# Sun SPARC Enterprise® T5440 Server

## *Just the Facts*

SunWIN token 526118

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# Version 2.3

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## Revision History

| Version | Date | Comments |
|---|---|---|
| 1.0 | Oct. 13, 2008 | - Initial version |
| 1.1 | Oct. 16, 2008 | - Enhanced I/O Expansion Module section<br>- Notes on release tabs of XSR-1242/XSR-1242E rack<br>- Updated IBM 560 and HP DL580 G5 competitive information<br>- Updates to external storage products |
| 1.2 | Nov. 18, 2008 | - Number of (X)6000A crypto accelerator adapters corrected to 2<br>- Updates to Solaris patch and firmware to allow more flexible configurations<br>- Inclusion of table of field replaceable units (FRUs)<br>- Inclusion of published benchmark results<br>- Updates to competitive information<br>- Updates to matrix of external storage products |
| 1.3 | March 4, 2009 | - Updated SPECjAppServer2004 benchmark result for T5440<br>- Updates to I/O Expansion unit<br>- Updates to configuration rules for unequal memory, 1 and 3 socket systems<br>- Inclusion of Sun Fire X4450 in competitive chart<br>- New configuration rules for SSDs<br>- New section entitled *Telemetry Recording* under Service Processor |
| 1.4 | April 23, 2009 | - Additional power cords/jumper cables<br>- (X)4447A-Z adapters corrected for consistency ATO vs. X-option |
| 2.0 | July 21, 2009 | - Updates for 1.6 Ghz offerings, including order, competitive and benchmarks |
| 2.1 | Aug 12, 2009 | - Corrected number of (X)4447A-Z supported |
| 2.2 | Oct 20, 2009 | - Revised number of (X)4447A-Z supported, with qualifications noted<br>- Inclusion of X1106A-Z and X1107A-Z (Oplin)<br>- New restriction: one processor systems should not use PCIe slots 4 – 7, except for XAUI. Revised *PCIe Slot Guidelines* section.<br>- Part number for 50 GB SSD<br>- Part number for OpenSolaris 2009.06 for ATO only<br>- PCIe storage accelerators (Aura) - **Future** |
| 2.3 | Dec 16, 2009 | - Remove reference to Try & Buy program, ended on Dec. 18, 2009 |
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# Sun SPARC Enterprise® T5440 Server Highlights

***Figure 1 - Sun SPARC Enterprise® T5440 Server***

The Sun SPARC Enterprise T5440 server brings numerous benefits and values to the data center running enterprise applications. Based upon industry standard benchmarks indicative of this class of application, the T5440 server outperforms the competition by up to five times. It costs as little as one-fifth, requires as little as one-fourth the rack space and consumes as little as one-quarter the power compared to competitive RISC based systems. The T5440 server has set numerous records for performance across a range of applications.

The built-in, no-cost virtualization/consolidation technologies available with CMT (Chip Multi-threading Technology) servers allow deployment of a single Sun SPARC Enterprise T5440 server to satisfy the resource requirements previously covered by numerous smaller to mid-sized systems. In addition to the benefits of consolidation such as reductions in power, cooling, space and maintenance contracts, resources can be allocated and shifted to meet varying demands. Management is simplified. The modular design and expandability offers an effective way to 'grow into' the full potential of this server as workloads increase or more applications are deployed.

The Sun SPARC Enterprise T5440 server has been designed for performance and reliability for the most demanding applications. The large memory capacity and high I/O bandwidth minimize response time to users.

## Key Differentiators and Benefits

## World Record Performance

Since the introduction of the Sun SPARC Enterprise T5440 server, it continues to offer outstanding, and often record levels of performance while maintaining the economies and compactness of the CMT family of servers. The latest 1.6 GHz processors extend the price/performance benefits as demonstrated by results covering a variety of enterprise activities, including

- SAP SD 2-tier - a sales and distribution model
- SPECjAppServer2004 - a multi-tier benchmark for measuring the performance of Java 2 Enterprise Edition (J2EE) technology-based application servers
- SPECjbb2005 – a benchmark to evaluate the performance of server side Java by emulating a three-tier client/server system with emphasis on the middle tier

- Siebel CRM PSPP - a customer relationship management system that tracks front and back office activities, relationships and offers business analytics for targeted marketing

Inherent in all of these models is an integrated database that is stressed by the complex relationships required to support the functionality provided by these applications.

The T5440 server has also been selected for analytics and modeling because of the very high memory capacity and bandwidth to support intensive I/O. Additional techniques for application acceleration such as inclusion of solid state disks (SSD) can be integrated for an even more responsive system.

## Cost of Acquisition

The Sun SPARC Enterprise T5440 server extends the range of applications that can be serviced by volume servers. In doing so, Sun offers an alternative that allows customers to address a class of enterprise applications such as ERP, CRM and other database intensive applications that was classically reserved for mid-range to higher end systems. Customers now have an opportunity to achieve significant savings in the initial purchase of equipment, the operation thereof and for upgrades.

In addition to these initial savings, there are no per core licensing fees for the operating system, virtualization software or memory activation fees based upon the amount of memory.

## Cost of upgrades

Relative to competitive systems, one can generally purchase a well-configured T5440 system for generally the same or lower cost as a single socket upgrade for the competitive systems.

## Consolidation/virtualization

The built-in, no-cost virtualiztion technology of Logical Domains (LDoms) provides opportunities to simplify management, shift resources according to changing demands. These benefits help to reduce costs. LDoms provides the opportunity to partition the system into as many as 128 independent virtual machines thereby assuring isolation and security. Customer may also choose to virtualize using Solaris Containers, with the ability to use Solaris 8 and 9 containers to run legacy applications unchanged.

## Highly compact footprint

The Sun SPARC Enterprise T5440 server occupies roughly one quarter to one half the rack space (RU) as comparable, current systems delivering an equivalent level of performance. More efficient utilization of the available space in a data center provides the opportunity to consolidate operations and reduce overhead.

When consolidating and/or updating older equipment and utilizing the virtualization features of this server, it is not uncommon to achieve compression ratios of ten to one.

## Power efficiency

The UltraSPARC T2 Plus processor with Chip Multithreaded Technology (CMT) significantly reduces the power requirements of the system. A comparable level of performance can be delivered with as low as half the power of competitive systems. There are multiple aspects of the power saving benefits that include

- installation and maintenance of power supplying/distribution equipment, including lines, circuits, etc.
- cost of operations for running the systems

- cost of installation and maintenance of cooling equipment
- operation of cooling equipment
- overhead/real estate charges for the space required by all of the above

## I/O expansion and bandwidth

The Sun SPARC Enterprise T5440 addresses the requirement for intensive I/O by providing high bandwidth, an internal bus structure that distributes the I/O activity across the available processors, eight PCIe slots, integrated controllers that minimizes the need for additional user selected controllers and a mechanism to extend the I/O capabilities with the Sun I/O Expansion Module.

## Memory capacity

Processing can be accelerated, resulting in faster response time and/or increasing the number of users supported by the large memory capacity of up to 512 GB. For example, memory may be used to retain/cache frequently used data, i.e. (portions of ) indices to databases as well as hold large data structures/matrices for data analysis.
A faster memory option of 800 Mhz FB-DIMMs is available with the 1.6 Ghz processors and further accelerates access to data and instructions.

The high memory capacity exceeds that of many competitive systems and can generally be achieved at a lower cost because of the large number of DIMM slots available, thereby allowing for the use of more, lower cost DIMMs.

## Reliability

The reliability of the Sun SPARC Enterprise T5440 is in excess of 99.999+% which translates to under 5.26 minutes per year. In addition, there is an integrated telemetry recording system (Electronic Prognostics) within the system controller that stores a history of over 200 'health' measurements such as temperatures, voltages, currents, fan speeds and energy metrics. Should the system ever encounter any quality issues during its life, the measurements can be analyzed to pinpoint the exact cause.

## Designed for serviceability

The system was designed for fast component replacement. The integrated telemetry recorder helps identify problems quickly and can be used as a preemptive tool to prevent downtime.

## Price/Performance

The initial cost of acquisition, reduced cost of upgrades, no licensing fees for the operating system or virtualization, other benefits noted and outstanding performance all lead to a very compelling case for considering the Sun SPARC Enterprise T5440 server as a solution for enterprise class applications.

# Introduction

The Sun SPARC Enterprise® T5440 server represent the third member of the high-efficiency systems based on the third generation of Sun's Chip Multi-threaded Technology (CMT). The Sun SPARC Enterprise T5140/T5240 servers were the first to blend the expansion and scalability of traditional mid-range servers with the efficiency and economics of CMT platforms

The Sun SPARC Enterprise T5140, T5240 and T5440 servers utilizes the T2 Plus processor which builds upon the success of the T2 with extensions for multiprocessing capabilities.

All of these systems are optimized for the data center with

- Highest throughput in smallest space and power envelope
- Highest rack density in the industry
- Large memory capacities utilizing cost effective 2, 4 and 8 GB FB-DIMMs
- High I/O bandwidth utilizing the latest PCIe standards and adapters
- Efficient designs that integrate the most popular I/O adapters for the purpose of reducing costs, reserving I/O slots for application specific deployments and increasing reliability by reducing the total number of components
- Lowering the total cost of ownership with reduced power requirements compared to competitive offerings,

In combination with the Sun SPARC Enterprise T5120 and T5220 servers, these products provide a highly compatible, scalable set of products that extends the Volume Server products to levels of performance and reliability that were traditionally reserved for mid-range to higher-end systems.

The Sun SPARC Enterprise T-series systems enable customers to respond to three specific challenges:

- Building for the demands of web scale business
- Creating virtualized and ECO-efficient data centers
- Securing enterprise applications

In designing for these customer challenges, the Sun SPARC Enterprise T-series systems will provide a notable improvement in throughput, enhanced performance per unit of power and density. The opportunities for server consolidation and virtualization offer additional opportunities for economies based upon reduced levels of system management, operations and warranty/support.

## Key Features Summary

### Sun SPARC Enterprise T5440 Serve Feature Summary

- One to four UltraSPARC T2 Plus CMT SPARC processors running at 1.2, 1.4 or 1.6 Ghz with 8 cores
  - Very similar to the UltraSPARC T2 processor used in the highly successful Sun SPARC Enterprise T5120 and T5220 servers
  - Identical to the UltraSPARC T2 Plus processor used within the Sun SPARC Enterprise T5140 and T5240 servers
- Power throttle features within the UltraSPARC T2 Plus chip provide for system power optimization
- 16 fully-buffered dual in-line memory modules (FB-DIMM) slots per processor supporting 2, 4 and 8 GB FB-DIMMs. The maximum memory capacity is:

- 128 GB when fully configured with 64 – 2 GB FB-DIMMs
- 256 GB when fully configured with 64 – 4 GB FB-DIMMs
- 512 GB when fully configured with 64 – 8 GB FB-DIMMs

- Eight, low-profile PCI-Express expansion slots, eight lanes wide (x8):
  - Four PCIe slots (x8),
  - Two PCIe slots (x8) with x16 connector (x16), ideal for higher-end graphics, and
  - Two PCIe (x8) shared with XAUI, 10 Gb/sec. networking interface

  **Note:** One or two XAUI, 10 Gbit/sec Ethernet adapters may be added. Each XAUI card shares the bulkhead connector otherwise reserved for a PCIe slot, i.e. the use of a XAUI card and the associated PCIe adapter are exclusive.
- Four 10/100/1000 Mb/sec. Ethernet RJ45 based ports

  **Note:** Installation of a XAUI card will disable one of the 10/100/1000 Ethernet ports
- Four USB 2.0 ports (2 forward, 2 rear facing)
- Four hot-plug disk drive bays supporting:
  - 73, 146 and 300 GB, 10,000 RPM SAS drives,
  - 73 GB, 15,000 RPM SAS drives
  - 32 GB SATA SSDs (solid state disks)

  **Note:** SAS and SATA drives may be mixed within a system. Drives of different capacities or rotational speed may also be used together.
- An integrated disk controller with hardware RAID (0, 1)
- One slot loading DVD ±R/W drive located on the front, right portion of the chassis
- One serial POSIX compliant DB9 port in the back of the chassis
- Next generation service processor with ILOM (integrated lights out manager) software implementation supporting both RJ45 serial interface and 10/100 based Ethernet access
- Four hot-swap high-efficiency 1,120 watt AC/DC power supplies providing 2+2 redundancy when distributed equally over two independent power circuits
- N+1 redundant cooling fan trays under environmental monitor control
- Enhanced environmental monitoring including independent fan speed control which adjusts to changes in temperature within the cabinet. Also included are power monitoring and vibrational monitoring
- Full binary compatibility for applications written to the Solaris API (application programming interface) standard

# Key Messages For The Sun SPARC Enterprise T5440 Servers

## Efficient and Predictable Scaling

– Modular design supporting one to four processors with ease of upgrades to processors and/or memory

– System on a Chip (SoC) design, integrating multiple cores, threads, I/O, cryptographic acceleration onto a single processor thereby greatly increasing performance and reliability while reducing power, cost and components

– Increases performance by scaling with cores and threads, rather than frequency, thereby minimizing power consumption while delivering at least two times higher performance per watt than previous designs

- 64 threads on a single processor with eight cores, four times as many as the latest Intel Nehalem/5500 series and 32 times as many as the latest p6+ processor from IBM. Threads are inexpensive with Sun's processor design thereby providing extra headroom
- The Sun SPARC Enterprise T5440 server delivers better levels of performance, performance per watt and SWaP versus comparable IBM Series p and HP Itanium 2 running a range of industry standard web, mail, Java and compute-intensive benchmarks across web, application and database workloads. [1]
- The Sun SPARC Enterprise T5440 delivers better performance than the IBM System 570 p™, 4 processor, 8 core system at 4.7 GHz while requiring less power and half the space, resulting in nearly twice the performance per watt and approaching four times the SWaP, all while costing about one-third as much.[2]
- The Sun SPARC Enterprise T5440 delivers better value than the HP Integrity rx6600 for application services, ERP and database with two to four times the performance, over two times better performance per watt and four to nine times the SWaP.
- The UltraSPARC T2 Plus processor and the Sun SPARC Enterprise T5440 server extend the benefits of CMT from commercial (i.e. web, application, database) multi-threaded workloads into technical workloads, rich in floating point operations. Workloads include financial modelling, simulations, visualization, engineering and HPC.
- Based upon SPECfl_rate2006 at 1.4 GHz, the Sun SPARC Enterprise T5440 server delivers approx. 20% more performance in the same space as the quad-core Xeon 2.93 GHz and approx. 50% more than the quad-core Opteron 8356 at 2.3 Ghz.
- Based upon SPECjbb2005 at 1.4 GHz, the Sun SPARC Enterprise T5440 server delivers approx. 50% more performance in the same space as the quad-core Xeon 2.93 GHz and approx. 80% more than the quad-core Opteron 8356 at 2.3 Ghz.
- The Sun SPARC Enterprise T5440 supports twice as much memory as the quad socket, 4U HP DL580 G5 server. There are twice as many FB-DIMM memory slots on a Sun SPARC Enterprise T5440 server potentially allowing more flexible memory configurations or expandability.

## Integrated, Flexible, Open Source and No Cost Virtualization Capabilities

- Using Solaris Containers and Logical Domains (LDoms), Sun offers a choice of open-source, no-cost virtualization technologies, making the Sun SPARC Enterprise T5440 server an ideal platform for consolidating existing servers and for providing a virtualized platform for new service deployment. Customers can consolidate hundreds of applications onto a single T5440 system to better utilize server capacity while greatly reducing energy, space and cooling requirements and simplifying management.
- With Solaris (Containers, ZFS, Predictive Self Healing, etc.), Logical Domains, and Sun Servers with CMT design, Sun can tackle customer pain points with a compelling virtualization solution.
- With world record performance in space and power efficient packaging, customers can consolidate their data centers in 3 dimensions: higher levels of performance in smaller power and space footprints than the legacy systems they are replacing
- Solaris Containers can provide hundreds of autonomous, isolated zones on just one OS instance
- Using Logical Domains (LDoms) customers have the flexibility to deploy multiple isolated operating systems simultaneously on a Sun SPARC Enterprise T5440 server - up to 128 isolated OS instances with granularity as low as a single thread
- LDoms are a no-cost feature of the Sun SPARC Enterprise servers. When compared to x86 servers, customers can save
  - $4,500 in VMware licensing costs per dual socket server. (Virtualization price for the VMware Infrastructure Standard 2P license with 1 year coverage. From HP DL380G5 pricing on HP Store,

1 Based on current performance information
2 Based on SAP and SPECjbb2005 performance and current product information

www.hp.com, 12/17/07).

  - VMware for a dual processor Dell PowerEdge R900, quad-core Xeon lists at $3,797 and
  - VMware for a four processor Dell PowerEdge R900, quad-core Xeon lists at $7,594

- Each Solaris OS instance running within an LDom is licensed free of charge unlike competitive environments where each OS has to be licensed. IBM charges a per core license fee for AIX.
- No per core activation fees with Sun and Solaris. IBM charges always charges a per core activation fee and a per core O/S licensing fee for the IBM 550, 560 and 570 systems. There is a memory activation fee as well for only the IBM 570.

  Please refer to the chart in the section entitled '*The Sun SPARC Enterprise T5440 vs. IBM System 550 and 570 Power 6 Servers*'. These fees apply to both the initial system purchase as well as upgrades.
- LDoms support multi-OS types, including different Solaris updates distributions providing maximum customer flexibility.
- With common x64 virtual machines (e.g. VMware, Xen, etc.), the entire system will reboot when the primary domain (Dom0) reboots. With LDoms, any domain, whether a guest domain or a primary domain, is an independent virtual machine which can be configured, started or stopped independently without requiring a power-cycle/reboot of the server. The customer benefits from higher reliability and availability.
- Using a combination of the 2 x 10 GbE interfaces integrated directly on the motherboards of the T5x40 servers, customers can cost effectively accelerate the network performance of virtualized environments, while costing up to $5k less than competitive solutions. (10 GbE price for 2 x SR-fiber PCIe adaptors = $6,740. From HP DL380G5 pricing on HP Store, www.hp.com, 12/17/07. The cost for the DL580 G5 is $7,198. Cost for 2 - 10 GbE and SR transceivers for T5440 are $1,788. Source: sun.com, August 2008)
- The combination of Sun's multithreaded networking technology and Solaris network virtualization technology makes it possible to virtualize and consolidate network infrastructure by binding specific CPU threads to network threads, creating many, custom, virtual network cards from just a single, physical, network interface.
- Sun Virtualization Consulting Services experts can help customers plan, design, and deploy a virtualized environment that helps them achieve significant savings on power and cooling, improve service availability to 99.999+%, increase utilization by as much as 80 percent and facilitate rapid provisioning to maximize return on IT investments. These services help curb datacenter sprawl by rapidly deploying an Eco responsible infrastructure that helps reduce power and cooling costs by as much as 60 percent and space savings by as much as 57 percent.

## High Reliability, High Uptime

- Greater processor and system integration reduces part counts, which directly reduces service interruptions due to component failure by up to 50% compared to x86 platforms and up to nine times when compared to legacy mid-range server platforms.
  - Sun SPARC Enterprise T5440 has 36% fewer parts than competitive 4-socket x86 systems.
- High RAS designed into the Sun SPARC Enterprise T5440 include
  - High MTBF to minimize any single points of failure.
  - Redundant hot-plug/swap of key system components, including power supplies, fans and disks
  - Independent fan control that adjusts rotational speed according to changes in temperature thereby reducing power consumption whenever possible and responding promptly to changes to extend component life.
  - RAID 0 and 1 as standard, not an expensive option
  - Ability to off-line individual threads, with no impact to adjacent threads, cores or sockets

  - Lower power consumption and higher performance per watt reduce the heat load on each data center, helping to avert the 10% of all hardware failures caused by excessive heat. (Based on Sun studies)
  - Vibrational monitoring, i.e. to minimize the impact of a failing disk upon the system
- Predictive Self Healing (PSH) features of Solaris 10 which result in reliability improvements of up to 50%. PSH automatically and transparently diagnoses, isolates, and recovers from many hardware and application faults. As a result, business-critical applications and essential system services can continue uninterrupted in the event of software failures, major hardware component failures, and even software mis-configuration problems.
- Sun Cluster, the most integrated high availability clustering solution supports all major third party and open source applications available for SPARC and x86/x64-based systems. It significantly increases availability with automated diagnosis and recovery and repair, fail/restart functionality, application isolation and automated failover.
- As noted above, with common x64 virtual machines (e.g. VMware, Xen, etc.), the entire system will reboot when the control domain (Dom0) reboots. With LDoms, any domain, whether a guest domain or a primary domain, is an independent virtual machine which can be configured, started or stopped independently without requiring a power-cycle/reboot of the server. The customer benefits from higher reliability and availability.

## Securing the Enterprise at Speed

- As with previously announced Sun SPARC Enterprise T-series servers, Zero Cost Security is a reality – FAST and FREE. The Sun SPARC Enterprise T5440 server supports 10 industry standard, including NSA approved, security ciphers available via the on-chip, integrated cryptographic accelerators of the UltraSPARC T2 Plus processor. There are no additional costs, and minimal impact to performance.

- No need to send plain text on the network or store plain text in your storage systems – encrypt everything to ensure security, privacy and business compliance. Implement secure connections with customers and partners, to bring more services on-line, with the highest levels of confidence in security and confidentiality. Store data and information securely by encrypting data out to storage arrays.
- Domain minimization support included with the latest release of LDoms serves to minimize/reduce Solaris installation for higher security and ease of maintenance.
- Keep up and running 24x7 by taking advantage of Solaris 10's advanced security, business continuity and availability features.
  - Solaris 10 provides security features previously only found in Sun's military-grade Trusted Solaris OS.
  - Solaris 10's User and Process Rights Management feature works in conjunction with Solaris Containers to allow one to securely host thousands of applications and multiple customers on the same system.
  - Solaris Trusted Extensions, an extension of the existing Solaris 10 security policy, allows Solaris 10 customers who have specific regulatory or information protection requirements to take advantage of labeling features previously only available in highly specialized operating systems or appliances.

## Accelerate TTM, Simplify Management

- Implementation of common Integrated Lights Out Management (ILOM) tools enables the management of both CMT and x64 platforms from Sun with the same tool set. ILOM's use of industry standard protocols, including SNMP and IPMI, also enables T5x40 servers to be easily integrated and managed by other Enterprise Management Frameworks (e.g. CA Unicenter, HP Openview, IBM Tivoli, etc.) and Element Managers (e.g. Insight Manager and IBM Director). This enables organizations to decrease installation time, improve time to market, and increase agility as well as reducing management overhead for on-going maintenance and patching.

- ILOM, working with xVM Ops Center, helps customers provision, monitor, patch, and manage Sun systems, providing an easy-to-setup, easy-to-use single point of integrated hardware and software management for Sun x64 and SPARC rack and blade systems.
- To preserve existing investment in SPARC Service Processor skills and training, ILOM offers an ALOM compatibility mode thus ensuring existing operators and administrators can be productive immediately.
- As noted above, system power consumption can be reported to management applications up to every 5 seconds, providing both instantaneous and historical analysis of power consumption trends – vital for effective data center power management and chargeback. Reporting of power consumption is a standard feature of Sun's UltraSPARC T2 and T2 Plus servers. System sensors constantly monitor power consumption of both the total system and individual power supplies, and report it back to the service processor. The reported values are available via the SNMP and IPMI protocols, and via the SP user interface. Therefore the power consumption data can be exported to an external management application for power consumption monitoring and chargeback.
- Sun's CMT servers are the only major server platforms with access to a range of no-cost tools, covering the complete application lifecyle: platform selection, development, tuning, deployment and management, along with pre-compiled and pre-optimized Open Source AMP (Apache, MySQL, PERL/PHP) applications.
- CMT servers enable up to three times faster time to market for new applications / services deployed on CMT systems, and deliver up to twice higher application performance than un-optimized applications. (based on internal studies)[3]

  **Note:** These tools are available for download at: http://www.sun.com/download/index.jsp?tab=2
- Both the server and LDoms functionality can be managed via 3rd party systems management applications, providing maximum flexibility and ease of integration. The Logical Domains MIB (management information base) is delivered as an extension module to the System Management Agent of Solaris 10 running in the control domain. The LDoms MIB helps enable third party system management applications to perform remote monitoring and the starting and stopping of logical domains using the Simple Network Management Protocol (SNMP).

  **Note:** SNMP Management Agent software is available for download at http://www.sun.com/download/index.jsp?tab=2

## Industry's Most Open Platform

- The industry's most open servers, packaging the only 64-bit processor and virtualization hypervisor offered under the GPL, along with a choice of open source Operating Systems and pre-installed Sun Java Enterprise System middleware.
- Solaris is free, open and everywhere, offering proven enterprise-class, indemnified features and led by community innovation. Solaris is the only open source UNIX OS to run on over 900 platforms on multiple x86 and SPARC processors, more than RHEL 3 or 4. Solaris 10 offers the best levels of ISV enthusiasm with support for over 5,300 shipping applications (6,400 committed) from over 3,000 ISVs - 2x more than AIX 5L and 11x more than Red Hat 5 (Oct. 2007 Solaris 10 Adoption Update)
- The choice of Solaris distributions certified on UltraSPARC T2 processors presents customers with greater choice to select the best technologies to meet business challenges.
- Reduce on-going costs by maintaining application compatibility between new generations of OS and hardware platforms, ensuring existing investments in code and skills are preserved. Get the extreme benefits of CMT without having to port existing Solaris applications – THEY JUST RUN. UltraSPARC and Solaris are the only open architecture to maintain binary compatibility over the past 20 years, with the past 3 OS versions legally underwritten by a unique binary compatibility guarantee.
- With Sun's expertise, migration to Solaris can be smooth and easy. Sun offers Solaris migration, upgrade,

3 Customer testimonials available from http://www.sun.com/servers/coolthreads/testimonials/

and adoption services to put customers on the fast track to leveraging the industry's most open platform.

– *"Sun should be considered the first choice for professional and managed services of its technology. Working with its strategic partners, Sun can deliver professional and managed services on heterogeneous infrastructures."* Vendor Rating: Sun Microsystems, Paul McGucken, Daryl C. Plummer, and Jess Thompson. Gartner, Inc. 4/23/07

## The Sun SPARC Enterprise T5440 Server

### Key Product Features, Functions, and Benefits

| Feature | Function | Benefit |
|---|---|---|
| • UltraSPARC T2 Plus processor with 8 cores per processor, 8 threads per core | • Support for up to 256 simultaneous threads, with 16 threads executed per clock cycle | • Dramatically improves throughput and utilization while using less power and dissipating less heat than conventional processor designs |
| • System on a Chip design | • Scaling performance with threads instead of frequency<br>• Integrates I/O and security capability for highly threaded workloads | • Optimizes processors to exploit application parallelism<br>• Reduces power consumption<br>• Provides rich availability feature set |
| • On-Chip Crypto Accelerators | • Support for 10 industry standard security ciphers | • Enhanced security for confidential information |
| • Up to 8 floating point units (FPUs) per processor, one per core, full VIS instruction set | • Extends proven CMT benefits from commercial to technical workloads | • Enables standardization of data center servers, reducing cost and complexity<br>• Protects investments as future workloads emerge |
| • Ultra low part count | • Redundancy of key parts and high MTBF of components<br>• Offline individual threads and cores, without reboot | • CMT Integration reduces part counts and service interruptions up to three times competitive systems |
| • Sockets connected via a inter-CPU coherency link | • Very fast communication between processors/sockets | • Higher performance and scalability through low latency |
| • High-bandwidth 16-way set associative 4-MB Level-2 cache | • Optimum sized cache for multithreaded processors | • Reduces processor cost and complexity, ensuring a balance is achieved between high throughput and low cost/complexity |
| • The Integrated Lights Out Management (ILOM) feature is a system controller, built into the server, that enables you to remotely manage and administer the server | • ILOM enables you to monitor and control your server over an Ethernet connection (supports SSH), or by using a dedicated serial port for connection to a terminal or terminal server | • ILOM may be used to remotely administer geographically distributed or physically inaccessible machines. In addition, ILOM enables you to run diagnostics remotely that would otherwise require physical proximity to the server's serial port. |
| • Typical processor power consumption of 103 watts (nominal) delivering 64 simultaneous threads | • Keeps the performance to power ratio very low while reducing heat dissipation | • Helps reduce cost, improve reliability and ensure customers can grow within current data center power and thermal limitations |
| • LDoms for hardware virtualization, up to 128 OS instances | • Virtualization solution for a flexible infrastructure that is Open Source with no fee | • Driving up utilization and agility while Reducing Costs |

| | | |
|---|---|---|
| • Up to 512 GB memory with 64 – 8 GB FB-DIMMs | • Support for larger workloads, especially many traditionally deployed on higher-end systems | • Enhanced performance and throughput, growth and investment protection. Customers have the ability to deploy and host larger workloads supporting more users and more transactions.<br>• Improved response times with more data available at memory access speed rather than disk access, a factor of $10^3$<br>• Reduced cost of ownership and delivered service |
| • ECC and parity protection on the internal cache memories. The internal L2 cache has parity protection on the tags, and ECC protection on the data. | • Maintenance of data integrity across on-chip memories | • Mainframe class processor RAS with features unique to volume, commodity processors, enhancing system uptime |
| • Hardware RAID 1 (mirroring) and hardware RAID 0 (striping) configurations for any pair of internal hard drives | • Supports either two-disk RAID 1 (integrated mirror) volumes, or two-, three-, or four-disk RAID 0 (integrated stripe) volumes | • Provides data redundancy and increased performance at no additional cost. |
| • Advanced ECC, corrects up to 4 bits in error on nibble boundaries, as long as they are all in the same DRAM, on selected FB-DIMMs only. | • Is used to detect failing DRAM; DRAM channel is then mapped away from failing DRAM through sparing | • Extreme levels of main memory reliability and availability, enhancing system uptime by allowing the system to keep running in the event of a memory DRAM failure |
| • Space efficient, rack-optimized 4 RU design | • Offers high compute density, providing maximum value per rack unit | • Up to 256 threads in a dense, rack-optimized enclosure enables customers to maximize throughput power in their data center |
| • Four hot-swappable, redundant, highly efficient power supplies providing 2+2 redundancy when distributed equally over two power circuits | • Nominal power consumption is 1,900 W. | • Lower operating costs, higher compute capacity, improved performance per watt and reliability<br>• Protection against failure of an individual power supply or circuit |
| • Four onboard 10/100/1000-Mbps Ethernet RJ45 ports | • Exceptional I/O performance and increased network reliability by providing redundancy | • Increases network efficiency, flexibility and availability<br>• Reduced cost by integrating commonly used adapters<br>• Saves PCIe slots for other, customer designated adapters<br>• Ease of configuration or upgrades, merely connect the Ethernet cable. No need to add to shut system down and add adapter(s) |

| | | |
|---|---|---|
| • Integrated controllers for<br>- SAS and SATA disks and SATA SSDs<br>- 4 10/100/1000 Ethernet,<br>- 4 USB and<br>- 1 serial port | • Integration and connectivity<br>• Reduced part count | • Cost-effective means to provide network and storage connectivity. Allows for fast deployment into an IT environment<br>• Fewer parts means improves reliability<br>• Integration as a standard feature reduces total cost |
| • Environmental monitoring | • Temperature sensors, airflow, fan speed, power monitoring and vibrational motion detection and capability to adjust for changes in readings | • Higher availability by reducing unexpected failures<br>• Higher levels of service and customer satisfaction |
| • Solaris 10 OS Operating System pre-installed | • Features such as LDoms, Solaris Containers, Predictive Self-Healing, Solaris Dynamic Tracing and support for the latest UltraSPARC platforms, Solaris 10 OS set entirely new standards for performance, efficiency, availability and security | • Innovations in the Solaris 10 OS save customers significant and measurable time and money when deploying, operating, and managing their IT infrastructure |
| • Legacy application support and Solaris Binary Compatibility Guarantee | • Software applications written to the Solaris ABI can run on the new UltraSPARC T2 and T2 Plus based systems with out modifications | • No need to migrate OS or to port applications to take advantage of new hardware features, providing unrivaled investment protection |
| • Rack-optimized system with support for most industry standard four-post racks | • Installation and serviceability | • Ease integration and deployment into production environments while enabling customers to preserve their investments in existing datacenter environments |
| • Sun Customer Ready Systems (CSI, formerly CRS) program | • For factory-configured, pre-racked, custom Sun SPARC Enterprise T5440 servers, refer to the CRS program website: http://www.sun.com/crs | • Simplification and speed of system deployment |
| • SunSpectrum[SM] Instant Upgrades available for the Sun SPARC Enterprise T-series of servers | • Provides essential services, support, system administration resources and Solaris OS updates in one package. | • Lower cost, higher productivity and improved system uptime; peace of mind that all service needs will be handled painlessly. One stop shop for all customer needs |

## Product Family Placement

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

- The Sun SPARC Enterprise T5440 server is among the first servers to incorporate the UltraSPARC T2 Plus processor.

- Building on the success of the UltraSPARC T2, the UltraSPARC T2 Plus represents a significant enhancement for the CMT technology. The Sun SPARC Enterprise T5440 servers are designed to compliment Sun's existing line of UltraSPARC IIIi, UltraSPARC IV, Opteron and Intel processor-based servers.

  In addition, this server provides opportunities for economies based upon reduced power and space requirements and operational considerations from consolidation and virtualization.

Overall platform positioning can be summarized as follows:

- **Sun SPARC Enterprise CMT servers** for highly threaded web, application tier, middleware, HPC and OLTP workloads requiring the highest levels of power and space efficiency. Large memory capacity help ensure responsive database applications.
- **Sun Fire x64 servers** for FP performance and compute-intensive workloads and for environments that are already standardized on x64 or Linux/Windows-based applications.

## Feature Comparison with Other UltraSPARC Servers

| Feature | Sun SPARC Enterprise M4000 | Sun SPARC Enterprise M5000 | Sun SPARC Enterprise T2000 | Sun SPARC Enterprise T5120/5220 | Sun SPARC Enterprise T5140/T5240 | Sun SPARC Enterprise T5440 |
|---|---|---|---|---|---|---|
| **Processors (Chips or Sockets)** | 4 | 8 | 1 | 1 | 2 | 1 to 4 |
| **Processor Type** | SPARC64 VI | SPARC64 VI | T1 | UltraSPARC T2 | UltraSPARC T2 Plus | UltraSPARC T2 Plus |
| **Cores and Speeds Available** | 4 cores @ 2.15 or 2.4 GHz | 4 cores @ 2.15 or 2.4 GHz | 4, 6 and 8 cores @ 1.0, 1.2 and 1.4 GHz | 4, 6 and 8 cores @ 1.2 Ghz, 8 cores @ 1.4 and 1.6 Ghz | 1U: 4, 6 and 8 cores @1.2 and 1.4 Ghz<br>2U: 4, 6 and 8 cores @1.2 Ghz, 8 cores at 1.4 and 1.6 GHz | 8 cores @ 1.2, 1.4 and 1.6 GHz |
| **Max. Threads** | 32 | 64 | 32 | 64 | 128 | 256 |
| **Total Bandwidth** | 32 GB/sec. | 64 GB/sec. | 134 GB/sec. crossbar | 268.8 GB/sec. crossbar | 51 GB/sec. | 204 GB/sec. |
| **Processor to memory bandwidth** | 8 GB/sec. | 25.2 GB/sec. | 25.6 GB/sec. | 42 GB/sec. Read; 21 GB/sec. Write | 43 GB/sec. Read; 21 GB/sec. Write | 85 GB/sec. Read; 43 GB/sec. Write |
| **Mini. memory** | 16 GB (2 modules 8 x 1 GB) | 16 GB (2 modules 8 x 1 GB) | 8 GB (8 x 1 GB) | 4 GB (4 x 1 GB) | 8 GB (8 x 1 GB) | 16 GB (8 x 2 GB) |
| **Max. memory** | 128 GB | 256 GB | 128 GB (16 x 4 GB) | 64 GB (16 x 4 GB) | 128 GB (32 x 4 GB) | 512 GB (64 x 8 GB) |
| **DIMMs capacities** | 1, 2 and 4 GB | 1, 2 and 4 GB | 1, 2 and 4 GB | 1, 2 and 4 GB | 1, 2, and 4 GB | 2, 4 and 8 GB |
| **Max. internal disk drives** | 2 | 4 | 4 | 1U: 4<br>2U: 8 | 1U: 4<br>2U: 8 or 16 config. dependent | 4 |
| **Disk Drives supported** | 73 and 146 GB SAS | 73 and 146 GB SAS | 73 and 146 GB SAS | 1U: 73 and 146 GB SAS<br>2U: 73 and 146 GB SAS | 1U: 73 and 146 GB SAS<br>2U: 73 and 146 GB SAS | 73 and 146 GB SAS |
| **SSDs support** | | | None | Yes | Yes | Yes |
| **Removable media** | CD-RW/DVD-RW, DAT | CD-RW/DVD-RW, DAT | Slimline DVD-ROM/CD-RW | Slimline DVD RW | Slimline DVD RW | Slimline DVD RW |
| **Serial Interfaces** | via PCI-X adapter | via PCI-X adapter | RS-232/DB-9, Four USB 1.1 | RS-232/DB-9, Four USB 2.0 | RS-232/DB-9, Four USB 2.0 | RS-232/DB-9 Four USB 2.0 |
| **PCIe slots, low profile** | 4 (4 per I/O Tray) | 8 (4 per I/O Tray) | 3 (1x, 4x and 8x width) | 1U: 3 or 1 +2 x 10 GbE<br>2U: 6 or 4 + 2 x 10 GbE | 1U: 3 x8 or 1 + 2 x 10 GbE<br>2U: 6 x8 or 4 + 2x 10 GbE | 8: 6 - x8 plus 2 x16 slots |
| **PCI-X slots,** | 1 | 2 | 2 PCI-x, | None | None | None |

| Feature | Sun SPARC Enterprise M4000 | Sun SPARC Enterprise M5000 | Sun SPARC Enterprise T2000 | Sun SPARC Enterprise T5120/5220 | Sun SPARC Enterprise T5140/T5240 | Sun SPARC Enterprise T5440 |
|---|---|---|---|---|---|---|
| **low profile** | (1 per I/O Tray) | (1 per I/O Tray) | 133MHz, 64 bit wide, 3.3V | | | |
| **Ethernet Adapters** | 2 | 4 | 4 x GbE | 2 x 10 GbE + 4 x GbE Mbps | 2 x 10 GbE + 2 x GbE or 4 x GbE | 2 x 10 GbE + 2 x GbE or 4 x GbE |
| **Form Factors (Rack Units)** | 6 RU | 10 RU | 2 RU | 1 RU/2 RU | 1 RU/2 RU | 4 RU |
| **Reliability/ Availability Features** | Hot swap processors and memory, power and cooling, ECC, memory mirroring, instruction retry, live O/S upgrades | Hot swap processors and memory, power and cooling, ECC, memory mirroring, instruction retry, live O/S upgrades | Hot-plug disks, redundant, hot-swap power supplies and fans, RAID 0 and 1, Extended ECC | Hot-plug disks, redundant, hot-swap power supplies and fans, RAID 0, 1 | Hot-plug disks, redundant, hot-swap power supplies and fans, RAID 0, 1 | Hot-plug disks, redundant, hot-swap power supplies and fans, RAID 0, 1 |
| **Solaris O/S version, minimum** | Solaris 10 11/06 or later | Solaris 10 11/06 or later | Solaris 10 11/06 or later | Solaris 10 08/07 (Update 4) + patches | Solaris 10 08/07 (Update 4) + patches | Solaris 10 08/07 (Update 4) + patches from Sunsolve |
| **Total Bandwidth** | 32 GB/sec. | 64 GB/sec. | 134 GB/sec. crossbar | 268.8 GB/sec. crossbar | 51 GB/sec. | 204 GB/sec. |
| **Processor to Memory Bandwidth** | 8 GB/sec. | 16 GB/sec. | 25.6 GB/sec. | 42 GB/sec. Read; 21 GB/sec. Write | 43 GB/sec. Read; 21 GB/sec. Write | 85 GB/sec. Read; 43 GB/sec. Write |
| **Typical power** | | | 275 w | | | |
| **Power supplies** | | | 2 - 450 w AC N + 1 | 1U: 650 w AC N + 1<br>2U: 750 w AC N + 1 | 1U: 2 - 720 w AC N+1<br>2U: 2 -1,100 w AC N+1 | 4 – 1,120 w AC; 2 + 2 redundant |
| **Power max.** | 2,350 w | 4,590 w | 400 w | 641 w | 843 / 1,365 w | 2,725 w |
| **Cryptography** | via PCIe adapter | via PCIe adapter | One H/W assisted accelerator per core | One H/W assisted enhanced accelerator per core | One H/W assisted enhanced accelerator per core | One H/W assisted enhanced accelerator per core |

## Feature Comparison with Sun Fire x64, Opteron-based Servers

| Feature | Sun Fire X4240 | Sun Fire X4450 | Sun Fire X4500 | Sun Fire X4600 M2 | Sun SPARC Enterprise T5440 |
|---|---|---|---|---|---|
| **Processors/ Sockets** | 1 – 2 | 1 - 4 | 2 | 2, 4, 6 or 8 | 1 to 4 |
| **Processor Type** | AMD Opteron 2200 and 2300 | Intel Xeon 7200, 7300 and | AMD Opteron Model 290 | AMD Opteron 8000 Series | UltraSPARC T2 Plus |

| Feature | Sun Fire X4240 | Sun Fire X4450 | Sun Fire X4500 | Sun Fire X4600 M2 | Sun SPARC Enterprise T5440 |
|---|---|---|---|---|---|
| | Series | 7400 series | | | |
| **Speed** | Dual core: 2.6–3.2<br>Quad core: 1-9-2.5 GHz | 2.93 Ghz quad-core; 2.66 Ghz six-core | 2.8 Ghz | 2.6 and 2.8 GHz dual; 3.0 Ghz single | 1.2 and 1.4 GHz |
| **Cores/Socket** | 2 and 4 | 2, 4 and 6 | 2 | 2 and 4 | 8 |
| **Threads, max.** | 4 and 8 | 6 | 4 | 16 and 32 | 256 |
| **Max. memory** | 128 GB | 128 GB, 32 DDR2 slots | 16 GB | 256 GB | 512 GB |
| **Max. Bandwidth CPU Interconnect** | 8 GB/sec. | 8 GB/sec. | 8 GB/sec. | 8 GB/sec. | 204 GB/sec. |
| **Internal disk drives, max.** | 16 | 8 | 48 | 4 | 4 |
| **RAID** | RAID 0, 1, 1E, 5, 5EE, 6, 10, 50, 60 with SAS RAID HBA | | RAID 0, 1, 0+1, 5, 6 enabled by RAID-Z and Raid Z2 | RAID 0 and 1 | RAID 0, 1 |
| **Removable media** | DVD-ROM/CD-RW | One EIDE DVD+/-RW drive | | DVD-ROM | DVD R/W |
| **PCIe** | Six internal MD2 Low Profile PCIe slots (1x 16-lane, 4x 8-lane, 1x 4-lane) | 6 PCIe slots: 2 8-lane slots (both x16 mechanically); 4 4-lane slots (3 x8 mechanically, 1 x16 mechanically) | None | 6 PCIe slots (4 x 8-lane PCIe slots, 2 x 4-lane PCIe slots | 8, expandable with Sun External I/O Expansion Unit |
| **PCI-X** | | None | 2 MD2 low-profile 64-bit PCI-X slots at 133 MHz | 2 - 64-bit/100 MHz PCI-X slots | None |
| **USB** | 5, one internal | 4 | 4 | 4 | 4 |
| **Management** | One dedicated 10/100Base-T Ethernet port | One dedicated 10/100Base-T Ethernet port | 1 dedicated 10/100Base-T Ethernet port, RJ-45 connector | 10/100 Ethernet and RS 232 Serial | 10/100 Ethernet and RS 232 Serial |
| **Ethernet** | 4 GbE | 4 GbE | 4 GbE | 4 GbE | 2 x 10 GbE + 2 x GbE<br>or 4 x GbE |
| **Reliability Features** | Dual redundant, hot -swappable power supply, optional RAID | Dual redundant, hot -swappable power supply, optional RAID | Hot plug drives, redundant power supplies and fans, optional RAID | | Hot plug drives, redundant power supplies and fans, Raid 0, 1 and 10, ECC memory with advanced ECC support |
| **Form Factor** | 2 RU | 2 RU | 4 RU | 4 RU | 4 RU |
| **O/S** | Solaris, Linux, Windows. VMware | Solaris, Linux, Windows, VMware. | Solaris 10 11/06, Red Hat Linux Enterprise, | Solaris 10 6/06, Red Hat Enterprise Linux, | Solaris 10 8/07 plus patches from Sunsolve or |

| Feature | Sun Fire X4240 | Sun Fire X4450 | Sun Fire X4500 | Sun Fire X4600 M2 | Sun SPARC Enterprise T5440 |
|---|---|---|---|---|---|
| | | | SuSE Linux, Microsoft Windows Server 2003 | SuSE Linux, Microsoft Windows, VMware | later |
| **Power Supplies** | 2 – 1,050 w (N+1) | 2 – 1,100 w (N+1) | 2 – 1,500 w (N+1) | 4 – 850 w (N + 1) | 4 – 1,120 w (2 + 2) |
| **Cryptography** | None | None | None | None | One H/W assisted enhanced accelerator per core |

# Selection Criteria

## Sun SPARC Enterprise T-series

| Sun SPARC Enterprise T2000 | Sun SPARC Enterprise T5x20 | Sun SPARC Enterprise T5x40 | Sun SPARC Enterprise T5440 |
|---|---|---|---|
| - Lowest absolute power consumption | - Maximum performance and efficiency across a spectrum of applications, including floating point | - First two-way CMT<br>- Highest compute density<br>- Memory and I/O expandability | - Modular scalability<br>- First four-way CMT |
| - Lowest entry price<br>- Ideal for development and prototyping | - Web servers, streaming media, IPTV/VoD, VoIP, LDAP/DNS, cluster interconnects, switching<br>- Organizations requiring rapid scalability of compute power<br>- Native 10GbE Networking | - Web, middleware, and application tier workloads, especially Java, D/B<br>- High capacity internal disk capacity, i.e. remote/branch locations | - Maximizes investment protection with expansion<br>- Large memory for enterprise apps. incl. D/B, CRM, ERP, web serving |
| - Continuation of existing deployments | - Heavy encryption requirements<br>- Wirespeed security | - Massive Bandwidth | - Extreme I/O bandwidth in 4 RU<br>- 8 PCIe slots, expandable |
| | - Highest level of virtualization in competitive class of systems<br>- Virtualize web apps | - Virtualize web and LOB applications, distributed OLTP, database | - Virtualize mission critical apps, OLTP, Database, data mining |
| - 4 internal drive bays, no SSD support | - 8 internal drive bays, moderate-sized internal storage array, SSD support | - 16 internal drive bays, large internal storage array, SSD support | - 4 internal drives bays, SSD support |
| - Solaris 10 11/06 OS | - Solaris 10 08/07 OS | - Solaris 10 08/07 OS | - Solaris 10 8/07 OS |
| - Redundant power supplies, fans and disks, RAID 0, 1, ECC memory | - Hot swap and redundant fans, power supplies and disks, ECC memory, RAID 0, 1 | - Hot swap and redundant fans, power supplies and disks, ECC memory, RAID 0, 1 | - Hot swap and redundant fans, power supplies and disks, ECC memory, RAID 0, 1<br>- Sensors for temperature, air flow, fan speed and vibration. Recording of history by service processor. |

### Related Web Sites for Product References

*External URL(s) for the Sun SPARC Enterprise T5120 and T5220 servers:*
*Sun SPARC Enterprise T5120 server: http://sun.com/t5120*
*Sun SPARC Enterprise T5220 server: http://sun.com/t5220*
*External URL(s) for the Sun SPARC Enterprise T5140 and T5240 servers:*
*Sun SPARC Enterprise T5140 server: http://sun.com/t5140*
*Sun SPARC Enterprise T5240 server: http://sun.com/t5240*
*External URL(s) for the Sun SPARC Enterprise T5440 server:*
Sun SPARC Enterprise T5440 server: http://sun.com/t5440

## Sun SPARC Enterprise T-series server are optimized for:

- Web, middleware and application tier workloads, especially Java environments
- Database environments with large memory requirements
- Multi-threaded HPC workloads with large instruction and data sets
- New web services deployments and SOA infrastructure implementations requiring scalability in processing and/or memory requirements
- Existing Sun/Solaris OS customers looking for breakthrough performance and efficiency increases while maintaining the consistency offered through the Solaris OS/SPARC architecture
- IBM, Dell, and HP RISC, Itanium or x86/64 customers dealing with the power and space issues of inefficient server sprawl, limiting their ability to deploy and scale new workloads, or to create a virtualized, eco-efficient data center infrastructure

## Sun Fire x64 servers excel in these areas:

- Customers running high performance technical computing workloads where Linux or Windows is a requirement.
- Customers requiring application flexibility and protection of asset investments, delivered through full Solaris binary compatibility, with support of Linux or Windows based applications and VMware virtualization
- Customers who have committed to x64 platforms or Linux/Windows as their standard, then Sun Fire Servers are the fastest, most reliable x64 servers on the market.

## Sun Fire x64 servers are optimized for:

- HPTC/Compute environments demanding cost-effective, high performance floating point performance and the Linux Operating System.
- Web services and application server deployments, especially where x64 is the standard or O/S choice is required
- Customers standardizing on one platform infrastructure for mixed workloads, including single thread, multi-thread and FP applications.
- Excellent platform choice for distributed database instances, typical in cluster environments
- Existing Sun/Solaris OS/SPARC customers looking to standardize on x64 platforms

- IBM, HP and Dell customers looking for a lower cost, lower power alternative

## Positioning Comparison with Other UltraSPARC Servers

| Feature | UltraSPARC T1 CPU-based Servers | UltraSPARC T2/T2 Plus based Servers | Sun SPARC Enterprise M4000/M5000 |
|---|---|---|---|
| **Selection criteria** | - Optimum performance, power and space balance<br>- Ideal for integer workloads and development platforms<br>- Advantageous costs of entry esp. with sales incentives<br>- Fully compatible with T2/T2 Plus based systems | - Exceptionally high compute densities<br>- Enhanced for floating point, networking, highly scalable family<br>- Very large memory capacities for web and D/B | - Highest levels of scalability and separation of applications/domains |
| **Target use** | - Multithreaded application specialist | - Mixed workload performance, esp. floating point<br>- Multimedia/streaming server with large memory and I/O bandwidth<br>- Large modeling applications | - Highest overall performance on widest variety of applications |
| **RAS** | - Strong RAS | - Extended RAS | - Highest-level of RAS, mainframe class, incl. Instruction retry, memory mirroring |
| **I/O Capability** | - Supports PCIe and PCI-X cards | - Focus on networking and total I/O bandwidth<br>- Integrated I/O controllers for economy and compactness | - Enhanced, modular I/O subsystems for expansion capability |
| **Flexibility** | | - Support for legacy accessories and devices | - Broad support for different processor speeds and new devices |
| **Form Factor** | Highly compact | Among the most dense computing capacity in industry | Slightly larger to accommodate additional RAS and expansion capability |

## Availability

General Availability for the Sun SPARC Enterprise T5440 server was achieved in mid-September 2008.

## Target Users

There is a large variety of target users for the Sun SPARC Enterprise T5440 servers. Look for users that run applications that require Java code, highly threaded commercial or technical applications and mid-sized to larger databases with higher I/O requirements. Customers looking to build their infrastructure for web-scale computing or who are designing virtualized and eco-efficient data centers are prime targets for the SPARC Enterprise T5440 servers.

The Sun SPARC Enterprise T5440 servers deliver breakthrough performance with the greatest power and space efficiency for multi-threaded workloads, coupled with high on-chip and systems integration to boost performance and lower costs.

Typical applications include:

- Web Serving
- Streaming Media
- Security Applications
- Java Application Servers & Virtual Machines
- OLTP Databases
- ERP, CRM, SCM
- Network Infrastructure
- SOA and Business Integration platforms
- Consolidated web and application tier infrastructure
- Technical computing workloads

### Target Markets

The Sun SPARC Enterprise T5440 servers are targeted for multi-threaded server workloads. Typical organizations include financial services, service providers, telcos, NEPs, education and government agencies. Just about any organization that matches the appropriate IDC categories listed below is a target.

| Number of Cores | Appropriate Markets/Applications |
|---|---|
| 6 Cores | • Proxy caching<br>• Email service<br>• Batch processing<br>• Streaming media<br>• Web serving<br>• Application development<br>• Networking<br>• Security<br>• Systems management |
| 8 Cores | • Java application servers and Java Virtual Machines<br>• ERP, CRM, OLTP, Database<br>• Data warehouses and marts<br>• Data analysis and mining<br>• Virtualized applications<br>• HPC Applications<br>• Consolidation and/or virtualization |

# Competitive Positioning

**Notice:** *This competitive section is designed to provide a view of the competitive landscape in early fourth quarter, calendar 2008 and is expected to be updated periodically.*

*The dynamic nature of the server platform marketplace, dictates pricing and server product variance over short time periods. Consequently, for the latest pricing and configurations, please refer to competitive.central or contact product management.*

## Sun SPARC Enterprise T5440 servers

### CMT Value Proposition

No other servers on the planet better empower organizations to virtualize their compute infrastructure and build highly scalable, highly efficient and robust internet infrastructure for the delivery of breakaway web services. Sun Microsystems' range of CMT rack and blade servers, based on the industry's first massive multi-core, multi-thread UltraSPARC T1,T2 and T2 Plus Chip Multi-Threading (CMT) processors, deliver a unique combination of world record performance, power and space efficiency and price / performance – without compromise. By upgrading to Sun's proven CMT platforms, customers have already been able to serve nearly 5x more users at 10x better price/performance while reducing both power and data centre operating costs by 75%[4]

For the first time, IT groups can securely, reliably and eco-efficiently serve millions of new customers and communities while saving significant amounts of money through a virtualized, environmentally efficient data center infrastructure with server platforms optimized for network, application, HPC and OLTP database services. Powered by the industry's only 64-bit open source processor, coupled with a choice of open-source operating systems, virtualization and middleware, organizations can benefit from the greatest levels of application choice and guaranteed binary compatibility to protect their investments. When combined with Sun and partner service offerings, customers have already accelerated their time to market to capture new revenue streams while dramatically improving throughput, energy efficiency and service level predictability, all at reduced costs.

- As the industry's first quad socket CMT system, the Sun SPARC Enterprise T5440 extends the proven benefits of Sun's CMT architecture to the most mission-critical application and OLTP database workloads supporting web services. With up to 256 threads, 512 GB memory and massive I/O bandwidth in just 4 RU, typically consuming less than 1,800 watts of power, customers can use the embedded no cost LDom and Solaris Containers virtualisation technologies to compress workloads that have traditionally demanded a huge SMP system occupying a full chassis or rack. To achieve the same core density on a Power-based system from IBM, a customer would need to purchase a p5 590 which is 10.5x higher, 2.2x deeper, 34x heavier and consumes 7x more power[5] The Sun SPARC Enterprise T5440 server delivers nearly two times higher performance and performance per watt than IBM' latest Power6-based p570, and nearly 2x the performance in the same footprint as the latest quad socket HP Intel Xeon based servers[6] High I/O bandwidth is complemented by integrated cryptographic acceleration to secure I/O traffic, and extreme I/O connectivity via the optional Sun I/O box. As a result, the T5440 can connect to a huge diversity of external storage arrays and network fabrics. With massive compute and I/O scalability in a space and power efficient footprint, coupled with no-cost, integrated virtualisation, the Sun SPARC Enterprise T5440 re-

4 http://www.sun.com/customers/index.xml?c=digitar.xml

5 IBM specifications based on 42U chassis, 52.2" deep, 2,735 lbs and consuming 80% of the maximum reported power consumption of 16,700 watts. All specifications dated 12/18/07 from ftp://ftp.software.ibm.com/common/ssi/pm/br/n/psb01628usen/PSB01628USEN.PDF

6 Based on SAP and SPECjbb2005 estimates

defines performance, availability and efficiency in mid-range computing by introducing the economics and efficiency of established CMT technologies.

The Sun SPARC Enterprise T5440 server has unique competitive differentiation that may not be matched by IBM, HP or Dell, including:

- First quad-socket CMT system, marrying virtually unprecedented mid-range performance and expandability – with the efficiency and economics of established CMT technology
- Delivers higher throughput in less space and power than any other 4-Socket, 4RU server on the planet, i.e. up to twice the throughput and performance per watt in half the space of competitive systems
- No compromise Eco-efficiency, low power and high performance
- Great I/O scalability - each UltraSPARC T2 Plus processor has a x8 PCIe port integrated directly into silicon so I/O throughput scales as processors are added to a system. With the optional I/O Expansion Module, the T5440 can scale to 28 PCIe slots. The I/O Expansion Module functions similarly to IBM's I/O Expansion Drawer.
- With massive memory expandability, the Sun SPARC Enterprise T5440 server supports twice as much memory as the equivalent quad socket, 4U HP DL580G5 server.
- Fewest parts in class, improving reliability and SLAs. Sun SPARC Enterprise T5440 server has 36% fewer parts than competitive 4-socket x86 systems.
- Zero-cost security available via on-chip, integrated cryptographic accelerators, saving up to $9k per server versus competitive solutions
- On-chip integration of I/O and on-motherboard integration of 10GbE networking, saving up to $5k per server versus competitive solutions
- Along with the UltraSPARC T2 servers, T5440 is the first to incorporate unique power management features at both core and memory levels of the processor, including the ability to reduce instruction issue rates, parking of idle threads, disabling cores and the ability to turn off clocks in both cores and memory to reduce power consumption by up to 35%
- Highly efficient *80 Plus* and *Climate Savers* compliant power supplies are standard with the T5440 platform, at no additional cost
- Up to 128 isolated OS instances, with no cost virtualization, saving a typical $5,000 per server versus competitive platforms
- Unique binary compatibility guarantee
- Most open platform on the planet
- Most advanced OS on the planet

## Key Competitive Differentiation

– The Sun SPARC Enterprise T5440 server based on open-source, open-industry standard hardware and software offer up higher throughput in less power and space than competitive platforms. For example, against IBM's latest Power6 570 platform, the Sun SPARC Enterprise T5440 delivers nearly twice the performance in half the space, with two times higher performance per watt, adding up to 4x SWaP, all at a third of the cost. When compared to the latest Intel Xeon 4-core systems, the Sun SPARC Enterprise T5440 delivers nearly 2x higher throughput in the same space as a 4-socket system.

– See http://www.sun.com/servers/coolthreads/benchmarks/index.jsp
for the latest benchmarks and comparisons.

- The Sun SPARC Enterprise T5440 packs 32 cores into an enclosure measuring just 4RU in height and 24" in depth, weighing 80 lbs. and consuming typically 1,900 watts of power. To achieve the same core density on a p5 system from IBM, a customer would need to purchase a p5 590 which is 10.5x higher, 2.2x deeper, 34x heavier and consumes 7x more power (IBM specifications based on 42U chassis, 52.2" deep, 2,735 lbs. and consuming 80% of the maximum reported power consumption of 16,700 watts. All specifications dated 12/18/07 from ftp://ftp.software.ibm.com/common/ssi/pm/br/n/psb01628usen/PSB01628USEN.PDF)
- The industry-first SMP System on a Chip design of UltraSPARC T2 Plus integrates 8 cores, 64 threads, 8 x Floating Point Units, cryptographic acceleration, and I/O directly onto each processor, resulting in systems delivering up to 256 threads and 256GB of memory in as little as a 4U form factor and with up to 36% fewer parts, and therefore 1/3rd fewer risks of system failure, than competitive systems.
- The Sun SPARC Enterprise T5440 Server equipped with 32 cores has 9x fewer parts than 24-core legacy mid-range platforms
- Customers have maximum application and platform choice with the the open source, no cost Solaris OS which offers the best levels of ISV enthusiasm with support for over 5,300 shipping applications (6,400 committed) from over 3,000 ISVs - 2x more than AIX 5L and 11x more than Red Hat 5. Sun's suite of open source, no cost Cool Tools for optimizing development and deployment on UltraSPARC T2 Plus systems enables customers to accelerate time to market by 3x and improve performance of their code by 2x.
- The SPARC / Solaris open source architecture uniquely guarantees binary compatibility across generations, so customer application investments are preserved more effectively than any other platform – enabling customers to enjoy all the benefits of CMT innovation, without having to re-write or port their code.
- Customer choice and flexibility is further complemented by the release of the processor and hypervisor to the open source community via the Open SPARC project and GPL, in addition to the choice of open source operating system supported on the UltraSPARC T2 Plus processor and the open source Sun Java Enterprise System middleware stack which is pre-installed onto every Sun SPARC Enterprise T5440 server.
- The Sun SPARC Enterprise T5440 server offers the most flexible, open and lowest cost virtualization and consolidation capability in class. Logical Domains support up to 128 isolated open source OS instances on a single platform, coupled with thousands of isolated application instances through Solaris Containers, enabling customers to achieve dramatic levels of server compression and data center efficiency, all via the implementation of open source and no-cost technologies, saving customers up to $5k per server when compared to equivalent functionality using proprietary virtualization technologies
- Solaris, LDoms and Solaris Containers are all bundled with the price of the server. Virtualization and an OS both add to the cost of many competitive servers – especially Windows, HP-UX or AIX based systems. Multiple copies of Solaris 10 running under LDoms are also available at no extra charge, thereby providing a further competitive advantage.
- The two on-board memory controllers allow the UltraSPARC T2 Plus processor to offer extremely high levels of performance on applications that move data with many small threads and high memory bandwidth.
- The Sun SPARC Enterprise T5440 servers are a fifth-generation CMT design (UltraSPARC IV, UltraSPARC IV+, UltraSPARC T1, UltraSPARC T2), while the competition is only on their second generation design.
- Sun's UltraSPARC processors and the Solaris OS have deep roots and expertise in optimizing applications on many cores/threads. Competitive x86 servers are just now, 10 years after the E10K and Solaris 2.6, beginning the multicore / multithread optimization journey.
- Sun's standard configurations are robust (i.e. memory with high processor core/frequency) bundled with redundant power supplies and disks as standard along with 4 x 1 GbE interfaces and RAID, unlike many competitive standard configurations where all of these items must be added, therefore adding to cost .
- The Sun SPARC Enterprise T5440 server offers three real dimensions of consolidation as a result of their high delivered performance in lower power and space power envelope. Many competitive platforms are unable to do this – usually only offering one or two consolidation dimensions.

# IBM - Competitive Summary Chart

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| **Product Type** | Mid-range Server | Mid-range Server | High-End Server | Mid-Range Server | Mid-Range Server | Entry-Level Server | Entry-Level Server |
| **Form Factor** | Rack | Rack | Rack | Rack | Rack | Rack, Tower | Rack, Tower |
| **Platform** | UNIX, Linux | UNIX, Linux | LINUX, Windows | UNIX, Linux | UNIX, Linux | UNIX, Linux | UNIX, Linux |
| **Announced** | 14-Feb-06 | 7-Oct-08 | 29-Jan-08 | 14-Feb-06 | 08-Jun-07 | 29-Jan-08 | 29-Jan-08 |
| **Available** | 14-Feb-06 | 21-Nov-08 | 29-Jan-08 | 24-Feb-06 | 21-May-07 | 8-Feb-08 | 29-Jan-08 |
| **Architecture** | RISC | RISC | x86 | RISC | RISC | RISC | RISC |
| **O/S** | AIX, Red Hat Linux, SUSE Linux | AIX, Red Hat Linux, SUSE Linux | Red Hat Linux, SUSE Linux, Windows | AIX, Red Hat Linux, SUSE Linux | AIX, Red Hat Linux, SUSE Linux | AIX, Red Hat Linux, SUSE Linux | AIX, Red Hat Linux, SUSE Linux |
| **Processor Family** | Power | Power | Xeon | Power | Power | Power | Power |
| **Processor Options** | POWER5+ (1.5GHz)* POWER5+ (1.8GHz)* *Quad Core Module | POWER6+ (3.6GHz) | Xeon E7310 (1.6GHz 80W) Xeon E7330 (2.4GHz 80W) Xeon X7350 (2.93GHz 130W) | Power5+ (1.9GHz) Power5+ (2.2GHz) | Power6 (3.5GHz) Power6 (4.2GHz) Power6+ (4.4GHz) Power6+ (4.7GHz, retired) Power6+ (5.0 GHz) | Power6 (3.5GHz) Power6 (4.2GHz) Power6+ (5.0 GHz) | Power6 (4.2GHz) Power6+ (4.7 GHz) |
| **Max. Processor Chips** | 8 | 8 | 16 | 8 | 16 | 4 | 2 |
| **Max. Processor Cores** | 16 | 16 | 64 | 16 | 32 | 8 | 4 |
| **Cache** | 32 MB or 72 MB L3 | 32MB L3 | 2 x 2MB, 2 x 3MB or 2 x 4MB L2 | 36 MB L3 per 2 CPUs | 4MB L2 each CPU and 32MB L3 shared per 2 CPUs | 32MB L3 | 4MB per core |

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| **Chipset** | Power5 | Power 6 | XA-64e | Power5 | Power6 | Power6 | Power6 |
| **Memory Minimum** | 2 GB | 8 GB | 2 GB | 2 GB | 2 GB | 1.00 GB | 1.00 GB |
| **Memory Maximum** | 128 GB | 384 GB | 1,024 GB | 512 GB | 768 GB | 256 GB at 4.2 Ghz, 128 at 3.5 Ghz | 64 GB |
| **Memory Type** | DDR2 SDRAM | DDR2 SDRAM | DDR2 SDRAM | DDR1 SDRAM, DDR2 SDRAM | DDR2 SDRAM | DDR2 SDRAM | DDR2 SDRAM |
| **DIMM slots** | 32; 8 DIMMs per CPU module, two modules in each of two drawers | 12 per dual processor (4 core) modules; maximum 48 | 8 per memory expansion board; 32 DIMM max. per chassis | 8 per processor card, 16 per drawer, 4 draws max. | 12 per processor card | 32, 8 per socket | 8 with two sockets, 4 otherwise |
| **Memory Protection** | Chipkill ECC with dynamic bit-steering memory | Chipkill ECC with single-error-bit correction and double-error-bit detection ECC memory | ECC via Checksum Chipkill, Active Memory, Memory ProteXion, Memory Mirroring, hot-swap, hot-add | Chipkill ECC with dynamic bit-steering memory | Chipkill ECC with dynamic bit-steering memory | Chipkill ECC with single-error-bit correction and double-error-bit detection ECC memory | ECC, Chipkill |
| **Disk Type** | SCSI | SAS | SAS | SCSI | SAS | SAS | SAS |
| **Disk Controller** | Dual Ultra320 SCSI | SAS/SATA | SAS | Dual Ultra320 SCSI | SAS | SAS/SATA | 3G SAS |
| **Internal Disk Bays** | 12, (six per drawer on split backplane 3/3) | 6 | 14 | 24 | 24 | 6 | 6 |
| **Bay Information** | 6 x hot swap drive bays per drawer, 2 x media bays per | Per CEC enclosure (maximum 2 CEC enclosures): 6 x 3.5" hot- | 6 x 2.5" hot-swap HDD 1 x 5.25" slim | 6 x hot swap drive bays per drawer 2 x media bays per | 6 x hot swap drive bays per drawer<br><br>1 x media | 6 x hot swap HDD bays (standard)<br><br>6 x hot | 1 x slim bay for DVD-ROM<br><br>1 x half-high bay for |

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| | drawer | swap disk drive bays<br>1 x slimline media bay | | drawer | bay per drawer | swap HDD bays (optional)<br><br>2 x media bays | optional tape drive<br><br>6 x 3.5" hot swap HDD bays |
| **Disk Max. Internal** | 3,600 GB (32.4TB using 8 x I/O Drawers - 1.8GHz only) | 5,400 GB | 2,349 GB | 7,200 GB (79.2TB using 20 x I/O Drawers) | 7,200 GB (79.2TB using 20 x I/O Drawers) | 1,800 GB | 1,800 GB (30.6TB using 8 x I/O Drawers) |
| **RAID Support** | Optional RAID 0, 5, 6, 10 | Optional RAID 1, 6 | Optional RAID 0, 1, 5, 1E, 00, 10, 50, 1E0, 5EE | Optional RAID 0, 5, 6, 10 | Optional RAID 0,1,1E, 5, 5E, 10 | Optional RAID 0, 5, 6, 10 | Optional RAID 0, 5, 6, 10 |
| **Hot Swap Disks** | SCSI | SAS | SAS | SCSI | SAS | SAS | SAS |
| **Media Drive** | Optional DVD-RAM or DVD-ROM | Optional slimline DVD | DVD-ROM | Optional | Optional | Optional DVD-ROM, DVD-RAM, (DVD-ROM or DVD-RAM is required in a minimum configuration) | DVD-ROM |
| **I/O Technology** | PCI-X | GX+, PCI Express, PCI-X | PCI Express | PCI-X | GX+, PCI, PCI Express, PCI-X | GX+, PCI Express, PCI-X | GX+, PCI Express, PCI-X |
| **I/O Slot Types** | Per 4U building block:<br><br>5 x PCI-X 64-bit 133MHz (long)<br><br>1 x PCI-X 64-bit 133MHz (short) | Per CEC enclosure (maximum 2 CEC enclosures):<br>3 x PCI Express x8<br>2 x PCI-X<br>1 x GX+<br>1 x PCI Express x8 OR GX+ | 7 x PCI Express x8 (two are hot plug) per chassis | Per 4U building block:<br><br>5 x PCI-X 64-bit, 133MHz (long)<br><br>1 x PCI-X 64-bit, 133MHz (short) | Per 4U building block:<br><br>3 x PCI Express 8x<br><br>2 x PCI-X DDR, 266MHz<br><br>1 x PCI Express 8x / | 2 x PCI Express x8 (short)<br><br>1 x PCI Express x8 (long)<br><br>2 x PCI-X (long)<br><br>1 x GX+ shared with | 2 x PCI Express x8 (short)<br><br>1 x PCI Express x8 (full)<br><br>2 x PCI-X 266MHz (full)<br><br>1 x GX+ |

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| | | | | | GX+<br><br>1 x GX+ | PCI Express x8 slot 2<br><br>1 x GX+/GX++ slot shared with PCI Express x8 slot 1 | (shares one PCI Express slot, not available on 1-core systems)<br><br>1 x GX+ (unshared, only available on 4-core systems) |
| **I/O Max. Slots** | 68, (using 8 x I/O Drawers - 1.8GHz only) | 140, (including 18 x 7311-D20 I/O Drawers) | 28 | 163, (using 20 x I/O Drawers) | 216, (using 32 x I/O Drawers: 7314-G30) | 5 | 62, (using 8 x I/O Drawers) |
| **I/O Internal Slots** | 6, (12 max internal) | 7, (14 max. internal) | 6 | 6, (24 max internal) | 7, (28 max internal) | 5 | 6 |
| **Networking** | Dual 10/100/1000 Ethernet | One per enclosure: 2-port 1 Gigabit Virtual Ethernet; 4-port 1 Gigabit Virtual Ethernet; 2-port 10 Gigabit Virtual Ethernet (SR) | Dual Gigabit Ethernet standard | Dual 10/100/1000 Ethernet | 1 x dual port Gigabit Virtual Ethernet and 2 x system ports OR<br>1 x quad port Gigabit Virtual Ethernet and 1 x system port OR<br>1 x dual port 10 Gigabit Virtual Ethernet and 1 x system port | Integrated 10/100/1000 dual-port Virtual Ethernet with optional 10/100/1000 quad-port or dual-port 10 Gb Virtual Ethernet | 2 x Gigabit Ethernet ports |
| **Rack Units** | 8U (System max) | 4U, 8U maximum | 3U | 4U, 16U (System max) | 4U, 16U (System max) | 4U | 4U |
| **Dimensions** | Height: 17.4 cm (6.85 in) Width: 48.3 | Height: 17.4 cm (6.85 in) (Per CEC | Height: 12.8 cm (5.04 in) Width: 44 | Height: 17.4 cm (6.85 in) (per System | Height: 17.4 cm (6.85 in) (per System | Height: 17.5 cm (6.89 in) Width: 44 | Height: 17.3 cm (6.81 in) Width: 44 |

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| | cm (19.02 in) Depth: 79 cm (31.1 in) | enclosure) Width: 48.3 cm (19.02 in) Depth: 82.4 cm (32.44 in) | cm (17.32 in) Depth: 71.5 cm (28.15 in) | Drawer) Width: 48.3 cm (19.02 in) Depth: 79 cm (31.1 in) | Drawer) Width: 48.3 cm (19.02 in) Depth: 82.4 cm (32.44 in) | cm (17.32 in) Depth: 73 cm (28.74 in) | cm (17.32 in) Depth: 53.8 cm (21.18 in) |
| **Weight** | 63.6 kg (140.2 lbs.) (max per drawer) | 63.6 kg (140.2 lbs.) (Per CEC enclosure) | 38.5 kg (84.88 lbs.) (Maximum) | 63.6 kg (140.2 lbs.) (max per drawer) | 63.6 kg (140.2 lbs.) (max per drawer) | 54.4 kg (119.9 lbs.) (max) | 31.75 kg (70 lbs.) (max) |
| **Heat Dissipation** | 4,681 kj/hr (4,437 Btu/hr) (max per drawer) | 4,322 kj/hr (4,096 Btu/hr) (Per CEC enclosure - 8 cores) | 5,832 kj/hr (5,527 Btu/hr) (Maximum) | 4,681 kj/hr (4,437 Btu/hr) (max per drawer) | 5,041 kj/hr (4,778 Btu/hr) (max per System Drawer) | 1,443 VA (max) | 3,061 kj/hr (2,901 Btu/hr) (max) |
| **Typical Power Consumption** | | | | | | | |
| **Max. Power Consumption** | 1,300 W (max per drawer) | 1,200 W (Per CEC enclosure - 8 cores) | 1,440 W (Maximum) | 1,300 W (max per drawer) | 1,400 W (per System Drawer) | 1,400 W | 850 W |
| **Hot Swap/Redundant Cooling Fans** | Standard | Standard | Standard | Yes/Yes | Yes/Yes | Yes/Yes | Yes/Yes |
| **Hot Swap/Redundant Power Supply** | Standard | Standard | Standard | Yes/Yes | Yes/Yes | Yes/Optional | Yes/Optional |
| **System Management** | | Integrated service processor | IBM Director mgmt. software | | Electronic Service Agent; IBM Electronic Services Web portal; Integrated Virtualization Manager (IVM) | | |
| **Capacity on Demand** | No | No | No | Yes | Yes | No | No |

| | IBM - System p5 560Q Express | IBM - System p6 560 | IBM - System x3950 M2 | IBM - System p5 570 | IBM - System p6 570 | IBM - System p6 550 | IBM - System p6 520 |
|---|---|---|---|---|---|---|---|
| **Clustering** | No | Yes | Yes | Yes, eServer Cluster 1600 | Yes | Yes | Yes |
| **Warranty** | 3yr (IOL) NBD Parts [CRU] + on-site<br><br>3-year IBM On-site Limited (IOL)<br><br>Some parts are Customer Replaceme nt Units (CRU)<br><br>IBM ships replacement CRU Next Business Day (NBD)<br><br>and client performs replacement<br><br>Other parts replacement is done by IBM NBD on-site | 1yr (IOL) NBD Parts [CRU] + on-site<br>1-year IBM On-site Limited (IOL)<br>Some parts are Customer Replaceme nt Units (CRU)<br>IBM ships replacement CRU Next Business Day (NBD) and client performs replacement<br>Other parts replacement is done by IBM NBD on-site | 3yr (IOL) NBD Parts [CRU] + on-site<br><br>3-year IBM On-site Limited (IOL)<br><br>Some parts are Customer Replaceme nt Units (CRU)<br><br>IBM ships replacement CRU Next Business Day (NBD)<br><br>and client performs replacement<br><br>Other parts replacement is done by IBM NBD on-site | 1yr (IOL) NBD Parts [CRU] + on-site<br><br>1-year IBM On-site Limited (IOL)<br><br>Some parts are Customer Replaceme nt Units (CRU)<br><br>IBM ships replacement CRU Next Business Day (NBD)<br><br>and client performs replacement<br><br>Other parts replacement is done by IBM NBD on-site | 1yr (IOL) NBD Parts [CRU] + on-site<br><br>1-year IBM On-site Limited (IOL)<br><br>Some parts are Customer Replaceme nt Units (CRU)<br><br>IBM ships replacement CRU Next Business Day (NBD)<br><br>and client performs replacement<br><br>Other parts replacement is done by IBM NBD on-site | 1yr (IOL) NBD Parts [CRU] + on-site<br>1-year IBM On-site Limited (IOL)<br>Some parts are Customer Replaceme nt Units (CRU)<br>IBM ships replacement CRU Next Business Day (NBD) and client performs replacement<br>Other parts replacement is done by IBM NBD on-site | 1yr (IOL) NBD Parts [CRU] + on-site<br><br>1-year IBM On-site Limited (IOL)<br><br>Some parts are Customer Replaceme nt Units (CRU)<br><br>IBM ships replacement CRU Next Business Day (NBD)<br><br>and client performs replacement<br><br>Other parts replacement is done by IBM NBD on-site |

## IBM Power 5 Rack-Optimized Servers

Before beginning the analysis, there are some general points to consider affecting all of IBM's System p Servers:

- IBM has shown a history of slippages in their processor roadmap. Power 6 was 1.5 years late and still has no CMT capability. Customers who want to take advantage of CMT capabilities will need to wait until at least 2010 and Power 7 !
- AIX represents a long-term lock-in, much like IBM's mainframe, into a closed, expensive (at least $300 per processor for entitlement) and proprietary architecture. Solaris is open and runs on SPARC & x86, allowing

the customer a choice of future hardware: x86, APL, CMT, UltraSPARC IV+ all of which are binary or source compatible.

- LDoms save customers up to $5k per server when compared to equivalent functionality on proprietary AIX Series p Servers from IBM
- Customers moving from the dual core to Quad Core Modules in IBM's Series p entry level servers will experience poor scalability. When comparing benchmarks, the QCMs generally only deliver 1.5x speed-up over their dual core counterparts, and yet licensing costs of AIX, virtualization and applications licensed per core will double.
- Sun's standard configurations are robust (i.e. memory with high processor core/frequency) bundled with redundant power supplies and disks as standard, unlike IBM's System p standard configurations where all of these items must be added, therefore adding to cost .

## The Sun SPARC Enterprise T5440 vs. IBM System 550 and 570 Power 6 Servers

IBM announced its first Power6 server, the 570 in May 2007. In late January, IBM extended the range with the 2 socket, 4 core p520 and 4 socket, 8 core p550

IBM's POWER6 is a fast single-threaded processor but the POWER6 architecture has fallen behind the industry leaders , Sun, AMD and Intel, who have made a fundamental shift in system design – more cores per chip with more threads per core – for balanced system designs to meet the demands of the modern data center. In contrast, IBM's approach and the POWER roadmap offers speed bumps and architecture designs to deliver incremental performance enhancements every 2-3 years through increased clock speed. The downside to this approach is that a POWER customer must choose between performance and power efficiencies – it's difficult to have both – and the performance gains are very expensive. IBM's expected future innovation with POWER7 quad core (targeted for late 2010/early 2011) will look similar to Sun's present CMT architecture.

According to IBM's POWER6 Chief Architect, Brad McCredie, *"You'll see us go more aggressively after threads. That's definitely a direction you'll see."* IBM's POWER7 direction indicates IBM is late in recognizing that they are running out of steam with their current approach of ramping clock rate, and will have to switch architecture direction to CMT.
Source: http://news.com.com/IBMs+Power6+Bigger+iron,+lower+power/2100-1006_3-6158739.html

AIX 6.1 also appears to be a "me too" product. IBM validates Sun's industry leadership with the Solaris OS by incorporating new features into AIX 6.1 that are very similar to Solaris 10, right down to the name in many cases. "New" AIX 6.1 features include: Trusted AIX, Trusted Execution, Probevue dynamic tracing, Workload partitions (positioned as equivalent to Solaris Containers) and Secure by Default.

Key Messages:

- Based on benchmark comparisons to IBM's Power 6 550 platform equipped with four p6 4.2 GHz processors, the Sun SPARC Enterprise T5240 delivers approximately twice the performance and 30% higher performance per watt in half the space.
- With the announcement of the p6+ in late April 2009, there is limited benchmark info available on this new processor. From the preliminary info, the performance improvement is 14 – 26% while the improvement from the faster clock speed should contribute approximately 20%. There are no relevant application oriented benchmarks such as SPECjbb2005, SAP or SPECjAppServer2004.
- With 1.3x higher performance per watt, customers can reduce both their energy and carbon footprint/cost, as well as completing more work for each watt of power consumed.
- Based on benchmarks, customers who have moved from the dual core to Quad Core Modules in IBM's Series p entry level servers will experience poor scalability. When comparing benchmarks, the QCMs generally only deliver 1.5x speed-up over their dual-core counterparts, and yet licensing of AIX, virtualization

and applications licensed per core will double. This brings into question the scalability of p6 generation products.

- Greater compute and network expandability, allowing seamless in-server growth and greater investment protection
- Memory/core rich standard configurations available - very high memory configurations available at reasonable costs.
- More memory slots allows the Sun SPARC Enterprise T5440 to be configured with lower density FB-DIMMs, thereby reducing costs
- Functionality is included on the Sun SPARC Enterprise Servers at no additional cost, including virtualization capabilities, 4 x 1 GbE, OS, cryptographic acceleration and low cost access to 10GbE connectivity. When these features are considered, the price of a competitive system can increase by as much as four fold..
- Upgrades are priced artificially low as generally, there are activation fees associated with the upgrades.

| System | Speed | Packing | Cost of | Processor | AIX | Virtualization | Each | 8 | Memory | Add'l GBs | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ghz | How Offered | Processor | Activation | License | License | Module | GB Memory | Activation | of Memory | |
| | | | Module | per core | per core | per core | | Cost | Per GB | 16 | |
| | | | | | | | | | | | |
| IBM 550 p6 | 3.5 | 1Chip/2Cores | 3,838 | 2,186 | 385 | 1,376 | 11,732 | 2,867 | 0 | 5,734 | **17,466** |
| | 4.2 | 1Chip/2Cores | 11,828 | 3,787 | 385 | 1,376 | 22,923 | 2,867 | 0 | 5,734 | **28,657** |
| IBM 550 p6+ | 5.0 | 1Chip/2Cores | 15,230 | 9,747 | 385 | 1,376 | 38,246 | 2,867 | 0 | 5,734 | **43,980** |
| | | | | | | | | | | | |
| IBM 560Q p5 | 1.8 | 2Chips/4Cores | 9,888 | 5,595 | 385 | 0 | 33,808 | 6,118 | 0 | 12,236 | **46,044** |
| | | | | | | | | | | | |
| IBM 560 p6 | 3.6 | 2Chip/4Cores | 7,749 | 5,900 | 385 | 1,376 | 38,393 | 2,867 | 0 | 5,734 | **44,127** |
| | | | | | | | | | | | |
| IBM 570 p6 | 3.5 | 1Chip/2Cores | 4,550 | 9,100 | 1,225 | 1,376 | 27,952 | 2,170 | 1,060 | 21,300 | **49,252** |
| | 4.2 | 1Chip/2Cores | 7,650 | 15,300 | 1,225 | 1,376 | 43,452 | 2,170 | 1,060 | 21,300 | **64,752** |
| | 4.4 | 1Chip/2Cores | 8,772 | 17,544 | 1,225 | 1,376 | 49,062 | 2,170 | 1,060 | 21,300 | **70,362** |
| | 4.7 | 1Chip/2Cores | 11,500 | 23,000 | 1,225 | 1,376 | 62,702 | 2,170 | 1,060 | 21,300 | **84,002** |
| | 5.0 | 1Chip/2Cores | 13,302 | 26,604 | 1,225 | 1,376 | 71,712 | 2,170 | 1,060 | 21,300 | **93,012** |
| | | | | | | | | | | | |
| | 4.2 | 2Chips/4Cores | 24,389 | 21,942 | 1,225 | 1,376 | 122,561 | 2,170 | 1,060 | 21,300 | **143,861** |

Pricing as of May 4, 2009

- Per the above chart, adding two processors to an IBM 570 generally exceeds the list price of a well-configured Sun SPARC Enterprise T5440 server. Upgrading an IBM 560 approaches the entry cost of a Sun SPARC Enterprise T5440 server.

## The Sun SPARC Enterprise T5440 vs. IBM System x Servers, Quad Socket, Competitive Analysis

IBM offers two servers that compete in this class against the Sun SPARC Enterprise T5440 Server – the Opteron based IBM x3755 and Xeon-based x3950 M2.

The x3755 is designed more around the needs of HPC customers requiring a high performance compute node, whereas the x3950M2 is positioned into more commercial environments.

The Sun SPARC Enterprise T5440 server provides strong competition against both of these systems:

- Nearly 2x higher throughput in the same space, based on benchmark comparisons, enabling customers to compress more compute performance into less data center space.
- Greater compute and network interface expandability, allowing seamless in-server growth and greater investment protection as well as lower upfront cost (i.e. 4 x 1 GbE network interfaces as standard versus 2 on the competitive systems)
- Full remote system manageability as standard, versus $385 option for the IBM servers
- Memory/core rich standard configurations available - very high memory configurations available at reasonable costs.
- More memory slots allows the Sun SPARC Enterprise T5440 to be configured with lower density FB-DIMMs, thereby reducing costs
- Sun SPARC Enterprise T5440 server offers a range of functionality at no additional cost, including virtualization capabilities, 4 x 1 GbE, OS, cryptographic acceleration, Lights Out Management and low cost access to 10 GbE connectivity. When these additional factors are considered, the price of competitive systems can increase by as much as 3x.

The IBM systems do have some features that may prove advantageous to certain classes of customers:

- Greater range of OS and applications supported. Solaris 10 has over 5,000 applications certified, so the Sun SPARC Enterprise T5440 server is still able to meet the vast majority of customer requirements. If the customer wishes to run an application that is not supported on Solaris 10, please register the requirement via techtracker.eng. Also consider proposing a Sun x64 server as an alternative system, to take advantage of its broad OS and application support
- Longer warranty, with 3 years support vs.1 year on the Sun SPARC Enterprise T5440 Server. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise T5x40 servers, and provide a whole range of value-added capabilities including Solaris support, training, remote management, etc. These are not included in the standard warranty contracts provided on IBM's x86 servers

# HP - Competitive Summary Chart

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| **Product Type** | Entry-Level Server | Mid-Range Serer | Mid-Level Server | Mid-Level Server | Entry-Level Server |
| **Form Factor** | Rack | Rack | Rack | Rack | Rack |
| **Platform** | LINUX, Windows | LINUX, Windows | UNIX, LINUX, Windows, Other OS | UNIX, LINUX, Windows, Other OS | UNIX, LINUX, Windows, Other OS |
| **Announced** | 05-Sep-07 | 17-Mar-08 | 20-Mar-06 | 20-Mar-06 | 06-Sep-06 |
| **Available** | 05-Sep-07 | 12-May-08 | 05-Sep-07 | 20-Mar-06 | 20-Mar-06 |
| **Architecture** | x86 | x86 | IA-64 | IA-64 | IA-64 |
| **O/S** | Solaris x86, Red Hat Linux, SUSE Linux, NetWare, Windows | Solaris x86, Red Hat Linux, SUSE Linux, Windows | HP-UX, OpenVMS, Red Hat Linux, SUSE Linux, Windows | HP-UX, OpenVMS, Red Hat Linux, SUSE Linux, Windows | HP-UX, OpenVMS, Red Hat Linux, SUSE Linux, Windows |
| **Processor Family** | Xeon | Opteron | Itanium | Itanium | Itanium |
| **Processor Options** | Xeon E7220 (2.93GHz 80W)<br>Xeon E7310 (1.6GHz 80W)<br>Xeon L7345 (1.86GHz 50W)<br>Xeon E7320 (2.13GHz 80W)<br>Xeon E7330 (2.4GHz 80W)<br>Xeon E7340 (2.4GHz 80W)<br>Xeon X7350 (2.93GHz 130W)<br>Xeon E7420 (2.13GHz 90W)<br>Xeon E7430 (2.13GHz 90W)<br>Xeon E7440 (2.4GHz 90W)<br>Xeon E7450 (2.4GHz 90W)<br>Xeon X7460 (2.67GHz 130W) | Opteron 8354 (2.2GHz 95W)<br>Opteron 8356 (2.3GHz 95W)<br>Opteron 8358 SE (2.4GHz 119W)<br>Opteron 8360 SE (2.5GHz 119W) | Itanium 2 (1.6GHz)<br>Itanium 2 9020 (1.42GHz)<br>Itanium 2 9040 (1.6GHz)<br>Itanium 2 9050 (1.6GHz) | Itanium 2 (1.6GHz)<br>Itanium 2 9020 (1.42GHz)<br>Itanium 2 9040 (1.6GHz) | Itanium 2 9020 (1.4GHz)<br>Itanium 2 9040 (1.6GHz)<br>Itanium 2 9050 (1.6GHz) |

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| **Max. Processor Chips** | 4 | 8 | 16 | 8 | 4 |
| **Max. Processor Cores** | 24 | 32 | 32 | 16 | '8 |
| **Cache** | 2 x 2MB or 2 x 3MB or 2 x 4MB L2, 8MB, 12MB or 16MB L3 | 2 MB L3 | 6MB, 12MB, 18MB or 24MB L3 | 6MB or 12MB or 18MB L3 | 12MB or 18MB or 24MB L3 |
| **Chipset** | Intel 7300 | Serverworks HT-2100 Northbridge and HT-1000 Southbridge | sx2000 | sx2000 | zx2 |
| **Memory Minimum** | 4.00 GB | 2.00 GB | 2.00 GB | 2.00 GB | 2.00 GB |
| **Memory Maximum** | 256 GB | 256 GB | 256 GB | 128 GB | 192 GB |
| **Memory Type** | FB-DIMMs | DDR2 SDRAM | DDR2 SDRAM | DDR2 SDRA | DDR2 SDRA |
| **DIMM slots** | 16, 32 with 4 add'l memory boards | 64 | 16 per cell board, 64 with 4 cell boards | 32; 16 per cell board, max. 2 cell boards | 48 DIMMs |
| **Memory Protection** | Advanced ECC; Mirrored Memory; Online Spare Memory | Advanced ECC | ECC, chip spare | ECC, chip spare | ECC and double chip spare protection |
| **Disk Type** | SAS | SAS | SCSI | SCSI | SAS |
| **Disk Controller** | Smart Array P400 | Smart Array | Ultra320 | Ultra320 | 8-port SAS |
| **Internal Disk Bays** | 16 | 16 | 4 | 4 | 16 |
| **Bay Information** | 8 x 2.5" hot-plug drive bays standard, optional 8 bays in second SAS backplane<br><br>1 x media bay | 8 x 2.5” standard, optional 8 bays in second SAS backplane | 4 x hot-plug drive bays, 4 additional drive bays with SEU (server expansion unit)<br><br>2 x media bays, 2 additional media bays with SEU | 4 x hot-plug drive bays<br><br>1 x media bay | 16 x 2.5" hot-plug drive bays<br><br>1 x media bay |
| **Disk Max. Internal** | 2,336 GB | 2,392 GB | 2,400 GB (with SEU) | 1,200 GB | 2,336 GB |
| **RAID Support** | RAID 0, 1, 1+0, | RAID 0, 1, 1+0, | Optional RAID | Optional RAID | RAID 1, 5, 6 |

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| | 5, 6 | 5 | 0, 1, 1+0, 5, 6 | 0, 1, 1+0, 5, 6 | |
| **Hot Swap Disks** | SAS | SAS | SCSI | SCSI | SAS |
| **Media Drive** | DVD | Optional | Optional | Optional | Optional |
| **I/O Technology** | PCI Express, PCI-X | PCI-Express | PCI-X | PCI-X | PCI Express, PCI-X |
| **I/O Slot Types** | 4 x PCI Express x8<br><br>4 x PCI Express x4<br><br>Optional 3 x 64-bit/133MHz PCI-X or 3 x PCI Express x8 | 3 x PCI-Express x16, 3 x PCI-Express x8, 5 x PCI-Express x4 or<br>7 x PCI Express + 2 x HTx Optional | 16 x 64-bit, 266MHz PCI-X<br><br>16 x 64-bit, 266MHz PCI-X via SEU | 15 x 64bit, 266MHz PCI-X slots | PCI Express backplane with 8 slots (4 x full length PCI Express x8 slots, 2 full-length 133MHz PCI-X slots, and 2 half-length 66MHz PCI-X slots) OR PCI-X backplane with 8 slots (2 x full length 266MHz slots, 2 x full length 133MHz slots, 2 full length 66MHz slots, and 2 half-length 66MHz slots) |
| **I/O Max. Slots** | 11 | 11 | 32 | 15 | 8 |
| **I/O Internal Slots** | 11 | 11 | 16 | 15 | 8 |
| **Networking** | Embedded NC373i Multifunction Gigabit Server Adapters with TCP/IP Offload Engine | 2 x Embedded NC371i Multifunction Gigabit Network Adapaters with TOE and iSCSI suppor | 1 x Gigabit Ethernet, 1 x 10/100BaseT (management LAN) | 1 x Gigabit Ethernet, 1 x 10/100BaseT (management LAN) | 1 x dual port Gigabit Ethernet controller, 1 x 100/10Base-T management port |
| **Rack Units** | 4U | 7U | 17U | 10U | 7U |
| **Dimensions** | Height: 17.6 cm (6.93 in)<br>Width: 48.3 cm (19.02 in)<br>Depth: 67.3 cm (26.5 in) | Height: 30.58 cm (12.04 in)<br>Width: 44 cm (17.32 in)<br>Depth: 69.6 cm (27.4 in) | Height: 75.57 cm (29.75 in)<br>Width: 48.26 cm (19 in)<br>Depth: 76.2 cm (30 in) | Height: 44.45 cm (17.5 in)<br>Width: 48.26 cm (19 in)<br>Depth: 76.2 cm (30 in) | Height: 30.48 cm (12 in)<br>Width: 43.99 cm (17.32 in)<br>Depth: 69.6 cm (27.4 in) |
| **Weight** | 30.8 kg (67.9 | 72 kg (158.7 | 171.5 kg (378 | 101.6 kg (224 | 150 kg (330.7 |

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| | lbs) | lbs.) (maximum) | lbs) (max) | lbs) (max) | lbs) (max) |
| **Heat Dissipation** | 5,185 kj/hr (4,914 Btu/hr) | 10,080 kj/hr (9,554 Btu/hr) (maximum at 240VAC) | 19,429 kj/hr (18,414 Btu/hr) (max) - 13510 Btu/hr (typical) | 9,498 kj/hr (9,002 Btu/hr) (max) - 7,403 Btu/hr (typical) | 5,876 kj/hr (5,569 Btu/hr) (max) |
| **Typical Power Consumption** | | | 3,962 VA | 2,171 VA | 998 W |
| **Max. Power Consumption** | 1,441 VA | 1,375 W (maximum at 240VAC) | 5,400 VA | 2,640 VA | 1,633 W |
| **Hot Swap/Redundant Cooling Fans** | Yes | Yes | Yes | Yes | Yes |
| **Hot Swap/Redundant Power Supply** | Yes | Yes | Yes | Yes | Yes |
| **System Management** | Integrated Lights-Out 2 featuring Integrated Remote Console with KVM over IP performance over shared network access, Automatic Server Recovery (ASR), ROM Based Setup Utility (RBSU), HP Systems Insight Manager, Status LED's including system health and UID, and SmartStart | integrated Lights Out 2 (iLO 2) | HP Ignite UX for installation and deployment of the operating system, HP Software Distributor UX for software and patch management, HP Integrity Essentials Foundation Pack for Linux, HP Integrity Essentials Foundation Pack for Windows including Smart Setup CD for easy server setup and configuration, Built in Integrity iLO 2 Management Processor for comprehensive remote server management of | HP Ignite UX for installation and deployment of the operating system, HP Software Distributor UX for software and patch management, HP Integrity Essentials Foundation Pack for Linux, HP Integrity Essentials Foundation Pack for Windows including Smart Setup CD for easy server setup and configuration, Built in Integrity iLO 2 Management Processor for comprehensive remote server management of | Manageability – Deploy, HP Ignite-UX for installation and deployment of the operating system, HP Software Distributor-UX for software and patch management, HP Integrity Essentials Foundation Pack for Linux, HP Integrity Essentials Foundation Pack for Windows including Smart Setup CD for easy server setup and configuration, Manageability – Monitor, Built-in Integrity iLO 2 Management Processor for |

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| | | | HP UX + Linux + Windows and OpenVMS, HP Servicecontrol suite for HP UX servers including tools for system administration + asset management + and fault management, HP UX kernel configuration for dynamic kernel parameter changes, HP System Insight Manager (SIM) | HP UX + Linux + Windows and OpenVMS, HP Servicecontrol suite for HP UX servers including tools for system administration + asset management + and fault management, HP UX kernel configuration for dynamic kernel parameter changes, HP System Insight Manager (SIM) | comprehensive remote server management of HP-UX + Linux + Windows and OpenVMS, HP Servicecontrol suite for HP-UX servers including tools for system administration + asset management and fault management, HP-UX kernel configuration for easy dynamic kernel parameter changes, HP System Insight Manager (SIM), Manageability – Optimize, Process Resource Manager for HP-UX resource management, HP-UX Workload Manager for HP-UX workload management based upon service-level objectives, HP OpenView GlancePlus Pack, HP Intelligent Networking Pack for Windows, HP Performance Management Pack for |

| | HP ProLiant DL580 G5 | HP ProLiant DL785 G5 | HP Integrity rx8640 | HP Integrity rx7640 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| | | | | | Windows, Windows System Resource Manager (included with each copy of Windows Server 2003 Enterprise Edition) |

## The Sun SPARC Enterprise T5440 vs 4 Socket HP Itanium 2 Servers

HP offers rx6600 quad socket 7U-high Itanium 2 server in its portfolio of entry level Integrity models that it targets for consolidation projects.

The Sun SPARC Enterprise T5440 server provides strong competition against the rx6600:

- Based on benchmark comparisons, the Sun SPARC Enterprise T5440 server delivers up to 4x higher performance in half of the space. This enables customers to compress more compute performance into less data center space.
- The T5440 delivers 2.5x higher performance per watt when compared to the HP systems, enabling customers to reduce both their energy and carbon footprint/cost, as well as completing more work for each watt of power consumed.
- Lower acquisition costs vs. the HP systems when comparing like-for-like configurations delivering up to 5x better price / performance. Also, a range of functionality is included on Sun SPARC Enterprise Servers at no additional cost, including virtualization capabilities, 4 x 1 GbE, OS, cryptographic acceleration, Lights Out Management and low cost access to 10 GbE connectivity. When these additional factors are considered, the price of competitive systems can increase by as much as 3x.
- Upgrades are expensive, especially because of the licensing for the base O/S and virtualization features

| System | Speed | Packing | Cost | Processor | HP-UX | Virtualization | Each | 8 | Memory | Add'l GBs | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ghz | How Offered | Processor | Activation | License | License | Module | GB Memory | Activation | of Memory | |
| | and cache | | Module | per core | per core | per core | | | Per GB | 16 | |
| | | | | | | | | | | | |
| HP rx3600 | 1.6 / 24 MB | 1Chip/2Cores | 5,775 | 0 | 455 | 3,965 | 14,615 | 4,417 | 0 | 8,834 | 23,449 |
| | | | | | | | | | | | |
| HP rx6600 | 1.6 / 24 MB | 1Chip/2Cores | 10,595 | 0 | 1,150 | 3,950 | 20,795 | 4,417 | 0 | 8,834 | 29,629 |
| | | | | | | | | | | | |
| HP rx7640 | 1.6 / 24 MB | 1Chip/2Cores | 29,000 | 0 | 1,970 | 6,298 | 45,536 | 16,000 | 0 | 32,000 | 77,536 |

Pricing as of May 4, 2009

- Per the above chart, adding two processors to an HP Integrity rx6600 or rx7640 approaches the list price of a well-configured Sun SPARC Enterprise T5440 server.

The HP systems do have some features that may prove advantageous to certain classes of customers:

- Longer warranty, with 3 years of support vs. one year for the Sun SPARC Enterprise T5440 server. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise servers, and provide a whole range of value-added capabilities including Solaris support, training, remote management, etc. These

are not included in the standard warranty contracts provided on HP's rx Integrity servers

– Broader OS support offered on the Itanium architecture, but this is more than offset by limited application and tools availability and costly / painful migrations to Itanium for HP's legacy PA-RISC / Alpha / VMS customers.

## Sun SPARC Enterprise T5440 vs HP ProLiant 4RU / Quad Socket Servers

HP offers two servers that compete in this class against the Sun SPARC Enterprise T5440 Server – the Opteron based HP Proliant DL585G2 and Xeon-based Proliant DL580G5.

Both servers are positioned into commercial compute environments, with the DL580 targeted at enterprise class applications (i.e. ERP, CRM, etc) while the DL585 at customers who value higher performance per watt .

The Sun SPARC Enterprise T5440 server provides strong competition against both of these systems:

– Nearly 2x higher throughput in the same space (nearly 4x the dual core Opteron), based on benchmark comparisons, enabling customers to compress more compute performance into less data center space.

– Greater compute and network interface expandability with integrated 10Gb Ethernet as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive systems)

– Full remote system manageability as standard, versus $200 option for the HP servers

– Memory/core rich standard configurations available—very high memory configurations available at competitive costs.

– More memory slots allows the Sun SPARC Enterprise T5440 to be configured with lower density FB-DIMMs, thereby reducing costs

– The HP DL580 G5 requires a range of additional cost options to facilitate memory and I/O expansion. For example, up to 4 Memory Expansion Boards must be added to increase total memory to 128GB. 4 x PSUs must be provided for complete redundancy. To expand to 16 disks, an additional backplane and an additional PCIe RAID card must be added. The HP server can not manage them from the same card.

The HP systems do have some features that may prove advantageous to certain classes of customers:

– Greater range of OS and applications supported. Solaris 10 has over 5,000 applications certified, so the Sun SPARC Enterprise T5440 server is still able to meet the vast majority of customer requirements. If the customer wishes to run an application that is not supported on Solaris 10, please register the requirement via techtracker.eng. Also consider proposing a Sun x64 server as an alternative system, to take advantage of its broad OS and application support

– Longer warranty, with 3 years support vs 1 year on the Sun SPARC Enterprise T5440 server. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise servers, and provide a whole range of value-added capabilities including Solaris support, training, remote management, etc. These are not included in the standard warranty contracts provided on HP's x86 servers.

– Lower acquisition costs can be offset by the Sun SPARC Enterprise T5440 superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) FB-DIMMs. Also, a range of functionality is included on Sun SPARC Enterprise Servers at no additional cost, including virtualization capabilities, 4 x 1GbE, OS, cryptographic acceleration, Lights Out Management and low cost access to 10GbE connectivity. When these additional factors are considered, the price of competitive systems can increase by as much as 3x.

## Sun SPARC Enterprise T5440 vs. Dell Quad Socket Servers

Dell offers two servers that compete in this class against the Sun SPARC Enterprise T5440 Server – the Opteron based PowerEdge 6950/R905 and Xeon-based PowerEdge R900. A detailed matrix follows after this high level analysis

Both servers are positioned for commercial compute environments to run business-critical database applications, server consolidation, virtualization and Unix migration

The Sun SPARC Enterprise T5440 server provides strong competition against both of these systems:

- Nearly 2x higher throughput in the same space (nearly 4x the dual core Opteron), based on benchmark comparisons, enabling customers to compress more compute performance into less data center space.
- Greater network interface expandability with integrated 10Gb Ethernet as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the 6950)
- Full remote system manageability as standard, versus a $385 option for the Dell servers
- Memory/core Rich standard configurations available—very high memory configurations available at competitive costs.
- More memory slots allows the Sun SPARC Enterprise T5440 to be configured with lower density FB-DIMMs, thereby reducing costs

The Sun systems do have some features that may prove advantageous for certain classes of customers:

- Greater range of OS and applications supported. Solaris 10 has over 5,000 applications certified, so the Sun SPARC Enterprise T5440 servers are still able to meet the vast majority of customer requirements. If the customer wishes to run an application that is not supported on Solaris 10, please register the requirement via techtracker.eng. Also consider proposing a Sun x64 server as an alternative system, to take advantage of its broad OS and application support
- Longer warranty, with 3 years support vs. 1 year on the Sun SPARC Enterprise T5440 server. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise servers, and provide a whole range of value-added capabilities including Solaris support, training, remote management, etc. These are not included in the standard warranty contracts provided on Dell's x86 servers.
- Lower acquisition costs can be offset for the Sun SPARC Enterprise T5440 server b ysuperior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) FB-DIMMs. Also, a range of functionality is included on the Sun SPARC Enterprise Servers at no additional cost, including virtualization capabilities, 4 x 1GbE, OS, cryptographic acceleration, Lights Out Management and low cost access to 10GbE connectivity. When these additional factors are considered, the price of competitive systems can increase by as much as 3x.

| | Sun SPARC Enterprise T5440 | Dell PowerEdge 6950 | Dell PowerEdge R900 |
|---|---|---|---|
| Form Factor | 4U Rack | 4U Rack | 4U Rack |
| Announced | April '08 | 10/23/06 | 11/12/07 |
| Architecture | RISC | x86 | x86 |
| Operating System | Solaris, Ubuntu Linux (in an LDom) | Linux, Windows | Linux, Windows |
| Processor Options | UltraSPARC T2 Plus 1.2GHz - 1.4GHz | 2 – 2.8GHz Dual-Core Opteron | Up to 2.93GHz Xeon |
| Max Processor Chips / Cores | 4 / 32 | 4 / 8 | 4 / 16 |
| Cache | 4MB L2 per processor | 1MB L2 per core | Up to 2 x 6MB |
| Memory Minimum | 16 – 256GB | 2.00 GB – 64GB | 1.00 GB – 128GB |
| Memory Type | FB-DIMMs | DDR2 | FB-DIMMs |
| Memory Protection | Extended ECC and DRAM Sparing, ECC Registered DIMMs | ECC, Memor Sparing | Advanced ECC, Mirrored Memory, Online Spare Memory |
| Disk Type | SAS, SATA | SAS | SAS |
| Internal Disk Bays | 4 | 5 | 8 |
| RAID Support | RAID 0, 1 standard | RAID 0, 1, 1 5, 10 | RAID 0, 1, 1 5, 6, 10 |
| Hot Swap Disks | SAS, SATA | SAS | SAS |
| I/O Slot Types | 8 x PCI Express low profile slots, of which:<br>6x 8 lane PCI-E<br>2x 8 lane PCI-E or XAUI combo | 2 x PCI-E x8, 5 x PCI-E x4 | 4 x PCI-E x8, 3 x PCI-E x4 |
| Networking | 4 x Integrated 10/100/1000Base-T Ethernet, 2 x 10GbE via optional XAUI | Embedded NC371i 2 x Gigabit Server Adapters | 4 x Broadcom 1GbE |
| Max Power Consumption | 4 x 1120W PSUs, 1800 watts at benchmark configurations | 1,570 W reported max power consumption | 1,570 W reported max power consumption |
| Hot Swap/Redundant Cooling Fans | Yes | Yes | Yes |
| Hot Swap/Redundant Power Supply | Yes | Yes | Yes |
| System Management | Integrated Lights Out Management system | IPMI Std, optional DRAC5 controller | IPMI Std, optional DRAC5 controller |
| Warranty | 1 Year,<br>Next Business Day On-site or Customer Replaceable Unit, Call Response: 8 hours, World Wide | 3yr NBD on-site | 3yr NBD on-site |

## Nehalem-based Servers

Nehalem is the codename for the successor to the currently shipping Xeon 5500 series of processors offering four and six cores per socket with one thread per core and clock speeds up to 2.93 Ghz with four cores or 2.66 Ghz with six cores.

The 5500 series of processors with dual socket, four core servers are currently available in the HP ProLiant DL180 G6, DL/ML 370 G6, DL 380 G6 and Sun Fire x4270,

A presentation by Intel on Nehalem is posted at:
http://download.intel.com/pressroom/pdf/nehalem-ex.pdf

Among the processor features are:

- Up to eight cores and 16 threads per socket

- Up to 8 sockets per system
- Up to 24 MB of shared cache
- Integrated memory controller
- 16 DIMM slots per socket providing up to 512 GB with a quad socket with 8 GB DDR3 DIMMs
- Approximately twice the memory bandwidth of the Xeon 7400 series using standard, unbuffered DDR3 DIMMs
- Advanced virtualization and I/O Technologies
- Roughly twice the performance of the Xeon 7400 series
- MCA Recovery that contains, corrects and predicts processor, memory and I/O errors thereby strengthening the opportunities for virtualization

However, higher-end Nehalem-EX based systems may not be available until early to mid 2010.

Limited benchmark info is available on the 5500 series:

- HP - ProLiant DL180 G6
  8 cores, 2 chips, 4 cores/chip x 2.93GHz Xeon X5570 processor with 8MB(I+D) on chip per chip L3 cache, 24GB (6 x 4GB) PC3-10600R memory, 1 x 160GB 7.2K SATA LFF disk, Microsoft Windows Server 2008 Enterprise x64 Edition SP1, bops = 567,842 – No pricing available

- HP – Proliant DL 380 G6
  configured as above will provide approximately the same performance and will list at approx. $11,080 as of May 28, 2009. The list price for the DL370 G6 will be nearly identical.

## Benchmark Results

Published benchmark results

| Benchmark | Sun SPARC Enterprise T5440 | IBM 570 p6 | IBM 550 p6 | IBM 560 | HP Integrity rx6600 |
|---|---|---|---|---|---|
| | T2 Plus | Dual-core Power 6 | Dual-core Power 6 | Dual-core Power 6 | Dual-core Itanium |
| SPECjAppServer2004 (SPECjAPP JOPS) **at application tier** | **7,661.16 jops world record in July 2009** | | | | |
| | 4 chips/32 cores – 1.6 Ghz, 256 GB of memory | | | | |
| | **6,334.86 Single node world record application tier in Oct. 2008** | **1,197.51** | | | **1,266.42 with single node 4,915.49 with 4 node cluster** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 2 chips/4 cores – 4.7 Ghz, 16 GB **Note:** Only two chips/4 cores | | | 4 chips/8 cores – 1.6 Ghz, 24 GB of memory |
| SPECjAppServer2004 (SPECjAPP JOPS) **at database tier** | **9,500.76 database tier in Oct. 2008** | | | | |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | | | | |
| SAP SD 2-tier (users) **Note:** Redefined benchmark effective January 2009 | **4,720 users world record in July 2009** | | | | |
| **Note:** Results with earlier benchmark | **7,520 users 4 socket record in Oct. 2008** | **4,010** | **3,104** | | **1,725** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 4 chips/8 cores – 4.7 Ghz, 64 GB of memory | 4 chips/8 cores – 4.2 Ghz, 64 GB | | 4 chips/8 cores – 1.6 Ghz, 64 GB of memory |
| | | **14,432** | | | |
| | | 16 chips/32 cores – 4.7 Ghz, 256 GB | | | |
| | | **8,000** | | | |
| | | 8 chips/16 cores – 4.7 Ghz, 128 GB | | | |

| | | | | | |
|---|---|---|---|---|---|
| SPECjbb2005 (BOPS) | **841,380 bops in July 2009** | | | | |
| | 4 chips/32 cores – 1.6 Ghz, 256 GB of memory | | | | |
| | **692,736 4 socket record in Oct. 2008** | **402,923** | **350,642** | **593,904** | **158,174** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 4 chips/8 cores – 4.7 Ghz, 64 GB of memory | 4 chips/8 cores – 4.2 Ghz, 32 GB | 8 chips/16 cores – 3.6 Ghz p6, 64 GB | 4 chips/8 cores – 1.6 Ghz, 24 GB of memory |
| | | **798,753** | | **278,384** | |
| | | 8 chips/16 cores – 4.7 Ghz, 128 GB | | 8 chips/16 cores – 1.8 Ghz p5, 64 GB | |
| SPECint_rate 2006 | 4 chips/32 cores – 1.6 Ghz, 128 GB of memory | | | | |
| | **301 4 socket record in Oct. 2008** | **243** | **213** | **289** | **102** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 4 chips/8 cores – 4.7 Ghz, 32 GB of memory | 4 chips/8 cores – 4.2 Ghz, 64 GB | 8 chips/16 cores – 3.6 Ghz p6, 64 GB | 4 chips/8 cores – 1.6 Ghz, 24 GB of memory |
| SPECfp_rate 2006 | 4 chips/32 cores – 1.6 Ghz, 128 GB of memory | | | | |
| | **230 4 socket record in Oct. 2008** | **216** | **156** | **226** | **18.1** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 4 chips/8 cores – 4.7 Ghz, 64 GB of memory | 4 chips/8 cores – 4.2 Ghz, 64 GB | 8 chips/16 cores – 3.6 Ghz p6, 64 GB | 4 – 1.6 Ghz, 24 GB of memory |
| Siebel - CRM Release 8.0 (users) | **14,000 absolute world record in Oct. 2008** | **7,000** | | | **5,200** |
| | 4 chips/32 cores – 1.4 Ghz, 128 GB of memory | 4 chips/8 cores – 4.7 Ghz, 64 GB of memory plus<br>- 2 chips/4 cores – 4.7 Ghz, 32 GB of memory<br>- 1 chip/2 cores – 1.9 p5+ Ghz, 8 GB of memory | | | 4 – 1.6 Ghz, 32 GB of memory plus<br>- 2 BL460c Xeon based servers |

Siebel benchmark results available at:

http://www.oracle.com/apps_benchmark/html/white-papers-siebel.html

Approximate competitive pricing as of May 4, 2009.

**Please note:** These competitive list prices are provided as guidelines and should not be disclosed. List prices are subject to frequent revisions. Actual street prices will vary according to the opportunity. Please contact product management for further competitive information.

IBM Power 570 p6, no longer offered at 4.7 Ghz, retired approx. 7/1/2009, last available pricing

- 2 chips/4 cores at 4.7 Ghz, 16 GB $ 173,444
- 2 chips/4 cores at 4.7 Ghz, 32 GB $ 194,744
- 4 chips.8 cores at 4.7 Ghz, 32 GB $ 337,087
- 4 chips/8 cores at 4.7 Ghz, 64 GB $ 379,685
- 8 chips/16 cores at 4.7 Ghz, 128 GB $ 753,555
- 16 chips/32 cores at 4.7 Ghz, 256 GB $1,195,315

IBM Power 570 p5+, no longer offered, last available pricing

- 1 chip/2 cores at 1.9 Ghz, 8 GB $ 55,621

IBM Power 550

- 4 chips/8 cores at 4.2 Ghz, 32 GB $ 102,879
- 4 chips/8 cores at 4.2 Ghz, 64 GB $ 114,399

IBM Power 560

- 8 chips/16 cores at 3.6 Ghz p6, 64 GB $ 148,339
- 8 chips/16 cores at 1.8 Ghz p5, 64 GB $ 188,446

## Competitive Services Offerings

These are the provisions of the Services Offerings from HP, IBM and Dell.

| | Sun SPARC Enterprises T5120 and T5220 | HP DL385 | HP DL585 G2 | HP rx3600 | HP rx4640 | HP rx7620 | HP rx8640 |
|---|---|---|---|---|---|---|---|
| Warranty Life | 1 year | 3 years | 3 years | 3 years | 3 years | 1 year | 1 year |
| Response Time (when part or tech will be at location) | Next business day | 1-5 business days | 1-5 business days | Next business day | Next business day | Next business day | Next business day |
| Hardware | 1 year | Base system covered for length of warranty (3 years). Component parts vary. Examples: Hard Disk Drives 1-3 years; HBA 1 year; Memory (parts only) 1 year; Optical drives 3 years, cables and batteries 1 year, Modems 1 year. | Base system covered for length of warranty (3 years). Component parts vary. Examples: Hard Disk Drives 1-3 years; HBA 1 year; Memory (parts only) 1 year; Optical drives 3 years, cables and batteries 1 year, Modems 1 year. | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] |
| Software | 90 days | 90 Days | 90 Days | Preinstalled software only -- warranties vary | Preinstalled software only -- warranties vary | Preinstalled software only -- warranties vary | Preinstalled software only -- warranties vary |
| OS | Solaris | Windows, Linux, NetWare | Windows, Linux, NetWare | HP-UX 11i, Windows, Red Hat Linux, SUSE Linux, Open VMS | HP-UX 11i, Windows, Red Hat Linux, SUSE Linux, Open VMS | HP-UX 11i, Windows, Red Hat Linux, SUSE Linux, Open VMS | HP-UX 11i, Windows, Red Hat Linux, SUSE Linux, Open VMS |
| Labor | Covered | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. | If customer can repair problem himself, part is shipped. If fix does not work, customer is charged for labor. If problem is deemed unfixable by customer, parts and labor are free. |
| Extended Warranties | Yes, four tiers | Yes, eight tiers | Yes, eight tiers | Yes, eight tiers | Yes, eight tiers | Yes, eight tiers | Yes, eight tiers |

1. Consumable parts include: rechargable batteries, ink/toner cartridges and tape cartridges.

| | Sun SPARC Enterprises T5120 and T5220 | Dell 1950 | Dell 2950 | IBM p505Q | IBM p550Q | IBM p560Q | IBM p5 570Q | IBM x3950 |
|---|---|---|---|---|---|---|---|---|
| Warranty Life | 1 year | 3 years | 3 years | 3 years | 3 years | 3 years | 1 year | 3 years |
| Response Time (when part or tech will be at location) | Next business day | Next business day | Next business day | Next business day | Next business day | Next business day | Next business day | Next business day |
| Hardware | 1 year | Covered for length of warranty | Covered for length of warranty | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] | Non-consumable parts, covered for length of warranty.[1] |
| Software | 90 days | NA | NA | Not covered | Not covered | Not covered | Not covered | Not covered |
| OS | Solaris | Windows, Red Hat Linux | Windows, Red Hat Linux | AIX, SUSE Linux, Red Hat Linux | AIX, SUSE Linux, Red Hat Linux | AIX, SUSE Linux, Red Hat Linux | AIX, SUSE Linux, Red Hat Linux | Windows, Red Hat Linux, SUSE Linux, VMWare ESX |
| Labor | Covered | Covered | Covered | Covered | Covered | Covered | Covered | Covered |
| Extended Warranties | Yes, four tiers | Yes, four tiers | Yes, four tiers | Yes, four tiers | Yes, four tiers | Yes, four tiers | Yes, four tiers | Yes, four tiers |

1. Consumable parts include: rechargable batteries, ink/toner cartridges and tape cartridges.

## The SWaP Metric

Evaluating a new server for your data center is no longer simply a matter of measuring raw performance. With today's increasing web scale and virtualization demands, you also need to consider how much power, air conditioning and space a server consumes. While traditional matrix are good for calculating throughput, they don't consider these new power and space demands in the equation.

That's why Sun created SWaP--the Space, Watts and Performance (SWaP) metric.

With the explosion of wireless devices, voice and data convergence and the increasing use of web applications, data centers are under pressure to deliver more services, transactions and data to more devices. And it's just the beginning. Demand for these new services is growing exponentially.

That's why Sun created SWaP--the Space, Watts and Performance (SWaP) metric.

**SWaP = Performance / (Space * Power Consumption)**

**Performance** is measured by industry-standard, audited benchmarks such as Subcontracted2004 and SPECweb2005.

**Space** refers to the height of the server, measured in rack units (Reuse).

**Power** is measured by watts used by the system. This is either measured during actual benchmark runs or is taken from vendors site planning guides.

# Selling Strategies

The Sun SPARC Enterprise T-series systems have been designed to enable organizations to securely and efficiently serve millions of new users while saving millions of dollars in cost by solving three specific customer challenges:

– Building for the demands of web scale business

– Creating virtualized and eco-efficient data centers

– Securing enterprise applications at speed

The Sun SPARC Enterprise T5440 servers deliver breakthrough throughput with dramatic space and power efficiency and, with the Solaris 10 OS, provide a highly efficient, virtualized and secure application environment.

Also make sure to touch on these points:

- Deploy eco-friendly servers without sacrificing the need for ever higher levels of throughput and performance.
- Reducing power consumption and heat generation serves to reduce environmental pollution while reducing costs, supporting business growth and improving SLAs
- Address data center space constraints by delivering maximum compute density and performance per system and per rack.
- Minimize downtime and meet / exceed SLAs with highly reliable systems
- General purpose systems with the ability to run and consolidate multiple types of commercial and technical workloads onto a single standardised, high performance, power efficient, reliable and cost effective platform

This powerful value proposition enables the Sun SPARC Enterprise T5440 server to drive an effective Retain-Develop-Acquire selling strategy.

## Retain

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

There are thousands of UltraSPARC II (US II) systems worldwide; most of which are running Solaris 2.6 or Solaris 8. If we assume 20% can be upgraded to CMT servers, it represents a $90M+ opportunity for Sun.

Customers who own USII based systems are a prime target because they fall off Sun service contracts at a rate of 20%-30% per year. Additionally USII based systems are approaching their End-of-Service Life announcement which will increase support costs. Furthermore, as of late 2007 most new/proselytized Sun servers will only run Solaris 9 and/or Solaris 10, but approximately 75 percent of Sun's installed base runs Solaris 8 or an earlier version of Solaris. Thus it's critical to get customers to certify and deploy Solaris 10 in their production environments.

Use the Solaris 10 Adoption Go-To-Market program, coupled with local Sun Solution Centers and loaner schemes to seed the account and prove the benefits of second generation CMT based servers running Solaris 10.

In conjunction with the announcements of the Sun SPARC Enterprise T5440 server, IBB is introducing a series of aggressive upgrade incentives for the Sun installed base as well as for competitive systems.

## Develop

As your installed base accounts qualify the Sun SPARC Enterprise T5440 servers and measure the benefits delivered by second generation CMT technology, propose the platform as a consolidated solution to address the web and application tier sprawl created by XEON-based servers running Windows and Linux.

Use the collateral and offers developed as part of the Eco / Virtualization Growth Targets and Go-to -Market programs to drive awareness and interest in your accounts

## Acquire

As the benefits of the second generation CMT are proven through the sales collateral discussed above and actual account wins, propose the Sun SPARC Enterprise T5440 servers into current non-Sun accounts running competitive UNIX® or Linux solutions. Again, using the collateral and offers developed above can enable account penetration.

## Applications

Web, application tier, middleware and OLTP database workloads make **excellent candidates** for the Sun SPARC Enterprise T5440 servers. These are characterized by:

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

**Poor candidates** for the Sun SPARC Enterprise T5440 servers include:

- Single-threaded, long-running batch applications, for which the primary performance metric is elapsed time.

## Compatibility

Because the Sun SPARC Enterprise T5440 server run the Solaris 10 Operating System, it runs the same applications as all other Solaris OS-based UltraSPARC servers that have been qualified for the Solaris 10 OS.

# Enabling Technology

## The UltraSPARC T2 Plus CMT Processor

The UltraSPARC® T2 Plus multi-core, multi-thread processor extends the capabilities of the previously announced UltraSPARC T2 processor in order to support multiprocessing capabilities.

### Objectives of the UltraSPARC T2 and T2 Plus Processors

- Optimization for throughput and application parallelism
  - The most important commercial server applications are heavily threaded
  - Parallelism through aggregation (multi-instance, multi-process)
  - Virtualized server environments (e.g. logical domains)
- Attack the memory wall
  - Commercial workloads exhibit poor memory locality
  - For a single thread, application, memory latency is the bottleneck to improving performance
  - Diminishing returns with increased cache sizes in terms of both performance and die area efficiency
- Trade off thread latency for thread throughput
  - For a single thread, only modest throughput speedup is possible by reducing compute time (Increased Frequency, ILP)
- Architected as core-centric designs to maximize thread count within die area limits
  - Relatively high thread count per core
  - Many cores imply small cores and associated L1 caches
  - Modest capacity shared outermost cache (L2$)
- Managing high concurrency at all levels of the design is the major scaling challenge

The key features of the UltraSPARC T2 and T2 Plus processors include:

- 8 SPARC V9 cores @ 1.2, 1.4 or 1.6 GHz
- 8 threads per core
- 8 stage in-order pipeline
- 2 execution pipelines per core
  - 1 instruction/cycle per pipeline
- 1 floating point unit (FPU) per core – 11 Gflops/sec. VIS 2.0
- 1 crypto (SPU) per core
- 4 MB, 16-way, 8-bank L2$
- Integrated memory controllers
- 2.5 Ghz, x8 PCI-Express interface
- Technology: TI 65 nm

The UltraSPARC T2 Plus differs from the T2 in that the T2 Plus provides:

- 2 - 4 socket SMP-enabled
- Coherency Link: Coherency Link: FB-DIMM, 4.8 Gb/sec. @ 1.4 GHz, 4.0 Gb/sec. @ 1.2 GHz
- 2 FB-DIMM DRAM controllers vs. 4 in T2, each still with 1 branch of 2 channels
  - 128 GB capacity
- Additional memory features, such as memory-mirroring capability (not implemented on Sun SPARC Enterprise T-series servers) and FB-DIMM single link fail-over

- Relaxed DMA ordering, a feature planned for successor UltraSPARC processor(s)
- No integrated XAUI/ 10 Gb Ethernet controller
- Die size: 348 mm$^2$
- Max power: 103 W for 1.2 GHz, 132 W for 1.4 GHz
  - Compares to T2 processor max power of 91 W for 1.2 GHz, 123 W for 1.4 GHz

## UltraSPARC T2 Plus Block Diagram

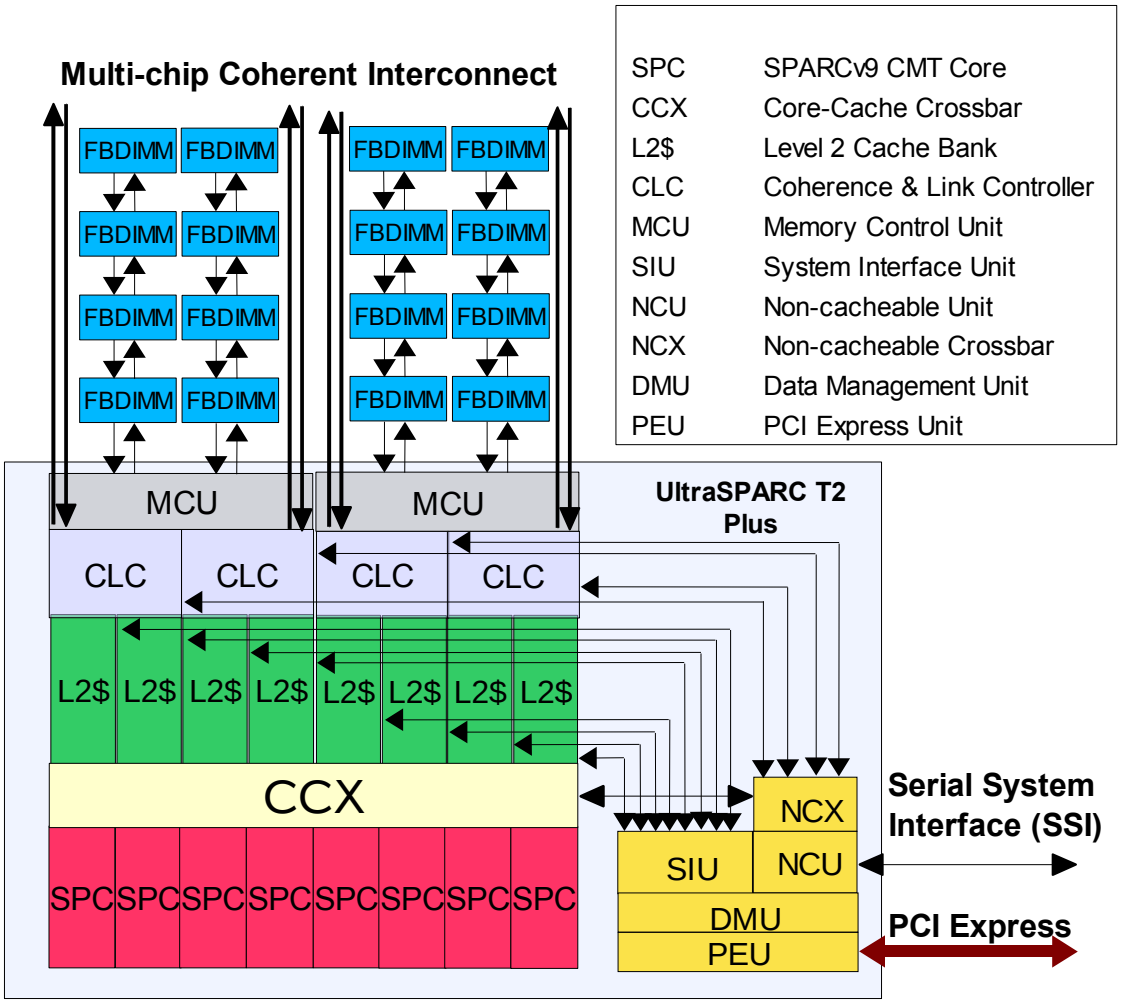



***Figure 2 – UltraSPARC T2 Plus Block Diagram***

## Hardware-Assisted Cryptography

The UltraSPARC T2 Plus CMT processor provides hardware-assisted acceleration of DES, 3DES, AES, RC4, SHA1, SHA256, MD5, RSA to 2048 key, ECC, CRC32 cryptographic operations. The Solaris 10 Operating Environment provides the multithreaded device driver that supports hardware-assisted cryptography. Both PKCS#11 and OpenSSL libraries provide access to end-user applications wishing to use these ciphers.

Customers wishing to enable IPsec cryptographic operations must obtain and install a separate activation file due to export restrictions on this functionality. In some cases (per country-specific U.S. export regulations), the file may need to be ordered on a CD, or may not be available at all. Please refer to http://www.sun.com/ipsec for

more information (T5440 information to be added to this site on the announce date). Refer to the *Sun SPARC Enteprise T5440 Servers Product Notes* for installation instructions.

## External Coherency Hub

The external coherency hub is a four port arbiter/switch implemented in a custom ASIC that interfaces to the coherency control portion of the UltraSPARC T2 plus processor. The external coherency hub:

- Serializes request to the same address for loads, stores and write-backs
- Broadcasts snoops and aggregates responses
- Proves flow control read and write requests to a node
- Provides ECC or parity protection
- Maintains LFU, routing ports, cross connect, transaction scoreboard and address serialization

## External Coherency Hub – Block Diagram

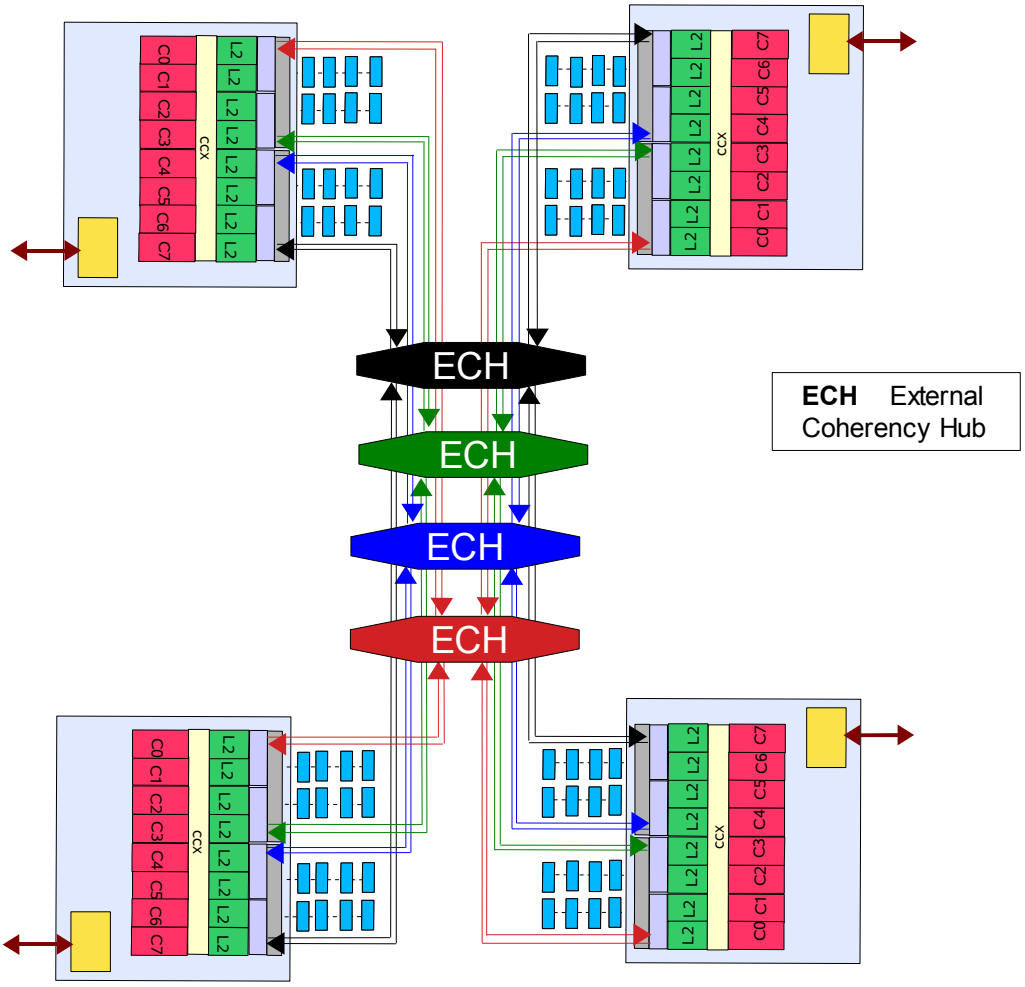



***Figure 3 – External Coherency Link***

# System Architecture

## Design Approach

The system feature set for the Sun SPARC Enterprise T5440 has been highly leveraged from the Sun SPARC Enterprise T1000 and T2000 servers incorporating incremental technology improvements that come as part of the UltraSPARC T2 Plus feature set. Many features are in common with the Sun SPARC Enterprise T5x20 and T5x40 servers. The system chassis utilizes the proven design from the 4 RU chassis used in the Sun Fire X4500 and X4600 servers.

The design effort and challenge for the Sun SPARC Enterprise T5440 focused on power and thermal issues, multiprocessing and cache coherency with minimal latencies and higher-level diagnostic capabilities. Close collaboration with design teams for follow-on SPARC and x86 based programs have resulted in the creation of system components that can readily be used either directly or as highly leveraged components by other platforms.

## Product Upgrade Paths

The Sun SPARC Enterprise T5440 server accommodates a variety of possible upgrades including:

### Processor Upgrades

- Additional processors for systems initially installed as one to three processor systems
- Upgrades to 1.4 or 1.6 Ghz modules from lower speeds

  **Note:** Processor modules running at different speeds may not be mixed within the same system cabinet Also, 800 Mhz are available only for systems at 1.6 Ghz and may not be mixed with other memories within the same system.

### Memory Upgrades

- Additional memory: all standard configurations are shipped with half populated memory FB-DIMM slots
- Denser memory FB-DIMMs: 4 GB FB-DIMMs are very cost-effective FB-DIMMs; the 8 GB FB-DIMMs are the highest capacity supported on the Sun SPARC Enterprise T5440 server.

## Environmental Controls

The Sun SPARC Enterprise T5440 monitors temperature and power level indications from all critical system components. This ability to regulate fan speed in addition to control power throttle of the processor provides power savings as well as a new level of environmental control that is unique to the industry.

The Sun SPARC Enterprise T5440 server features an environmental monitoring subsystem that protects the server and its components against:

- Extreme temperatures
- Lack of adequate airflow through the system
- Power supply failures
- Hardware faults

Temperature sensors are located throughout the system to monitor the ambient temperature of the system and internal components. The software and hardware ensure that the temperatures within the enclosure do not

exceed predetermined safe operation ranges. If the temperature observed by a sensor falls below a low-temperature threshold or rises above a high-temperature threshold, the monitoring subsystem software will generate an alert indicating a temperature warning. If the temperature condition persists and reaches a critical threshold, the monitoring subsystem lights the amber Service Required LEDs on the front and back panel and initiates a system shutdown. In the event of a failure of the system controller, backup sensors protect the system from serious damage, by initiating a forced hardware shutdown. Required LEDs remain lit after an automatic system shutdown to aid in problem diagnosis. The power subsystem is monitored in a similar fashion by monitoring power supplies and reporting any fault in the front and rear panel LEDs.

**Sensors**

- Input and output current and voltage for each bulk supply,
- Voltage, current and temperature for each DVRM (D206, D207, D208, D210, D212),
- Inlet temperature,
- Die temperature for each processor,
- DIMM temperature for each FB-DIMM,
- Air temperature after each processor chip,
- Air temperature of the I/O section down stream from CPU/Memory cage
- Chassis vibration,
- Fan speed for each fan.

## The Sun SPARC Enterprise T5440 Functional Block Diagram

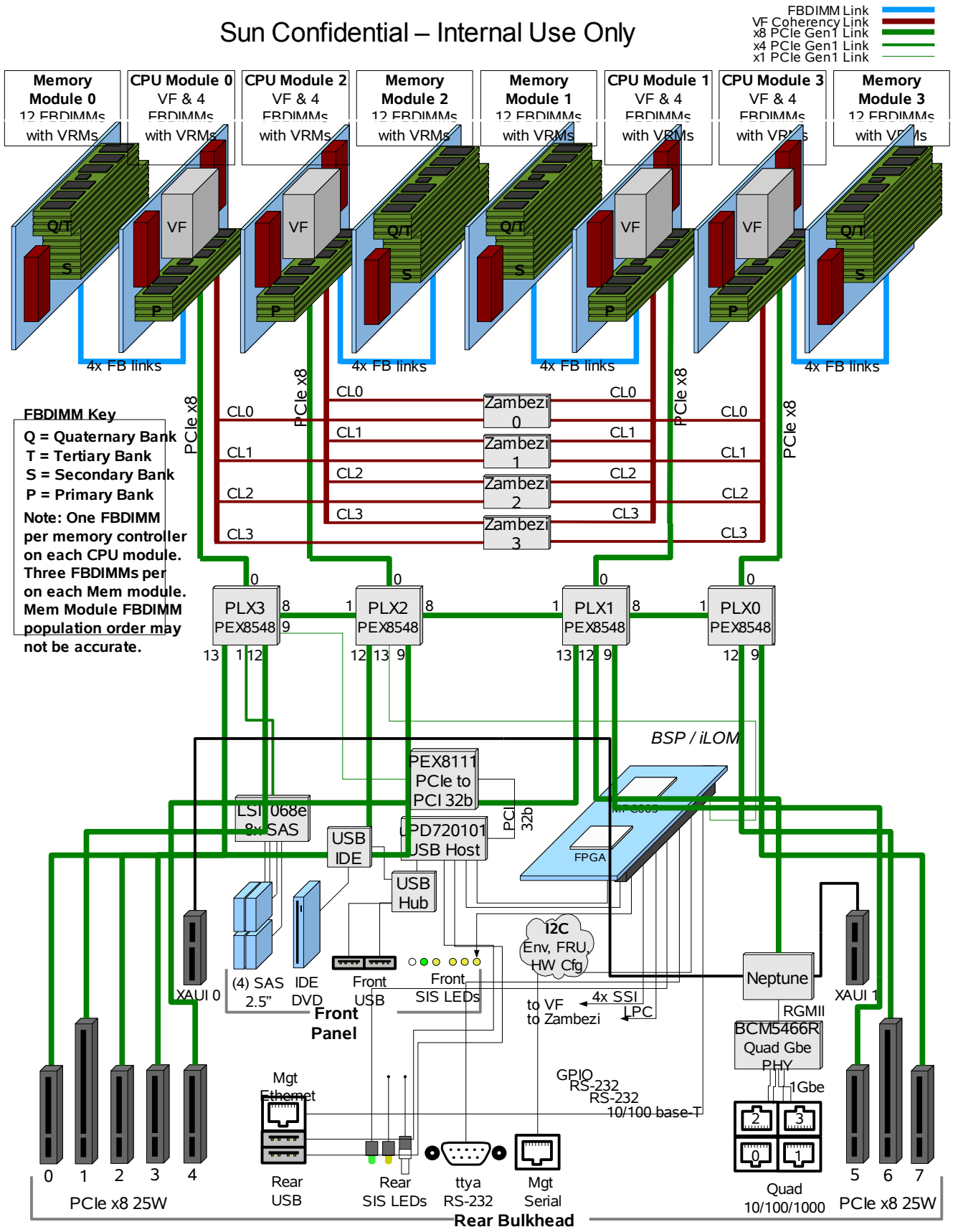

FBDIMM Link
VF Coherency Link
x8 PCIe Gen1 Link
x4 PCIe Gen1 Link
x1 PCIe Gen1 Link
Memory Module 0
12 FBDIMMs with VRMs
CPU Module 0
VF & 4 FBDIMMs with VRMs
CPU Module 2
VF & 4 FBDIMMs with VRMs
Memory Module 2
12 FBDIMMs with VRMs
Memory Module 1
12 FBDIMMs with VRMs
CPU Module 1
VF & 4 FBDIMMs with VRMs
CPU Module 3
VF & 4 FBDIMMs with VRMs
Memory Module 3
12 FBDIMMs with VRMs
Q/T
S
P
VF
4x FB links
PCIe x8
CL0
CL1
CL2
CL3
Zambezi 0
Zambezi 1
Zambezi 2
Zambezi 3
FBDIMM Key
Q = Quaternary Bank
T = Tertiary Bank
S = Secondary Bank
P = Primary Bank
Note: One FBDIMM per memory controller on each CPU module. Three FBDIMMs per on each Mem module. Mem Module FBDIMM population order may not be accurate.
PLX3 PEX8548
PLX2 PEX8548
PLX1 PEX8548
PLX0 PEX8548
BSP / iLOM
PEX8111 PCIe to PCI 32b
PCI 32b
LSI 1068e 8x SAS
USB IDE
uPD720101 USB Host
USB Hub
FPGA
I2C Env, FRU, HW Cfg
Neptune
RGMII
BCM5466R Quad Gbe PHY
1Gbe
XAUI 0
XAUI 1
(4) SAS 2.5"
IDE DVD
Front USB
Front SIS LEDs
Front Panel
to VF
to Zambezi
4x SSI
I2C
GPIO
RS-232
RS-232
10/100 base-T
Mgt Ethernet
Rear USB
Rear SIS LEDs
ttya RS-232
Mgt Serial
Quad 10/100/1000
PCIe x8 25W
PCIe x8 25W
Rear Bulkhead

*Figure 4 – System Block Diagram*

## Motherboard

The motherboard contains four CPU board slots, four memory expansion slots, four coherency link ASICs, four system fan connectors and the I/O subsystem including four PCI Express switches, eight PCI Express slots, the quad Ethernet ASIC, the SAS/SATA storage controller, rear connectors and the connector for the Service Processor board.

The motherboard is 14.6" wide x 22.5" deep x 0.088" (.093 finished) thick. It is an 18-layer PCB, with four internal signal layers and four internal power planes.

## CPU Board

Each CPU board contains one UltraSPARC T2 Plus processor, four FB-DIMM sockets (the minimum memory required to support the processor) and power converters for the processor and four FB-DIMMs. These four make up the "Primary" bank of FB-DIMMs.

The CPU Board is 8.4" wide x 5.7" high x 0.088" (.093 finished) thick. It is an 18-layer PCB, with four internal signal layers and four internal Power planes. This module fits vertically in the 4U System height and maintains the 1.635" Motherboard connector pitch.

In the case of a fault occurring on a CPU board, a single yellow LED visible through a cutout window in the ejector handle as viewed from the top of the system will be lit, identifying which CPU board in the system has an error. If the fault is due to a bad FB-DIMM, when the CPU board is removed from the system and the single Push Button present on the CPU module (upper right corner) is depressed, a single yellow LED in line with the failing FB-DIMM will be lit for a short period of time until the stored charge to light this LED has drained away.

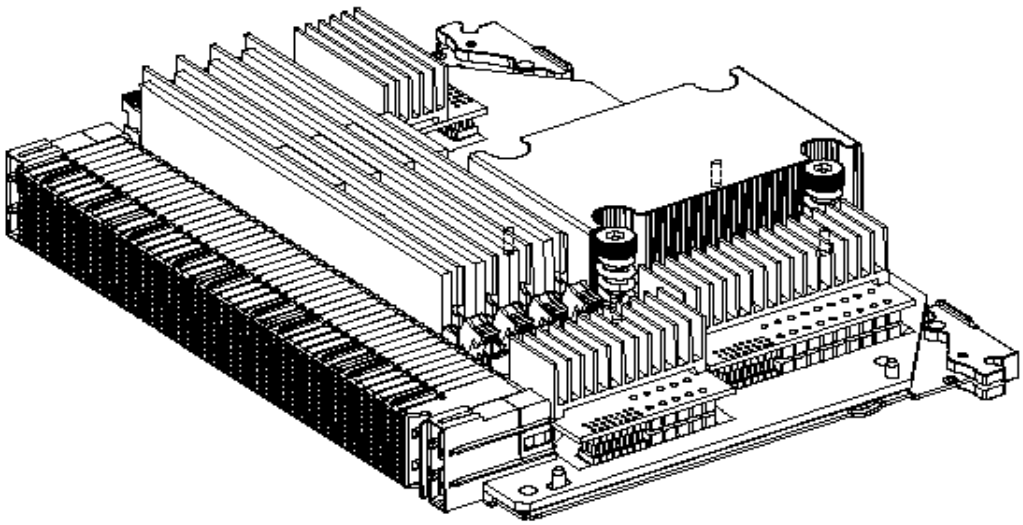


*Figure 5 - CPU Board 3-D View and FB-DIMM Location*

# Memory

For each processor, two memory controller units (MCUs) support a pair of FB-DIMM channels, constituting a single FB-DIMM branch per controller. Both channels of a branch must be populated with the same configuration of FB-DIMMs, although the MCU also supports single-channel mode. Each channel may be populated with 2 or 4 FB-DIMMs, yielding 4, 8 or 16 FB-DIMMs per processor.

Each memory channel supports 10 southbound (from MCU to memory) and 14 northbound (from memory to MCU) high-speed serial lanes. The processor supports single-lane automatic fail-over, allowing continued operation if a lane fails dues to excessive errors.

FB-DIMM sizes of 2, 4 and 8 GB are supported. Memory is implemented with 1.8 V 533/667 Mhz FB-DIMMs.

## Memory Boards

Each memory board contains twelve FB-DIMM sockets (expansion memory for a single processor), and power converters for the twelve FB-DIMMs. Memory boards may be populated with either zero, four, or twelve FB-DIMMs. Note that the FB-DIMMs on each of the Expansion memory boards are connected to only one processor. When exactly four FB-DIMMs are installed they must be in the four sockets closest to the board edge connector (the bottom four in the above picture). These four make up the "Secondary" bank of FB-DIMMs seen from each Victoria Falls processor. The remaining eight make up the "Tertiary" and "Quaternary" banks, which must be installed together.

The memory board is 8.4" wide x 5.7" high x 0.088" (.093 finished) thick. It is a 10-layer PCB, with two internal signal layers and two shared signal/Power layers. This module fits vertically in the 4U system height and maintains the 1.635" motherboard connector pitch.

In the case of a fault occurring on a memory board, a single yellow LED visible through a cutout window in the ejector handle as viewed from the top of the system will be lit, identifying which Memory board in the system has an error. If the fault is due to a bad FB-DIMM, when the Memory board is removed from the system and the single Push Button present on the memory module (upper left corner) is depressed, a single yellow LED in line with the failing FB-DIMM will be lit for a short period of time until the stored charge to light this LED has drained away.

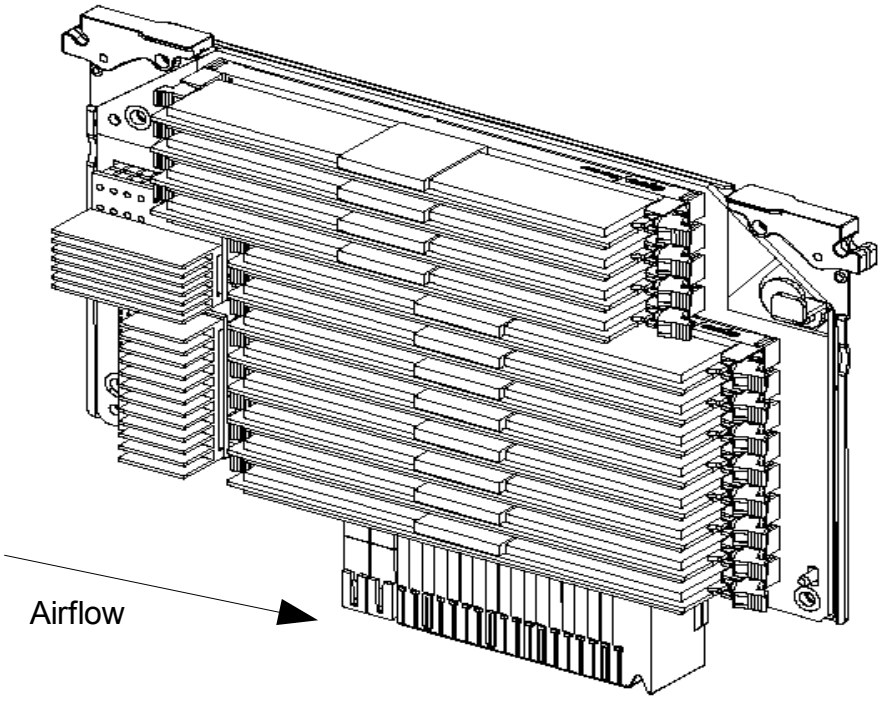



***Figure 6 - Memory Board 3-D View and FB-DIMM Location***

# I/O Subsystem

## PCI Express Switches

The four PCI Express switches are implemented with PLX PEX8548 bridge chip and operate independently of each other. Each runs at 2.5 Gbps and each supports link widths of 1, 2, 4, or 8 lanes.

The port numbers for each switch are shown in the Functional Block Diagram in order to help in understanding the device paths for various configurations

# Network

The system uses the Neptune quad Ethernet ASIC, which provides two 10/100/1000 Mbps and two 10/100/1000/10000 Mbps auto-negotiating Ethernet ports. These four ports are available on the motherboard via a quad RJ45 connector, but only for 10/100/1000 Mbps speeds. The two 10 Gbps ports utilize the XAUI interface, and require the use of a plug-in XAUI-to-fibre or XAUI-to-copper card. Whenever a XAUI card is present in the system, that Neptune port may only be used via that XAUI card, and its matching 10/100/1000 Mbps port is deactivated on the motherboard.

Each of the four RJ45 connectors associated with an Ethernet port includes two LEDs:

- a bi-color Speed indicator, off for 10 Mbps, green for 100 Mbps, or yellow for 1000 Mbps operation, and

- a green Activity indicator, which blinks during packet transfers.

## Storage

Internal storage is supported by an LSI Logic LSISAS1068E 8-port, 3.0 Gbit/sec. Serial Attached SCSI (SAS) / Serial ATA (SATA) controller. Four ports connect to the four hard drives, one port connects to a single port SATA connector on the motherboard to allow future support for a SATA DVD (not available at first release). The controller is accessed via the system's internal PCI Express bus. The combined SATA/SAS controller allows the system to offer a standard SAS configuration where performance and/or RAS are concerns, or a low-cost SATA configuration where performance and RAS are not primary concerns.

Details for the controller may be found at:

http://www.lsi.com/storage_home/products_home/standard_product_ics/sas_ics/lsisas1068e/index.html

The use of SSDs requires the upgrade to the firmware in the LSI 1068E controller. Please refer to patch 140949-01 and the *Product Notes* for details.

Disk and SSD drives require the 'Nemo' mounting bracket, in common with the Sun SPARC Enterprise T2000 server. The Sun SPARC Enterprise T5120/T5220 and T5140/T5240 servers utilize the 'Marlin' bracket.

An internal removable media "SuperMulti"-format optical disk drive is supported, currently accessed via the IDE bus.

## USB and IDE

The system uses the same hardware solution as the Sun SPARC Enterprise T5140/T5240 server to interface to the four USB ports and the one IDE DVD drive.

### Expansion Slots

The system supports 8 expansion cards directly plugged into the system enclosure. All expansion card slots accept and support PCI Express x8 cards. Two of the slots also support XAUI-based networking cards.

Two of the expansion slots can accept a PCI Express card with a x16 connector, although the actual link width is still limited to x8. Similar to the 4 RU system, and in alignment with the current Sun direction, only low-profile PCI-E cards are supported.

Installation of the optional XAUI adapters will cover the connectors associated with PCIe slots 4 and 5 that utilize common bulkhead connectors. Consequently, use of a XAUI adapter and the associated PCIe slot are exclusive.

## Service Processor

The Sun SPARC Enterprise T5440 contains an on-board service processor similar in hardware functionality and capability to what exists for T1000 and T2000. However, the software stack running on the hardware has migrated from ALOM to ILOM – the Integrated Lights Out Manager. ILOM is also used with Sun's x64 platforms and provides support for more industry standard systems management protocols and enables easier and more flexible integration with existing customer systems.

### Service Processor Module

The Service Processor board, commonly referred to as the BSP, is a mezzanine-style card that plugs internally to the motherboard between the PCI Express slots. The BSP is similar in hardware features to the Service Processor on the Sun SPARC Enterprise T5140/T5240 motherboard. It contains a Power PC processor and the FPGA which controls low-level system functions and interfaces between the service processor and the managed host system. The components on this card are similar to the components on Sun SPARC Enterprise T2000 server SP (OSP), in particular all system level firmware code is located on this board.

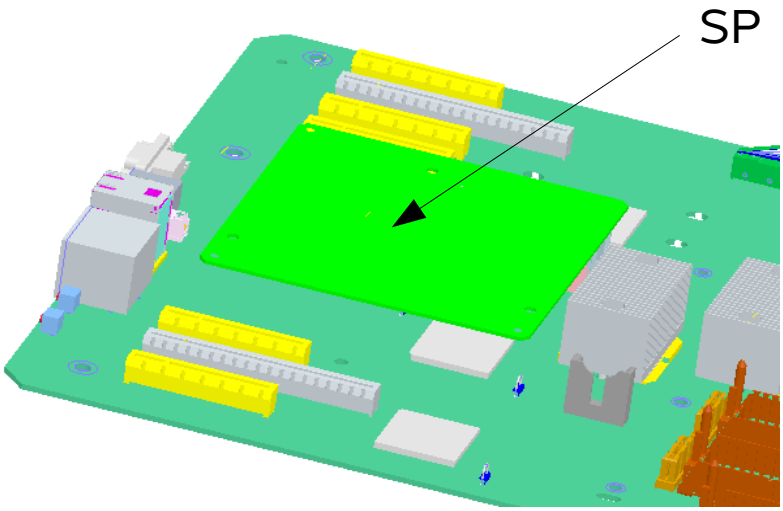



***Figure 7 – Service Processor Module***

### Telemetry Recording

The T5440 is the first server in the industry that has an integrated "Black Box Recorder" that stores a lifetime history of over 200 health signatures (temperatures, voltages, currents, fan speeds, energy metrics). The health signatures act as a real time EKG for the server. If T5440s should ever encounter any quality issues during the life of the server, the BBR files are analyzed to pinpoint the exact cause of the issue. For a large data center full of servers, a Sun utility called the BBR_Sifter does intelligent mining of the BBR files and can tell, for example, which servers are showing wear symptoms, elevated temperatures, noisy power supplies and a wide range of diagnostic and prognostic conditions so that service actions can be scheduled pro actively before the customer experiences any interruptions or challenges to data center availability goals.

The real challenge was in finding the right balance of where to locate the code (Service processor or CPU side), data collected, resolution of history accumulated, memory and storage used, and sensor selection to be monitored. This information was needed without adding overhead to the design of a running system while collecting meaningful data that can used to truly diagnose problems.

The interface to the event log is restricted to services; there is no current user interface for analysis.

## Infrastructure Boards

The small infrastructure boards are mostly unchanged from the standard 4U enclosure. Unlike other recent systems from Sun, none of these boards contain a FRU PROM. Therefore, the system FRUID information is located in the Motherboard FRU PROM.

– Power Distribution Board (four power supplies, system bus bars)

Modifications made to sense signals and 3.3 V auxiliary power through an additional cable to the motherboard (backwards compatible with Galaxy-4, if desired)

– Hard Disk Backplane (four 2.5 inch SAS HDDs)

Unlike Sun SPARC Entprise T5140/T5240 servers, there are no HDD present signals

– Front IO board (USB) and front indicator board (LEDs, switches)

### XAUI 10 GbE Boards

The XAUI boards are common with the Sun SPARC Enterprise T5120/T5220 and T5140/T5240 servers. Only the copper interface versions are supported.

Installation of the optional XAUI adapters will cover the connectors associated with PCIe slots 4 and 5 and utilize common bulkhead connectors. Consequently, use of a XAUI adapter and the associated PCIe slot are exclusive.

### Power Supplies

The system contains four (A238) 1,120 W redundant (2+2) hot-swap AC power supplies. Each power supply contains two independent cooling fans, generates 12 V DC and 3.3 V Standby DC for use inside the system, and presents a status and control interface (logically, physically, and electrically) to the system, including AC input voltage/current monitoring and DC 12V output voltage/current monitoring. The power supplies operate from a wide-range 100 V – 240 V, 50 - 60 Hz (nominal) AC input.

## Cooling Strategy

There are three cooling zones

- Zone 1 -- CPUs 1 and 3
- Zone 2 -- CPUs 0 and 2
- Zone 3 -- PSUs and Disks

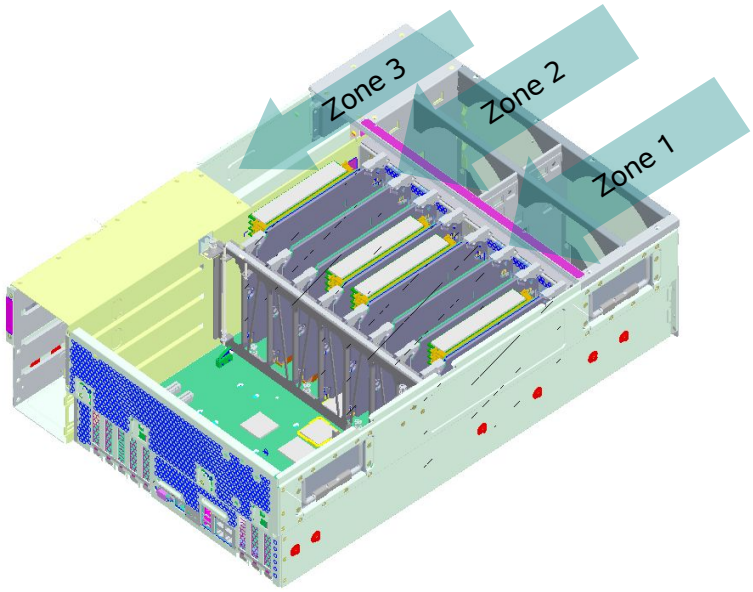


*Figure 8 – Cooling Zones and Fans*

## Pre-installed Solaris Operating System

The Sun SPARC Enterprise T54400 Servers is pre-installed with the Solaris10 Operating Environment and offers the following Solaris features:

- Stability, high performance, scalability and precision of a mature 64-bit operating system
- Support for over 12,000 leading technical and business applications
- Solaris Containers – Isolate software applications and services using flexible, software-defined boundaries
- DTrace – A comprehensive dynamic tracing framework for tuning applications and troubleshooting systemic problems in real time
- Predictive Self-Healing – Capability that automatically diagnoses, isolates and recovers from many hardware and application faults.
- Security – Advanced security features designed to protect the enterprise at multiple levels
- Network Performance – Completely rewritten TCP/IP stack dramatically improves the performance and scalability of networked services

Customers may use the pre-installed Solaris 10 image or re-install a supported version of the Solaris 10 from the network, a CD or downloaded copy. Refer to the *Sun SPARC Enterprise T5440 Servers Product Notes* for information on the supported releases.

## Support for Virtualization Through Logical Domains (LDoms)

The Sun SPARC Enterprise T5440 server support the use of Logical Domains (LDoms) technology. Through the use of the Solaris OS and the built-in server firmware, and by installing the Logical Domains Manager software, customers can virtualize the compute services that run on the customer's server.

A logical domain is a discrete, logical grouping with its own operating system, resources, and identity within a single computer system. Each logical domain can be created, destroyed, re-configured, and rebooted independently, without requiring a power cycle of the server.

One may run a variety of applications software in different logical domains and keep them independent for performance and security purposes.

Each logical domain can be managed as an entirely independent machine with its own resources, such as:

- Kernel, patches, and tuning parameters
- User accounts and administrators
- Disks
- Network interfaces, MAC addresses and IP addresses

Each logical domain can interact only with those server resources made available to it, and the configuration is controlled using the Logical Domains Manger.

## Logical Domains (LDoms)

Logical Domains (LDoms) is Sun's server virtualization and partitioning technology for Sun servers with CMT. A logical domain is a full virtual machine that runs an independent operating system instance and contains virtualized CPU, memory, storage, console, and cryptographic devices.

Within the logical domains architecture, the hypervisor is a small firmware layer that provides a stable, virtualized machine architecture to which an operating system can be written. As such, each logical domain is completely isolated and the maximum number of virtual machines created on a single platform relies upon the capabilities of the hypervisor as opposed to the number of physical hardware devices installed in the system. The Sun SPARC Enterprise T5440 server can support up to 128 logical domains.

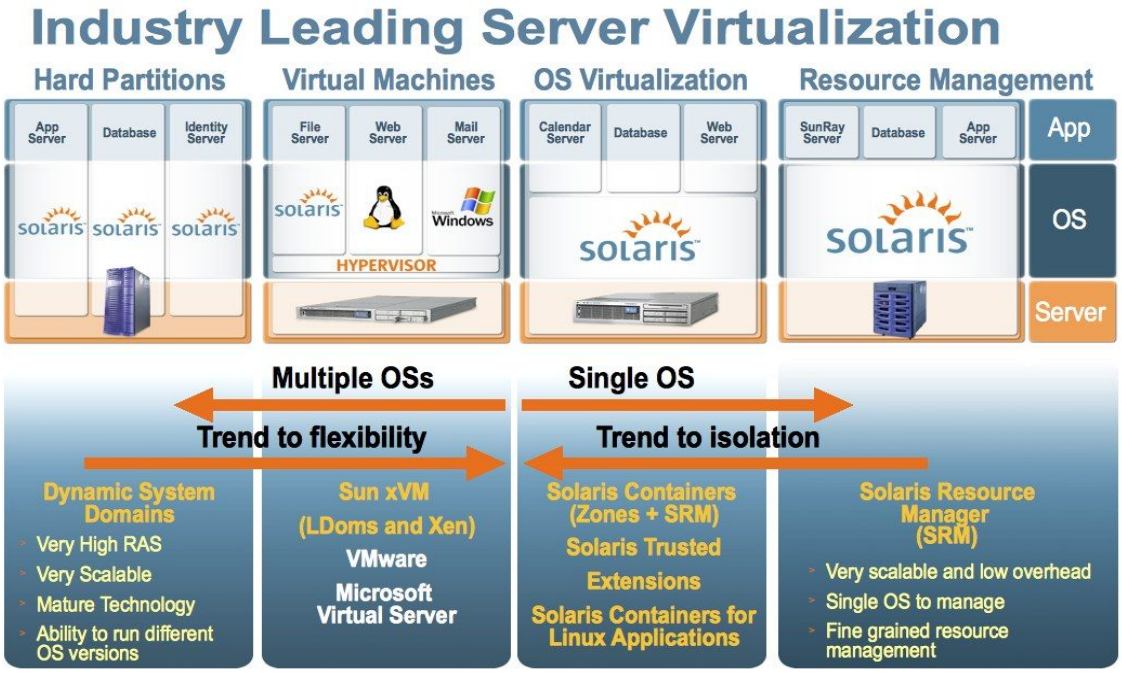



***Figure 9 – Virtualization Structure***

Sun virtualization technologies have varying degrees of flexibility, availability and security. Except for xVM products there are no extra costs

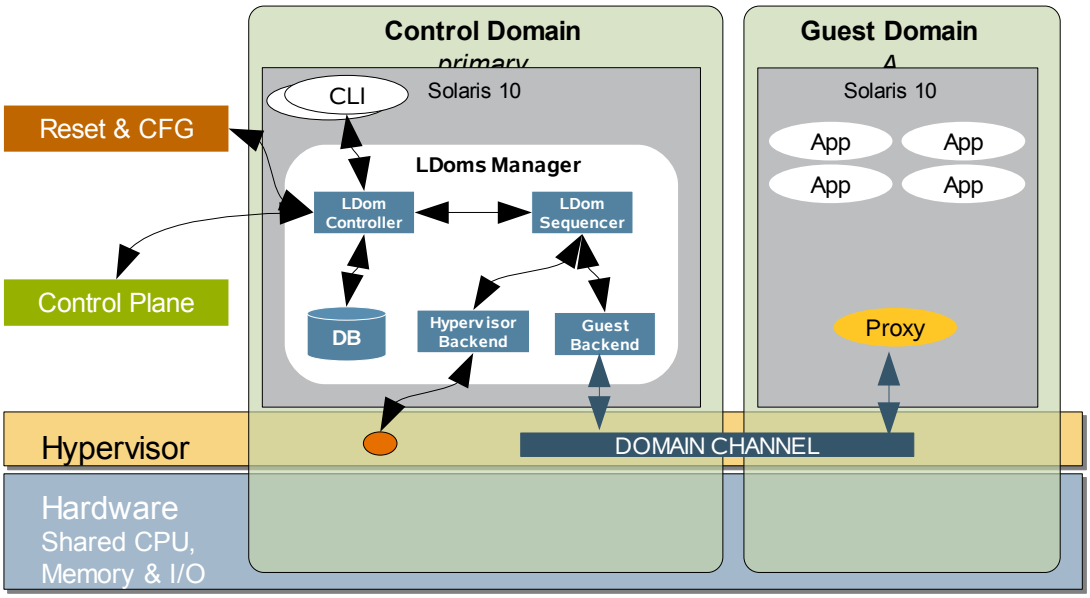
By taking advantage of logical domains, organizations gain the flexibility to deploy multiple operating systems simultaneously on a single platform. Administrators can leverage virtual device capabilities to transport an entire software stack hosted on a logical domain from one physical machine to another.

Logical domains can also host Solaris Containers to capture the isolation, flexibility, and manageability features of both technologies. By deeply integrating logical domains with both the industry-leading chip multithreading (CMT) capability of the Sun UltraSPARC® T1 and UltraSPARC® T2 processors and the Solaris 10 OS, logical domains technology increases flexibility, isolates workload processing, and improves the potential for maximum server utilization.

### Logical Domains Architecture

The following key architectural components work together to accomplish the partitioning and isolation capabilities of logical domains.

- Hypervisor — A small firmware layer that provides a set of hardware-specific support functions to operating systems through a stable interface, known as the sun4v architecture. The hypervisor creates virtual machines by subdividing physical devices across multiple logical domains, exposing some resources to a specific partition and hiding others. In addition, the hypervisor creates communication channels, logical domain channels, between logical domains to provide a conduit for services, such as networks and shared devices.




- Virtual devices — Physical system hardware, including CPU, memory, and I/O devices, that are abstracted by the hypervisor and presented to logical domains within the platform.
- Logical Domains Manager — Software that communicates with the hypervisor and logical domains to sequence changes, such as the removal of resources or creation of a logical domain. The Logical Domains Manager provides an administrative interface and keeps track of the mapping between the physical and virtual devices in a system.
- Guest operating system — An operating system that understands both the sun4v platform and the virtual devices presented by the hypervisor. Currently, this is the Solaris 10 11/06 OS at a minimum.

There are several different roles for logical domains, and these are mainly defined by context; their usage defines them. A domain may have one or more of these roles, such as combining the functions of an I/O and service domain:

- Control domain — Executes Logical Domains Manager software to govern logical domain creation and assignment of physical resources.
- Service domain — Interfaces with the hypervisor on behalf of a guest domain to manage access to hardware resources, such as CPU, memory, network, disk, console, and cryptographic units.
- I/O domain — Controls direct, physical access to input/output devices, such as PCI Express cards, storage units, and network devices.
- Guest domain — Utilizes virtual devices offered by service and I/O domains and operates under the management of the control domain.

## Logical Domains Manager

The Logical Domains Manager and associated daemon processes execute within the control domain to accomplish communication and configuration tasks. The control domain communicates with the hypervisor to create and manage all logical domain configurations within a server platform. At system startup or during a re-configuration operation, the Logical Domains Manager reads the physical resource inventory, performs constraint-based device mapping, and passes re-configuration instructions to the sequencer. In this manner, Logical Domains Manager takes locality of hardware into account and intelligently maps logical domains to physical resources, working to minimize latency and increase throughput of each logical domain.

Logical Domains Manager is required for all logical domain creation and re-configuration tasks. In fact, without access to the Logical Domains Manager all logical domain resource levels remain static. Administrators interact with the Logical Domains Manager using a command-line user interface. Sun continues to invest in logical domains technology and intends to also provide an optional browser user interface and graphical user interface in the future.

### Logical Domains MIB

The Logical Domains (LDoms) Management Information Base (MIB) enables third party system management applications to perform remote monitoring of and starting and stopping logical domains using the Simple Network Management Protocol (SNMP).

The LDoms MIB software runs on the control domain only, and only one instance of the LDoms MIB can be run.

### LDoms Features

Logical Domains is at the core of Sun's virtualization strategy for SPARC and Solaris. The LDoms technology provides system administrators the ability to create and manage logical domains; virtualize resources; create communications channels; and define network, storage, and other I/O devices as services able to be shared from one domain to another.

LDoms is an integrated part of Sun CMT (Chip Multi-Threading) systems.

Key features for the 1.0 release:

- Up to 64 logical domains per server on UltraSPARC T2 platforms
- Guest domains can be configured, started and stopped independently
- Ability to dynamically add and remove virtual CPUs while OS is running
- Predictive self healing capability for each logical domain
- Control domain hardening for higher level of security

Key features in the 1.0.1 release:

- UltraSPARC T2 (Niagara 2) Platform Support (32 domain support at RR; 64 domain support as a post-RR feature)
- Reliability - I/O domain can reboot while the other domains keep running
- Manageability - LDoms SNMP MIB, based DMTF CIM model and running on control domain to enable remote SNMP monitoring
- Security - Domain minimization support, to enable minimal/reduced Solaris installation

Key features for the 1.2 release:

- Enhanced usability and a startup configuration assistant
- Enable LDoms by default
- Virtual Appliance (Guest) support
- Virtual Tape - Enterprise Backup requirement
- Dynamic Resource Management - Phase 1
- User Level Domain Services API

Please refer to *Sun Logical Domains, Just the Facts*, SunWin Token 559718, for more detail.

# Remote Manageability With ILOM

The Integrated Lights Out Management (ILOM) is a integrated system controller that provides remote management and administration of the server.

The ILOM firmware is pre-installed and initializes as soon as power is applied to the system.

ILOM enables you to monitor and control your server over an Ethernet connection (supports SSH), or by using a dedicated serial port for connection to a terminal or terminal server. ILOM provides a command-line interface, a browser-based interface, IPMI interface and SNMP interface that you can use to remotely administer geographically distributed or physically inaccessible machines. In addition, ILOM enables you to remotely change server state (power on, power off, etc), configure the server to run diagnostics (such as POST) and allows users to connect to a read/write server console stream where users can view execution of POST, OBP and booting OS.

ILOM maintains an event log where important server events (IE: server state changes, failures, etc.) and ILOM events are recorded. In addition, ILOM can be configured to send some or all of these events via email if desired. The ILOM circuitry runs independently of the server, using the server's standby power. Therefore, ILOM continues to function when the server operating system goes offline or when the server is powered off. ILOM monitors the following Sun SPARC Enterprise T54400 server conditions:

- CPU temperature conditions
- Hard drive status
- Enclosure thermal conditions
- Fan speed and status
- Power supply status
- Voltage conditions
- System faults

In addition to the ILOM CLI and BUI, you can set up ILOM to use an ALOM CMT compatibility CLI. The ALOM CLI provides commands that approximate the ALOM system controller interface used on some previous Sun servers.

# System Management

## ILOM Software

Although the SP hardware is functionally equivalent to the T1000/T2000 implementation, the software stack which runs on top of the hardware in the Sun SPARC Enterprise T5x20 has been changed from ALOM to ILOM – the Integrated Lights Out Manager.

The ILOM application is built on a Linux kernel. For the Sun SPARC Enterprise servers it is a SPARC port of the ILOM Service Processor application used on Sun x86 server platforms. Some of the key features of ILOM are:

- User CLI over asynchronous serial and Ethernet (SSH) interfaces
- ALOM-CMT CLI
- ILOM DMTF CLP CLI
- LDAP support
- RADIUS support
- Browser-based interfaces (BUI)
- Public SNMP v1/v2c/v3 interface for remote monitoring and control
- Managed system (host) interface to system status data

- Enclosure (environmental) monitoring and control
- Fan speed control
- OS (Solaris) watchdog, boot time-outs and Automatic Server Restart
- Managed system (host) firmware download, from the SP and from the host
- Dynamic FRUID support
- Event and console logging
- Event notifications (SNMP, email, CLI)
- Power state control
- IPMI support
- Pre-configured for "out of box" operation
- Service Processor Power On Self Test (POST) (ported from ALOM)
- Fault Monitoring

The following list highlights some specific items not supported by ILOM on SPARC:

- Telnet access (was supported by ALOM, not supported by ILOM)
- KVMS support (since KVMS is not supported by the hardware)
- LDoms management (other than setting the factory default LDoms configuration)

## Enclosure

## Sun SPARC Enterprise T5440

Sun SPARC Enterprise T5440 server is designed to fit into 4 RU within a standard 19” wide rack. The system chassis utilizes the proven design from the 4 RU chassis used in the Sun Fire X4500 and X4600 servers.

## Front View of the System

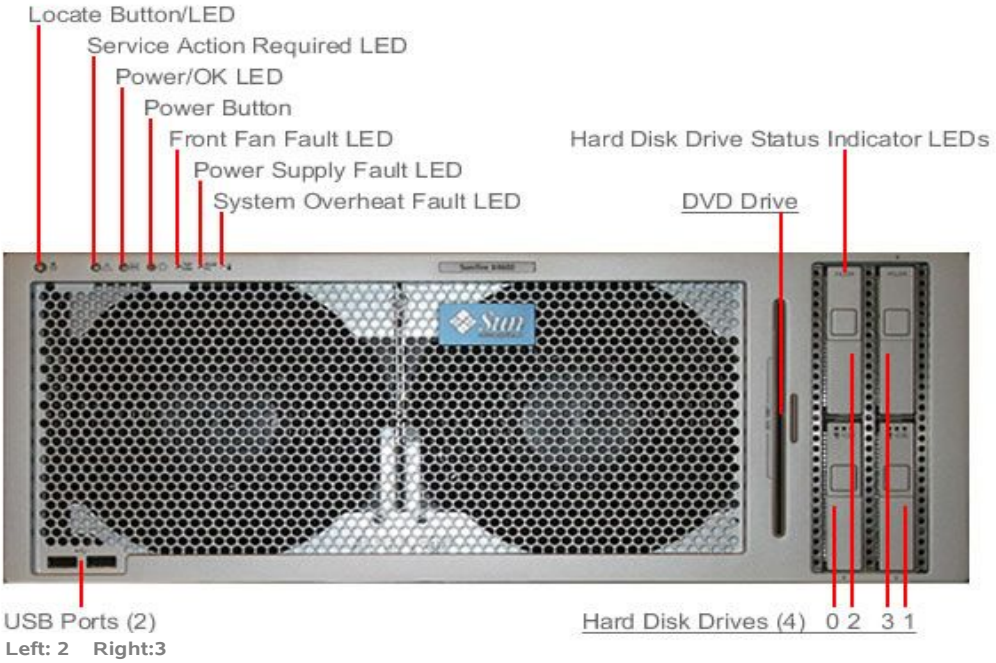



***Figure 10 – System Cabinet, Front View***

At the front of the system is the standard set of serviceability LED indicators and pushbuttons as defined in the VITA 40-2003 and Sun status indicator standards. The actual LEDs and pushbuttons are contained on boards within the chassis, and are viewed and/or actuated through lightpipes reaching to the front of the system. The following are implemented:

- white **Locator** indicator with integrated momentary **Locator** push button
- yellow **Service Required** indicator
- green **Power/Activity** indicator
- momentary **Power** push button
- yellow **Over Temperature** indicator
- yellow **Fan Fail** indicator
- yellow **Power Supply Fail** indicator

As Sun SPARC Enterprise T5440 sever system itself is not a hot-swap FRU, there is no blue **OK to Remove** indicator.

## Rear View of the System

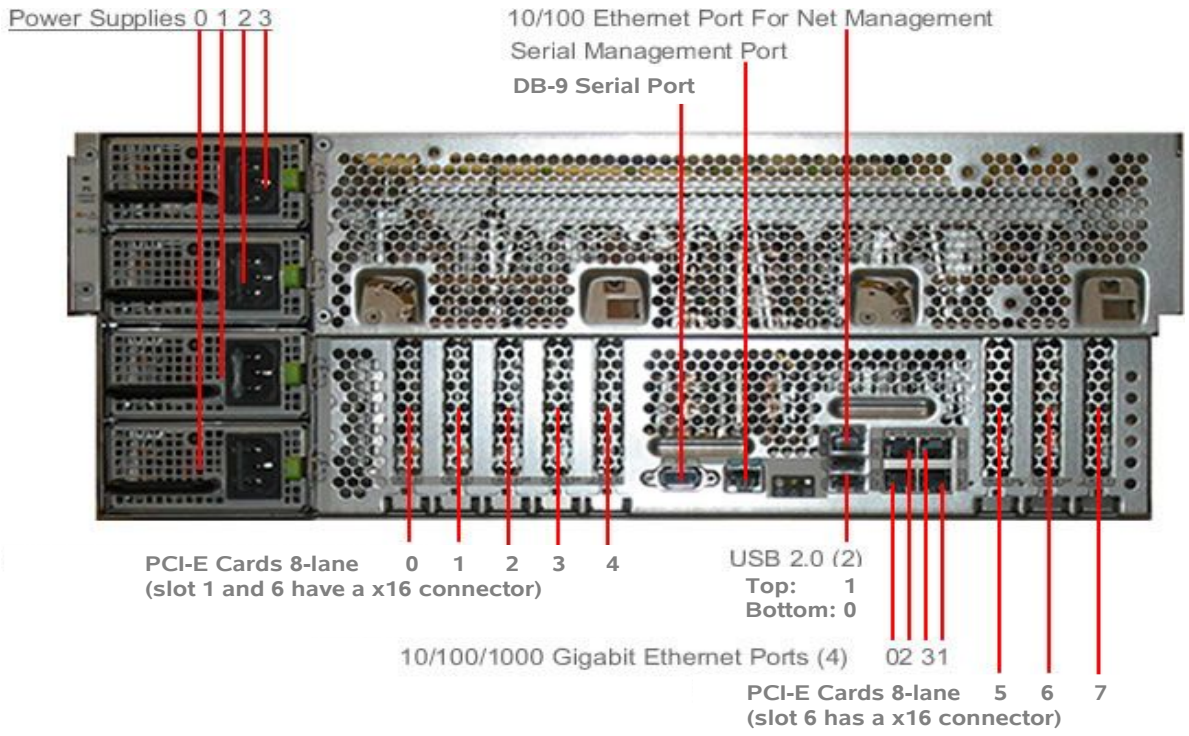



***Figure 11 – System Cabinet, Rear View***

At the rear of the system are power and I/O connections, including:

- 4 power supplies, each with an AC input power connector
- white **Locator** indicator with integrated momentary push button
- yellow **Service Required** indicator
- green **Power/Activity** indicator (but no push button)
- service processor RJ45 serial port and RJ45 10/100 Ethernet connector (management)
- 4 host RJ45 10/100/1000 Ethernet connectors
- 2 USB connectors
- host DB9 serial port connector
- eight low-profile PCI-E openings, two can also be used for optional XAUI 10GbE expansion cards

## Top View of the System

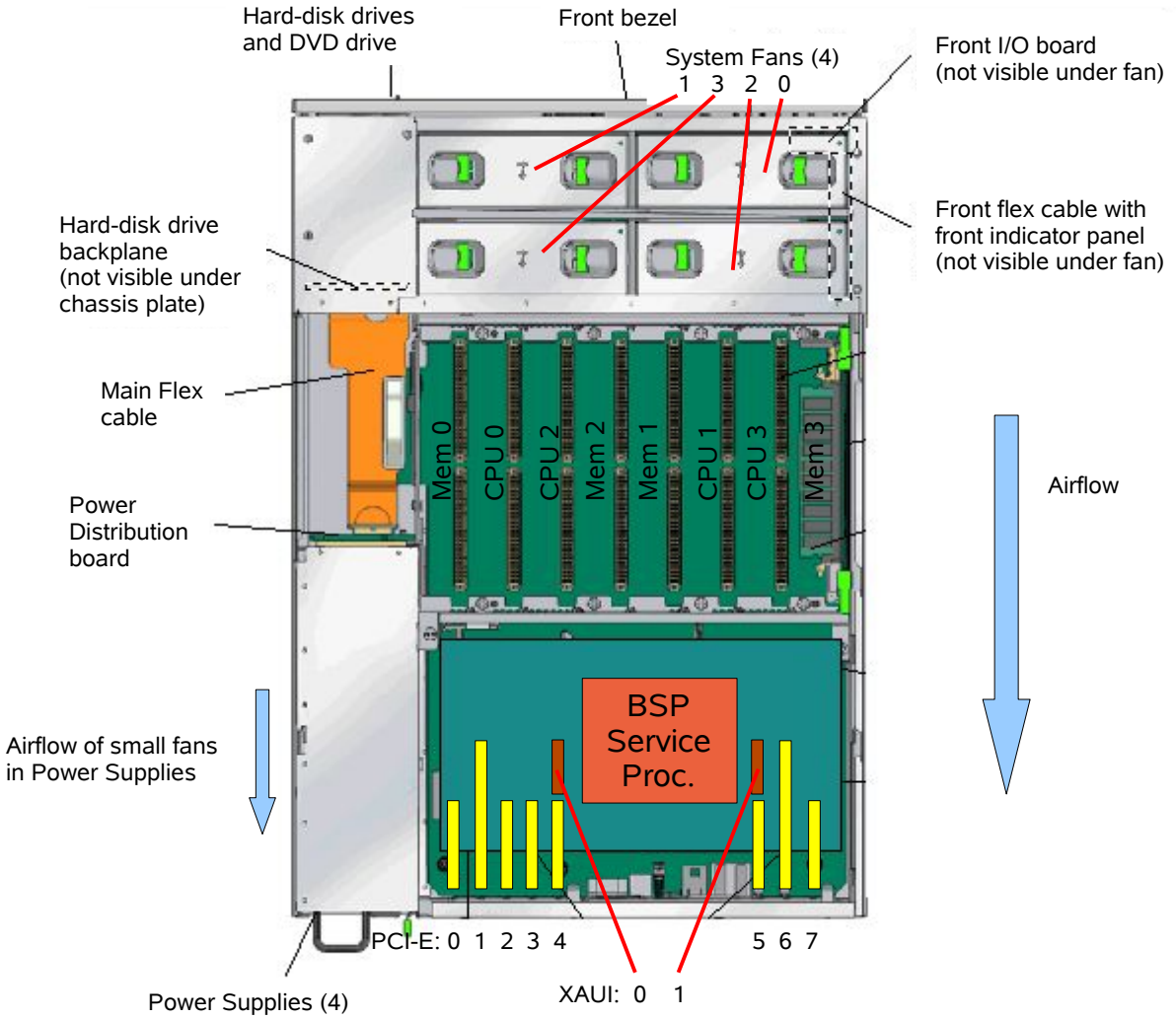



***Figure 12 – System Cabinet, Top View***

Each CPU board (CPU0 - CPU3) is paired with a corresponding expansion memory board (Mem0 - Mem3). A CPU board is not required to have its corresponding expansion memory board installed; however, all system offerings and upgrades include a memory expansion board for every processor module. All CPU boards are not required to be installed for the system to operate. If any CPU or memory board is not installed, a filler module must be installed in its place in order for the system to be cooled properly.

All eight PCIe slots are low profile and are wired to x8 PCIe lanes. Slot 1 and 6 are x16 connectors for low-profile graphics cards. The other six slots are x8 connectors. Slots 4 and 5 share the rear opening with optional XAUI (10g network) cards which plug in behind the PCI-E connectors. When the XAUI card is used, no PCIe card can be used in the corresponding PCIe slot.

Fans and power supplies are redundant. The four power supplies provide 2 + 2 redundancy. The system can

continue to operate at full capacity with any combination of two of the four power supplies, thereby covering a failure of an individual power supply or an entire circuit within the datacenter.

## Rackmounting Guidelines

The rackmount/rail kit offered for the Sun SPARC Enterprise T5440 server is intended for use in an EIA standard rack with rail to rail depth between 25 1/2 and 34 1/8 inches. The cabinet has been designed to fit within 4 RU. While the rackmount kit and server have been tested within a limited number of EIA standard racks/cabinets, variances in individual racks may influence the positioning and number of servers that may be installed within any particular rack.

The factors influencing the number of servers that may be installed within a particular rack include available power and cooling, clearances within the rack/cabinet for doors/panels, power distribution and cable management, adjacent equipment and method of mounting, vertical tolerances and positioning of equipment, access requirements, etc.

Please note that rackmount kit does not accommodate either the SG-(X)ARY030A, the 72-inch Sun StorEdge expansion cabinet, or the SF-(X)CAB, Sun Fire Expansion rack

## High Levels of System Reliability, Availability, and Serviceability

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

To deliver high levels of reliability, availability, and serviceability, the Sun SPARC Enterprise T5440 server offer the following features:

- Up to 2.5x fewer parts than competitive platforms, serving to improve reliability
- Ability to disable individual threads and cores without rebooting
- Lower heat generation reduces hardware failures
- Four hot-plug hard drives
- Internal disk controller with hardware RAID 1 support (mirroring)
- Four redundant, hot-swap power supplies (2 + 2 redundancy when distributed over two power circuits)
- Redundant hot-swap fan units
- Environmental monitoring
- Error detection and correction for improved data integrity
- Easy access for most component replacements

## Hot-Pluggable and Hot-Swappable Components

Sun SPARC Enterprise T5440 server is designed to support hot-plug of hard drives, hot-swap of fan units and power supplies. Hot swap of the power supplies and fans requires no preparation or notification to the system. Similarly, if hard drives are mirrored, no action is required. Otherwise, all file systems associated with a disk should be dismounted prior to removing the disk drive.

## Power Supply Redundancy

The Sun SPARC Enterprise T5440 servers provide four hot-swap power supplies providing continuous operation should one of the power supplies or a power circuit fail.

## Environmental Monitoring

The Sun SPARC Enterprise T5440 servers feature an environmental monitoring subsystem that protects the server and its components against:

- Extreme temperatures
- Lack of adequate airflow through the system
- Power supply failures
- Hardware faults

Temperature sensors are located throughout the system to monitor the ambient temperature of the system and internal components. The software and hardware ensure that the temperatures within the enclosure do not exceed predetermined safe operation ranges. If the temperature observed by a sensor falls below a low-temperature threshold or rises above a high-temperature threshold, the monitoring subsystem software will generate an alert indicating a temperature warning. If the temperature condition persists and reaches a critical threshold, the monitoring subsystem lights the amber Service Required LEDs on the front and back panel and initiates a system shutdown. In the event of a failure of the system controller, backup sensors protect the system from serious damage, by initiating a forced hardware shutdown. Required LEDs remain lit after an automatic system shutdown to aid in problem diagnosis. The power subsystem is monitored in a similar fashion by monitoring power supplies and reporting any fault in the front and rear panel LEDs.

## Support for RAID Storage Configurations

Hardware RAID 1 (mirroring) and hardware RAID 0 (striping) configurations for any pair of internal hard drives are available in order to provide a high-performance solution for hard drive mirroring. By attaching one or more external storage devices to the Sun SPARC Enterprise T5440 server, one can use a redundant array of independent drives (RAID) software application such as Solaris Volume Manager™ (SVM) or VERITAS Volume Manager to configure system drive storage in a variety of different RAID levels.

## Error Correction and Parity Checking

The UltraSPARC T2 Plus CMT processor provides parity protection on its internal cache memories, including tag parity and data parity on the D-cache and I-cache. The internal L2 cache has parity protection on the tags, and ECC protection on the data. Advanced ECC corrects up to 4 bits in error on nibble boundaries, as long as they are all in the same DRAM. If a DRAM fails, the FB-DIMM continues to function.

## Fault Management and Predictive Self Healing

The Sun SPARC Enterprise T5440 server provide the latest fault management technologies. The Solaris 10 OS architecture provides a means for building and deploying systems and services capable of *predictive self-healing*. Self healing technology enables systems to accurately predict component failures and mitigate many serious problems before they actually occur. This technology is incorporated into both the hardware and software of the Sun SPARC Enterprise T5440 Server.

At the heart of the predictive self-healing capabilities is the Solaris™ Fault Manager Architecture (FMA), a service that receives data relating to hardware and software errors, and automatically diagnoses the underlying problem. Once a problem is diagnosed, a set of agents automatically responds by logging the event, and if necessary, takes the faulty component offline. By automatically diagnosing problems, business-critical applications and essential system services can continue uninterrupted in the event of software failures, or major hardware component failures.

# Software

The Sun SPARC Enterprise T5440 server requires the Solaris 10 5/08 OS plus patches or later.

The Sun SPARC Enterprise T54400 system is shipped with a pre-installed disk image consisting of a Solaris 10 8/07 OS, including all components installed by the "Entire Distribution plus OEM support" option, Logical Domains Manager 1.0.3, Studio 12 and the Sun Java Enterprise System Release 5. After performing minimal configuration, the user can evaluate the products or even create a full deployment. Sun Java Enterprise System is a full version of the infrastructure software system which includes all component products needed for a full commercial deployment. The license that accompanies the pre-installed software allows for a free 90 day evaluation.

A custom installation may be performed. Please refer to the following link for specific software version and part number:

http://mysales.central.sun.com/public/configGuide/

## Solaris 10 Operating System

For customers, the Solaris 10 OS will drive significant and measurable cost savings through increased performance - allowing customers to do more with less (or to do more with what they already have) with increased simplicity and ease of administration.

Solaris 10 works to ensure that customer applications and platforms stay up and running giving them increased utilization of their IT assets. Improved security ensures that their IT assets are protected leading to ease of mind.

The Solaris 10 OS is free to use for any end user, requiring only a simple registration. For those who want enhanced support, access to fixes, and training, there are multiple support options available at competitive prices. Thus, the Solaris 10 software offers customers the ability and the flexibility to pay for only what they need, while making use of Solaris' advanced technologies.

In short, ground-breaking innovations of Solaris 10 save customers significant and measurable time and money when deploying, operating, and managing their IT infrastructure.

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

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

- Stability, high performance, scalability, and precision of a mature 64-bit operating system
- Trusted Extensions – Advanced security features designed to protect the enterprise at multiple levels.
- Network Performance – Completely rewritten TCP/IP stack dramatically improves the performance and scalability for network services.

The Solaris 10 OS has been optimized for CMT. Below are some of the many features to take advantage of this technology:

- CMT-smart scheduler balances load
- Highly-threaded kernel and device drivers
- Fast, efficient thread implementation
- Virtualization and resource management
- Large page support throughput
- New IP network stack architecture, CMT-aware device drivers
- Optimized encryption framework and implementation
- Enhancements in UltraSPARC T2 / UltraSPARC T2 Plus for crypto, NIU, load balancing, scheduling and caching

## Sun Management Center

The Sun Management Center software platform is an element management solution that is based on open standards such as SNMP. The software allows for a rich set of features that enables the complete modeling of Sun hardware and software solutions. It provides the most comprehensive instrumentation and administrative knowledge for Sun environments, and open interfaces that enable information to be shared with other management platforms. The net result is systems management becomes easier, and the overall cost of operations lower.

Support for hardware monitoring within the Sun Management Center environment is achieved through the use of appropriate hardware platform module add-on software called configuration reader (config-reader), which presents hardware-configuration and fault-reporting information to the Sun Management Center management server and console.

The add-on software is released as a web download. You must have the current version of Sun Management Center 3.6 or 3.6.1 installed before you install one of the add-ons. You should install only the add-on software needed for the platforms you intend to manage.

Please refer to the alphabetized list available via the Sun Download Center
http://www.sun.com/download/index.jsp?tab=2

Sun Management Center 3.6 Version 7 Add-on software is the minimum version required by Sun SPARC Enterprise T5440 server.

## Sun SNMP Management Agent

The Sun SNMP Management Agent enables access to system inventory and monitoring and provides support for alarms, using the industry standard management protocol Simple Network Management Protocol (SNMP). The agent supports SNMP v1, SNMP v2c and SNMP v3 to enable interoperability with all common management applications. The provision of SNMP v3 enables management accesses to be fully authenticated and secured.

The agent provides a management model SUN-PLATFORM-MIB which is based on the standard ENTITY-MIB, and is augmented by extensions that provide further information dependent on the component being represented. These extensions are based on the generic network information model (NIM) presented in ITU-T M.3100 with further extensions taken from attributes defined by the common information model (CIM) v2.5 schema. These MIBs are supported on other platforms, enabling common management solutions to be developed.

Please refer to the alphabetized list available via the Sun Download Center
http://www.sun.com/download/index.jsp?tab=2

for SNMP Management Agent 1.5.2.

## Sun Cluster Licensing

Part numbers for Sun Cluster software for Sun SPARC Enterprise T5440 server:

CLUIS-320-AG29 for Sun Cluster 3.2
CLUIS-310-AG29 for Sun Cluster 3.1

# Specifications

## Physical Specifications

| Description | U.S. | International |
|---|---|---|
| Height (4 RU – rack units) | 6.92 inches | 176 mm |
| Width | 17.5 inches | 445 mm |
| Depth | 24.9 inches | 633 mm |
| Weight, approximate maximum (without PCI cards, rack mounts or shipping materials), including<br>- 4 processors,<br>- 64 – 4 GB FB-DIMMs and<br>- 4 – 146 GB disk drives | 88 lb. | 40 kg |

**Note:** The additional depth required for the CMA, at its closed position, is 6.7 inches, 175 mm

## Clearance for Service Access

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

## Environment Specifications

| Specification | Operating | Non-Operating |
|---|---|---|
| **Temperature**<br>**Sea Level to 2,953 ft. (900 m)**<br><br>**Above 2,953 ft. (900 m)** | 41° to 95° F. (5° to 35°C)<br><br>Decrease maximum temperature as altitude increases, 1.6° F/1,000 ft. (1° C/300 m)<br><br>IEC 60068-2-1 Test Ad, and 60068-2-2 Test Bd | -40° F to 149° F (-40° to 65° C)<br><br>-40° to 60° C<br>Maximum altitude 40,000 feet<br><br>IEC 60068-2-1 Test Ad, and 60068-2-2 Test Bd |
| **Relative Humidity** | 10 to 90% relative humidity, non-condensing, 27°C wet bulb<br><br>IEC 60068-2-56 Test Cb | 93% relative humidity 35°C, non-condensing,<br><br>IEC 60068-2-56 Test Cb |
| **Altitude** | 0 - 10,000 feet (0 - 3,000 meters)<br><br>IEC 60068-2-13 Test M, and 60068-2-41 Test Z/BM | 0 - 40,000 feet (0 - 12,000 meters)<br><br>IEC 60068-2-13 Test M |
| **Vibration** | 0.15G (z-axis), 0.10G (x,y axes) 5 - 500 Hz swept sine | 0.5G (z-axis), 0.25G (x, y axes) 5 - 500 Hz swept sine |

| Specification | Operating | Non-Operating |
|---|---|---|
| | IEC 60068-2-6 Test Fc | IEC 60068-2-6 Test Fc |
| **Operating Shock** | 3 G, 11 ms half-sine<br><br>IEC 60068-2-27 Test Ea | 1-inch roll-off free fall, front-to-back rolling directions,<br>25 mm threshold height at 0.75 m/s impact velocity<br><br>ETE-1010-02 Rev A |

## Power Source Requirements

The Sun SPARC Enterprise T5440 server has four autoranging power supplies. To ensure redundant operation of the power supplies, the four power cords should be equally distributed over two separate AC circuits.

| Description | Specification |
|---|---|
| Operating input voltage range – 110 VAC | 100 to 240 VAC, 50-60 Hz (input voltage tolerance +/- 10%) |
| Maximum operating input current at 100 VAC* | 27.00 A |
| Maximum operating input current at 200 VAC* | 13.25 A |
| Maximum operating input power at 100 VAC | 2,700 W |
| Maximum heat dissipation | 9,212.8 BTU/hour or 9720 KJ/hour |
| Maximum standby power | 70 W |
| Maximum Server Configuration Specifications<br>Under Nominal Temperature and Voltage Conditions<br>4 processor/memory modules, 1.6 GHz, 32 cores (8 cores each), 64 x 4 GB FB-DIMMs at 800 MHz, 4 disk, 8 PCIe I/O cards | |
| Idle AC Input Power | 1,671 W |
| Peak AC input power running SpecJBB | 2,213 W |
| Minimum Server Configuration Specifications<br>Under Nominal Temperature and Voltage Conditions<br>2 processor/memory modules, 1.2GHz, 16 cores (8 cores each), 8 x 2 GB FB-DIMMs, no disks, no I/O cards | |
| Idle AC Input Power | 495 W |
| Peak AC input power running SpecJBB | 590 W |

* The maximum operating input current values are based on P/V using these two equations:

- [90-120 V] P = 3316 - 6.87 * V  Example: I = 22.0 A @ 115 V or 11.0 A per line cord with 2 PSUs active
- [200-240 V] P = 2447 + 0.375 * V  Example: I = 12.0 A @ 210 V or 6.0 A per line cord with 2 PSUs active

## Acoustic Noise Emissions

These are the acoustic noise emissions of a Sun SPARC Enterprise T5440 server. Declared noise emissions are in accordance with ISO 9296 standards.

| Description | Mode | Specification |
|---|---|---|
| LwAd (1 B = 10 dB) | Operating acoustic noise @ 100% fan speed<br>Idling acoustic noise | 8.9 B<br>7.4 B |
| LpAm (bystander positions) | Operating acoustic noise @ 100% fan speed<br>Idling acoustic noise | 80 dB<br>63 dB |

## Agency Compliance Specifications

The Sun SPARC Enterprise T5440 server complies with the following specifications.

| Category | Relevant Standards |
|---|---|
| Safety | UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all country deviations, IEC825-1,2<br>CFR21 part 1040, CNS14336 |
| Ergonomics | EK1-ITB-2000 |
| EMI/EMC | EN55022 Class A, 47 CFR 15B Class A, ICES-003 Class A, VCCI Class A, AS/NZ3548 Class A<br>CNS 13438 Class A<br>KSC 5858 Class A, EN61000-3-2, EN61000-3-3 |
| Immunity | EN55024<br>IEC 61000-4-2<br>IEC 61000-4-3<br>IEC 61000-4-4<br>IEC 61000-4-5<br>IEC 61000-4-6<br>IEC 61000-4-8<br>IEC 61000-4-11 |
| Regulatory Markings (pending) | CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, MIC, UL/cUL, UL/S-mark |

# Guidelines for Configurations

## Introduction

The System Block Diagram provided in the System Architecture section provides the physical representation of the system. For each processor module present, there is an associated memory expansion module.

The processor and associated memory expansion module may be represented by the following logical diagram.

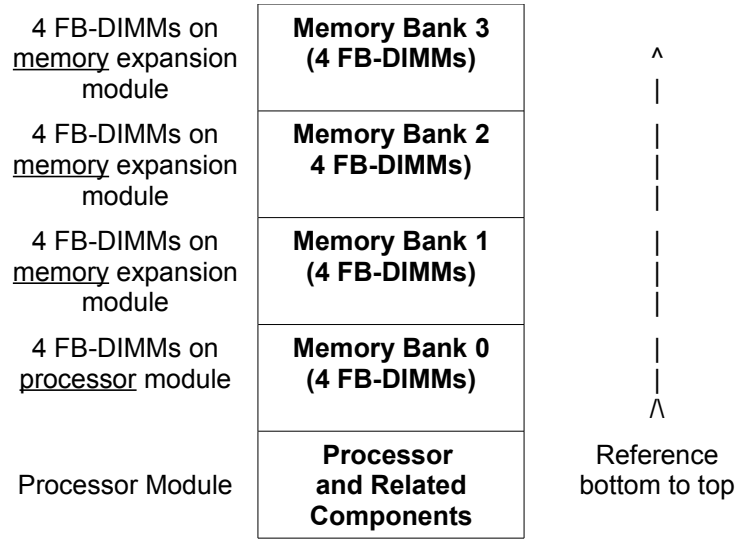



***Figure 13 – Logical Representation of One Processor and Associated Memory Expansion Module***

(A reference to processor module includes the associated memory expansion module, per the logical representation.)

Configurations will influence

- Performance
- Failover characteristics
- Total system cost

All standard configurations provide 'balanced' systems whereby

- the total amount of memory is uniformly distributed across all processor modules
- all FB-DIMMs within the system are of the same capacity
- all processor modules have the same number of cores

In comparison, having significantly more memory on a subset of the processor modules may

- increase memory latency, and
- limit the Automatic System Recovery (ASR) code from optimizing the restored system until failed components can be replaced. As the memory controller is integrated onto the processor, failure of a processor module will remove all local memory, including that on the associated memory expansion module.

Decisions affecting configuration will be influenced by price/performance characteristics of the options available, especially for upgrades. Nevertheless, it is encouraged that all ATO orders and upgrades attempt to balance system resources toward maintaining optimal performance.

## Processor Considerations

- All processors within a system must operate at the same speed, either 1.2, 1.4 or 1.6 Ghz
- While not absolutely required, processor modules should be installed in the order of slot 0, followed by slots 1, 2 and finally 3.
  **Note:** If a processor is not installed in slot 0, or if that processor fails, then the DB9 serial port will not function

## Memory Considerations

Every standard configuration provides exactly eight empty FB-DIMM slots on each processor module, per the logical representation.

It is always possible to at least double the amount of memory for any processor, or the entire system, without the replacement of FB-DIMMs. If it is anticipated that the memory requirements will exceed twice the starting capacity, one should consider ordering a system that utilizes higher capacity memory FB-DIMMs, either 4 or 8 GB.

The rules for populating memory are noted:

- Banks consist of four FB-DIMMs and must be populated completely, never partially
- All FB-DIMMs on an individual processor and associated memory expansion module must be of the same capacity, either 2 GB, 4 GB or 8 GB per FB-DIMM.
- Bank 0 must always be populated as provided by the standard configurations, X-options and ATO options.
- The number of FB-DIMMs installed on a processor and its associated memory expansion module must be either 4, 8 or 16. Any other combinations, especially twelve, are not supported.
- Memory bank 1 must be populated before banks 2 and 3
- Memory banks 2 and 3 must be populated simultaneously and completely
- 4 GB FB-DIMMs at 800 Mhz are available for 1.6 Ghz systems only and may not be mixed with other FB-DIMMs of different speed within the same system

**Notes:**

- One processor configurations should not utilize PCIe slots 4 – 7 except for XAUI. Please reference the revised *PCIe Slot Guidelines* section. This restriction reflects the number of PCIe bridges required to access these PCIe slots and the probe depth and width of the OBP boot firmware. Similar to the considerations for the I/O Expansion Module, there is a finite limit to the attempts by the firmware in probing for adapters to configure.

- Three processor configurations require firmware 7.1.7.d or later and Solaris patch 138888-01. Please refer to the *Product Notes* for details. These updates also allow different amounts of memory to be configured onto different processor and memory module pairings thereby removing an earlier restriction.

For any processor and memory expansion module combination, there are exactly nine supported memory configurations.

| | Bank 1, if filled, must contain FB-DIMMs of the same capacity as Bank 0 | | Either empty or completely filled. Must have the FB-DIMMs of the same capacity as Banks 0 and 1 | |
|---|---|---|---|---|
| | **Memory Bank 0** | **Memory Bank 1** | **Memory Bank 2** | **Memory Bank 3** |
| Config. 1 | 4 x 2 GB | -- | -- | -- |
| Config. 2 | 4 x 2 GB | 4 x 2 GB | -- | -- |
| Config. 3 | 4 x 2 GB | 4 x 2 GB | 4 x 2 GB | 4 x 2 GB |
| Config. 4 | 4 x 4 GB | -- | -- | -- |
| Config. 5 | 4 x 4 GB | 4 x 4 GB | -- | -- |
| Config. 6 | 4 x 4 GB | 4 x 4 GB | 4 x 4 GB | 4 x 4 GB |
| Config. 7 | 4 x 8 GB | -- | -- | -- |
| Config. 8 | 4 x 8 GB | 4 x 8 GB | -- | -- |
| Config. 9 | 4 x 8 GB | 4 x 8 GB | 4 x 8 GB | 4 x 8 GB |

***Figure 14 - Supported Memory Configurations per Processor Module***

## ATO Configurations for Processors and Memory

As mentioned above, the 'balanced' system approach is recommended, i.e.

- All processors having the same amount of memory

When an ATO order is received that mixes processor cores and/or amounts of memory then the following assembly rules will be applied:

1. The ranking will be ordered by memory capacity with the highest amount of memory installed with processor(s) in the lower positions.

   For example, a processor at 1.2 Ghz with 16 GB of memory will be installed in position 0 followed by a processor at 1.2 Ghz with 8 GB of memory installed in position 1

2. When additional memory is ordered via ATO, then an attempt will be made to uniformly distribute it across all processor and the associated memory expansion modules to maintain the 'balanced' system approach. Obviously, the number of available positions for the extra memory may be limited as:
   - All memory FB-DIMMs on a processor module and the associated memory expansion module must be of the same capacity
   - Only 4, 8 and 16 FB-DIMMs per processor and associated memory expansion module are supported

3. Any additional memory that cannot be evenly distributed will be then placed onto the processor and associated memory expansion module in the lower positions

4. ATO memory options that cannot be installed in accordance with configuration requirements will force the entire order to be rejected. Memory beyond that which can installed by manufacturing should be specified by X-options.

### Memory Expansion Possibilities

This chart provides the supported options for upgrading an individual processor and associated memory expansion module.

| *Total Memory Capacity GB (Initial Capacity)* | *Total Number of FB-DIMM Slots Occupied* | *Number of 2 GB FB-DIMMs* | *Number of 4 GB FB-DIMMs* | Number of 8 GB FB-DIMMs | Expansion Option(s) in GB | *Add the number of FB-DIMMs specified in a row* | | | Total Memory Capacity GB (Ending Capacity) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Number of 2 GB FB-DIMMs* | Number of 4 GB FB-DIMMs | Number of 8 GB FB-DIMMs | |
| 8 | 4 | 4 | -- | -- | 8 | 4 | -- | -- | 16 |
| 8 | 4 | 4 | -- | -- | 24 | 12 | -- | -- | 32 |
| 16 | 8 | 8 | -- | -- | 16 | 8 | -- | -- | 32 |
| 32 | 16 | 16 | -- | -- | -- | -- | -- | -- | 32 |
| 16 | 4 | -- | 4 | -- | 16 | -- | 4 | -- | 32 |
| 16 | 4 | -- | 4 | -- | 48 | -- | 12 | -- | 64 |
| 32 | 8 | -- | 8 | -- | 32 | -- | 8 | -- | 64 |
| 64 | 16 | -- | 16 | -- | -- | -- | -- | -- | 64 |
| 32 | 4 | -- | -- | 4 | 32 | -- | -- | 4 | 64 |
| 64 | 8 | -- | -- | 8 | 64 | -- | -- | 8 | 128 |
| 128 | 16 | -- | -- | 16 | -- | -- | -- | -- | 128 |

***Figure 15 – Memory Expansion Possibilities per Processor and Associated Memory Expansion Module***

## I/O Adapter Considerations

The table of supported adapters and the maximum numbers listed for each type in the section entitled *Ordering Information* does not ensure that the system can drive all interfaces at maximum, sustained rates. The numbers listed are guidelines that anticipate configurations for redundancy and partitioned networks or storage arrays.

Whenever options are added to an existing system, even to those systems which have just been configured through the manufacturing process, it is encouraged that customers review all PCIe slot allocations for compliance with the PCIe Slot Guidelines that follow. The addition of adapter(s) may encourage a reconfiguration for optimal performance. The factory build process for ATO does not anticipate the placement of additional adapters into the system.

# PCIe Slot Guidelines (including External I/O Expansion Module)

- Definitions
    - 1P means a T5440 server with 1 CMP module (CMP0)
    - 2P means a T5440 server with 2 CMP modules (CMP0, CMP1)
    - 3P means a T5440 server with 3 CMP modules (CMP0, CMP1, CMP2)
    - 4P means a T5440 server with 4 CMP modules (CMP0, CMP1, CMP2, CMP3)

1. Install XAUI Cards first
   SESY7XA1Z (10 GbE XAUI card, single port - Fiber)
   Install in this order (maximum 2) PCIe Slot: (4, 5)

For a 1P, do not populate slots (4, 5, 6, 7) with any cards (except for XAUI cards in 4, 5)

2. Install I/O Box(I/O Boat) PCIe Link cards if this configs. will use any External I/O Boxes
   SENY8BE1Z, SENY8TE1Z (External IO Expansion Unit - PCI-E Base config.)
   Install in this order
   4P (max. 4) PCIe Slot: (0, 4, 2, 6, 5)
   3P (max. 3) PCIe Slot: (0, 4, 2, 5)
   2P (max. 2) PCIe Slot: (0, 4, 5)
   1P (max. 1) PCIe Slot: (0)
   Note: IO/Box (I/O Boat) Link cards must be placed in a PCIe slot with a CMP module present as follows
   PCIe Slots 0, 1 require CMP0
   PCIe Slots 4, 5 require CMP1
   PCIe Slots 2, 3 require CMP2
   PCIe Slots 6, 7 require CMP3
   Note: These cards may not be installed in the I/O Box
   (X)6000A (Sun Crypto Accelerator 6000)
   (X)3000A (XVR-300 low-profile, PCIe x8 graphics adapter)
   (X)1027A-Z (Atlas PCIe Dual Port 10 GigE Low Profile)

The intention of the rest of these guidelines (3 - 8) is to spread out the PCIe options across the CMP modules to try to balance the IO load of a large system. These are guidelines, not restrictions. In the steps below if a slot is already populated from a previous step, skip that slot and move to the next one.

Configuration Guidelines, populate numbered groups of options below in this order of priority (3, 4, 5, 6, 7, 8)

3. Crypto, Raid controllers
   (X)6000A (Sun Crypto Accelerator 6000)
   SG-(X)PCIESAS-R-EXT-Z (SAS 8 port RAID controller; Intel (GA 2QCY07) - Prometheus)
   Install in this order:
   4P (max. 2) PCIe Slot: (0, 4, 2, 6, 1, 5, 3, 7)
   3P (max. 2) PCIe Slot: (0, 4, 2, 1, 5, 3)
   2P (max. 2) PCIe Slot: (0, 4, 1, 5, 2, 6)
   1P (max. 2) PCIe Slot: (0, 1, 2, 3)

4. Graphics Interfaces
   (X)3000A (XVR-300 low-profile, PCIe x8 graphics adapter)
   Install in this order:

4P (max.. 4) PCIe Slot: (0, 4, 2, 6, 1, 5, 3, 7)
3P (max.. 4) PCIe Slot: (0, 4, 2, 1, 5, 3, 6, 7)
2P (max. 4) PCIe Slot: (0, 4, 1, 5, 2, 6, 3, 7)
1P (max. 4) PCIe Slot: (0, 1, 2, 3)

5. Atlas and InfiniBand Networking Interfaces
(X)4447A-Z (Atlas, PCI-E Quad port GigE – copper)
(X)1027A-Z (Atlas PCI-E Dual Port 10GigE Low Profile)
(X)1236A-Z (Dual Port 4x IB host channel adapter – low-profile)
Install in this order:
4P (max. 4) PCIe Slot: (0, 4, 2, 6, 1, 5, 3, 7)
3P (max. 4) PCIe Slot: (0, 4, 2, 1, 5, 3, 6, 7)
2P (max. 4) PCIe Slot: (0, 4, 1, 5, 2, 6, 3, 7)
1P (max. 4) PCIe Slot: (0, 1, 2, 3)

6. Storage Interfaces (SAS)
SG-(X)PCIE8SAS-E-Z (SAS, 8 port, PCI-E - Pandora)
Install in this order
4P (max. 8) PCIe Slot: (0,4,2,6,1,5,3,7)
3P (max. 8) PCIe Slot: (0,4,2,1,5,3,6,7)
2P (max. 8) PCIe Slot: (0,4,1,5,2,6,3,7)
1P (max. 4) PCIe Slot: (0,1,2,3)

7. Storage Interfaces (others)
SG-(X)PCIE*FC-QF4 (Qlogic, 4Gb PCI-E single/dual port)
SG-(X)PCIE*FC-EM4 (Emulex, 4Gb PCI-E single/dual port)
SG-(X)PCIE2SCSI U320Z (U320 SCSI, PCI-E dual port)
Install in this order
4P (max. 8) PCIe Slot: (0, 4, 2, 6, 1, 5, 3, 7)
3P (max. 8) PCIe Slot: (0, 4, 2, 1, 5, 3, 6, 7)
2P (max. 8) PCIe Slot: (0, 4, 1, 5, 2, 6, 3, 7)
1P (max. 4) PCIe Slot: (0, 1, 2, 3)

8. Dual-port Networking Interfaces
(X)7280A-2 (Northstar, Dual Port GigE UTP Low-profile)
(X)7281A-2 (Northstar, Dual Port GigE MMF Low-profile)
Install in this order
4P (max. 8) PCIe Slot: (0, 4, 2, 6, 1, 5, 3, 7)
3P (max. 8) PCIe Slot: (0, 4, 2, 1, 5, 3, 6, 7)
2P (max. 8) PCIe Slot: (0, 4, 1, 5, 2, 6, 3, 7)
1P (max. 4) PCIe Slot: (0, 1, 2, 3)

# Ordering Information

**Note:** New, 1.6 Ghz offerings highlighted with yellow background.

## Standard Components

All systems, regardless or ordering process or method, include:

- One 4 RU chassis including all necessary electrical components
- Four - 1 Gb/sec. (10/100/1000 Mbs) Ethernet ports
- Integrated Lights Out Manager (ILOM) with dedicated 100 Base-T (10/100 Mbs) Ethernet port and serial management port
- Eight PCIe slots, all 8-lanes wide, all low-profile slots:
  - Four PCIe slots (x8),
  - Two PCIe slots (x8) with x16 connectors (x16), and
  - Two PCIe (x8) shared with XAUI, 10 Gb/sec. networking interface
- Four USB ports, two on the front panel and two on the rear panel
- One RS-232/DB-9 serial port
- Four hot-swap, 1,120 watt AC power supplies providing 2+2 redundancy when distributed equally over two independent power circuits
- Redundant (N+1), hot-swap fans
- Integrated disk controller supporting SAS/SATA disk drives with integrated RAID 0 and 1
- One year, next business day, on-site warranty for hardware; 90 days on software
- Four power cords, specified separately for geographic considerations, one for each power supply

All systems are built so that they can be delivered and installed in any geography worldwide. The only differences are related to power cords and ship kits. Consequently, power cords and ship kits are delivered with the systems but in separate packages.

## Standard Configurations (PTOs)

Standard configurations offer popularly configured systems as a single line item for the convenience of customers, sales, and operation/manufacturing. Sun Microsystems generally maintains an inventory of these systems to minimize delivery times based upon their popularity with the vast majority of customers.

To any standard configuration, X-options may be added. However, they will not be integrated within the factory.

All standard configurations include:

- One slimline, slot-loaded DVD ±R/W drive
- Two 146 GB, 2.5”, 10,000 RPM, SAS disks
- One rackmount kit
- One cable management arm

### Original Standard Configurations

The following configurations will be retired with the announcement of the new ones.

| Part Number | Description | *Comments* |
|---|---|---|
| SEVPCJF1Z | 2 x 1.2 Ghz, 8 core processors/sockets, 4 RU Chassis, 16 x 2 GB FB-DIMMS, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim DVD ±RW, 2 memory expansion boards (one for each processor module). Mfg. part 602-4513 | ***Last order date Oct. 2009*** |
| SEVPGLF1Z | 4 x 1.2 GHz 8 core processors/sockets, 4U Chassis, 32 x 2 GB FB-DIMMS, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim DVD ±RW, 4 memory expansion boards (one for each processor module) | ***Last order date Oct. 2009*** |
| SEVPHSF1Z | 4 x 1.4 Ghz, 8 core processors/sockets, 4U Chassis, 32 x 4GB FB-DIMMS, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim DVD ±RW, 4 memory expansion boards (one for each processor module) | ***Last order date Oct. 2009*** |

These systems ship with the following software:

- Solaris 10 5/08 O/S plus patches
- Sun Studio 12
- Logical Domains Manager 1.0.2
- Logical Domains MIB 1.0.1 U1
- Sun Java Enterprise System 5 U1
- GCC for SPARC Systems Version [4.0.4]
- CMT Developer Tools Version [1.0]

## New Standard Configurations

These standard configurations will replace the original offerings listed above.

Part numbers still subject to review

| Part Number | Description | Comments |
|---|---|---|
| SEVPDJF2Z | 2 – 1.4 Ghz, 8 core, 32 GB (16 x 2 GB) 667 Mhz FB-DIMMs, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim SATA DVD RW, 2 memory expansion boards | **New entry PTO, announced July 21, 2009** |
| SEVPHSF2Z | 4 - 1.4 Ghz, 8 Core, 128 GB (32 x 4GB) 667 MHz FB-DIMMS, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim SATA DVD RW, 4 memory expansion boards | **Refreshed, previously was high-end, announced July 21, 2009** |
| SEVPJSF3Z<br>**(notice 3 in 8th position)** | 4 – 1.6 Ghz, 8 core, 128 GB (32 x 4 GB) 800 Mhz FB-DIMMs, 2 x 146 GB SAS 2.5" HDD, 4 x 1120 Watt PSU, Slim SATA DVD RW, 4 memory expansion boards | **New high-end PTO at 1.6 Ghz, announced July 21, 2009** |

Pre-installed software for the new systems includes:

– Solaris 10 5/09, (Upgrade 7)
  - Sun Studio 12
  - Logical Domains Manager 1.2, includes Logical Domains MIB
  - GCC for SPARC Systems Version[4.0.4]
  - CMT Developer Tools Version[1.0]
  - LiveUpgrade
  - Sys F/W Dowload Utility V1.5.0
  - MAI,10 GBE ETCSYS CFG
  - Electronic Prognostics 1.0

# ATO (Assemble-to-Order) Configurations

ATO configurations provide custom configurations that have been pre-assembled and pre-tested within the factory. Certain limitations apply, especially to the extent that external adapters can be tested for connectivity to equipment as found in the intended customer environment.

The ATO order must include:

- Base chassis
- One to four processor modules with various amounts of memory pre-installed. (Each processor module includes a memory expansion module required to accommodate up to twelve additional FB-DIMMs.)
- At least one disk drive
- Solaris operating system and other pre-installed/preloaded software
- Four power cords, specified separately for geographic considerations, one for each power supply

The optional items that may be specified with an ATO order include:

- Additional memory
- Additional disks with Nemo mounting bracket
- PCI adapters, the most popular as specified from a subset of those supported
- DVD ±R/W device
- Rackmount kit
- Cable management arm

**Note:** Only the most popular X-options are available for factory integration. Please refer to the section entitled *ATO (Assemble-to-Order) Configurations.*

## ATO Configuration Process Steps

**1. Specify the chassis**

- ***This part will be retired with the product update.***

| ATO Option | Description | Comments |
|---|---|---|
| SEVASY11Z | 4 RU chassis, including all common components, i.e. motherboard, disk controller, Ethernet ports, ILOM system management module, four power supplies, four fan trays.<br><br>**Note:** DVD, rackmount kit and cable management arm not | ***Retired with the new configurations and options. Last order date Oct. 23, 2009*** |

| ATO Option | Description | Comments |
|---|---|---|
| | included with chassis. May be ordered separately. | |

**New Base Chassis**

- **This part number will replace the existing base part number above, SEVASY11Z. This chassis is required for all ATO configurations at 1.6 Ghz.**

| Part Number | Description | Comments |
|---|---|---|
| SEVASY12Z<br><br>**(notice 2 in 8th position)** | Sun SPARC Enterprise T5440 Sever 4 RU Chassis, including common components: motherboard, four power supplies, four fans and service processor. Includes updated, ILOM 3 firmware.<br><br>CPUs, memory, disks, DVD, rackmount kit and cable management arm not included.<br><br>Solaris 10 5/08, SESY9SC1Z, not available with this chassis. | ***New*** |

**2. Select one to four processor modules**

- All processors within a system chassis must be of the same speed designation
- Please refer to the section entitled *Configuration Guidelines*

**Notes:**

- One processor configurations should not utilize PCIe slots 4 – 7 except for XAUI. Please reference the revised *PCIe Slot Guidelines* section. This restriction reflects the number of PCIe bridges required to access these PCIe slots and the probe depth and width of the OBP boot firmware. Similar to the considerations for the I/O Expansion Module, there is a finite limit to the attempts by the firmware in probing for adapters to configure.

- Three processor configurations require firmware 7.1.7.d or later and Solaris patch 138888-01. Please refer to http://sunsolve.sun.com and the *Product Notes* for details. These updates also allow different amounts of memory to be configured onto different processor modules thereby removing an earlier restriction.

Firmware 7.2.2.e or later is required for 1.6 Ghz systems. Please refer to the *Product Notes* for details.

| ATO Option | Description | Comments |
|---|---|---|
| **1.2 GHz, 8 core processor modules (single socket)** | | |
| SEVY1CB1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 8 GB, 4 - 2 GB FB-DIMMs, includes one memory expansion board | |
| SEVY1CC1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 16 GB, 4 - 4 GB FB-DIMMs, includes one memory expansion board | |
| SEVY1CD1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 32 GB, 4 - 8 GB FB-DIMMs, includes one memory expansion board | |
| **1.4 GHz, 8 core processor modules (single socket)** | | |

| ATO Option | Description | Comments |
|---|---|---|
| SEVY1DB1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 8 GB, 4 - 2 GB FB-DIMMs, includes one memory expansion board | |
| SEVY1DC1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 16 GB, 4 - 4 GB FB-DIMMs, includes one memory expansion board | |
| SEVY1DD1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 32 GB, 4 - 8 GB FB-DIMMs, includes one memory expansion board | |
| SEVY9CF1Z | CPU/Memory Filler Panel<br>**Note:** Not orderable by customers | ***For Configurator and Operations only*** |
| **New 1.6 Ghz , 8 core processor modules (single socket)** | | |
| SEVY1EB1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 8 GB (4 x 2 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVY1EC1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 16 GB (4 x 4 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVY1ED1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 32 GB ( 4 x 8 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVY1EC2Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 16 GB (4 x 4 GB) FB-DIMMs at 800 MHz, with one memory board | **Only offering with 800 Mhz FB-DIMMs** |

**3. Select additional memory**

- All FB-DIMMs on a processor and memory module pairing must be of the same capacity/density
- A processor module and its associated memory module must have a total of 4, 8 or 16 FB-DIMMs installed. Twelve, or any other number of FB-DIMMs is not a supported configuration.
- Manufacturing will attempt to balance the additional memory equally across all processor modules
  - For those orders where the extra memory cannot be distributed equally across all modules, then the additional memory will be installed into the module(s) in the lower position(s), i.e. 0, followed by 1, 2 and then 3
- Please refer to the section entitled *Configuration Guidelines*

| ATO Option | Description | Comments |
|---|---|---|
| SESY2B2Z | 4 GB memory expansion option consisting of 2 - 2 GB FB-DIMMs at 667 MHz | ***Refer to configuration rules*** |
| SESY2C1Z | 8 GB memory expansion option consisting of 2 - 4 GB FB-DIMMs at 667 MHz | ***Refer to configuration rules*** |
| SESY2D1Z | 16 GB memory expansion option consisting of 2 - 8 GB FB-DIMMs at 667 MHz | ***Refer to configuration rules*** |
| **800 Mhz FB-DIMMs for use with 1.6 Ghz processors only** | | |
| SESY2C4Z | 8 GB Memory Expansion Option (2 x 4 GB) 800 Mhz, extended ECC. **Cannot mix with other FB-DIMMs within the system.** | ***Available with 1.6 Ghz only*** |

**4. Select at least one disk drive**

- A total of four drives in total, either disks or SSDs are supported per system
- The system device may be configured to be either an SSD or disk drive
- SAS and SATA drives may be mixed within a system

| ATO | Description | Comments |
|---|---|---|
| **Disk Drives** | | |
| SEVY3A11Z | 73 GB, 2.5", 10K,000 RPM, SAS drive with Nemo mounting bracket | Max. four per system ***last order July 2009*** |
| SEVY3A21Z | 73 GB, 2.5", 15,000 RPM, SAS drive with Nemo mounting bracket | Max. four per system ***last order Oct. 23, 2009*** |
| SEVY3C11Z | 146 GB, 2.5", 10,000 RPM, SAS drive with Nemo mounting bracket | Max. four per system |
| SEVY3G11Z | 300 GB, 2.5", 10,000 RPM, SAS drive with Nemo mounting bracket | Max. four per system |
| SEVY9MF1Z | Disk Filler Panel<br>**Note:** Not orderable by customers | ***For Configurator and Operations only*** |

**5. Select optional SSDs**

- A maximum of four hard disk drives and/or SSDs per system as there are just four bays per system.
- The use of SSDs requires updated firmware for the LSI 1068E disk controller. Please refer to patch T140494-01 at http://sunsolve.sun.com and the *Product Notes* for details
- The size of the disk image currently exceeds the capacity of an SSD. In order to utilize an SSD as the boot device, it will be necessary to customize the boot image by adjusting the size of the partitions until a new version of the boot image is available. Please refer to the *Product Notes* for details.
- SSDs may not be used currently within a Sun Cluster environment.

| ATO | Description | Comments |
|---|---|---|
| **Solid State Disks (SSDs)** | | |
| SEVY3Y11Z | 32 GB, 2.5" SATA solid state disk drive with Nemo bracket | |
| SEVY3Y21Z<br>***Future/TBD*** | 50 GB, 2.5" SATA solid state disk drive with Nemo bracket | ***Future*** |
| SEVY3Y31Z<br>***Future/TBD*** | xxx GB, 2.5" SATA solid state disk drive with Nemo bracket | ***Future*** |

**6. Select any or all of the following optional components**

Maximum of one of each of the following

- DVD,
- Rackmount kit and
- Cable management arm

| ATO | Description | Comments |
|---|---|---|
| **Removable Media/DVD** | | |
| SEVY9DV1Z | DVD ±R/W, 8x, slimline, slot loaded drive, PATA interface | Max. 1 per system |
| SEVY9DF1Z | DVD Filler Panel<br>**Note:** Not orderable by customers | ***For Configurator and Operations only*** |
| **Other/Rackmount related Options** | | |
| SEVY9RK1Z | Rackmount/rail kit, tools required for installation<br>**Note:** This option will be eliminated once the tool-less kit is available | |
| SEVY9CA1Z | Cable management arm assembly, snap-in | |

**7. Select PCI adapters**

**Note:** This table of supported adapters and the maximum numbers listed for each type does not ensure that the system can drive all interfaces at maximum, sustained rates. The numbers listed are guidelines that anticipate configurations for redundancy and partitioned networks or storage arrays.

| Model Number | Description | Max. Quantity or Comments |
|---|---|---|
| **Storage Interfaces** | | |
| SG-PCIE1FC-QF4 | Qlogic, 4Gb PCIe single port | 8 |
| SG-PCIE2FC-QF4 | Qlogic, 4Gb PCIe dual port | 8 |
| SG-PCIE1FC-EM4 | Emulex, 4Gb, PCIe single port | 8 |
| SG-PCIE2FC-EM4 | Emulex, 4Gb PCIe dual port | 8 |
| SG-PCIE2SCSI U320Z | U320 SCSI, PCIe dual port | 8 |
| SG-PCIE8SAS-E-Z | SAS, 8 port, PCIe | 8 |
| TA-FAS-S3IE96GB<br>***Future*** | 96 GB solid state Flash Accelerator PCIe card with 2 x 4-wide SAS-1 ports for internal disk drives, 4 x 24GB enterprise-class SLC Flash modules, integrated super cap power backup, low-profile | 6<br>***Future*** |
| **Networking Interfaces** | | |
| SESY7XA1Z | 10 GbE XAUI card - Fiber (at RR) – requires one of the following transceivers: | 2 |
| SESY7XT1Z | Transceiver for Atlas/XAUI- 10 GE SR XFP Transceiver for base board for short reach (20 to 300 meters) | 2 |

| Model Number | Description | Max. Quantity or Comments |
|---|---|---|
| SESY7XT2Z | Transceiver for Atlas/XAUI - 10 GE LR XFP Transceiver for base board for long reach (2 to 10 kilometers) | 2 |
| 7280A-2 | Gigabit Ethernet, dual port, UTP Low-profile, Northstar | 8 |
| 7281A-2 | Gigabit Ethernet,dual port, MMF Low-profile, Northstar | 8 |
| 4447A-Z | Gigabit Ethernet, quad port, PCIe, (copper), Atlas<br><br>**Note**: Eight supported on a quad processor system for the purposes of redundancy, partitioned networks or to support extra connectivity where absolute bandwidth is not the primary consideration. If maximum performance is required, then the limit is four adapters active simultaneously. Four adapters supported on systems with fewer than four processors. | 4 - 8<br><br>***Refer to Note*** |
| **Graphics Interfaces** | | |
| 3000A | XVR-300, x8, PCIe, low-profile, graphics adapter | 4 |

### 8. Solaris Operating System

In addition to the Solaris Operating Environment specified below, other components will also be pre-loaded onto the disk image when Solaris 10 05/08 OS or later is specified.

| ATO Option | Description | Comments |
|---|---|---|
| SESY9SC1Z | Solaris 10 05/08, i.e. Update 5 (plus patches), includes:<br>• Sun™ Studio 12<br>• Logical Domains Manager 1.0.1<br>• Logical Domains MIB 1.0.1<br>• Sun Java™ Enterprise System 5 U1<br>• GCC for SPARC® Systems Version[4.0.4]<br>• CMT Developer Tools Version[1.0]<br>• Electronic Prognostics 1.0 | ***EOL on July 21, 2009; last order on Oct. 23, 2009.***<br><br>***Not available with new chassis, SEVASY12Z*** |
| SEVY9SD1Z | Solaris 10 10/08, i.e. Update 6 (plus patches), includes<br>• Sun™ Studio 12<br>• Logical Domains Manager 1.0.3<br>  • Includes integrated Logical Domains MIB 1.0.1<br>• GCC for SPARC® Systems Version[4.0.4]<br>• CMT Developer Tools Version[1.0]<br>• Electronic Prognostics 1.0 | 1 |
| SESY9SF1Z | Solaris 10 5/09, Update 7 (plus patches), ATO option, includes<br>• Sun Studio 12<br>• Logical Domains Manager 1.2<br>  • Includes Logical Domains MIB<br>• GCC for SPARC Systems Version[4.0.4]<br>• CMT Developer Tools Version[1.0] | 1 |

| ATO Option | Description | Comments |
|---|---|---|
| | • Electronic Prognostics 1.0 | |
| SEVY9SG1Z<br><br>***(Note V in position 3.)***<br><br>***Future*** | Solaris 10 10/09, Update 8, ATO option. Includes:<br>- Sun Studio 12<br>- Logical Domains Manager 1.2, includes Logical Domains MIB<br>- GCC for SPARC Systems Version [4.3.2]<br>- CMT Developer Tools Version [1.0]<br>- LiveUpgrade ABE (Alternate Boot Environment)<br>- Electronic Prognostics 1.0 | 1<br><br><br><br><br>***Future*** |

**9. OpenSolaris Operating System**

| Model Number | Description | Max. |
|---|---|---|
| SESY9NA1Z<br><br>***Future*** | OpenSolaris 2009.06, ATO option. Includes:<br><br>- Logical Domains Manager 1.2, includes Logical Domains MIB<br><br>(**Note:** Electronic Prognostics 1.0 is not present in OpenSolaris) | 1<br><br>***Future*** |

**10. Select Power Cords**

- Select four, geographically specific, power cords, one for each power supply as separate, no charge items on the order
- Power cords ending in 'U' are Fujitsu designations for cross reference only, not applicable for Sun orders

| Option | Description | Comments |
|---|---|---|
| X311L<br>(SERXP311LU) | U.S./Asia, AC Power Cord | |
| X312L<br>(SERXP312LU) | Continental Europe, AC Power Cord | |
| X340L<br>(SERXP340LU) | N. America/Asia, 4.0m,L6-20P,15A,C13 | |
| X320A<br>SERXP320AU | U.S./Asia (200V), IEC 320 C13 to NEAC PowMA 6-15P - 15A/ 220V 2.5M Power Cord, Direct to wall | |
| X332T<br>(SERXP332TU) | International, 4.0m, IEC309-IP44, 10A, C13 | |
| X312E<br>(SERXP312EU) | China, AC Power Cord | |
| X386L<br>(SERXP386LU) | Australia, AC Power Cord | |
| X312F<br>(SERXP312FU) | Argentina, AC Power Cord | |
| X317L<br>(SERXP317LU) | U.K, AC Power Cord | |
| X383L<br>(SERXP383LU) | Denmark, AC Power Cord | |
| X384L<br>(SERXP384LU) | Italy, AC Power Cord | |
| X333A-25-10-IL<br>(SERXP333CU) | Israel, 2.5m, SI-32,10A, C13 | |
| X333A-25-15-JP<br>(SERXPJ33AU) | Japan localized power cord kit, IEC 320 C13 to PSE 5-15P, 15A/125V, 2.5M, Black, RoHS:Y, 180-2243 | |
| X333F-25-15-JP<br>(SERXPJ33FU) | Japan localized power cord kit, IEC 320 C13 to PSE 6-15P, 15A/250V, 2.5M, Black, RoHS:Y, 180-2244 | |
| X312G<br>(SERXP312GU) | Korea, AC Power Cord | |
| X314L<br>(SERXP314LU) | Switzerland, AC Power Cord | |
| X333A-25-15-TW<br>(SERXP333AU) | Taiwan 15A, AC Power Cord | |
| X9237-1-A<br>(SERXP9237U) | Power cord jumper, 1.0m, C13, 13A, C14<br>(Add when a product can be rack mounted) | |
| X9238-1-A<br>(SERXP9238U) | Power cord jumper, 2.5m, C13, 13A, C14<br>(Add when a product can be rack mounted) | |
| XSR-JUMP-1MC13<br>(SERXPRJ11U) | Jumper Cable,SR2,1.0m,C13,13A,C14RA. (Added when a product can be rack mounted in SunRack II – Redwood.) | |

| | | |
|---|---|---|
| XSR-JUMP-2MC13 (SERXPRJ21U) | Jumper Cable,SR2,2.0m,C13,13A,C14RA. (Added when a product can be rack mounted in SunRack II – Redwood.) | |

**10. Sun External I/O Expansion Unit**

The Sun External I/O Expansion Unit will not be integrated into the system as part of the ATO process. As with all external storage products, it may be added to any order by specifying the appropriate X-options. Please refer to the section entitled External Storage for ordering options and details.

**11. External Storage**

Please refer to entitled External Storage for ordering options and details.

## X-options

X-options should be used to order components for field installation, especially post-system sales or upgrades, not factory integration.

**Note:** This table of supported adapters and the maximum numbers listed does not ensure that all interfaces, and all combinations can operate at maximum, sustained rates. The numbers listed are guidelines that allow for redundancy and partitioned networks or storage.

| Option | Description | Max. Number or Comments |
|---|---|---|
| **Processor Modules** | | |
| **1.2 GHz, 8 core processor modules (single socket)** | | |
| SEVX1CB1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 8 GB, 4 - 2 GB FB-DIMMs, includes one memory expansion board | |
| SEVX1CC1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 16 GB, 4 - 4 GB FB-DIMMs, includes one memory expansion board | |
| SEVX1CD1Z | Processor module, 8 core, 64 threads, 1.2 Ghz with 32 GB, 4 - 8 GB FB-DIMMs, includes one memory expansion board | |
| **1.4 GHz, 8 core processor modules (single socket)** | | |
| SEVX1DB1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 8 GB, 4 - 2 GB FB-DIMMs, includes one memory expansion board | |
| SEVX1DC1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 16 GB, 4 - 4 GB FB-DIMMs, includes one memory expansion board | |
| SEVX1DD1Z | Processor module, 8 core, 64 threads, 1.4 Ghz with 32 GB, 4 - 8 GB FB-DIMMs, includes one memory expansion board | |
| **New 1.6 Ghz , 8 core processor modules (single socket)** | | |
| SEVX1EB1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 8 GB (4 x 2 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVX1EC1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 16 GB (4 x 4 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVX1ED1Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 32 GB ( 4 x 8 GB) FB-DIMMs at 667 MHz, with one memory board | |
| SEVX1EC2Z | CPU module, 8 core, 64 threads, 1.6 Ghz with 16 GB (4 x 4 GB) FB-DIMMs at 800 MHz, with one memory board<br>**Note:** Cannot mix with other memories within the same system | **Only offering with 800 Mhz FB-DIMMs** |
| **Memory** | | |
| SESX2B2Z | 4 GB memory expansion option consisting of 2 - 2 GB FB-DIMMs | 4, 8 or 16 FB-DIMMs per processor only |
| SESX2C1Z | 8 GB memory expansion option consisting of 2 - 4 GB FB-DIMMs) | 4, 8 or 16 FB-DIMMs per processor only |

| | | |
|---|---|---|
| SESX2D1Z | 16 GB memory expansion option consisting of 2 - 8 GB FB-DIMMs) | 4, 8 or 16 FB-DIMMs per processor only |
| SESX2C4Z | 8 GB Memory Expansion Option (2 x 4 GB) 800 Mhz, extended ECC. **Cannot mix with other FB-DIMMs within the system.** | ***Available with 1.6 Ghz only*** |
| **Disk Drives** | | |
| SEVX3A11Z | 73 GB, 2.5", 10,000 RPM, SAS drive with Nemo bracket | Max. four per system ***last order July 2009*** |
| SEVX3A21Z | 73 GB, 2.5", 15,000 RPM, SAS drive with Nemo bracket | Max. four per system |
| SEVX3C11Z | 146 GB, 2.5", 10,000 RPM, SAS drive with Nemo bracket | Max. four per system |
| SEVX3G11Z | 300 GB, 2.5", 10,000 RPM, SAS drive with Nemo bracket | Max. four per system |
| **Sold State Disks (SSDs)** | | |
| SEVX3Y11Z | 32 GB, 2.5" SATA solid state disk drive with Nemo bracket | |
| SEVX3Y21Z ***Future/TBD*** | 50 GB, 2.5" SATA solid state disk drive with Nemo bracket | ***Future*** |
| SEVX3Y31Z ***Future/TBD*** | ??? GB, 2.5" SATA solid state disk drive with Nemo bracket | ***Future*** |
| **Removable Media/DVD** | | |
| SEVX9DV1Z | DVD ±R/W, 8x, slimline, slot-loaded drive, PATA interface **Note: For use only with SEVASY11Z chassis.** | Max. 1 per system |
| **Rackmount Kit and Cable Management Arm** | | |
| SEVX9RK1Z | Rackmount/rail kit, tools required for installation **Note:** This option may be eliminated once the tool-less kit is available | 1 |
| SEVX9CA1Z | Cable management arm assembly, snap-in assembly | 1 |
| **PCI Adapters** | | |
| Storage Adapters | | |
| SG-XPCIE1FC-QF8-Z | 8 Gb Fibre Channel, PCIe HBA, Qlogic, Single Port | 8 |
| SG-XPCIE2FC-QF8-Z | 8 Gb Fibre Channel, PCI-e HBA, Qlogic, Dual Port | 8 |
| SG-XPCIE1FC-EM8-Z | 8 Gb Fibre Channel, PCIe HBA, Emulex, Single Port | 8 |
| SG-XPCIE2FC-EM8-Z | 8 Gb Fibre Channel, PCIe HBA, Emulex, Dual Port | 8 |
| SG-XPCIE1FC-QF4 | 4 Gb Fibre Channel, PCIe single port, Qlogic | 8 |
| SG-XPCIE2FC-QF4 | 4 Gb Fibre Channel, PCIe dual port, Qlogic | 8 |
| SG-XPCIE1FC-EM4 | 4 Gb Fibre Channel, PCIe single port, Emulex | 8 |
| SG-XPCIE2FC-EM4 | 4 Gb Fibre Channel, PCIe dual port, Emulex | 8 |
| SG-XPCIE2SCSIU320Z | Ultra 320 SCSI, dual port, PCIe adapter | 8 |
| SG-XPCIE8SAS-E-Z | SAS, 8 port, PCIe, Pandora | 8 |

| | | |
|---|---|---|
| PCIe Storage Accelerators | | |
| XTA-FAS-S3IE96GB<br><br>***Future*** | 96 GB solid state Flash Accelerator PCIe card with 2 x 4-wide SAS-1 ports for internal disk drives, 4 x 24GB enterprise-class SLC Flash modules, integrated super cap power backup, low-profile | 6<br>***Future*** |
| RAID Controller | | |
| SGXPCIESAS-R-EXT-Z | SAS, 8-port, external RAID controller | 2 |
| Network Adapters | | |
| X7280A-2 | Gb Ethernet, dual port, UTP, low-profile, Northstar | 8 |
| X7281A-2 | Gb Ethernet, dual port, MMF, low-profile, Northstar | 8 |
| X1027A-Z | 10 Gb Ethernet, PCIe Dual Port, Low Profile, Atlas – requires one of the following 2 transceivers: | 4 |
| X5558A | Transceiver for Atlas/XAUI - 10 GE SR XFP Transceiver for base board for short reach | 8 |
| X5560A-Z | Transceiver for Atlas/XAUI - 10 GE LR XFP Transceiver for base board for long reach | 8 |
| X4447A-Z | Gigabit Ethernet, quad port, PCIe, (copper), Atlas<br><br>**Note**: Eight supported on a quad processor system for the purposes of redundancy, partitioned networks or to support extra connectivity where absolute bandwidth is not the primary consideration. If maximum performance is required, then the limit is four adapters active simultaneously. Four adapters supported on systems with fewer than four processors | 4 - 8<br><br>***Refer to Note*** |
| XAUI Adapters | | |
| SESX7XA1Z | 10 GbE XAUI card - Fiber (at RR) – requires one of the following transceivers: | 2 |
| SESX7XT1Z | Transceiver for Atlas/XAUI- 10 GE SR XFP Transceiver for base board for short reach (20 to 300 meters) | 2 |
| SESX7XT2Z | Transceiver for Atlas/XAUI - 10 GE LR XFP Transceiver for base board for long reach (2 to 10 Kilometers), multimode | 2 |
| X1106A-Z | Single port 10 Gb Ethernet with Intel (R) 82598 10 Gigabit Ethernet controller and includes fixed transceiver(s) with range up to 300 m., fibre cable dependent, PCIe gen 1. (Oplin)<br>**Note:** Max. of four in any combination of X1106A-Z or X1107A-Z | ***Announce 10/13/09*** |
| X1107A-Z | Dual port 10 Gb Ethernet with Intel (R) 82598 10 Gigabit Ethernet controller and includes fixed transceiver(s) with range up to 300 m., fibre cable dependent, PCIe gen 1. (Oplin)<br>**Note:** Max. of four in any combination of X1106A-Z or X1107A-Z | ***Announce 10/13/09*** |
| InfiniBand Adapters | | |
| X1236A-Z | InfiniBand, dual port, 4x, host channel adapter – low-profile | ***Not supported*** |
| Other Adapters | | |

| | | |
|---|---|---|
| X6000A | Crypto Accelerator 6000 | 2 |
| Graphic Interfaces | | |
| X3000A | XVR-300, x8, PCIe, low-profile, graphics adapter | 4 |

# External Storage

The external products listed are available for inclusion in either ATO or X-option orders. However, they will not be integrated and tested with the systems. Sun Services is prepared to assist customers in this effort.

## External I/O Expansion Unit (I/O Box)

The Sun External I/O Expansion Unit provides additional PCIe connectivity by multiplexing one adapter, installed within Sun SPARC Enterprise T5440 server, to many adapters in the external I/O Box and the I/O boats therein. This technique provides additional bus connectivity, not additional throughput or bandwidth.

- Only PCIe options are supported with the I/O Box; PCI-X options are not supported
- Hot plug of PCIe slots within the External I/O Expansion Unit is not supported
- While the server is powered on, the I/O Expansion Unit cannot be powered off and the link card cables cannot be disconnected.
- One I/O boat per processor is supported on the Sun SPARC Enterprise T5440 server. A maximum of four I/O boats is supported with a four processor system.
  - Only one I/O boat (link card) per processor.
- Link cards must be installed into PCIe slots that are local to a processor. Please refer to the section entitled, *PCIe Slot Guidelines (including External I/O Expansion Module)*.
  - Processor failure may result in inaccessibility to the External I/O Expansion Unit as the PCIe slot may no longer be local to a processor. The firmware probe depth is limited and attempts to connect via remapping the I/O subsystem may result in the firmware not seeing the end points of the adapter/bus through the I/O Expansion Module. In other words, the controller portion of the adapter may be visible whereas the channels or devices may not be. The recommended solutions are to replace the failed processor or move the link card to another PCIe slot that is local to a processor.
  - Secondary considerations involve probe width for OPB and latency/responsiveness.
- The Fault Management Architecture (FMA) is not able to isolate to a component in the External I/O Expansion Module. The diagnosis will fault the I/O slot in the Sun SPARC Enterprise T5440 server to which the External I/O Expansion Module is attached to rather than the component in the External I/O Expansion Module itself.
- An I/O Expansion Unit cannot be shared between two systems, each accessing a single I/O Boat exclusively. Two systems cannot be managing and updating the FRU-ID information on the common centerplane or power supplies.
- Customer must select two power cords per I/O Box, not per I/O Boat
- This section extracted from '*Just the Facts - External I/O Expansion Unit*', SunWin document 498978

**Ordering**

Selecting the base unit, an optional second I/O Boat and the copper link kit. These components will be assembled as a unit, in an ATO manner. For post-sales additions to an existing I/O Expansion Module in which there is room for a second I/O Boat, select the PCIe I/O Boat and a link card/connection kit from the section entitled '*Post-sales Additions'* below

| Part Number | Description | Comments |
|---|---|---|

| | | |
|---|---|---|
| **Required: Select base unit, chassis and I/O Boat** | | |
| SENY8BE1Z | External I/O Expansion Unit - PCIe Base<br><br>A 4 Rack Unit External I/O Expansion Unit for servers, includes:<br>• Base chassis with 2 high-efficiency power supplies/fan units and status LEDs<br>• 1 PCI-Express "boat" and 6 "smart adjust" hot pluggable carriers for x8 or smaller PCI-Express cards<br>• Filler panels as needed.<br>• Sun "Getting Started Guide"<br>• Ship Kit containing:<br>  • Cable Management bracket (1)<br>  • Rack mount kit (1)<br><br>**Note:** This part number may not be sold in Taiwan. Use the Taiwan specific SENY8BE1Z-TWN. | Available as an X-option only |
| **Optional: Second I/O Boat. One (maximum) additional I/O boat per External I/O Expansion Unit base** | | |
| SENY8TE1Z | PCI-Express "boat" for the External I/O Expansion Unit. Includes 6 "smart adjust" Hot pluggable carriers for x8 or smaller PCI-Express cards and 6 PCI-E filler cards. | Only PCIe I/O boat(s) for T5440, not PCI-X |
| **Required: Link Kits. Select 1 kit per I/O Boat** | | |
| SELY8LK1Z | Copper connection kit from a server with a PCI-Express slot to a External I/O Expansion Unit equipped PCI-E or PCI-X expansion "boat" Includes 2 cards and one 4m dual path copper cable | Only option for T5440 |
| X9237-1-A (SERXP9237U) | Power Jumper Cable, 1m, Rack, (IEC-320) (For use in a Sun Rack) | |
| X9238-1-A (SERXP9238U) | Power Jumper Cable, 2.5m, Rack, (IEC-320) (For use in a Sun Rack) | |

**Post-sales/In-field Additions**

To expand the number of PCIe slots available in an I/O Expansion Module, order one I/O boat and one Link/Connection kit

| | | |
|---|---|---|
| **I/O Boat** | | |
| SENX8TE1Z | PCI-Express "boat" for the External I/O Expansion Unit. Includes 6 "smart adjust", hot pluggable carriers for x8 or smaller PCI-Express cards and 6 PCIe filler cards. | Only PCIe I/O boat(s) for T5440, not PCI-X; Hot-plug not supported |
| **LinkCards/Connection Kit** | | |
| SELX8LK1Z | Copper connection kit from a server with a PCI-Express slot to a External I/O Expansion Unit equipped PCI-E or PCI-X expansion "boat" Includes 2 cards and one 4m dual path copper cable | Only option for T5440 |

**Adapters Supported in the I/O Expansion Module**

| Adapter | Description | Maximum per I/O Boat |
|---|---|---|
| Network Adapters | | |
| X7280A-2 | Dual port, Gb Ethernet, UTP | 4 |
| X7281A-2 | Dual port, Gb Ethernet, MMF | 4 |
| X4447A-Z | PCI-E Quad port Gb Ethernet (copper) | 4 |
| | | |
| Storage Adapters | | |
| SG-XPCIE1FC-QF8-Z | 8 Gb Fibre Channel PCI-Express HBA, Qlogic, Single Port | 6 |
| SG-XPCIE2FC-QF8-Z | 8 Gb Fibre Channel PCI-Express HBA, Qlogic, Dual Port | 6 |
| SG-XPCIE1FC-EM8-Z | 8 Gb Fibre Channel PCI-Express HBA, Emulex, Single Port | 6 |
| SG-XPCIE2FC-EM8-Z | 8 Gb Fibre Channel PCI-Express HBA, Emulex, Dual Port | 6 |
| SG-XPCIE1FC-QF4 | 4 Gb PCI-E single port, Qlogic | 6 |
| SG-XPCIE2FC-QF4 | 4 Gb PCI-E dual port, Qlogic | 6 |
| SG-XPCIE1FC-EM4 | 4 Gb PCI-E single port, Emulex | 6 |
| SG-XPCIE2FC-EM4 | 4 Gb PCI-E dual port, Emulex | 6 |
| SGXPCI2SCSILM320-Z | U320 SCSI, PCI-E dual port | 4 |
| SG-XPCIE8SAS-E-Z | SAS, 8 port, PCI-E - Pandora | 4 |

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**Adapters not Supported in the I/O Expansion Module**

The following adapters are explicitly not supported in the Sun External I/O Expansion Unit

| Adapter | Description | |
|---|---|---|
| X1236A-Z | Dual port, 4x IB host channel adapter – low-profile | N/A |
| X3000 | XVR-300 low-profile, PCI-E x8 Graphics card | N/A |
| X6000A | Sun Crypto Accelerator 6000 | N/A |
| X1027A-Z | PCI-E Dual Port 10 Gb Ethernet Low Profile | N/A |

## Field Replaceable Units (FRUs)

Always check for the latest available revision before ordering. Revision level specified by the final two digit sequence.

| Part Number | Description |
|---|---|
| F501-7049-05 | FRU,DISK BACKPLANE,X4600/T5440 |

| | |
|---|---|
| F501-7057-04 | FRU,USB,I/O BOARD,X4600/T5440 |
| F350-1250-01 | CMA,4U,T5440 |
| F350-1251-01 | RAIL KIT,4U,T5440 |
| F530-3394-06 | FRU,FLEX,LED,FRONT,X4600/T5440 |
| F511-1044-01 | FRU,PDB,BATOKA,G4 |
| F541-2749-08 | FRU,MBRD W/HARDWARE,BATOKA |
| F541-2751-07 | ASY,BSP W/HARDWARE,BATOKA |
| F541-2551-04 | ASY,MEM MODULE,BATOKA |
| F541-2754-04 | ASY,CPU MODULE,1.2GHZ-8C |
| F541-2753-04 | ASY,CPU MODULE,1.4GHZ-8C |
| F390-0403-01 | FRU,SL SLOT DVD RW MULTIPATA T |
| F541-2945-05 | FRU,FAN,WIREFORM,T5400 |
| F300-2158-05 | FRU,PS,AC,A238,F,MULT,1133W |
| F530-3958-02 | FRU,CABLE,FLEX,BATOKA,X4600 |
| F530-4006-01 | FRU,CBL,MBRD TO PDB,BATOKA |
| F150-4277-01 | FRU,BATT,COIN,LI/MNO2,3V,220MA |
| F330-4660-02 | FRU,MODULE FILLER, T5440 |
| F541-2017-04 | FRU,HDD FILLER,2.5,BLK |
| F541-2082-04 | FRU,DRIVE, 73 GB, SFF, SAS, ROHS, B |
| F540-7319-03 | FRU, DR, 146GB, 10K, SFF, SAS, BLACK |
| F540-7698-01 | ASY, DR, 73 GB,15K RPM, 2.5", SAS D |
| | FRU, DR, 300 GB 10K , SFF, SAS |
| F511-1161-01 | FRU,FBDIMM,2GB,2RX8,667 |
| F501-7954-01 | FRU,FBDIMM,4GB,2RX4,667 |
| F525-2146-02 | FRU,PRGM,PROM,NSCC_MAC,ROHS |

## External Arrays and Libraries

Please refer to product specific documentation for details, including supported adapters, etc.

No comment in the *Options* column means that support is available on the Sun SPARC Enterprise T5440 server.

| Option | Description | Comments |
|---|---|---|
| **Boot and JBOD Products** | | |
| ***Not supported*** | Sun StorEdge D240 Media Tray | |
| | Sun StorEdge 3120 SCSI JBOD | |
| | Sun StorEdge S1 Array | EOL |
| | LCA2530 via Pandora | |
| | 6130 via Summit/Summit-E | |
| | 9910 via Summit & Summit-E | |
| | 9980 via Pallene & Pallene-E | |
| | Flexline 380 array via Summit/Summit-E | |
| | Flexline 380 array via Pallene & Pallene-E | |
| **Modular Arrays** | | |
| | Sun StorageTek ST4200 Alamo 2U SAS JBOD | |
| | Sun StorageTek ST4500 Loki SAS JBOD | |
| | Sun StorageTek ST4400 Riverwalk SAS JBOD | |
| | Sun StorageTek 2540 Hickory (LCA) FC host ports | |
| | Sun StorageTek 2530 Hickory (LCA) SAS host ports | |
| | Sun StorageTek 2510 Omaha (LCA) iSCSI host ports | |
| | Sun StorEdge 3320 SCSI Array | |
| | Sun StorEdge 3510 FC array | |
| | Sun StorageTek 6140 Array | |
| | Sun StorageTek 6540 Array | |
| | Sun StorageTek 6920 System | |
| | Sun StorEdge 3310 SCSI Array | EOL |
| | Sun StorEdge 3511 FC Array | EOL |
| ***Not supported*** | Sun StorEdge 6120 Array | EOL |
| | Sun StorEdge 6130 Array | EOL |
| | Sun StorEdge 6320 Array | EOL |
| ***Not supported*** | Sun StorEdge 6910/6960 Array | EOL |
| ***Not supported*** | Sun StorEdge T3 Series | EOL |

| | | |
|---|---|---|
| | Sun StorEdge S1 Array | EOL |
| ***Not supported*** | Sun StorEdge 3960 | EOL |
| ***Not supported*** | Sun StorEdge 3910 | EOL |
| **Data Center Arrays** | | |
| | Sun StorageTek 9990V (J3) | |
| | Sun StorageTek 9985V (formerly J4) | |
| | Sun StorEdge 9985 System | |
| | Sun StorEdge 9990 System | |
| | Sun StorEdge 9910 System | EOL |
| | Sun StorEdge 9960 System | EOL |
| | Sun StorEdge 9970 System | EOL |
| | Sun StorEdge 9980 System | EOL |
| **NAS Products** | | |
| | Sun StorEdge 5220 NAS | |
| | Sun StorEdge 5320 NAS | |
| | Sun StorEdge 5210 NAS | EOL |
| | Sun StorEdge 5310 NAS | EOL |
| | Sun StorEdge 5220 iSCSI attach | |
| | Sun StorEdge 5320 iSCSI attach | |
| | Sun StorEdge 5210 iSCSI attach | EOL |
| | Sun StorEdge 5310 iSCSI attach | EOL |
| Tape Products | | |
| | 9840C FC | |
| | DAT72 SCSI Desktop | |
| | DAT72 SCSI 1U Rackmount | |
| ***Not supported*** | DAT72 USB Desktop | |
| | DAT160 SCSI Desktop | |
| ***Not supported*** | DAT160 USB Desktop | |
| | DAT160 SCSI 1U Rackmount | |
| | HP LTO2 Full Height SCSI Desktop | |
| | HP LTO2 Full Height SCSI 2U Rackmount | |
| | HP LTO2 Half Height SCSI Desktop | |
| | HP LTO2 Half Height SCSI 1U Rackmount | |
| | HP LTO3 Full Height SCSI Desktop | |
| | HP LTO3 Full Height SCSI 2U Rackmount | |
| | HP LTO3 Half Height SCSI Desktop | |

| | | |
|---|---|---|
| | HP LTO3 SAS Half Height Desktop | |
| | HP LTO3 Half Height SCSI 1U Rackmount | |
| | HP LTO3 SAS Half Height 1U Rackmount | |
| | HP LTO4 Half Height SCSI Desktop | |
| | HP LTO4 Full Height SCSI Desktop | |
| | HP LTO4 Half Height SAS Desktop | |
| | HP LTO4 SAS Full Height Desktop | |
| | HP LTO4 Full Height SCSI 2U Rackmount | |
| | HP LTO4 SAS Full Height 2U Rackmount | |
| | | |
| | SDLT320 SCSI Desktop | |
| | SDLT600 SCSI Desktop | |
| | SDLT600 SCSI 2U Rackmount | |
| | DLT-S4 SCSI Desktop | |
| | DLT-S4 SCSI 2U Rackmount | |
| | T10000B FC tape drive | |
| **Libraries** | | |
| | C2 | |
| | C4 | |
| | SL500 | |
| | L1400/L180/L700 | |
| | Sun StorageTek SL8500 | |
| ***Not Supported*** | Sun StorageTek SL 24/48 | |
| **Virtual Tape** | | |
| ***Not supported*** | VTL Plus | |
| **Switches & Routers** | | |
| | Brocade Silkworm 48000 – 4Gb/sec | |
| | Brocade Silkworm 24000 – 2Gb/sec | EOL |
| | Brocade Silkworm 4900 – 4Gb/sec | |
| | Brocade Silkworm 4100 – 4Gb/sec | |
| | Brocade Silkworm 3900 – 2Gb/sec | EOL |
| | Brocade Silkworm 3850 – 2Gb/sec | EOL |
| | Brocade Silkworm 200e – 4Gb/sec | |
| | Brocade Silkworm 7500 – 4Gb/sec | |
| | Brocade 5300 | |
| | Brocade 5100 | |

| | | |
|---|---|---|
| | Brocade 5000 | |
| | Brocade 300 | |
| | Brocade DCX | |
| | McDATA Intrepid 10000 – 4Gb/sec | |
| | McDATA Intrepid 6140 – 4Gb/sec | |
| | McDATA Sphereon 4700 – 4Gb/sec | |
| | McDATA Sphereon 4500 – 2 Gb/sec | EOL |
| | McDATA Sphereon 4400 – 4Gb/sec | |
| | McDATA Sphereon 4300 – 2 Gb/sec | EOL |
| | McDATA Sphereon 3232 – 2 Gb/sec | EOL |
| | McDATA 1620 | |
| | McDATA USDx | |
| | McDATA Edge | |
| | Cisco MDS 9513 | |
| | Cisco MDS 9509 | |
| | Cisco MDS 9216A | |
| | Cisco MDS 9216i | |
| | Cisco MDS 9222i | |
| | Cisco MDS 9140 | |
| | Cisco MDS 9134 | |
| | Cisco MDS 9120 | |
| | Cisco MDS 9124 | |
| | Q-Logic 5602 | |
| | Q-Logic 9000 | |
| | Sun StorEdge 2 Gb Network FC Switch-64 | |
| | Sun Storage FC Switch Model 5802 (Qlogic 5802V) | RR – Dec. 2008 |
| **Sun Grid Switches** | | |
| SGRS-1524A-Z | Cisco 24 port switch WS-C3750G-24TS-S1U for use with Sun Grid Rack System. RoHS-5 Compliant. (FOR INTEGRATION OR SITE UPGRADES ONLY) | |
| SGRS-1548A-Z | Cisco 48 port switch 3750G-48TS-S for use with Sun Grid Rack System. RoHS-5 compliant. (FOR INTEGRATION OR SITE UPGRADES ONLY) | |
| X1516A-Z | Terminal Server MRV model LX-4048T 48 ports for use with the Sun Grid Rack System. RoHS-5 compliant version. Not available in China. (FOR INTEGRATION OR ONSITE UPGRADES ONLY) | |

## Racks

| Part Number | Description | |
|---|---|---|
| SR2-2938-XPDS | Sun Rack 900-38 with PDS, Alloy | |
| SR2-21038-XPDS | Sun Rack 1000-38 with PDS, Alloy | |
| SR2-21042-XPDS | Sun Rack 1000-42 with PDS, Alloy | |
| SR2-21042-X30SPL | Sun Rack 1000-42 with 30A Single Phase, Alloy | |
| SR2-21042-X32TPL | Sun Rack 1000-42 with 32A Three Phase, Alloy | |
| SR2-21042-X60TPL | Sun Rack 1000-42 with 60A Three Phase, Alloy | |
| SR2-21042-X60A60 | Sun Rack 1000-42 with 120A Three Phase, Alloy | |
| SR9-2BM036A-IP | Sun Rack 900-36N (earthquake) with PDS, Purple | |
| XSR-1242 | Sun Rack, 42U, 1200 depth, 600mm width, empty shipping only (do not install product inside this rack while on the pallet) | ***See note below*** |
| XSR-1242E | Sun Rack, 42U, 1200 depth, 600mm width, packaging suitable for shipping fully loaded | ***See note below*** |
| **Industry Standard Racks** | | |
| Industry standard racks | 19” racks that meet EIA-310-D, including M6, 10-32, and those with square holes | Please refer to comments in *Rackmounting Guidelines* |
| Legacy Sun racks | | |
| SG-XARY030A | 72-inch Sun StorEdge expansion cabinet (deLorean) | **Not supported** |
| SF-XCAB | Sun Fire Expansion Rack (Serengeti) | **Not supported** |
| For ordering via XATO (Custom Build via CSI/CRS | | |
| SR-2938A | Sun Rack 900-38, Alloy | |
| SR-21038A | Sun Rack 100-38 Alloy | |
| SR-21042A | Sun Rack 1000-42 Alloy | |
| SR-2936NA | Sun Rack 900-36N (earthquake) Alloy | |

**Note:** The XSR-1242/XSR-1242E racks have stabilizer bars that store vertically along the bottom portion of the front, corner mounting posts. When in the vertical position, these stabilizer bars may present a close fit to the release tabs of the slide rails, thereby making the release of the safety locks more difficult. The close fit of components is strictly an inconvenience and does not present any safety concerns; nor does it interfere with the proper functioning of the stabilizer bars.

# Sun System Packs Configuration Part Numbers

## In-Warranty Upgrade (IWU)

Customers are required to order one of the Sun Spectrum Instant Warranty Upgrade (IWU) parts for the **T5440** in the following table:

| | |
|---|---|
| **IWU-T5440-2P-1P** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Platinum system support. |
| **IWU-T5440-2P-2P** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 years of Platinum system support. |
| **IWU-T5440-2P-3P** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 years of Platinum system support. |
| **IWU-T5440-2P-24-1G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Gold 24/7 system support. |
| **IWU-T5440-2P-24-2G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 years of Gold 24/7 system support. |
| **IWU-T5440-2P-24-3G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 years of Gold 24/7 system support. |
| **IWU-T5440-2P-1G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Gold system support. |
| **IWU-T5440-2P-2G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 years of Gold system support. |
| **IWU-T5440-2P-3G** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 years of Gold system support. |
| **IWU-T5440-2P-1S** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Silver system support. |
| **IWU-T5440-2P-2S** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 years of Silver system support. |
| **IWU-T5440-2P-3S** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 years of Silver system support. |
| **IWU-T5440-2P-22-1H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Platinum hardware support. |
| **IWU-T5440-2P-22-2H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 year of Platinum hardware support. |
| **IWU-T5440-2P-22-3H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 year of Platinum hardware support. |
| **IWU-T5440-2P-24-1H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Gold 24/7 hardware support. |
| **IWU-T5440-2P-24-2H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 year of Gold 24/7 hardware support. |
| **IWU-T5440-2P-24-3H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 year of Gold 24/7 hardware support. |

| | |
|---|---|
| **IWU-T5440-2P-SD-1H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 1 year of Silver hardware support. |
| **IWU-T5440-2P-SD-2H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 2 year of Silver hardware support. |
| **IWU-T5440-2P-SD-3H** | Sun SPARC Enterprise T5440 2-processor server Upgrade to 3 year of Silver hardware support. |
| **IWU-T5440-2P-R4-1Y** | Sun SPARC Enterprise T5440 2-processor server upgrade to 1 year of Time to Repair support with 4 hour response. |
| **IWU-T5440-2P-R6-1Y** | Sun SPARC Enterprise T5440 2-processor server upgrade to 1 year of Time to Repair support with 6 hour response. |
| **IWU-T5440-2P-R8-1Y** | Sun SPARC Enterprise T5440 2-processor server upgrade to 1 year of Time to Repair support with 8 hour response. |
| **IWU-T5440-4P-1P** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Platinum system support. |
| **IWU-T5440-4P-2P** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 years of Platinum system support. |
| **IWU-T5440-4P-3P** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 years of Platinum system support. |
| **IWU-T5440-4P-24-1G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Gold 24/7 system support. |
| **IWU-T5440-4P-24-2G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 years of Gold 24/7 system support. |
| **IWU-T5440-4P-24-3G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 years of Gold 24/7 system support. |
| **IWU-T5440-4P-1G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Gold system support. |
| **IWU-T5440-4P-2G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 years of Gold system support. |
| **IWU-T5440-4P-3G** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 years of Gold system support. |
| **IWU-T5440-4P-1S** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Silver system support. |
| **IWU-T5440-4P-2S** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 years of Silver system support. |
| **IWU-T5440-4P-3S** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 years of Silver system support. |
| **IWU-T5440-4P-22-1H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Platinum hardware support. |
| **IWU-T5440-4P-22-2H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 year of Platinum hardware support. |
| **IWU-T5440-4P-22-3H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 year of Platinum hardware support. |
| **IWU-T5440-4P-24-1H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Gold 24/7 hardware support. |

| | |
|---|---|
| **IWU-T5440-4P-24-2H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 year of Gold 24/7 hardware support. |
| **IWU-T5440-4P-24-3H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 year of Gold 24/7 hardware support. |
| **IWU-T5440-4P-SD-1H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 1 year of Silver hardware support. |
| **IWU-T5440-4P-SD-2H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 2 year of Silver hardware support. |
| **IWU-T5440-4P-SD-3H** | Sun SPARC Enterprise T5440 4-processor server Upgrade to 3 year of Silver hardware support. |
| **IWU-T5440-4P-R4-1Y** | Sun SPARC Enterprise T5440 4-processor server upgrade to 1 year of Time to Repair support with 4 hour response. |
| **IWU-T5440-4P-R6-1Y** | Sun SPARC Enterprise T5440 4-processor server upgrade to 1 year of Time to Repair support with 6 hour response. |
| **IWU-T5440-4P-R8-1Y** | Sun SPARC Enterprise T5440 4-processor server upgrade to 1 year of Time to Repair support with 8 hour response. |
| | |
| **IWU-T5440-PM-22-1H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Platinum hardware support. |
| **IWU-T5440-PM-22-2H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 years of Platinum hardware support. |
| **IWU-T5440-PM-22-3H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 years of Platinum hardware support. |
| **IWU-T5440-PM-24-1H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Gold 24/7 hardware support. |
| **IWU-T5440-PM-24-2H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 year of Gold 24/7 hardware support. |
| **IWU-T5440-PM-24-3H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 year of Gold 24/7 hardware support. |
| **IWU-T5440-PM-SD-1H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Silver hardware support. |
| **IWU-T5440-PM-SD-2H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 year of Silver hardware support. |
| **IWU-T5440-PM-SD-3H** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 year of Silver hardware support. |
| **IWU-T5440-PM-1P** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Platinum system support. |
| **IWU-T5440-PM-2P** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 years of Platinum system support. |
| **IWU-T5440-PM-3P** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 years of Platinum system support. |
| **IWU-T5440-PM-24-1G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Gold 24/7 system support. |
| **IWU-T5440-PM-24-2G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 year of Gold 24/7 system support. |

| | |
|---|---|
| **IWU-T5440-PM-24-3G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 year of Gold 24/7 system support. |
| **IWU-T5440-PM-1G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Gold system support. |
| **IWU-T5440-PM-2G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 year of Gold system support. |
| **IWU-T5440-PM-3G** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 year of Gold system support. |
| **IWU-T5440-PM-1S** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 1 year of Silver system support. |
| **IWU-T5440-PM-2S** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 2 year of Silver system support. |
| **IWU-T5440-PM-3S** | Sun SPARC Enterprise T5440 x-option processor module Upgrade to 3 year of Silver system support. |
| **IWU-T5440-PM-R4-1Y** | Sun SPARC Enterprise T5440 x-option processor module upgrade to 1 year of Time to Repair support with 4 hour response. |
| **IWU-T5440-PM-R6-1Y** | Sun SPARC Enterprise T5440 x-option processor module upgrade to 1 year of Time to Repair support with 6 hour response. |
| **IWU-T5440-PM-R8-1Y** | Sun SPARC Enterprise T5440 x-option processor module upgrade to 1 year of Time to Repair support with 8 hour response. |

## Solaris OS Support

If customers opt out of a Sun System Pack, they should purchase support for the Solaris OS. Sun requires that each system receiving any of the benefits of a Sun support plan, such as Solaris Updates or Software Updates for the Solaris OS, be covered with a current Sun service agreement. This agreement entitles customers to the latest Solaris Updates, Solaris Named Releases, Software Updates, and other Sun support, increasing productivity, helping to safeguard business processes, and helping provide protection from legal risks

# Upgrade Paths

The Sun SPARC Enterprise T5440 servers are eligible for the Sun Upgrade Advantage Program (UAP). Through this program customers can trade-up their current Sun or non-Sun severs for a new Sun SPARC Enterprise T5440 server and receive a trade-in allowance that is applied as a percentage off of the list price on the new Sun SPARC Enterprise T5440 server. Customers can trade-in their old systems in on a 1 for 1 server basis or consolidate many servers. Customers will also have the option trade-in components of their T5440 system and get a trade-in allowance. For example, customers can upgrade the current FB-DIMMs by trading them in for new FB-DIMMs and receive a trade-in allowance. Customers will have 90 days from the shipment of their new server/hardware to return the old equipment.

## Sun Upgrade Allowance Program (Sun UAP)

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

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

**Allowance codes and upgrade paths for all Sun Hardware products can be found at:**
**http://ibb.eng**

### How to Determine the Right Allowance Code

Scenario: My customer has a Sun SPARC Enterprise 280R server and would like to upgrade to a Sun SPARC Enterprise T5440 server. What allowance part number should I select?

- From left hand column select the platform the **customer has.**
- The correct allowance part number appears in the right column. The correct number for the Sun SPARC Enterprise 280R server is **ALW-10-S-B-T5440**. This part number is applied to the list price of the standard marketing part number. In this case it is a 10% allowance for the old Sun SPARC Enterprise 280R server.
- If the customer is trading-in multiple systems (either Sun or Non-Sun) use the point consolidation section which provides a value for older generation products that may be used towards an upgrade allowance of a new system.

### Entry Level Server Upgrade and Allowance Matrix

| FROM: UPGRADE TO: | Sun SPARC Enterprise T5440 Server |
|---|---|
| **Sun SPARC Enterprise V100, V120, Netra 120<br>Sun Enterprise™ 250, 220R<br>Netra™ 1120, 1125** | **ALW-05-S-L-T544-CN** |
| **Sun SPARC Enterprise V210, V240, V250<br>Sun Enterprise 450, 420R, 280R, V440, XX00** | **ALW-10-S-L-T544-CN** |
| **3 to 5-year old competitive systems** | **ALW-05-S-Z-T544-CN** |
| **Less than 3 year old non-Sun systems** | **ALW-10-S-Z-T544-CN** |

**Consolidation codes:** These may be used in refresh consolidation upgrades, provided the customer meets the necessary trade-in points requirements. Point requirements may be found in the upgrade guide and provide allowances at 15% and 20%.

ALW-15-S-L-T544-CN

ALW-15-S-Z-T544-CN

ALW-20-S-L-T544-CN

ALW-20-S-Z-T544-CN

**Note** – Actual allowance codes and percentages are subject to change. The allowances used in the table listed above are for example only. Please refer the following URL for actual allowance codes and percentages: http://ibb.eng/

**CPU Processor Upgrade Plan:**

In addition to our server upgrade plan we also will provide customers with a CPU processor upgrade path. For customers going from dual core to quad core, any one generation difference they will receive a 20% trade-in allowance. ALW-20-S-2XMOD

For customers upgrading from a CPU two or more generation difference will be eligible to receive a 10% trade-in allowance. ALW-10-S-1XMOD

Complete details of this program may be found at ibb.eng within the upgrade guide.

## Upgrade Ordering Notes

The ALW code is applied the system part number. Applying the allowance code will calculate the trade-in allowance percentage off of the list price of the new Sun SPARC Enterprise T5440 server. This trade-in allowance is used in addition to the customers VEU discount. For a complete list of eligible trade-in products you can go to http://www.sun.com/ibb. The customer must order an RMA kit with each upgrade and the customer will be required to trade-in their old servers within ninety days of shipment of the new server. The allowance codes are not applicable to products in CAT D.

# Service and Support

## Warranty

The Sun SPARC Enterprise T5440 servers feature a 1 year warranty providing a next business day response time with replacement parts delivered on-site or via parts exchange as applicable for all components designated as Customer Replaceable Units (See table below for Sun SPARC Enterprise T5440 server CRUs).

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

## Sun Service Offering Overview

Sun Services offers a full range of services to assist customers who deploy the Sun SPARC Enterprise T5440 servers. Whether it is architecture services, implementation services, or services to help customers manage the servers once released to production, Sun has the right services during every phase of the project's life cycle.

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

### Why the Warranty Isn't Enough

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

## SunSpectrum Service Plans

SunSpectrum Service Plans provide integrated hardware and Solaris[TM] Operating System support for Sun systems as well as comprehensive storage system support· For each Sun system, customers can choose the service plan that best fits their needs. Customers benefit from lower SunSpectrum In-Warranty Upgrade (IWU) pricing when purchasing support at time of system sale. This allows customers a discount of 1% on their Sun SPARC Enterprise T5440 purchase when the Sun Spectrum In-Warranty Upgrade is sold at the time of purchase. The following allowance codes are available for this discount:

**ALW-01-M-T5440 (T5440)**

More information is available at

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

SunSpectrum Service Plan highlights include:

- Integrated whole-system support, *including the operating system*
- All the essentials for one great price
- Priority service
- No “per incident” limits
- Includes Solaris™ Operating System releases and updates
- Resources for proactive system management
- A choice of four simple plans
- Proven return on investment

## SunSpectrum Service Plans

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

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

### Solaris OS Support

If customers opt out of a Sun System Pack, they should purchase support for the Solaris OS. Sun requires that each system receiving any of the benefits of a Sun support plan, such as Solaris Updates or Software Updates for the Solaris OS, be covered with a current Sun service agreement. This agreement entitles customers to the latest Solaris Updates, Solaris Named Releases, Software Updates, and other Sun support, increasing productivity, helping to safeguard business processes, and helping provide protection from legal risks.

### Warranty Upgrade to SunSpectrum Service

Please see the Ordering Information section for the part numbers and descriptions of the warranty upgrades to SunSpectrum programs for the **Sun SPARC Enterprise T5440 servers.**

The following services are available for post warranty support:

- SunSpectrum Platinum program
- SunSpectrum Gold program 24x7 on-site
- SunSpectrum Gold program
- SunSpectrum Silver program
- SunSpectrum Bronze program

## Enterprise Installation Service for Sun T5440 Servers

Sun's exceptional support for server installation is also available for the Sun SPARC Enterprise T5440 servers. This service can be purchased at the time of the server sale. Use the following part numbers to order the installation service.

| Part Number | Description |
|---|---|
| EIS-4WAYWGS-E | Install 4-way Workgroup Server |
| EIS-4WAYWGS-E-AH | Install 4-way Workgroup Server-AH |
| EIS-4WAYWGS-5-E | Install 5 4-way Workgroup Servers |
| EIS-4WAYWGS-5-E-AH | Install 5 4-way Workgroup Servers-AH |
| EIS-4WAYWGS-10-E | Install 10 4-way Workgroup Servers |
| EIS-4WAYWGS-10-E-AH | Install 10 4-way Workgroup Servers - AH |

For additional information about the server installation service see:

http://www.sun.com/service/support/install/entrylevel-server.html

http://sunweb.germany/EIS/Web/index.html

## Education and Learning Solutions

### Sun SPARC Enterprise T5440 server

A web-based course for the Sun SPARC Enterprise T5440 systems is available. Course number: WET-6229: Sun SPARC® Enterprise T5440 Servers Installation, Administration, and Troubleshooting.

This course is an 8-hour web-based training course. It provides an overview of the technologies, features, and architecture for the Sun SPARC Enterprise T5440 servers. The course also covers administrative commands and features associated with the servers, and offers troubleshooting tips for handling potential issues and tasks on the servers.

This course is available at the following URLs (upon announcement):

https://slp.sun.com/sun

https://slp.sun.com/partners

# Professional Services

## Internal resources can be found at:
## http://mysales.central.sun.com/public/services/services-professional.html

### Key Services for Consideration with the Sun SPARC Enterprise T5440 systems.

### Sun Enterprise Migration Suite

Sun Enterprise Migration Suite helps customers safely upgrade to a new IT infrastructure or upgrade to Solaris 10 from older versions of Solaris while staying focused on their critical business.

http://www.sun.com/service/enterprisemigration/index.jsp

### Solaris 10 Evaluation Service

For Sun customers considering adopting Solaris 10, this two day service reviews the business reasons for their organization to run Solaris 10, explores upgrade options, and then interactively demonstrates the technical tools for migrating one application that currently runs on an older version of Solaris.

http://www.sun.com/service/solaris10/solaris10eval.xml

### Application Migration Service

Sun can help customers port a custom UNIX application or upgrade an older Solaris application to Solaris 10.

http://www.sun.com/service/migration/ams.xml

### Application Readiness Service

Specifically designed to ease resource constraints, speed deployment time, and move customers onto Solaris 10 quicker and easier.

http://www.sun.com/service/applicationreadiness/index.jsp

### Sun Virtualization Suite of Services

Virtualization services consist of a set defined, repeatable services, which build upon each other, consecutively, and are mapped to each phase of the AIM methodology.

Sun Virtualization Consulting Services experts can help customers plan, design, and deploy a virtualized environment that helps them achieve significant savings on power and cooling, improve service availability levels up to 99.99%, increase utilization by as much as 80%, and facilitate rapid provisioning to maximize return on IT investments. These services help curb datacenter sprawl by rapidly deploying an eco responsible infrastructure that helps reduce power and cooling costs by as much as 60% and space savings by as much as 57%.

http://www.sun.com/service/virtualization/index.jsp

### Sun Eco Services Suite

Provides a complete portfolio of eco-related services designed to establish a baseline for existing conditions, identify areas of improvement and provide plans for optimizing energy usage, cooling and general environmental conditions. Services include:

- Sun Eco Assessment Service for Datacenter (Basic or Advanced)
- Sun Eco Cooling Efficiency Service for Datacenter
- Sun Eco Optimization Service for Datacenter

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

### Identity Management Suite

Provides customers the right skill sets and the right technologies to implement their identity management solution quickly, effectively and predictably, while reducing their project risk and deployment cost..

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

### Performance Analysis & Capacity Planning Services

Includes collection of a variety of data points in customer systems (e.g., CPU utilization, memory utilization and swap rates, disk I/O rates, wait time) and analysis of data, evaluating ways to improve server performance using the customer's existing hardware configurations, making recommendations if additional hardware is required.

http://www.sun.com/service/performance/index.jsp

### iRunbook Services

Creates a knowledge power-base for IT organizations, allowing systems administrators to find the vital information they need to manage the data center using the latest Sun preferred practice advice from a central source – accessed within seconds via a simple web interface.

http://www.sun.com/service/irunbook/index.jsp

## Managed Services

### Sun Onsite Operations Management

During the onsite operations management engagement, a dedicated Sun team improves and manages the day-to-day operation of the Sun platform and imparts this expertise to customer staff. Sun Onsite Operations Management engagements can last for as little as three months, although many customers prefer to engage a team for much longer; during this time, we create or enhance customers' operational procedures and then provide systems administration, technical and operational support staff to manage their environments to this tailored approach.

http://www.sun.com/service/managedonsite/index.jsp

# Glossary

| | |
|---|---|
| 100BASE-T | See Fast Ethernet |
| Adapter | A host bus adapter or interface which plugs into a PCI slot to provide connectivity, for example, to networks, storage, graphics or other I/O devices. |
| ASR | Automatic System Recovery. A RAS feature that initiates a system reboot sequence that bypasses failed system components or a software failure. |
| Chip Multithreaded Technology (CMT) | A technology that speeds processing by dedicating silicon and threads to network tasks. Compute, packet processing, and switching tasks run concurrently, not sequentially as in single threaded systems, resulting in dramatic increases in performance and system utilization. |
| CMT | See Chip Multithreaded Technology |
| Controller | A microprocessor based device which is dedicated to a specific task, especially 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. |
| CRM | Customer Relationship Management, an enterprise application for managing the customer database and selecting groups thereof appropriate for offers or other levels of contact |
| DIMM | Dual in-line memory module. A memory unit that is available in a range of capacities. May also be used generically, i.e. to FB-DIMM, fully buffered DIMM. |
| DIMM group | A group of four DIMMs |
| ECC | Error correcting code, i.e. used within memory DIMMs |
| ERP | Enterprise Resource Planning, an enterprise application that tracks and supports the entire resource allocation, manufacturing processes and customer interaction including order entry, billing and collection |
| eFUSE | A technology that combines software algorithms and microscopic electrical fuses to produce chips that can regulate and adapt their own actions in response to changing conditions and system demands. |
| 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 its counterpart. |
| FB-DIMM | Fully buffered dual in-line memory module |
| FC-AL | Fibre Channel arbitrated loop. A loop topology used with Fibre Channel |
| Fibre Channel | See FC-AL |

| | |
|---|---|
| $I^2C$ | 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 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 | See Adapter |
| Hot-plug | A component that can be electrically safe to remove or add while the system is still running. Generally, an exchange between the system and staff takes place so that the operating system can prepare for the intended action, i.e. dismounting a file system upon which the affected disk(s) reside. |
| Hot-swap | A component that can be removed without intervention/notification to the operating system, i.e. a power supply or fan. |
| NFS | Sun's distributed computing file system, e.g., network file system |
| PCI | Peripheral component interconnect. An industry-standard for connecting peripherals such as disk drives, tape drives and other external devices. |
| PCIe | Peripheral Component Interconnect Express. Formerly known as third-generation I/O, this implementation of the PCI computer bus that uses existing PCI programming concepts and communication standards, but bases it on a much faster serial communications system. |
| PCI-X | Peripheral Component Interconnect Extended. A computer bus technology that increases the speed that data can move within a computer from 66 MHz to 133 MHz. |
| 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 | See Pre-configured System |
| Rack unit | A measurement of vertical height within an equipment rack or cabinet, approx. 1.75" or 44.5 mm. Also, please see RU. |
| 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. |
| Redundancy | Duplication for the purpose of achieving fault tolerance. Refers to duplication or addition of components. |
| RU | A measurement of vertical height within an equipment rack or cabinet, a rack unit, approximately 1.75" or 44.5 mm. |
| SAS | Serial Attached SCSI. The successor to the original SCSI technology with the ability to address up to 16,256 devices per port. It also has a more reliable point-to-point serial connection at speeds of up to 3 Gbps. |

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|---|---|
| SATA | Serial attached ATA |
| SCM | Supply Chain Management, a standard enterprise application |
| SCSI | Small Computer Systems Interface. An ANSI standard for controlling peripheral devices by one or more host computers. |
| Standard configuration | A pre-configured systems (PTOs) which offers popular combinations of processors, memory and disks with accelerated delivery time |
| Volume shadowing | See Mirroring |

# Materials Abstract

All materials are available on SunWIN except where noted otherwise.

| Collateral | Description | Purpose | Distribution | Token or COMAC |
|---|---|---|---|---|
| **Product Literature** | | | | |
| • *Sun SPARC Enterprise T5440 Server, Just the Facts* | Reference Guide (this document) | Training Sales Tool | SunWIN, Reseller Web | 526118 |
| • Sun SPARC Enterprise Server T5440 Data Sheet | Data Sheet | Sales Tool | SunWIN, Reseller Web, COMAC | 542155 |
| • | | | | |
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| **Related Materials** | | | | |
| • Sun SPARC Enterprise Server T5x20, Just the Facts | Reference Guide | Training Sales Tool | SunWIN, Reseller Web | 512743 |
| • Sun SPARC Enterprise Server T5120 Data Sheet | Data Sheet | Sales Tool | SunWIN, Reseller Web, COMAC | 512744 |
| • Sun SPARC Enterprise Server T5220 Data Sheet | Data Sheet | Sales Tool | SunWIN, Reseller Web, COMAC | 512745 |
| • Sun SPARC Enterprise T5140 and T5240 Servers, Just the Facts | Reference Guide | Training Sales Tool | SunWIN, Reseller Web | 526117 |
| • Sun SPARC Enterprise Server T5140 Data Sheet | Data Sheet | Sales Tool | SunWIN, Reseller Web, COMAC | |
| • Sun SPARC Enterprise Server T5240 Data Sheet | Data Sheet | Sales Tool | SunWIN, Reseller Web, COMAC | |
| • *Sun Logical Domains, Just the Facts* | Reference Guide | Training Sales Tool | SunWIN, Reseller Web | 559718 |
| **Presentations** | | | | |
| Sun SPARC Enterprise T5120 and T5220 Servers Customer/Sales Presentation | Customer Presentation | Sales Tool | SunWIN | 512741 |
| Sun SPARC Enterprise T5120 and T5220 Servers Technical Presentation | Customer Presentation | Sales Tool | SunWIN | 512749 |

| Collateral | Description | Purpose | Distribution | Token or COMAC |
|---|---|---|---|---|
| Sun SPARC Enterprise T5140 and T5240 Servers Customer/Sales Presentation | Customer Presentation | Sales Tool | SunWIN | 542156 |
| Sun SPARC Enterprise T5140 and T5240 Servers Technical Presentation | Customer Presentation | Sales Tool | SunWIN | 544629 |
| **White Papers** | | | | |
| • Sun SPARC Enterprise T5120 and T5220 Servers Technical • Whitepaper | White Paper | Sales Tool | SunWIN | 512750 |
| • Sun SPARC Enterprise T5120 and T5220 Servers RAS Whitepaper | White Paper | Sales Tool | SunWIN | 512751 |
| • Sun SPARC Enterprise T5440 Server Architecture Whitepaper | White Paper | Sales Tool | SunWIN | 542157 |
| • Sun SPARC Enterprise T5440 Server RAS Whitepaper | White Paper | Sales Tool | SunWIN | 542158 |
| **Solution Brief** | | | | |
| CoolTools Solution Brief | Solution Brief | Sales Tool | SunWIN | 483449 |
| Web Tier Advantage Solution Brief | Solution Brief | Sales Tool | SunWIN | 492087 |
| Siebel CRM Solution Brief | Solution Brief | Sales Tool | SunWIN | 544624 |
| SugarCRM Sun Blueprint | Solution Brief | Sales Tool | SunWIN | 544625 |
| **External Web Sites** | | | | |
| • Sun SPARC Enterprise T5120 | http://sun.com/t5120 | | | |
| • Sun SPARC Enterprise T5220 | http://sun.com/t5220 | | | |
| • Sun SPARC Enterprise T5440 | http://sun.com/t5440 | | | |
| • Logical Domains (LDoms) | http://sun.com/ldoms | | | |

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