IBM has a total bandwidth of 8.0 GB/sec. but the system scales poorly.

  HP system bus provides 4.3 GB/sec. of aggregate bandwidth from two buses, each at 2.13 GB/sec.

  The important point is that one must look for system balance across all the resources. Sun believes it has done an outstanding job in the design which will provide balance, and hence, an extremely scalable systems.

- Sun doesn't understand the enterprise environment at the same level as IBM or HP/Compaq.

  Counterpoint

  Please keep in mind that extensive Sun solutions are found in the most demanding environments including manufacturing, financial, healthcare, telecommunications and Internet service providers. Many of these customers have standardized almost exclusively on Sun.

- 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
  - $1,799 license fee includes 25 CALs
    - Windows 2000 Server Internet Connector License provides unlimited CAL licensing for Internet clients only

  Windows 2000 Advanced Server supports:
  - Up to an 8-way SMP system
  - Up to 8 GB of memory
  - A two node cluster
  - $3,999 license fee includes 25 CALs
    - Windows 2000 Internet Connector License = $1,999
    - Note: For 100 CALs then skip the cost of the Internetconnector, but add $3,980

  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 through OEMs
- License, maintenance and subscription fees in excess of $60,000

As can be appreciated, the above model could force one to obtain a license in excess of the 'overall requirements'. For example, if one required a six-way SMP processor with 12 GB of memory in order to support large or numerous databases, then one would be required to obtain the Data Center license. Whereas, the Sun model does not differentiate on memory but merely on processors.

The reception of Windows Data Center has been quite weak.

Windows .NET Operating System is expected in early 2003 and to be offered at a license fee of $5,998.

Where the Sun Fire V880 is the Ideal Solution

This section is a brief summary of the feature and benefits mentioned previously.

- Consolidation of multiple systems each with independent and/or shared storage.

  The consolidation may likely offer the opportunity to simplify operational procedures and reduce overall costs including management as well as the form factors and associated environmental costs.

  Additionally, the one or fewer larger units may provide more total resources to be available to the set of applications, especially if all applications do not contend for resources during the same time period.

  Clustering among a few systems would mean higher availability as well as shareability.
- Scalability in number of processors, i.e. starting with two to six and having growth potential
- Balanced system architecture, i.e. processing, memory capacity and bandwidth and I/O are well-proportioned so that pressing one resource will not prematurely exhaust another.
- Internal storage array capable of support up to twelve disks for compactness of the total solution, cost efficiency and performance
- Cost effective, i.e. integrated I/O controllers, RAS features, no-cost Solaris license and binary compatibility for applications
- RAS features that are more typically associated with critical, data center operations
- Stability, upward/future compatibility and wide acceptance of Solaris as a defacto standard
- Extending the utilization of workgroup servers and applications with more users and more dependence within remote/branch offices and complementing data center operations
- Assurance of preservation of investments in application development and staff, i.e. can migrate directly to enterprise-class systems with as many as 72 processors.

Where the Sun Fire V880 may not be the Ideal Solution

- Need the most compact form factor.

  The Sun Fire V480 server may be preferable. Alternatively, if form factor and higher availability are required, consider Sun Fire 3800 or 4800

- Where lots of small systems offer an 'overall availability' consideration.

For example, with many ISPs, losing a smaller, two-way system is preferable to losing a larger system with hundreds or thousands of subscribers. The activities do not warrant overall higher levels of availability as users can quickly re-log into the systems. The philosophy is distributing the load and minimizing the impact when an individual system fails.

- Where cPCI is required.
- Where the additional RAS features of Sun Fire 3800 - 6800 are needed.
- Customer needs an 8-way on day one with growth potential and multiple systems and/or a Sun Cluster are not appropriate.
- Where the customer wants to start with a 2-way and price is critical.

  The expandability and flexible I/O subsystem impose an initial cost factor for the Sun Fire V880 relative to other solutions such as the Sun Fire 280R or Sun Fire V480 with low cost, external storage

- Where the customer wants independent, highly available shared or centralized storage.

  The Sun Fire V880 storage subsystem is not assured to remain up in the event of a major failure. It is linked to the processing unit. However, still consider selling a Sun Fire V880 with an enhanced independent storage subsystem, especially the Sun StorEdge A5200 or T3.

- Where the I/O demands significantly exceed 1.0 GB/sec.

  A Sun Fire 4800 or beyond may be more appropriate based upon additional PCI slots and additional Sun Fireplane Interconnects