Sun SPARC® Enterprise T5120 and T5220 Servers

Sun Codename: Huron

Just the Facts

SunWIN token #512743

Feb. 2, 2010

Version 2.1

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Revision History

Template Version	Comments	Date	Author
1.0	Original Release	July 2007	Jim Brennan Byron Magrane
1.1	Revisions: • Inserted Sun Codename: Huron on title page • Modified the System Architecture Section • Added content to the Additional Features Information Section • Extensive formatting and font modification	July 26, 2007	Jim Brennan Byron Magrane
1.2	Revisions: • Inserted new Software section • Inserted new Services section • Inserted ATO ordering instructions and flowchart • Replaced Huron references with Sun SPARC Enterprise T5120/T5220 as appropriate • Inserted Competitive Services provisions comparisons	August 9, 2007	Jim Brennan Byron Magrane
1.3	Revisions: • Reviewed and edited all sections for final draft	September 15, 2007	Jim Brennan Byron Magrane
1.4	Revisions: • Added Marketing collateral content • Added new version of Services content • Made edits from engineering review of technical content • Added Intel Tigerton competitive section • Reviewed and edited all sections for final draft • Deleted XVR 200 Graphics PCI-E cards • Added XVR 300 Graphics PCI-E cards • Modified availability dates for PCI-E RAID cards: Prometheus Cougar • Changed Maximum quantity to 3 for x4447A card	October 25, 2007	Jim Brennan Byron Magrane

	• Updated Materials Abstract • Modified ATO ordering steps content • Deleted ATO graphics ordering flow charts		
1.5	Revisions: • Modified all sections to include changes announced on 28 October 2008	October 25, 2008	Jim Brennan
1.6	Revisions: • Inserted Sun I/O Box Storage Expansion Unit guidelines and part numbers (Page 101 • Added clarification of the configuration guidelines for the Sun internal RAID PCI-e card part numbers SGPCIESAS-R-INT-Z and the SGXPCIESAS-R-INT-Z (Page 100)	Decemb er 11.2008	Jim Brennan
1.7	Revisions: • Inserted availability of ATO and Xoption 300 GB, 10K RPM, 2.5", SAS with Marlin bracket with part numbers: ATO = SESY3G11Z Xoptn=SESX3G11Z • Inserted availability of 32 GB, 2.5" SATA solid state disk drive with Marlin bracket with part numbers and maximum quantities limitations ATO = SESY3Y11Z Xoptn= SESX3Y11Z • Inserted availability of DC Power supply for T5220 (2U) – (1200W) ATO ONLY option = SESY9PS6Z • Updated Power Source Requirement Data	04/25/09	Jim Brennan
1.8	Revisions: Revised to reflect the Refreshed T5120 and T5220 systems As of July 2009, the following changes have been made to the Sun SPARC Enterprise T5120/T5220:	06/03/09	Jim Brennan

	• Solaris 10 Update 7 (05/09) and the latest firmware will be preloaded on all PTO configurations. The pre-install image will include: ◦ 259-5154-01 Solaris 10 5/09, Update 7 -IP Pre-install ◦ 259-5169-01 LDoms Manager and MIB 1.2 Pre-install ◦ 259-4808-01 CMT Tools 1.0 Pre-install ◦ 259-4809-01 GCC 4 for SPARC Systems 4.0.4 Pre-install ◦ 259-4815-01 Sun Studio 12 Pre-install ◦ 259-4829-01 SYS, FW, DL, UTIL, Pre-install ◦ 259-4904-01 MAI,10 GBE ETCSYS CFG ◦ 259-4855-01 Live Upgrade, ABE Pre-install • ILOM 3.0 will be included **Solaris 10 Update4 will no longer be an ATO option as of 21 July 2009.** **The Solaris Operating System ATO options are:** Solaris 10 (10/08) Update 6 Solaris 10 (05/09) Update 7 **Solaris 10 Update4+ patches remains the minimum supported OS, and all subsequent releases are supported.** • The 1GB FBDIMM has been eliminated as an option, Sun support will continue • The 1.2Ghz 8 core CPU is available for ATO configurations only ▪ We plan to EOL the 8 core 1.2GHz entirely in one quarter from the announcement of the new systems • There is an internal DVD drive transition from a PATA to SATA interface ◦ These servers will have a new HDD label showing "SATA DVD" identifier • There are new T5120 and T5220 disk backplanes • There are 1.6GHz CPU-based PTO and ATO configurations • **T5120 8 disk backplane cannot be utilized with a 1.6 GHz CPU** • The T5220 has a “Climate Saver” 750 watt		

	Power Supply Unit ◦ The currently shipping Power Supply Unit was EOLd on the day of the new system announcement • Documentation has been updated to reflect these changes		
2.0	• Update to X4447A-Z configuration info • Inclusion of X1106A-Z/X1107A-Z (Oplin)	11/19/09	
2.1	– EOL notice for standard configurations and transition to ATO	02/02/10	

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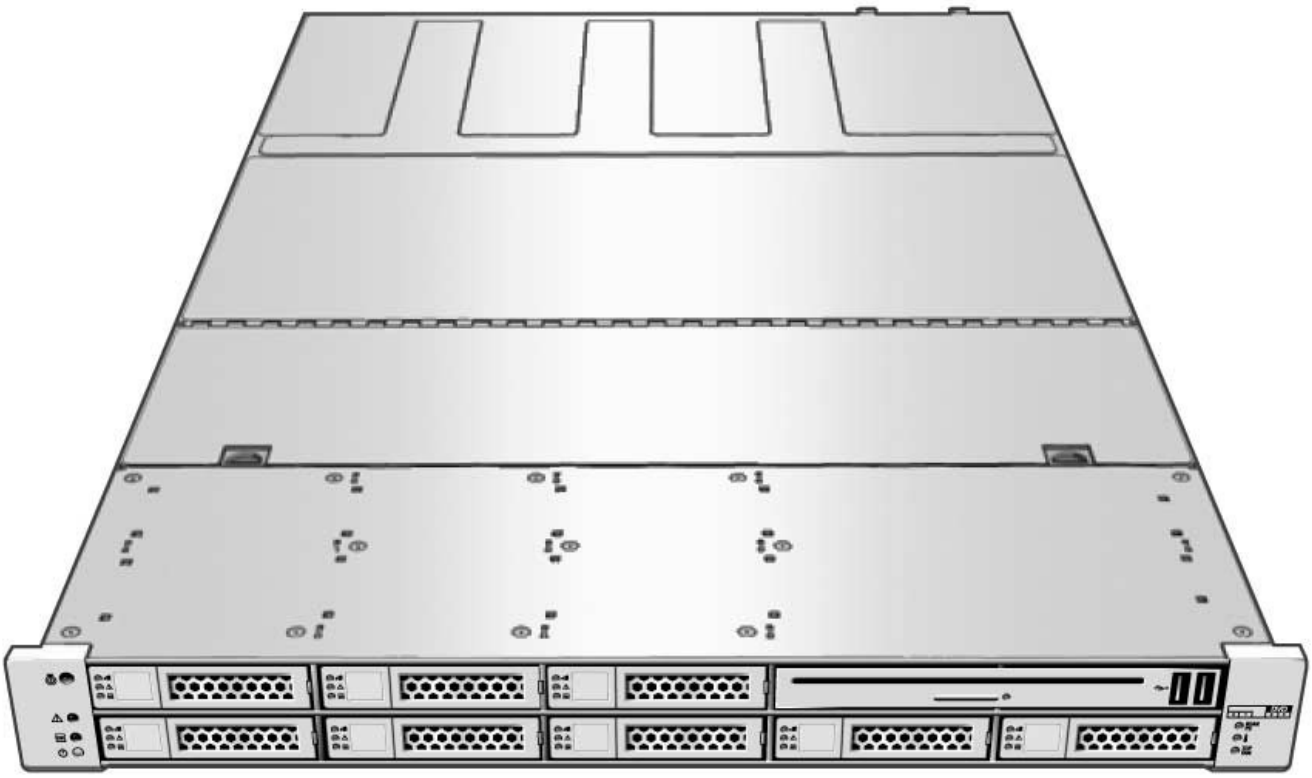
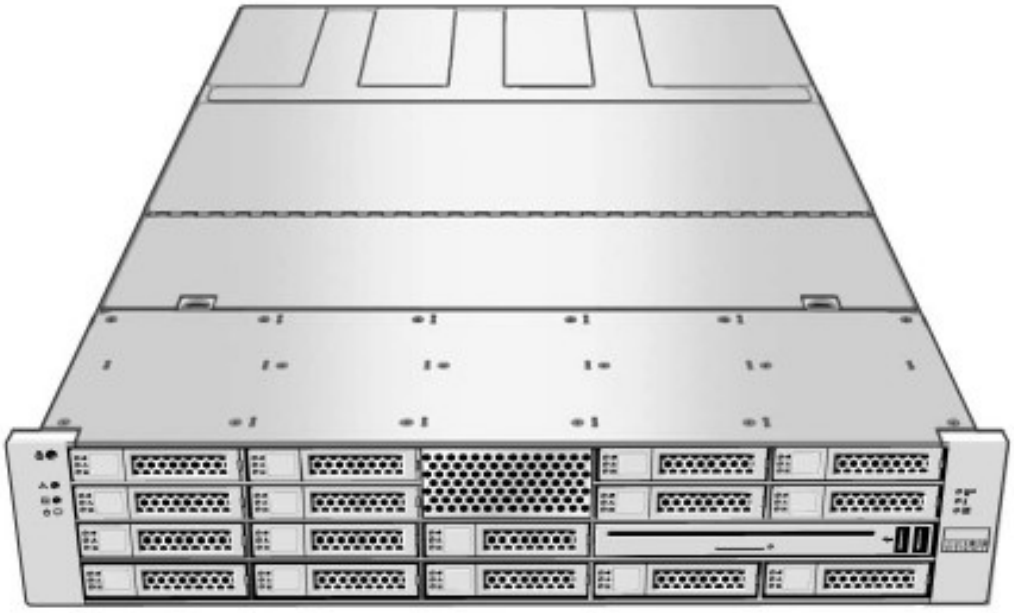


Sun SPARC Enterprise T5220 (2U) Server



Key Messages For The Sun SPARC Enterprise T5120 and T5220 Servers

The Sun SPARC Enterprise®T5120 and T5220 systems 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
- Securing enterprise applications at speed
- Creating virtualized and eco-efficient data centers

In designing for these customer challenges, the Sun SPARC Enterprise T5120 and T5220 systems provide the most reliable, scalable Web build-outs, including taking MySQL deployments to new levels. The results prove it – the T5120 server has nearly 3x the performance and 4x the performance per watt of competitive servers on the SPECjbb2005 benchmark.

These servers feature integrated on-chip cryptographic acceleration for wire speed security, on-chip I/O to reduce bottlenecks, and on-chip 10 Gigabit Ethernet for incredible networking performance. It's the whole package, and customers reap the rewards of that built-in value with lower acquisition costs and higher uptime driven by lower component count.

For measurable cost savings, customers can drive up utilization, drive down costs, and massively consolidate workloads with the built-in, no-cost virtualization technology of Logical Domains (LDoms) and Solaris Containers.

Extreme Efficiency, Speed, Scale and Security For Customers' Web Infrastructure

Efficient and Predictable Scale:

- Accelerates network-intensive applications, including web, mail, database access, cluster computing, streaming media and server to server communications.
- Greatly increases performance and reliability, while reducing power, cost and components by integrating multiple cores, threads, I/O, networking and cryptographic acceleration onto a single processor.
-
- First server to integrate 10Gigabit Ethernet technology and I/O directly on chip, ready for the emerging generation of network-intensive services, without additional NIC costs.

Eco-Efficiency:

- Best Performance per Watt, by 3x, and SWaP scores by 22x, across webscale workloads when compared to HP and IBM UNIX-based systems at higher price points running the SPECjbb2005 benchmark.
- Incorporates unique power management features that can reduce power consumption by 50%.
- Reduced energy consumption further reduces data center cooling requirements.

Zero Cost Security

- End-to-end encryption for all data communicated across the network, to ensure security, privacy and business compliance, without impacting performance or increasing costs.
- The UltraSPARC T2 supports 10 industry standard security ciphers available via on-chip, integrated cryptographic accelerators.
- There are no additional costs, and virtually no impact to performance as most crypto activities occur at close to wire-speed.
-

Virtualize / Consolidate:

- A combination of open-source and no-cost virtualization technologies make the Sun SPARC Enterprise T5120 and T5220 ideal for Virtualization and Consolidation of web infrastructure and networking-facing workloads.
- The Logical Domains (LDoms) software 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 64 independent virtual machines thereby assuring isolation and security.

System and Data Center Reliability

- Greater processor and system integration reduces component count, leading to fewer failures and higher uptime.
- High MTBF for any single points of failure.
- Redundant hot plug / swap of key system components, including PSUs, fans and disks.

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.
- Use of standard ILOM protocols also enables the Sun SPARC Enterprise T5120 and T5220 servers to be integrated and managed into other Enterprise Management Frameworks (i.e. CA Unicenter, HP Openview, etc.) and Element Managers (i.e. Insight Manager, IBM Director).
- Enables organizations to decrease installation time, improve Time to Market, increase agility as well as reducing management overheads for on-going maintenance and patching.

Introduction

These are the external Urls for each Sun SPARC Enterprise T5120 and T5220 server:

Sun SPARC Enterprise T5120 server: http://sun.com/t5120

Sun SPARC Enterprise T5220 server: http://sun.com/t5220

For detailed documentation
All Sun SPARC Enterprise T5120 documentation is located at:
http://docs.sun.com/app/docs/coll/t5120

All Sun SPARC Enterprise T5220 documentation is located at:
http://docs.sun.com/app/docs/coll/t5220

The Sun SPARC Enterprise T5120 and T5220 systems, Sun internal codename “Huron”, represent Sun’s next evolutionary advance in high-efficiency server platforms based on the second generation of Sun's Multi-threaded Technology (CMT) utilized in the UltraSPARC™ T2 processor, code-named “Niagara2”, or simply, “N2”. These systems are optimized for the enterprise data center, targeted primarily at multi-threaded commercial and technical workloads.

The Sun SPARC Enterprise® T5120 and T5220 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

In designing for these customer challenges, the Sun SPARC Enterprise T5120 and T5220 systems provide a notable improvement in throughput, in addition to performance per unit of power and density over the competition, as well as over current offerings from Sun, including the T1000/2000 systems.

The Sun SPARC Enterprise T5120 and T5220 platform consists of either a one Rack Unit (1RU) height rack-mountable (Sun SPARC Enterprise T5120) or a two Rack Unit (2RU) height rack-mountable (Sun SPARC Enterprise T5220) server, sharing a common motherboard featuring a single UltraSPARC T2 CPU. The UltraSPARC T2 represents Sun’s first truly integrated “System on a Chip” processor. This processor is optimized for highly threaded transactional processing whereby, the core utilization is maximized through the reduction in time spent on waiting for memory access.

The UltraSPARC T2 processor is a generational improvement over the Niagara1 processor used in the T1000/2000 platforms, with integrated integrated PCI-E ASIC features, two XAUI ports, 8 SPARC cores with the ability to concurrently run 8 threads per core, a separate Floating Point Unit for each core, L2 cache, memory access crossbar, and 4 independent, dual channel memory controllers featuring the introduction of new technology memory in the form of fully buffered DDR2 based memory DIMMs, commonly known as FB-DIMMs.

The Sun SPARC Enterprise T5120 and T5220 servers provide an optimized environment to fully utilize the capabilities of the UltraSPARC T2 processor, incorporating Sun’s value add of advanced platform management.

Key Features Summary

As of July 2009, the following changes have been made to the Sun SPARC Enterprise T5120/T5220:

- Solaris 10 Update 7 (05/09) and the latest firmware will be preloaded on all PTO configurations. The pre-install image will include:
  - 259-5154-01 Solaris 10 5/09, Update 7 -IP Pre-install
  - 259-5169-01 LDoms Manager and MIB 1.2 Pre-install
  - 259-4808-01 CMT Tools 1.0 Pre-install
  - 259-4809-01 GCC 4 for SPARC Systems 4.0.4 Pre-install
  - 259-4815-01 Sun Studio 12 Pre-install
  - 259-4829-01 SYS, FW, DL, UTIL, Pre-install
  - 259-4904-01 MAI,10 GBE ETCSYS CFG
  - 259-4855-01 Live Upgrade, ABE Pre-install
- ILOM 3.0 will be included

Solaris 10 Update4 will no longer be an ATO option as of 21 July 2009.

The Solaris Operating System ATO options are:

Solaris 10 (10/08) Update 6

Solaris 10 (05/09) Update 7

Solaris 10 (10/09) Update 8 **TBD/Future**

Solaris 10 Update4+ patches remains the minimum supported OS. All subsequent releases are supported as well.

- The 1 GB FBDIMM has been eliminated as an option, Sun support will continue
- The 1.2Ghz 8 core CPU is available for ATO configurations only
  - We plan to EOL the 8 core 1.2GHz entirely in one quarter from the announcement of the new systems
- There is an internal DVD drive transition from a PATA to SATA interface
  - These servers will have a new HDD label showing "SATA DVD" identifier
- There are new T5120 and T5220 disk backplanes
- There are 1.6 GHz CPU-based PTO and ATO configurations
- **T5120 8 disk backplane cannot be utilized with a 1.6 GHz CPU**
- The T5220 has a "Climate Saver" 750 watt Power Supply Unit
  - The currently shipping Power Supply Unit was EOLd on the day of the new system announcement
- Documentation has been updated to reflect these changes

Sun SPARC Enterprise T5120/T5220 Feature Summary

- One common motherboard supports either the T5120 or the T5220 Rack Optimized Chassis
- UltraSPARC T2 CMT SPARC processor running at 1.2GHz with 4, or 8 cores or 1.4GHz with 8 cores, and 1.6GHz with 8 cores
- Power throttle features within the UltraSPARC T2 chip provide for system power optimization
- 16 Fully Buffered Dual In line Memory Module (FBDIMM) slots that support commodity 2, 4, and 8 Gigabyte FBDIMM modules (maximum capacity of 128 Gigabytes of system memory)
- Dedicated low profile PCI-Express expansion slots:
  - The T5120 has three (3) PCI-E expansion slots that can be utilized for low profile PCI-Express option cards or XAUI option cards. Up to two XAUI cards can be added. Note that each XAUI card installed will occupy the space of one PCI-E slot.
  - The T5220 has six (6) PCI-E expansion slots that can be utilized for low profile PCI-Express option cards or XAUI option cards. Up to two XAUI cards can be added. Note that each XAUI card installed will occupy the space of one PCI-E slot.

- Two industry standard XAUI (10 Gigabit Ethernet) ports through Network Interface Unit (NIU) in UltraSPARC T2 processor supporting fibre and copper from proprietary add-in card installed into the combination PCI-E/XAUI expansion slot(s).
- Four 10/100/1000 Ethernet RJ45 based ports through 2 independent controllers
- Four USB 2.0 ports (2 forward, 2 rear facing)
- Four or eight available disk drive bays in the T5120 chassis supporting SAS commodity drives up to 300 Gigabyte capacity each and four Solid State Drives
- Eight or sixteen available disk drivebays in the T5220 chassis supporting SAS commodity drives up to 300 Gigabyte capacity each and eight Solid State Drives
- One slot loading SATA-based DVD drive located in the front of the chassis
- One Serial POSIX compliant DB9 port in the back of the chassis
- Next generation service processor ILOM 3.0 software implementation supporting both an RJ45 serial interface and 10/100 based Ethernet access
- 2x Hotplug/hotswap high efficiency AC/DC power supplies:
- The T5120 system has an AC 720 watt “Climate Saver” PSU or a DC 660 watt PSU
- The T5220 has a “Climate Saver” 750 watt Power Supply Unit or a DC 1200 watt PSU
- AC and DC PSU cannot reside in the same system.
- N+1 system cooling via fan bank in front of chassis under environmental monitor control
- Additional system boards consist of: PDB, PDB connector card, Disk Backplane, Fan connector board(s), and PCI-e Riser cards that are unique to the chassis size (1U vs 2U), but common across platforms

Sun SPARC Enterprise T5120 (1U)

The physical characteristics of the Sun SPARC Enterprise T5120 with four disk drives

Front of the Sun SPARC Enterprise T5120 Server (1U)

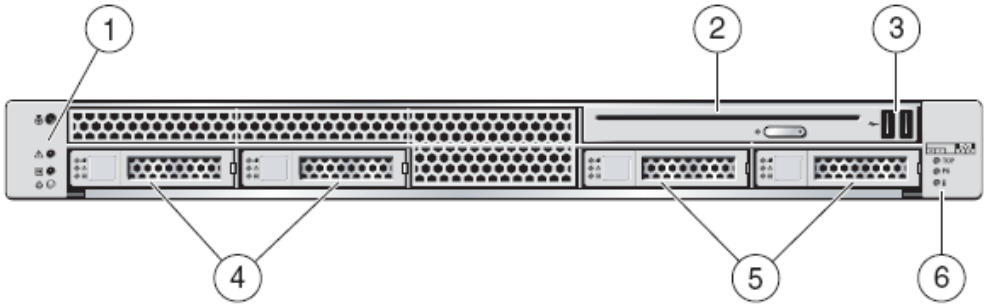


Figure Legend

1	System status indicators	4	Hard drives (left to right; HDD0, HDD1)
2	DVD drive	5	Hard drives (left to right; HDD2, HDD3)
3	USB ports (left to right; 2, 3)	6	Component status indicators

Rear of the Sun SPARC Enterprise T5120 Server (1U) with four disk drives

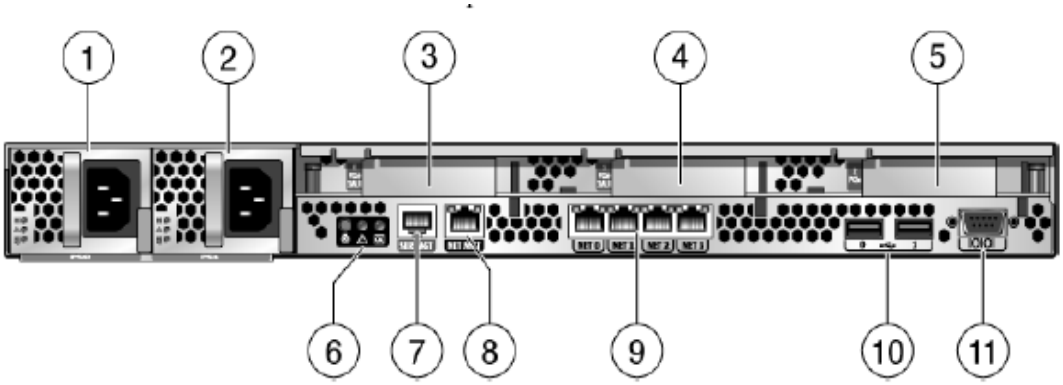


Figure Legend

1	Power supply (PS0)	7	Serial System controller port (SER MGT)
2	Power supply (PS1)	8	Ethernet System controller port (NET MGT)
3	PCIe or XAUI slot 0	9	10/100/1000 Ethernet ports (left to right; NET0, NET1, NET2, NET3)
4	PCIe or XAUI slot 1	10	USB ports (left to right; 0, 1)
5	PCIe slot 2	11	Host serial port, DB9 connector (POSIX compliant, TTYA)
6	System status indicators		

Sun SPARC Enterprise T5220 (2U)

The physical characteristics of the Sun SPARC Enterprise T5220 with eight disk drives

Front of the Sun SPARC Enterprise T5220 Server (2U) with eight disk drives

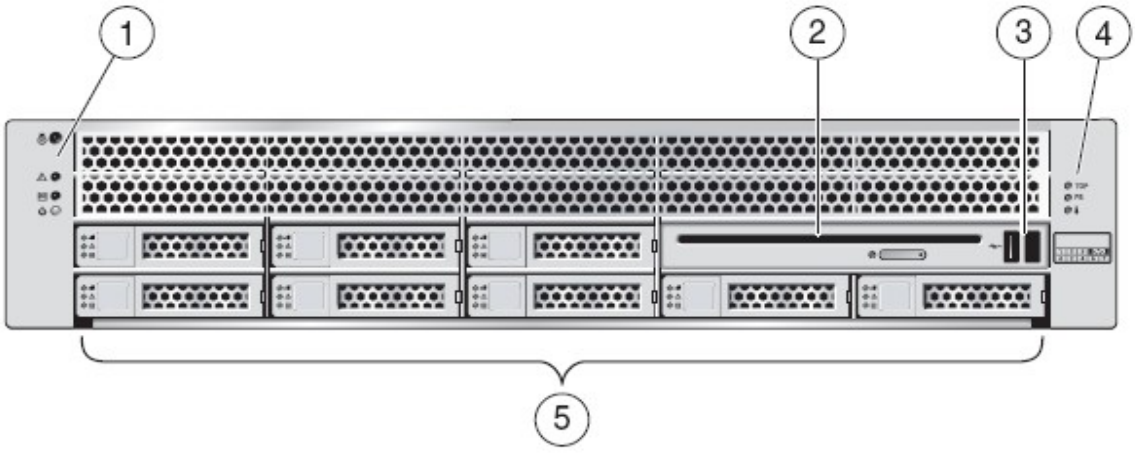


Figure Legend

1	System status indicators	4	Hard drives (top left to right; HDD1, HDD3, HDD5 bottom left to right; HDD0, HDD2, HDD4, HDD6, HDD7)
2	DVD drive	5	Component status indicators
3	USB ports (left to right; 2, 3)		

Rear of the Sun SPARC Enterprise T5220 Server (2U) with eight disk drives

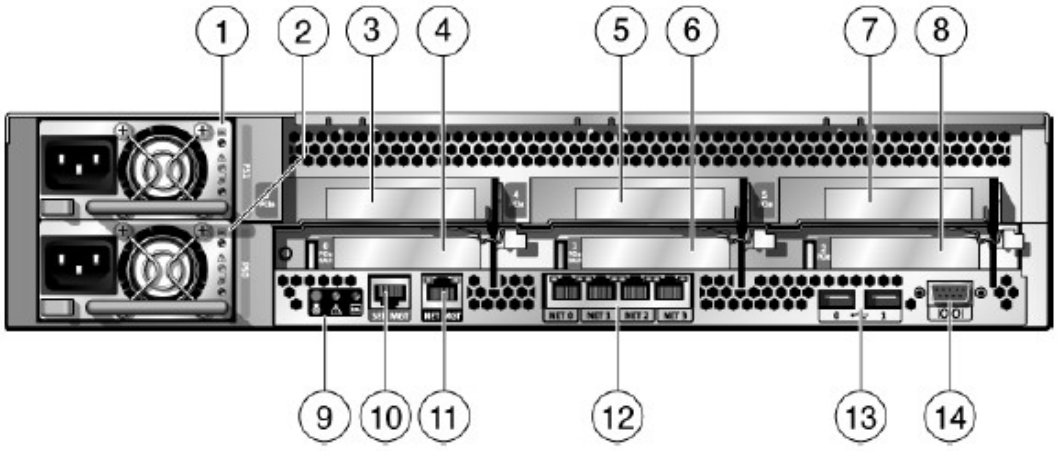


Figure Legend

1	Power supply (PS0)	8	PCIe slot 2
2	Power supply (PS1)	9	System status indicators
3	PCIe slot 3	10	Serial System controller port (SER MGT)
4	PCIe or XAUI slot 0	11	Ethernet System controller port (NET MGT)
5	PCIe slot 4	12	10/100/1000 Ethernet ports (left to right; NET0, NET1, NET2, NET3)
6	PCIe or XAUI slot 1	13	USB ports (left to right; 0, 1)
7	PCIe slot 5	14	Host serial port, DB9 connector (POSIX compliant, TTYA)

1.

The Sun SPARC Enterprise T5120 and T5220 Servers

Key Product Features, Functions, and Benefits

Feature	Function	Benefit
• UltraSPARC T2 processor equipped with up to 8 cores with 8 threads per core	• Support for 64 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
• First True System on a Chip	• Scaling performance with threads instead of frequency • Integrates networking, I/O and security capability for highly threaded workloads	• Optimizes processors to exploit application parallelism • Provides rich availability feature set
• On chip 10GbE	• Multithreaded 10 GbE integrated on a chip	• Up to 4X the performance of current network interface cards • Eliminates network I/O bottlenecks
• First Integrated, On-Chip Crypto Accelerators	• Crypto processing at close to wirespeed, no card or co-processor requirement • Support for 10 industry standard security ciphers	• No impact to system performance and no additional costs • Support for 10 industry standard security ciphers – secure your systems and your services
• 8 FPUs per processor, full VIS instruction set	• Extends proven CMT benefits from commercial to technical workloads	• Enables standardization of data center servers, reducing cost and complexity • Protects investments as future workloads emerge
• Ultra low part count of Huron	• Redundancy of key parts + high MTBF of components • Offline individual threads and cores, without reboot	• CMT Integration reduces part counts and Service Interruptions by nearly 3X
• Cores connected through a 268.8 GB/sec. crossbar switch	• Very fast communication between cores	• Higher performance 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 can 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 95 watts 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 64 OS instances	• Virtualization solution for a flexible infrastructure at no additional cost	• Driving Up Utilization & Agility while Reducing Costs
• Up to 128GB memory	• Support for larger workloads	• Enhanced performance and throughput, growth and investment protection. Customers have the ability to deploy and host larger workloads supporting more users and more transactions and improving on response times.
• ECC and parity protection on on its 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.
• Space efficient, rack-optimized 1RU and 2RU designs	• Offers high compute density, providing maximum value per rack unit	• Up to 64 threads in a dense, rack-optimized enclosure enables customers to maximize throughput power in their data center
• Two hot-swappable, redundant, highly efficient power supplies	• Full redundancy for main power.The system can run at full speed and full capacity using either one or two main power supplies.	• Added reliability and up time in the event of either a single power supply fault or a loss of AC line power when each supply is plugged into an independent AC line.
• 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
• Integrated controllers for SAS disks,3 – 6 PCI-E, four USB, and one serial port	• Integration and connectivity	• Cost-effective means to provide network and storage connectivity. Allows for fast deployment into an IT environment
• Solaris 10 Update 7 5/09 Operating System pre-installed	• With features such as Ldoms, Solaris Containers, predictive self-healing, Solaris Dynamic Tracing and support for the latest UltraSPARC platforms, Solaris 10 Update 7 OS sets entirely new standards for performance, efficiency, availability and security	• Innovations in the Solaris 10 Update 7 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 CPU-based systems with no modification required.	• No need to migrate OS or to port applications to take advantage of new hardware features, providing unrivaled investment protection
• Rack-optimized system with support for most industry standard four-post racks	• Installation and serviceability	• Ease integration and deployment into production environments while enabling customers to preserve their investments in existing datacenter environments
• Sun Customer Ready Systems (CRS) program	• For factory-configured, pre-racked, custom Sun SPARC Enterprise T5120 servers, refer to the CRS program website: http://www.sun.com/crs	• Simplification and speed of system deployment

Product Family Placement

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

- The Sun SPARC Enterprise T5120/5220 servers are among Sun's first servers to incorporate the UltraSPARC T2 processor.
- Building on the success of the UltraSPARC T1, UltraSPARC T2 represents the next giant step in CoolThreads technology. The Sun SPARC Enterprise T5120/5220 servers are designed to be complimentary to Sun's existing line of UltraSPARC IIIi, UltraSPARC IV, Opteron and Intel processor-based servers.

Overall platform positioning can be summarized as follows:

- **Sun SPARC Enterprise CoolThreads servers** for highly threaded web, application tier, middleware, HPC and OLTP workloads requiring the highest levels of power and space efficiency
- **Sun Fire x64 servers** for FP performance and compute-intensive workloads and for environments that are already standardized on x64 or Linux/Windows-based applications.
- **Sun Fire V125 - V445 servers** for continuing build out of SPARC / Solaris architectures requiring pre-Solaris 10 support and legacy PCI cards
- **Sun Fire V490 to E25K and SPARC Enterprise M4000 to M9000 servers** for workload consolidation and highly scalable, mission-critical workloads requiring the highest levels of isolated domains and RAS

Feature Comparison of UltraSPARC T2-based Servers

Feature	Sun SPARC Enterprise T5120 Server (1U)	Sun SPARC Enterprise T5220 Server (2U)
CPUs	4 core 1.2 GHz and 8 core 1.4GHz. 8 core 1.6GHz UltraSPARC T2 1 processor per system.	4 core 1.2 GHz and 8 core 1.4GHz, 8 core 1.6GHz UltraSPARC T2 1 processor per system.
Threads	64 max.	64 max.
Max. memory	4x 2 GB FBDIMM min 16x 2, 4, 8 GB FBDIMM max	4x 2 GB FBDIMM min 16x 2, 4, 8 GB FBDIMM max
Max. internal disk drives	Up to 8 SFF SAS 73 or 146 GB	Up to 16 SFF SAS 73 or 146GB
I/O	SAS 2.5" HDD, RAID 0/1 8 x 146, 300	SAS 2.5" HDD, RAID 0/1 16x 146, 300

	GB hard drives or 4 SSD drives	GB drives or 8 SSD drives
PCI	Three (3) PCI-E slots for low profile PCI-Express option cards or XAUI option cards. Two XAUI cards can be added and each XAUI card will occupy the space of one PCI-E slot.	Six (6) PCI-E slots for low profile PCI-Express option cards or XAUI option cards. Two XAUI cards can be added and each XAUI card will occupy the space of one PCI-E slot.
Ethernet	4x 10/100/1000 Mbps	4x 10/100/1000 Mbps
Power supplies	N+1 AC 720 W “Climate Saver” or DC 660W w/8 disk drives	N+1 750W “Climate Saver” or DC 660W/8 disk drives and AC 1100W w/16 disk drives
Fans	Redundant hot-swappable fan units 8 Hot-swappable system fan trays (4 pairs of fan trays @2 fans per tray)	Redundant hot-swappable fan units 6 Hot-swappable system fan trays (3 pairs of fan trays @2 fans per tray)
Form factor	1 RU	2 RU
Solaris OS version	Solaris 10 Update 6 (10/08) or Update 7 (05/09)	Solaris 10 Update 6 (10/08) or Update 7 (05/09)

Select the Sun SPARC Enterprise T5120 server when:	**Select the Sun SPARC Enterprise T5220 server when:**

• Customer needs very high throughput but has significant power, cooling, and space constraints
  • 64 thread UltraSPARC T2 processor in 1RU, low power package
• Customer demands very high levels of price/performance with lowest acquisition price
  • Lower expandability
• Typical workloads
  • Compute node within massively horizontally scaled environment, typically access/presentation tier of low-end app layer of web services environment
	• Customer demands best levels of throughput and expandability
	  • I/O, and internal disk
	• Typical workloads
	  • Demanding mid-tier application server deployments or web tier consolidation projects requiring maximum uptime with future growth and integration into diverse environments
	  • OLTP Databases

Feature Comparison with Other UltraSPARC CPU-based Servers

Feature	Sun SPARC Enterprise T5120/5220	Sun SPARC Enterprise T1000
CPUs	**4,core 1.2 GHz UltraSPARC T2 8 Core 1.4 GHz and 8 Core 1.6 GHz UltraSPARC T2 1 chip per system.**	**6, 8 core 1.0 GHz UltraSPARC T1 CPUs**
Threads	**64 max.**	**32 max.**
Max. memory	**4x 1 GB FBDIMM min 16x 1, 2, 4, 8 GB FBDIMM max**	**32GB**
Max. internal disk drives	**T5120 (1U) SAS 2.5” HDD, RAID 0/1 8 x 146, 300 GB hard drives or 4 SSD drives T5220 (2U) SAS 2.5” HDD, RAID 0/1 16x 146, 300 GB drives or 8 SSD drives**	**One 160 GB SATA disk or two 73 GB or 146 GB SAS disks**
Removable media	**Slimline DVD-ROM**	**-**
Interfaces	**Four USB 2.0 ports**	**-**
PCI slots	**T5120 has three (3) PCI-E slots T5220 has six (6) PCI-E slots for low profile PCI-Express option cards or XAUI option cards. Two XAUI cards can be added and each XAUI card will occupy**	**One PCI-E slot ofr low-profile cards (supports 1x, 4x and 8x width)**

	the space of one PCI-E slot	
Ethernet	Two 10-Gb Ethernet ports are available by adding Sun XAUI cards 4x 10/100/1000 Mbps	Four on-board Gigabit ports
Form factor	1 RU/2 RU	1 RU
Solaris OS version pre-installed	Solaris 10 Update 6 (10/08) or Update 7 (05/09)	Solaris 10 11/06 or Update 6 (10/08)

Feature	Sun SPARC Enterprise T5120/5220	Sun SPARC Enterprise T2000
CPUs	4,core 1.2 GHz UltraSPARC T2 8 Core 1.4 GHz and 8 Core 1.6 GHz UltraSPARC T2 1 chip per system.	4, 6, 8 core 1.0/1.2/1.4-GHz UltraSPARC T1 CPUs
Threads	64 max.	32 max.
Max. memory	4x 1 GB FBDIMM min 16x 1, 2, 4, 8 GB FBDIMM max	64 GB, 400MHz DDR2
Max. internal disk drives	T5120 (1U) SAS 2.5” HDD, RAID 0/1 8 x 146, 300 GB hard drives or 4 SSD drives T5220 (2U) SAS 2.5” HDD, RAID 0/1 16x 146, 300 GB drives or 8 SSD drives	Up to four 73 GB or 146GB SFF SAS
Removable media	Slimline DVD-ROM	Slimline DVD-ROM/CD-RW
Interfaces	Four USB 2.0 ports	Four USB 1.1 ports
PCI slots	T5120 has three (3) PCI-E slots T5220 has six (6) PCI-E slots for low profile PCI-Express option cards or XAUI option cards. Two XAUI cards can be added and each XAUI card will occupy the space of one PCI-E slot	Max: 2x 8 lane PCI-E, 2x 4 lane PCI-E, 2x 4 lane PCI-E or XAUI combo
Ethernet	Two 10-Gb Ethernet ports are available by adding Sun XAUI cards 4x 10/100/1000 Mbps	Four on-board Gigabit ports
Form factor	1 RU/2 RU	2 RU
Solaris OS version	Solaris 10 Update 6 (10/08) or Update 7 (05/09)	Solaris 10 11/06 or Update 6 (10/08)

Selection Criteria

Sun Fire T2000/T1000 vs. Sun SPARC Enterprise T5120 and T5220

Sun SPARC Enterprise T5120 and T5220 *is Ideal for...*	Sun SPARC Fire T1000/T2000 *is Ideal for...*
Maximum performance and efficiency across a spectrum of applications, including Floating Point	**Lowest absolute power consumption**
Organizations requiring rapid scalability of compute power	**Lowest cost of entry**
Heavy Crypto requirements	**Continuation of existing deployments**
Native 10GbE Networking	**Solaris 10 01/06 update requirements**
Highest level of virtualization	

Sun SPARC Enterprise T5120 and T5220 servers are optimized for:

- Web, middleware and application tier workloads, especially Java environments
- OLTP Database environments
- Multi-threaded HPC workloads with large instruction and data sets
- New web services deployments and SOA infrastructure implementations
- 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

Positioning Comparison with Other UltraSPARC Servers

Feature	UltraSPARC T1 CPU-based Servers	UltraSPARC IIIi CPU-based Servers	UltraSPARC IV+ and SPARC Enterprise SPARC 64 CPU-based Servers
Selection criteria	Optimum performance, power, and space balance for integer workloads	Optimum price, feature, flexibility balance	Highest levels of scalability
Target use	Multithreaded application specialist	Mixed workload performance	Highest overall performance on widest variety of applications
RAS	Superior RAS	Good RAS	Highest-level RAS; best application separation
Flexibility	Supports PCI-E and PCI-X cards	Support for legacy accessories and devices	Broadest support for legacy and new devices

Target Users

There is a large variety of target users for the Sun SPARC Enterprise T5120 and T5220 servers. Look for users that run applications that require Java code, highly threaded commercial or technical applications, and mid-sized OLTP databases with moderate I/O requirements. Customers looking to build out their infrastructure for web-scale computing, or who are designing virtualized and eco-efficient data centers are prime targets for the SPARC Enterprise T5120 and T5220 servers.

The Sun SPARC Enterprise T5120 and T5220 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 T5120 and T5220 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 Processing Cores	Appropriate Markets/Applications
4 Cores	• Proxy caching • Email service • Batch processing • Streaming media • Web serving • Application development • Networking • Security • Systems management
8 Cores	• Java application servers and Java Virtual Machines • ERP, CRM, OLTP • Data warehouses and marts • Data analysis and mining • Virtualized applications • HPC Applications

Competitive Positioning

This competitive section is designed to provide a view of the competitive landscape at the time of the October 2008 announcement.

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, you should consult competitive.central for current information.

Sun SPARC Enterprise T5120/5220 servers

No other server on the planet better empowers organizations to build for web scale and push the boundaries of network participation. The Sun SPARC Enterprise 5120/5220 CoolThreads servers based on the UltraSPARC T2 CMT processor enable IT groups to securely, reliably and eco-efficiently serve millions of new customers and communities while saving $millions, through a virtualized, environmentally responsible data center infrastructure. Underpinned by the most innovative open source processor, Operating System and middleware technology stack available, organizations benefit from greatest levels of application choice and investment protection in the industry.

The Sun SPARC Enterprise T5120/5220 servers have unique competitive differentiators that cannot be matched by IBM, HP or Dell, including:

- First general purpose System on a Chip
- Delivers higher throughput in less space and power than any other server on the planet
- No compromise eco-efficiency, low power & high performance
- Fewest parts in class, improving reliability and SLAs
- First platform to deliver zero-cost security available via on-chip, integrated cryptographic accelerators
- On-Chip Integration of I/O and 10GbE Networking
- 64 isolated OS instances, with no cost virtualization
- Unique binary compatibility guarantee
- Most open platform on the planet
- Most advanced OS on the planet

Key Competitive Differentiation:

- The Sun SPARC Enterprise T5120/5220 servers based on open-source, open-industry standard hardware and software offer up higher throughput in less power and space than competitive platforms. See the product pages on sun.com for the latest benchmarks.
- The industry-first System on a Chip design of UltraSPARC T2 integrates 8 cores, 64 threads, 8 x Floating Point Units, cryptographic acceleration, Dual 10Gb Ethernet ports and I/O directly onto the processor, resulting in systems with nearly 3x fewer parts, and therefore 3x fewer risks of system failure, than competitive systems. Zero-Cost security becomes a reality with the integration of 10 common security ciphers directly onto the chip, enabling 1 x The Sun SPARC Enterprise

T5120/5220 systems to deliver 28x higher crypto-graphic throughput than competitive proprietary processors, and therefore save $40k in acquisition costs, 16x less power and 14x less space. The Sun SPARC Enterprise T5120/5220 deliver up to 11x higher network bandwidth than competitive systems through the integration of dual 10 Gigabit Ethernet directly onto the processor.

- Customers have maximum application and platform choice with the open source, no cost Solaris OS. Sun's suite of open source, no cost Cool Tools for optimizing development and deployment on UltraSPARC T2 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 processor.
- The Sun SPARC Enterprise T5120/5220 servers offer the most flexible, open and lowest cost virtualization and consolidation capability in class. Logical Domains support up to 64 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 $10k 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 four on-board memory controllers allow the UltraSPARC T2 processor to perform superbly on applications that move data with many small threads and high memory bandwidth.
- The Sun SPARC Enterprise T5120/5220 servers are a fourth-generation CMT design (UltraSPARC IV, UltraSPARC IV+, UltraSPARC T1, UltraSPARC T2)
- 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 provide rich configurations (i.e. memory with high processor core/frequency) bundled with redundant power supplies and disks as standard along with 4 x 1GbE interfaces and RAID, unlike many competitive standard configurations where all of these items must be added, therefore adding to cost .
- The Sun SPARC Enterprise T5120/5220 servers offer three real dimensions of consolidation. They can consolidate workloads because of their high performance in lower power and space power envelope. Many competitive platforms are unable to do this – usually only offering one or two consolidation dimensions.

The following sections analyze core competitive platforms to the Sun SPARC Enterprise T5120 and T5220 servers.

IBM System p5+ Rack-Optimized Servers

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

–

- AIX represents a long-term lock-in, much like IBM's mainframe, into a closed, expensive 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 thousands of dollars 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 of AIX, virtualization and applications licensed per core will double.
- Sun's standard configurations provide rich configurations (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 T5120 vs IBM System p5+ Servers, 1 & 2 RU / Dual Processor Servers

IBM offers two server families that compete in this class against the Sun SPARC Enterprise T51201U Server – the 1U high p5 505Q and the 2U high p510Q. Both of these server families are based on a a dual processor or the lower frequency quad processor p5+ module. The Quad processor-capable modules are denoted with the letter “Q”, indicating Quad Core Module. The 2U servers offer richer disk and I/O expandability, allowing greater scalability and redundancy of configuration when compared to the 1U servers.

A detailed matrix follows after this high level analysis

The p505Q is positioned for HPC workloads, SMB customers, and high density enterprise compute environments.

The p510Q is positioned for enterprise application, database infrastructure, high density consolidated workloads and business analytic applications in enterprise environments.

The Sun SPARC Enterprise T5120 server provides strong competition against both of these families of systems from IBM:

- Based on benchmark comparisons, the Sun SPARC Enterprise T5120 delivers up to 3x higher throughput than the highest-performing QCM versions of the IBM systems in up to half of the rack space. This enables customers to compress more compute performance into less data center space.
- Lower power consumption when running real workloads enabling customers to reduce both their energy and carbon footprint/cost, as well as completing more work for each watt of power consumed.
- Greater compute, memory, I/O, network and disk spindle expandability, allowing seamless in-server growth and greater investment protection. (The T5120 has 8 disk drives compared to 4 disk drives on the IBM)

- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Hot swap disks, PSUs, fans and RAID support as standard. These are optional on IBM's systems, allowing Sun to deliver greater levels of RAS at lower cost

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

-
- Longer warranty, with 3 years support vs 1 year on the Sun SPARC Enterprise T51201U. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise T5120 and T5220 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 Series p servers
- Lower absolute power consumption with the IBM p510Q, but this is offset by the higher performance per watt of the Sun SPARC Enterprise T5120 – so more work can be accomplished per watt of power delivered to the data center.
- Lower acquisition costs, however this can be offset by the Sun SPARC Enterprise T5120's superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) DIMMs.

	Sun - SPARC Enterprise T5120	IBM - System p5 510Q Express	IBM - System p5 505Q Express
Manufacturer	Sun	IBM	IBM
Product Type	Entry-Level Server	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack	Rack
Platform	UNIX	UNIX, LINUX	UNIX, LINUX
Announced	10/28/08	14-Feb-06	25-Jul-06
Available	11/10/08	14-Feb-06	11-Aug-06
Architecture	RISC	RISC	RISC
Rack Units	1U	2U	1U
Operating System	Solaris	AIX, Red Hat Linux, SUSE Linux	AIX, Red Hat Linux, SUSE Linux
Processor Family	SPARC	POWER	POWER
Processor Options	UltraSPARC T2 (1.2GHz) UltraSPARC T2 (1.4GHz)	POWER5+ (1.65GHz)* *Quad Core Module	POWER5+ (1.65GHz)* *Quad Core Module
Max Processor Chips	1	2	2
Max Processor Cores	8	4	4
Cache	4MB L2	2 x 36MB L3	2 x 36MB L3
Chipset		IBM proprietary	IBM proprietary
Memory Minimum	4.00 GB	1.00 GB	1.00 GB
Memory Maximum	128 GB	32 GB	32 GB
Memory Type	FB-DIMMs	DDR2 SDRAM	DDR2 SDRAM
Disk Type	SAS	SCSI	SCSI
Disk Controller		Dual Ultra320 SCSI	Dual Ultra320 SCSI
Internal Disk Bays	8	4	2
Bays Information	8 x hot swap HDD bays	4 x 3.5" hot swap drive bays	2 x 3.5" DASD disk drive bays
	1 x media bay	1 x 5.25" slimline media bay	1 x slimline media bay
Disk Max Internal	1168 GB	1,200 GB	600 GB
RAID Support	RAID 0, 1	Optional RAID 0, 5, 6, 10	Optional RAID 0, 5, 6, 10
Hot Swap Disks	SAS	SCSI	SCSI
Media drive	DVD/CD-RW	DVD-ROM or DVD-RAM	DVD-ROM or DVD-RAM
I/O Technology	PCI Express	PCI-X	PCI-X
I/O Slot Types	1 x PCI Express X8	1 x PCI-X 64-bit, 133MHz (long)	1 x PCI-X 64-bit, DDR 266MHz (long)
	2 x PCI Express X4 or XAUI	2 x PCI-X 64-bit, 266MHz (long)	1 x PCI-X 64-bit, DDR 266MHz (low-profi
I/O Max Slots	3	3	2
I/O Internal Slots	3	3	2
Networking	4 x Gigabit Ethernet; up to two optional 10 GbE XAUI ports	Dual 10/100/1000 Ethernet	Dual 10/100/1000 Ethernet
Dimensions	Height: 4.4 cm (1.746 in) Width: 42.5 cm (16.75 in) Depth: 71.4 cm (28.125 in)	Height: 8.9 cm (3.5 in) Width: 48.3 cm (19.02 in) Depth: 68.6 cm (27.01 in)	Height: 4.3 cm (1.69 in) Width: 44 cm (17.32 in) Depth: 71 cm (27.95 in)
Weight	18 kg (40 lbs)	23.2 kg (51.15 lbs) (maximum)	17 kg (37.48 lbs) (max)
Heat Dissipation	2,511 kj/hr (2,380 Btu/hr) (maximum)*	2,251 kj/hr (2,133 Btu/hr) (maximum)	1,440 kj/hr (1,365 Btu/hr) (max)
Max Power Consumption	662 W	625 W	400 W
Hot Swap/Redundant Cooling Fans	Yes/Yes	Yes/Yes	Yes/Yes
Hot Swap/Redundant Power Supply	Yes/Yes	Yes/Optional	Yes/Optional
Warranty	1yr - NBD Parts [CRU] + on-site	3yr (IOL) NBD Parts [CRU] + on-site	3yr (IOL) NBD Parts [CRU] + on-site
	Year 1 Next Business Day (NBD) on-site	3-year IBM On-site Limited (IOL)	3-year IBM On-site Limited (IOL)
	or Customer Replaceable Unit (CRU)	Some parts are Customer Replacement U (CRU)	Some parts are Customer Replacement U (CRU)
	If Sun determines the failing part is a CRU		
	Sun will ship part for customer replacement	IBM ships replacement CRU Next Busine Day (NBD)	IBM ships replacement CRU Next Busine Day (NBD)
	Other parts replaced by Sun on-site	and client performs replacement	and client performs replacement
	World Wide	Other parts replacement is done by IBM on-site	Other parts replacement is done by IBM on-site

*Sun system has 8 disk drives
Versus 4 disk drives on IBM

The Sun SPARC Enterprise T5220 vs IBM System p5+ Servers, 4RU Server

IBM offers the 4RU p5+ 550 server, which is based on a multi socket design which can accommodate up to 4 processors.

A detailed matrix follows after this high level analysis

The p550 is positioned for enterprise application, database infrastructure, high density consolidated workloads and business analytic applications in enterprise environments.

The Sun SPARC Enterprise T5220 (2U) server provides strong competition against both of these systems from IBM:

- Based on benchmark comparisons, the Sun SPARC Enterprise T5220 delivers up to 3x higher throughput than the p550 and nearly 2x higher throughput than p550Q in half of the rack space. This enables customers to compress more compute performance into less data center space.
- Greater compute, I/O and network expandability, allowing seamless in-server growth and greater investment protection
- Hot swap disks, PSUs, fans and RAID support as standard. These are optional on IBM's systems, allowing Sun to deliver greater levels of RAS at lower cost
- Lower acquisition cost when comparing like-for-like configurations, in conjunction with higher performance delivers up to better price/performance.
- Memory/core Rich standard configurations available—very high memory configurations available at reasonable costs.
- Performance / Watt, SWaP, price / performance and power comparisons are improved further if the customer does not need the additional I/O or disk expansion offered by the Sun SPARC Enterprise T5220, therefore enabling the account team to propose the Sun SPARC Enterprise T5120 platform.

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

-
- Longer warranty, with 3 years support vs 1 year on the Sun SPARC Enterprise T5120 and T5220. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise T5120 and T5220 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 Series p servers.

	Sun - SPARC Enterprise T5220	IBM - Power 550 Express
Manufacturer	Sun	IBM
Product Type	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack, Tower
Platform	UNIX	UNIX, LINUX
Announced	9-Oct-07	29-Jan-08
Available	9-Oct-07	8-Feb-08
Architecture	RISC	RISC
Rack Units	2U	4U
Operating System	Solaris	AIX, IBM i, Red Hat Linux, SUSE Linux
Processor Family	SPARC	POWER
Processor Options	UltraSPARC T2 (1.2GHz) UltraSPARC T2 (1.4GHz)	POWER6 (3.5GHz) POWER6 (4.2GHz) POWER6+ (5.0GHz)
Max Processor Chips	1	4
Max Processor Cores	8	8
Cache	4MB L2	32MB L3
Chipset		IBM proprietary
Memory Minimum	4.00 GB	1.00 GB
Memory Maximum	128 GB	256 GB
Memory Type	FB-DIMMs	DDR2 SDRAM
Memory DIMM Slots	16	32
Max Memory DIMM Slots		
Memory Protection		Chipkill ECC with single-error-bit correction and double-error-bit detection ECC memory
Disk Type	SAS, Solid State	SAS
Disk Controller		SAS
Internal Disk Bays	16	6
Bays Information	16 x hot swap HDD bays 1 x media bay	6 x 3.5" hot-swap disk drive bays (standard) 6 x 3.5" hot-swap disk drive bays (optional) 1 x 5.25" half-high bay for optional tape drive 1 x 5.25" slimline media bay occupied with a DVD-ROM or DVD-RAM drive
Disk Max Internal	4,800 GB	2,700 GB (an additional 43.2TB via 8 x I/O drawer attachment)
RAID Support	RAID 0, 1	Optional RAID 0, 5, 6, 10
Hot Swap Disks	SAS	SAS
Media drive	DVD/CD-RW	Optional DVD-ROM, DVD-RAM, (DVD-ROM or DVD-RAM is required in a minimum configuration)
I/O Technology	PCI Express	GX+, PCI Express, PCI-X
I/O Slot Types	2 x PCI Express X8 2 x PCI Express X4 2 x PCI Express X4 or XAUI	2 x PCI Express x8 (short) 1 x PCI Express x8 (long) 2 x PCI-X (long) 1 x GX+ shared with PCI Express x8 slot 2 1 x GX+/GX++ slot shared with PCI Express x8 slot 1
I/O Max Slots	6	59, (using 8 x I/O Drawers)

I/O Internal Slots	6	5
Networking	4 x Gigabit Ethernet; (GbE XAUI ports	Integrated Virtual Eth 10/100/1000 Mbps po 10/100/1000 Mbps po two 10 Gigabit Ethern
Dimensions	Height: 8.8 cm (3.46 i Width: 42.5 cm (16.73 Depth: 71.4 cm (28.11	Height: 17.5 cm (6.89 Width: 44 cm (17.32 i Depth: 73 cm (28.74 i
Weight	23.58 kg (51.98 lbs)	54.4 kg (119.9 lbs) (m
Heat Dissipation		5,041 kj/hr (4,778 Btu
Max Power Consu	7m5p0tiWn (5,670 CO2ek	1g,4p0a0) W (10,585 CO2
Hot Swap/Redund	Yaretes CYoeosling Fans	Yes/Yes
Hot Swap/Redund	Yaretes PYoewser Supply	Yes/Yes
Clustering	Yes	Yes
Warranty	1yr-NBD Parts [CRU Year 1 Next Business or Customer Replace If Sun determines the Sun will ship part for c Other parts replaced World Wide	1yr (IOL) NBD Parts [1-year IBM On-site Li Some parts are Custo (CRU) IBM ships replacem e Day (NBD) and client perform s re Other parts replacem on-site

IBM x86 Rack-Optimized Servers - Competitive Analysis

The Sun SPARC Enterprise T5120 vs IBM System x3550

IBM offers Xeon-based x3550 against the The Sun SPARC Enterprise T5120 1U Server. A detailed matrix follows after this high level analysis

the x3550 is positioned into commercial environments.

The Sun SPARC Enterprise T5120 (1U) server provides strong competition against this system:

- The T5120 has a maximum of 8 internal disk drives versus 4 for the IBM system
- 1.5-2.5x higher throughput in the same footprint, based on benchmark comparisons to equivalent x86 servers, enabling customers to compress more compute performance into less data center space.
- 2-3x higher performance per watt, enabling customers to reduce both their energy and carbon footprint/cost with fewer systems, as well as completing more work for each watt of power consumed.
- Greater compute, memory, I/O, network and disk spindle expandability, allowing seamless in-server growth and greater investment protection as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive system)
- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Hot swap disks, PSUs and fans as standard. These are optional on x3550, allowing greater levels of RAS at lower cost
- Memory/core Rich standard configurations available—very high memory configurations available at competitive costs.

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 4,000 applications certified, so the Sun SPARC Enterprise T5120 and T5220 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 T5120. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise T5120 and T5220 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
- Lower acquisition costs can be offset by The Sun SPARC Enterprise T5120 1U's superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) DIMMs.

	Sun - SPARC Enterprise	IBM 5M1 2-0System x3550
Manufacturer	Sun	IBM
Product Type	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack
Platform	UNIX	LINUX, Windows
Announced	9-Oct-07	23-May-06
Available	9-Oct-07	7-Jul-06
Architecture	RISC	x86
Rack Units	1U	1U
Operating System	Solaris	Red Hat Linux, SUSE Lin
Processor Family	SPARC	Xeon
Processor Options	UltraSPARC T2 (1.2GHz UltraSPARC T2 (1.4GHz	Xeon 5160 (3.0GHz 80W Xeon E5205 (1.86GHz 65 Xeon E5405 (2.0GHz 80W Xeon E5420 (2.5GHz 80W Xeon L5420 (2.5GHz 50W Xeon E5430 (2.6GHz 80W Xeon E5440 (2.83GHz 80 Xeon X5450 (3.0GHz 120 Xeon X5460 (3.16GHz 12 Xeon X5470 (3.33GHz 12
Max Processor Chips	1	2
Max Processor Cores	8	8
Cache	4MB L2	4MB L2 (Xeon 5100), 6M 6MB L2 (Xeon 5400)
Chipset		Intel 5000X
Memory Minimum	4.00 GB	1.00 GB
Memory Maximum	128 GB	32 GB
Memory Type	FB-DIMMs	FB-DIMMs
Memory DIMM Slots	16	8
Memory Protection		Active Memory: memory spare memory, Chipkill, E
Disk Type	SAS, Solid State	SATA, SAS
Disk Controller		SAS, SATA
Internal Disk Bays	8	4
Bays Information	8 x hotswap HDD bays 1 x media bay	Choice of: 2 x 3.5" hot-swap disk dri 2 x 3.5" simple-swap disk 4 x 2.5" hot-swap disk dri
Disk Max Internal	2,400 GB	2,000 GB
RAID Support	RAID 0, 1	RAID 0, 1, 10
Hot Swap Disks	SAS	SATA and SAS
Media drive	DVD/CD-RW	CD-RW/DVD Combo
I/O Technology	PCI Express	PCI Express
I/O Slot Types	1 x PCI Express X8 2 x PCI Express X4 or XA	2 x PCI Express x8 full he
I/O Max Slots	3	2
I/O Internal Slots	3	2
Networking	4 x Gigabit Ethernet; upt GbE XAUI ports	Two on board Broadcom 10/100/1000 ethernet ada ethernet MAC and PHY la 64-bit 100MHz, full duple TCP/IP Offload Engine (T Format 2.0, two RJ-45 po
Dimensions	Height: 4.4 cm (1.73 in) Width: 42.5 cm (16.73 in) Depth: 71.4 cm (28.11 in	Height: 4.3 cm (1.69 in) Width: 44 cm (17.32 in) Depth: 71.1 cm (27.99 in
Weight	16.55 kg (36.49 lbs)	15.6 kg (34.39 lbs) (maxi
Heat Dissipation		2,522 kj/hr (2,390 Btu/hr)
Max Power Consumption	650 W (4,914 CO2e kg p	700 W (5,292 CO2e kg p
Hot Swap/Redundant Cooling	Fans/Yes	Yes/Yes
Hot Swap/Redundant Power S	Yes/Yes	Yes/Optional
Clustering	Yes	Yes

Warranty	1yr-NBD Parts [CR Year 1 Next Busines or Customer Replace If Sun determines the Sun will ship part for Other parts replaced World Wide	3yr (IOL) NBD Parts 3-year IBM On-site L Some parts are Cust (CRU) IBM ships replacem e Day (NBD) and client perform s r Other parts replacem on-site

The Sun SPARC Enterprise T5220 (2U) vs IBM System x3650 Competitive Analysis

IBM offers the Xeon-based x3650 server as competition against the Sun SPARC Enterprise T5220 (2U) Server. A detailed matrix follows after this high level analysis

The x3650 is positioned into commercial environments.

The Sun SPARC Enterprise T5220 server provides strong competition against this systems:

- Lower power consumption when running real workloads, adding up to higher performance per watt and SWaP, enabling customers to reduce both their energy/space and carbon footprint/cost, as well as completing more work for each watt of power consumed.
- Greater disk and network interface expandability, allowing seamless in-server growth and greater investment protection as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive systems)
- Hot swap disks, PSUs and fans are standard. Many of these are options on the IBM system, so the Sun SPARC Enterprise T5220 allows greater levels of RAS at lower cost.
- Memory/core Rich standard configurations available—very high memory configurations available at reasonable costs.
- Performance / Watt, SWaP, price / performance and power comparisons are improved further if the customer does not need the additional I/O or disk expansion offered by the Sun SPARC Enterprise T5220, therefore enabling the account team to propose the Sun SPARC Enterprise T5120 platform.

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 4,000 applications certified, so the Sun SPARC Enterprise T5120 and T5220 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 T5120. Sell Sun Service Packs which provide extended coverage for the Sun SPARC Enterprise T5120 and T5220 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

	Sun - SPARC Enterprise T5B2M20- System	x3650
Manufacturer	Sun	IBM
Product Type	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack
Platform	UNIX	UNIX, LINUX, Windows
Announced	9-Oct-07	23-May-06
Available	9-Oct-07	7-Jul-06
Architecture	RISC	x86
Rack Units	2U	2U
Operating System	Solaris	Solaris, Red Hat Linux, SU
Processor Family	SPARC	Xeon
Processor Options	UltraSPARC T2 (1.2 GHz) UltraSPARC T2 (1.4 GHz)	Xeon 5160 (3.0 GHz 80W) Xeon E5205 (1.86 GHz 65W Xeon E5405 (2.0 GHz 80W Xeon E5420 (2.5 GHz 80W Xeon L5420 (2.5 GHz 50W Xeon E5430 (2.66 GHz 80W Xeon E5440 (2.83 GHz 80W Xeon X5450 (3.0 GHz 120W Xeon X5460 (3.16 GHz 120 Xeon X5470 (3.33 GHz 120
Max Processor Chips	1	2
Max Processor Cores	8	8
Cache	4 MB L2	4 MB L2 (Xeon 5100), 6 MB 6 MB L2 (Xeon 5400)
Chipset		Intel 5000P
Memory Minimum	4.00 GB	1.00 GB
Memory Maximum	128 GB	48 GB
Memory Type	FB-DIMMs	FB-DIMMs
Memory DIMM Slots	16	12
Memory Protection		Active Memory: memory m spare memory, Chipkill, E
Disk Type	SAS, Solid State	SAS
Disk Controller		SAS/SATA
Internal Disk Bays	16	8
Bays Information	16 x hotswap HDD bays 1 x media bay	Choice of: 6 x 3.5" hot-swap disk driv slim-high media drive bay 4 x 3.5" hot-swap disk driv slim-high media drive bay, bay or 8 x 2.5" hot-swap disk driv slim-high media drive bay, bay
Disk Max Internal	4,800 GB	6,000 GB (SATA)
RAID Support	RAID 0, 1	RAID 0, 1, 10
Hot Swap Disks	SAS	Yes
Media drive	DVD/CD-RW	CD-R/CD-RW DVD Comb
I/O Technology	PCI Express	PCI Express
I/O Slot Types	2 x PCI Express X8 2 x PCI Express X4 2 x PCI Express X4 or XAU	2 x PCI Express x8 2 x PCI Express x4
I/O Max Slots	6	4
I/O Internal Slots	6	4
Networking	4 x Gigabit Ethernet; up to GbE XAUI ports	Dual on planar Broadcom 10/100/1000 ethernet ports ethernet MAC and PHY lay Express, full duplex, Wake Offload Engine (TOE), Ale 2.0, two RJ-45 ports in rea
Dimensions	Height: 8.8 cm (3.46 in) Width: 42.5 cm (16.73 in) Depth: 71.4 cm (28.11 in)	Height: 8.54 cm (3.36 in) Width: 44.36 cm (17.46 in) Depth: 69.8 cm (27.48 in)
Weight	23.58 kg (51.98 lbs)	29.6 kg (65.26 lbs) (maxim
Heat Dissipation		3,494 kj/hr (3,312 Btu/hr) (
Max Power Consumption	750 W (5,670 CO2e kg pa	835 W (6,313 CO2e kg pa
Hot Swap/Redundant Cooling Fa	Yness/Yes	Yes/Optional
Hot Swap/Redundant Power Su	Ypely/Yes	Yes/Yes
Clustering	Yes	Yes

Warranty	1yr - NBD Parts [CRU Year 1 Next Business or Customer Replace If Sun determines the Sun will ship part for Other parts replaced World Wide	3yr (IOL) NBD Parts 3-year IBM On-site Li Some parts are Custo (CRU) IBM ships replaceme Day (NBD) and client performs re Other parts replacem on-site

HP Itanium 2 Rack-Optimized Servers - Competitive Information

Before beginning the analysis, there are some general points to consider affecting all of HP's Integrity Servers:

- Itanium has proven a huge disappointment in sales for Intel and its OEM vendors – including HP who represent circa 75% of all Itanium shipments. Low ISV enthusiasm coupled with the massive migration costs faced by legacy customers as they move to this architecture has stifled demand and has introduced much risk to Titanium's long term roadmap
- Itanium represents an architecture trying to solve the computing challenges of a decade ago. Higher frequency and huge caches are artefacts of a design that has been overtaken by CMT architectures
- HP-UX represents a long-term lock-in into a closed, expensive and proprietary processor 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.
- 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. Itanium is still a relatively new architecture and a complete break for HP's PA-RISC / Alpha / VMS predecessors.

The Sun SPARC Enterprise T5120 vs HP Integrity, 1 & 2RU / Dual Processor Servers

HP will position their rx2660 server against the Sun SPARC Enterprise T5120 and T5220 system.

A detailed matrix follows after this high level analysis

The rx2660 is targeted at high density enterprise compute environments where efficiency is a key consideration. As demonstrated below, the Sun SPARC Enterprise T5120 and T5220 servers deliver much higher performance per watt, at lower levels of power and space consumption (SWaP).

The Sun SPARC Enterprise T5120 server provides strong competition.

- Based on benchmark comparisons, the Sun SPARC Enterprise T5120 delivers higher throughput than the latest rx2660 in up to half of the rack space. This enables customers to compress more compute performance into less data center space.

- Lower power consumption when running real workloads and nearly higher performance per watt when compared to the rx2660, enabling customers to reduce both their energy and carbon footprint/cost, as well as completing more work for each watt of power consumed.
- Greater compute, memory, I/O and network expandability, allowing seamless in-server growth and greater investment protection
- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Hot swap disks, PSUs, fans and RAID support as standard. These are optional on rx2660, or not available at all on rx1620, allowing Sun to deliver greater levels of RAS at lower cost
- Memory/core Rich standard configurations available—very high memory configurations available at reasonable costs.

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

- The rx2660 offers longer warranty, with 3 years support vs 1 year on the Sun SPARC Enterprise T5120.
- 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 T5120	HP - Integrity rx2660
Manufacturer	Sun	HP
Product Type	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack
Platform	UNIX	UNIX, LINUX, Windows, Oth
Announced	9-Oct-07	15-Feb-07
Available	9-Oct-07	15-Feb-07
Architecture	RISC	IA-64
Rack Units	1U	2U
Operating System	Solaris	HP-UX, OpenVMS, Red Hat Linux, Windows
Processor Family	SPARC	Itanium
Processor Options	UltraSPARC T2 (1.2GHz) UltraSPARC T2 (1.4GHz)	Itanium 9110N (1.6GHz 75W Itanium 9120N (1.42GHz 104 Itanium 9140N (1.66GHz 104
Max Processor Chips	1	2
Max Processor Cores	8	4
Cache	4MB L2	6MB, 12MB or 18MB L3
Chipset		HP zx2
Memory Minimum	4.00 GB	1.00 GB
Memory Maximum	128 GB	32 GB
Memory Type	FB-DIMMs	DDR2 SDRAM
Memory DIMM Slots	16	8
Memory Protection		Registered ECC, double chip
Disk Type	SAS, Solid State	SAS
Disk Controller		8-port SAS
Internal Disk Bays	8	8
Bays Information	8 x hotswap HDD bays 1 x media bay	8 x 2.5" hot-plug drive bays 1 x media bay
Disk Max Internal	2,400 GB	2,400 GB
RAID Support	RAID 0, 1	RAID 1, 5, 6
Hot Swap Disks	SAS	SAS
Media drive	DVD/CD-RW	Optional
I/O Technology	PCIExpress	PCIExpress, PCI-X
I/O Slot Types	1 x PCIExpress X8 2 x PCIExpress X4 or XAUI	One I/O card cage: Configure PCI-X card cage with two 266 one 133-MHz/64-bit or as a C cage with two PCIExpress (x MHz PCI-X
I/O Max Slots	3	3
I/O Internal Slots	3	3
Networking	4 x Gigabit Ethernet; up to tw GbE XAUI ports	Dual port 10/100/1000Base-T auto speed sensing, Wake o
Dimensions	Height: 4.4 cm (1.73 in) Width: 42.5 cm (16.73 in) Depth: 71.4 cm (28.11 in)	Height: 8.6 cm (3.39 in) Width: 48.2 cm (18.98 in) Depth: 68 cm (26.77 in)
Weight	16.55 kg (36.49 lbs)	28 kg (61.73 lbs) (max)
Heat Dissipation		2,874 kj/hr (2,724 Btu/hr) (m (idle)
Typical Power Consumption		800 W (6,049 CO2e kg pa)
Max Power Consumption	650 W (4,914 CO2e kg pa)	1,000 W (7,561 CO2e kg pa)
Hot Swap/Redundant Cooling Fans	Yes/Yes	Yes
Hot Swap/Redundant Power Supply	Yes/Yes	Hot Swap standard, Redunda
Clustering	Yes	Yes
Warranty	1yr-NBD Parts [CRU] + on-s Year 1 Next Business Day (N or Customer Replaceable Un If Sun determines the failing Sun will ship part for custome Other parts replaced by Sun World Wide	3yr NBD on-site 3 Years - Next-Business-Day USA, EMEA & AUSTRALIA

The Sun SPARC Enterprise T5220 vs 4U+ HP Itanium 2 Servers

HP offers both the rx3600 dual socket / 4U Itanium 2 server and the rx6600 quad socket 7U Itanium 2 server in its portfolio of entry level Integrity models. The Sun SPARC Enterprise T5220 (2U) can be positioned against both of these systems in terms of performance, RAS and virtualization.

A detailed matrix follows after this high level analysis

HP positions the rx3600 as a platform for application and database serving, while the rx6600 is targeted at consolidation projects.

The Sun SPARC Enterprise T5220 server provides strong competition against both of these systems from HP:

- Based on benchmark comparisons, the Sun SPARC Enterprise T5220 delivers up 2x higher throughput than the rx3600 in half of the rack space, while delivering 25% more throughput than the rx6600 in 3.5x less rack space . This enables customers to compress more compute performance into less data center space.
- Power consumption savings range from 1.5 – 2.5x compared to the HP systems, which translates to up to 4x higher performance per watt when running real workloads, 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, therefore delivering better price / performance.

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

- Richer I/O, compute and memory expandability, along with RAID levels 5 & 6 as standard, but these features are reflected in list prices that are higher than the Sun SPARC Enterprise T5220
- Longer warranty, with 3 years support vs 1 year on the Sun SPARC Enterprise T5120.
- 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 T5120	HP - Integrity rx3600	HP - Integrity rx6600
Manufacturer	Sun	HP	HP
Product Type	Entry-Level Server	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack	Rack, Tower
Platform	UNIX	UNIX, LINUX, Windows, Other OS	UNIX, LINUX, Window
Announced	9-Oct-07	6-Sep-06	6-Sep-06
Available	9-Oct-07	6-Sep-06	6-Sep-06
Architecture	RISC	IA-64	IA-64
Rack Units	2U	4U	7U
Operating System	Solaris	HP-UX, OpenVMS, Re Linux, Windows	HP-UX, OpenVMS, Re Linux, Windows
Processor Family	SPARC	Itanium	Itanium
Processor Options	UltraSPARC T2 (1.2G UltraSPARC T2 (1.4G	Itanium 9120N (1.42G Itanium 9140M (1.66G	Itanium 9120N (1.42G Itanium 9140N (1.6GH Itanium 9150N (1.6GH
Max Processor Chips	1	2	4
Max Processor Cores	8	4	8
Cache	4MB L2	12MB or 18MB L3	12MB, 18MB or 24MB
Chipset		zx2	zx2
Memory Minimum	4.00 GB	2.00 GB	2.00 GB
Memory Maximum	128 GB	192 GB	384 GB
Memory Type	FB-DIMMs	DDR2 SDRAM	DDR2 SDRAM
Memory DIMM Slots	16	8 Min	24 Min
Max Memory DIMM Slots		24	48
Memory Protection		ECC and double chip spare protection	ECC and double chip s
Disk Type	SAS, Solid State	SAS	SAS
Disk Controller		8-port SAS	8-port SAS
Internal Disk Bays	16	8	16
Bays Information	16 x hotswap HDD bays 1 x media bay	8 x 2.5" hot-plug drive bays 1 x media bay	16 x 2.5" hot-plug drive 1 x media bay
Disk Max Internal	4,800 GB	2,400 GB	4,800 GB
RAID Support	RAID 0, 1	RAID 1, 5, 6	RAID 1, 5, 6
Hot Swap Disks	SAS	SAS	SAS
Media drive	DVD/CD-RW	Optional	Optional
I/O Technology	PCI Express	PCI Express, PCI-X	PCI Express, PCI-X
I/O Slot Types	2 x PCI Express X8 2 x PCI Express X4 2 x PCI Express X4 or	PCI Express backplan length PCI Express x8 PCI-X, and 2 half-leng PCI-X backplane with 266MHz, 2 x full length 66MHz, and 2 half-len	PCI Express backplan PCI Express x8, 2 full- and 2 half-length 66MH backplane with 8 (2 x f full length 133MHz, 2 f half-length 66MHz)
I/O Max Slots	6	8	8
I/O Internal Slots	6	8	8
Networking	4 x Gigabit Ethernet; u GbE XAUI ports	1 x Dualport Gigabit E T management port	1 x dualport Gigabit E 100/10Base-T manage
Dimensions	Height: 8.8 cm (3.46 in Width: 42.5 cm (16.73 Depth: 71.4 cm (28.11	Height: 17.25 cm (6.79 Width: 43.99 cm (17.3 Depth: 69.6 cm (27.4 i	Height: 30.48 cm (12 i Width: 43.99 cm (17.3 Depth: 69.6 cm (27.4 i
Weight	23.58 kg (51.98 lbs)	45.36 kg (100 lbs) (max)	68.04 kg (150 lbs) (ma
Heat Dissipation		3,942 kj/hr (3,736 Btu/hr (max)	5,876 kj/hr (5,569 Btu/
Typical Power Consumption		685 W (5,179 CO_2e kg pa)	998 W (7,546 CO_2e kg
Max Power Consumption	750 W (5,670 CO_2e kg pa)	1,095 W (8,279 CO_2e kg pa)	1,633 W (12,347 CO_2
Hot Swap/Redundant Cooling Fans	Yes/Yes	Yes/Yes	Yes/No
Hot Swap/Redundant Power Supply	Yes/Yes	Yes/Yes	Yes/Yes
Clustering		Yes	Yes
Warranty	1yr - NBD Parts [CRU] Year 1 Next Business or Customer Replacea If Sun determines the Sun will ship part for c Other parts replaced b World Wide	3yr NBD on-site 3 Years - Next-Busine USA, EMEA & AUSTR	3yr NBD on-site 3 Years - Next-Busine USA, EMEA & AUSTR

HP x86 Rack-Optimized Servers - Competitive Analysis

The Sun SPARC Enterprise T5120 vs HP ProLiant 1RU / Dual Socket Servers

HP offers two servers that compete in this class against the the Sun SPARC Enterprise T5120 – the Opteron based HP DL365G5 and Xeon-based DL360G5. A detailed matrix follows after this high level analysis.

HP provide no firm positioning guidance on these systems, targeting both at scale out deployments

The Sun SPARC Enterprise T5120 (1U) server provides strong competition against both of these systems:

- 1.5x – 2.5x higher throughput in the same footprint, based on benchmark comparisons to equivalent x86 servers, enabling customers to compress more compute performance into less data center space.
- 2-3x higher performance per watt, enabling customers to reduce both their energy and carbon footprint/cost with fewer systems, as well as completing more work for each watt of power consumed.
- Greater compute, memory, I/O and network expandability, allowing seamless in-server growth and greater investment protection as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive systems)
- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Memory/core Rich standard configurations available—very high memory configurations available at competitive costs.

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 4,000 applications certified, so the Sun SPARC Enterprise T5120 and T5220 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 T5120.
- Lower acquisition costs can be offset by the Sun SPARC Enterprise T5120 1U's superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) DIMMs.

	Sun - SPARC Enterp	HisPe -TP5 rto2LOiant DL360 G	HP - ProLiant DL365
Manufacturer	Sun	HP	Hewlett Packard
Product Type	Entry-Level Server	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack	Rack
Platform	UNIX	UNIX, LINUX, Window	UsNIX, LINUX, Window
Announced	9-Oct-07	26-Jun-06	31-Mar-08
Available	9-Oct-07	26-Jun-06	31-Mar-08
Architecture	RISC	x86	x86
Rack Units	1U	1U	1U
Operating System	Solaris	Solaris, Red Hat Linux	S, oSlaUr$sE, RLeinduH, aWt Linnduo Windows
Processor Family	SPARC	Xeon	Opteron
Processor Options	UltraSPARC T2 (1.2G UltraSPARC T2 (1.4G	Xeon 5110 (1.6GHz 6 Xeon 5120 (1.86GHz Xeon 5130 (2.0GHz 6 Xeon 5140 (2.33GHz Xeon 5148 (2.33GHz Xeon 5150 (2.66GHz Xeon 5160 (3.0GHz 8 Xeon E5205 (1.86GH Xeon L5240 (3.0GHz Xeon X5260 (3.33GH Xeon E5310 (1.6GHz Xeon E5320 (1.86GH Xeon L5320 (1.86GHz Xeon E5345 (2.33GH Xeon X5355 (2.66GH Xeon E5405 (2.0GHz Xeon E5410 (2.33GH Xeon L5410 (2.33Ghz Xeon E5420 (2.5GHz Xeon L5420 (2.5GHz Xeon E5430 (2.66GH Xeon L5430 (2.66GHz Xeon E5440 (2.83GH Xeon E5450 (3.0GHz Xeon X5450 (3.0GHz Xeon X5460 (3.16GH Xeon X5470 (3.33GH	Opteron 2346 HE (1.8 Opteron 2352 (2.1GH Opteron 2354 (2.2GH Opteron 2356 (2.3GH Opteron 2378 (2.4GH Opteron 2382 (2.6GH Opteron 2384 (2.7GH
Max Processor Chips	1	2	2
Max Processor Cores	8	8	8
Cache	4MB L2	4MB L2 (Xeon 5100), x4MB L2 (Xeon 5300 5400)	2MB or 6MB L3
Chipset		Intel 5000P	
Memory Minimum	4.00 GB	1.00 GB	2.00 GB
Memory Maximum	128 GB	64 GB	32 GB
Memory Type	FB-DIMMs	FB-DIMMs	DDR2 SDRAM
Memory DIMM Slots	16	8	8
Memory Protection		Advanced ECC (multi Online Spare, Mirrorin	Advanced ECC
Disk Type	SAS, Solid State	SATA, SAS	SATA, SAS
Disk Controller		Smart Array E200 ior	**Smart Array P400i/64**
Internal Disk Bays	8	6	6
Bays Information	8 x hotswap HDD ba 1 x media bay	6 x 2.5" hot-plug drive 1 x slim line media bay	6 x 2.5" hot-plug drive standard) 1 x slim line media bay
Disk Max Internal	2,400 GB	1,800 GB (SAS Drives	1),800 GB (SAS Drive
RAID Support	RAID 0, 1	RAID 0, 1, 1+0, 5, 6	RAID 0, 1, 1+0
Hot Swap Disks	SAS	SAS and SATA	SAS and SATA
Media drive	DVD/CD-RW	DVD/CD-RW standar	Oipntiopenrafo rm ance m od
I/O Technology	PCI Express	PCI Express, PCI-X	PCI Express
I/O Slot Types	1 x PCI Express X8 2 x PCI Express X4 o	2 x PCI-Express x8 or 1 x PCI-Express x8 1 x PCI-X 64-bit 133M	1 x full-length/full heig be replaced with a 64 1 x half-length/low-pro
I/O Max Slots	3	2	2
I/O Internal Slots	3	2	2
Networking	4 x Gigabit Ethernet; GbE XAUI ports	Two Embedded NC37 Server adapters with	Dual Embedded NC3 Server Adapters with

Dimensions	Height: 4.4 cm (1.73 Width: 42.5 cm (16.7 Depth: 71.4 cm (28.1	Height: 4.32 cm (1.7 Width: 42.62 cm (16. Depth: 69.22 cm (27.	Height: 4.32 cm (1.7 Width: 42.62 cm (16. Depth: 70.49 cm (27
Weight	16.55 kg (36.49 lbs)	17.92 kg (39.51 lbs) (	[illegible] kg (36.99 lbs) (
Heat Dissipation		3,070 kj/hr (2,910 Btu	3/h, Or)7 0 kj/hr (2,910 Btu
Max Power Consumption	650 W (4,914 CO2e	[illegible] (6,442 CO2e M	8g5 [illegible] aW) ([illegible],r4 [illegible] wCeOr [illegible]
Hot Swap/Redundant Coo	Yinegs /Pr aens s	No/Yes	Yes/Yes
Hot Swap/Redundant Pow	YeersS/Yu [illegible] ly	No/Yes	Yes/Yes (Redundant
Clustering	Yes	Yes	Yes
Warranty	1yr-NBD Parts [CR Year 1 Next Busines or Customer Replace If Sun determines the Sun will ship part for Other parts replaced World Wide	3yr NBD on-site 3 Years - Next-Busine USA, EMEA & AUST	3yr NBD on-site 3 Years - Next-Busin USA, EMEA & AUST

The Sun SPARC Enterprise T5220 vs HP ProLiant 2RU / Dual Socket Servers

HP offers two servers that compete in this class against the the Sun SPARC Enterprise T5220 – the Opteron based HP DL385G5 and Xeon-based DL380G5. A detailed matrix follows after this high level analysis

HP states that the DL380G5 is the world's best selling server and is targeted for virtualization, while the DL385G5 is designed for environments requiring the best performance per watt.

The Sun SPARC Enterprise T5220 server provides strong competition against both of these systems:

- Higher throughput in the same footprint, based on benchmark comparisons to equivalent x86 servers, enabling customers to compress more compute performance into less data center space.
- Higher performance per watt, enabling customers to reduce both their energy and carbon footprint/cost with fewer systems, as well as completing more work for each watt of power consumed.
- Greater compute, memory, I/O and network expandability, allowing seamless in-server growth and greater investment protection as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive systems)
- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Memory/core rich standard configurations available—very high memory configurations available at competitive costs.

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 4,000 applications certified, so the Sun SPARC Enterprise T5120 and T5220 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 T5120.
- Lower acquisition costs can be offset by the Sun SPARC Enterprise T5220 superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) DIMMs.

	Sun - SPARC Enterpris	HeP T-5 P2 2o0 Liant D L 3 8 5 G H	5 P - Pro Liant D L 3 8 0 G
Manufacturer	Sun	HP	HP
Product Type	Entry-Level Server	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack	Rack
Platform	UNIX	UNIX, LINUX, Windows	UNIX, LINUX, Windows
Announced	9-Oct-07	31-Mar-08	26-Jun-06
Available	9-Oct-07	31-Mar-08	26-Jun-06
Architecture	RISC	x86	x86
Rack Units	2U	2U	2U
Operating System	Solaris	Solaris, Red Hat Linux, Linux, NetWare, Windo	Solaris, Red Hat Linux, Linux, NetWare, Windo
Processor Family	SPARC	Opteron	Xeon
Processor Options	UltraSPARC T2 (1.2 GH UltraSPARC T2 (1.4 GH	Opteron 2347 HE (1.9 G Opteron 2352 (2.1 GHz Opteron 2356 (2.3 GHz	Xeon E5205 (1.86 GHz Xeon L5240 (3.0 GHz 4 Xeon X5260 (3.33 GHz Xeon X5270 (3.5 GHz 8 Xeon E5335 (2.0 GHz 8 Xeon L5335 (2.0 GHz 5 Xeon E5345 (2.33 GHz Xeon X5355 (2.66 GHz Xeon X5365 (3.0 GHz 1 Xeon E5405 (2.0 GHz 8 Xeon E5410 (2.33 GHz Xeon L5410 (2.33 GHz 5 Xeon E5420 (2.5 GHz 8 Xeon L5420 (2.5 GHz 5 Xeon E5430 (2.66 GHz Xeon L5430 (2.66 GHz 5 Xeon E5440 (2.83 GHz Xeon E5450 (3.0 GHz 8 Xeon X5450 (3.0 GHz 1 Xeon X5460 (3.16 GHz Xeon X5470 (3.33 GHz
Max Processor Chips	1	2	2
Max Processor Cores	8	8	8
Cache	4 MB L2	2 MB L3 (Opteron 2300	6 MB L2 (Xeon 5200), 2 2 x 6 MB L2 (Xeon 5400
Chipset		Serverworks HT-2100 HT1000 Southbridge	Intel 5000P
Memory Minimum	4.00 GB	1.00 GB	1.00 GB
Memory Maximum	128 GB	64 GB	64 GB
Memory Type	FB-DIMMs	DDR2 SDRAM	FB-DIMMs
Memory DIMM Slots	16	8	8
Memory Protection		Advanced ECC	Advanced ECC, Online Interleaving
Disk Type	SAS, Solid State	SATA, SAS	SATA, SAS
Disk Controller		Smart Array E200/P40	Smart Array P400 or Sm
Internal Disk Bays	16	8	8
Bays Information	16 x hotswap HDD ba 1 x media bay	8 x 2.5" hot-plug disk d 1 x media drive bay	8 x 2.5" hot-plug drive b 1 x slim line media bay
Disk Max Internal	4,800 GB	2,400 GB (SAS Drives)	2,400 GB (SAS Drives)
RAID Support	RAID 0, 1	RAID 0, 1, 1+0, 5, 6	RAID 0, 1, 1+0, 5, 6
Hot Swap Disks	SAS	SATA and SAS	SATA and SAS
Media drive	DVD/CD-RW	Optional, DVD/CD RW	Options/configuration/performance model
I/O Technology	PCI Express	PCI Express	PCI Express, PCI-X
I/O Slot Types	2 x PCI Express X8 2 x PCI Express X4 2 x PCI Express X4 or	3 x PCI Express x8 1 x PCI Express x4	2 x embedded PCI Exp PCI Express Riser (Sta Express x4 Riser full-he Express x8 Riser full-he PCI Express/PCI-X Ris PCI Express x8 Riser fu 64-bit/133 MHz
I/O Max Slots	6	4	5
I/O Internal Slots	6	4	5
Networking	4 x Gigabit Ethernet; u GbE XAUI ports	2 x Embedded NC373i Network Adapters with	Embedded NC373i Mul Server Adapters with T
Dimensions	Height: 8.8 cm (3.46 in Width: 42.5 cm (16.73 Depth: 71.4 cm (28.11	Height: 8.59 cm (3.38 i Width: 44.54 cm (17.54 Depth: 66.07 cm (26.01	Height: 8.59 cm (3.38 in Width: 44.54 cm (17.54 Depth: 66.07 cm (26.01
Weight	23.58 kg (51.98 lbs)	27.22 kg (60.01 lbs) (m	2a 7x .i2n 2u mg) (60.01 lbs)
Heat Dissipation		4,210 kj/hr (3,990 Btu/h	4r) 2 (1m 0 a kx j/mh ru (m3 .) 990 Btu/h
Max Power Consum	7p5t0o nW (5,670 CO2e kg	1p1a7) 0 W (8,846 CO2e	k1g,1p7a0) W (8,846 CO2e k

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.

Dell x86 Rack-Optimized Servers - Competitive Analysis

Sun SPARC Enterprise T5120 and T5220 vs Dell PowerEdge 1-2RU / Dual Socket Servers

Dell offers two servers that compete in this class against the the Sun SPARC Enterprise T5120 and T5220 servers – the PowerEdge 1950 (1U) and 2950 (2U). A detailed matrix follows after this high level analysis

Dell positions both servers for general purpose, scale out computing.

The Sun SPARC Enterprise T5120 and T5220 servers provide strong competition against both of these systems:

- Higher throughput in the same footprint, based on benchmark comparisons to equivalent x86 servers, enabling customers to compress more compute performance into less data center space.
- igher performance per watt, enabling customers to reduce both their energy and carbon footprint/cost with fewer systems, as well as completing more work for each watt of power

consumed.

- Greater compute, memory, I/O and network expandability, allowing seamless in-server growth and greater investment protection, as well as lower upfront cost (i.e. 4 x 1GbE network interfaces as standard versus 2 on the competitive systems)
- More memory slots allows the Sun SPARC Enterprise T5120 to be configured with lower density DIMMs, thereby reducing costs
- Hot swap disks, PSUs, fans and RAID as standard. Features such as redundant fans are not standard on the Dell systems allowing greater levels of RAS at lower cost
- Full remote system manageability as standard, versus an additional cost option for the Dell server
- Memory/core Rich standard configurations available—very high memory configurations available at competitive costs.

The Dell 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 4,000 applications certified, so the Sun SPARC Enterprise T5120 and T5220 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 T5120.
- Lower acquisition costs can be offset by The Sun SPARC Enterprise T5120 1U's superior price / performance, lower energy costs and the ability to achieve higher memory density with lower capacity (less expensive) DIMMs.

	Sun - SPARC Enterp	Dell - TP5 ot w2 e0 r E dge 1 9 5	Sun - SPARC Enterp	Dell - TP5 o2 w2 e0 r E dge 2 9
Manufacturer	Sun	Dell	Sun	Dell
Product Type	Entry-Level Server	Entry-Level Server	Entry-Level Server	Entry-Level Server
Form Factor	Rack	Rack	Rack	Rack
Platform	UNIX	UNIX, LINUX, Windo	UNIX	UNIX, LINUX, Windo
Announced	9-Oct-07	7-Jun-06	9-Oct-07	7-Jun-06
Available	9-Oct-07	7-Jun-06	9-Oct-07	7-Jun-06
Architecture	RISC	x86	RISC	x86
Rack Units	1U	1U	2U	2U
Operating System	Solaris	Solaris, Red Hat Lin Windows	Solaris	Solaris, Red Hat Lin Windows
Processor Family	SPARC	Xeon	SPARC	Xeon
Processor Option	UltraSPARC T2 (1.2 UltraSPARC T2 (1.4	Xeon E5205 (1.86G H Xeon L5240 (3.0G H Xeon X5260 (3.33G H Xeon X5270 (3.5G H Xeon E5320 (1.86G H Xeon L5320 (1.86G H Xeon L5335 (2.0G H Xeon X5355 (2.66G H Xeon E5405 (2.0G H Xeon E5410 (2.33G H Xeon L5410 (2.33G H Xeon E5420 (2.5G H Xeon L5420 (2.5G H Xeon E5430 (2.66G H Xeon L5430 (2.66G H Xeon E5440 (2.83G H Xeon E5450 (3.0G H Xeon X5450 (3.0G H Xeon X5460 (3.16G H Xeon X5470 (3.33G H	UltraSPARC T2 (1.2 UltraSPARC T2 (1.4	Xeon E5205 (1.86G Xeon L5240 (3.0G H Xeon X5260 (3.33G Xeon X5270 (3.5G H Xeon E5320 (1.86G Xeon L5320 (1.86G H Xeon L5335 (2.0G H Xeon E5405 (2.0G H Xeon E5410 (2.33G Xeon L5410 (2.33G H Xeon E5420 (2.5G H Xeon L5420 (2.5G H Xeon E5430 (2.66G Xeon L5430 (2.66G H Xeon E5440 (2.83G Xeon E5450 (3.0G H Xeon X5450 (3.0G H Xeon X5460 (3.16G Xeon X5470 (3.33G
Max Processor C	Mips	2	1	2
Max Processor C	Cores	8	8	8
Cache	4 MB L2	6 MB L2 (Xeon 5200 5300), 2 x 6 MB L2 (X	4 MB L2	6 MB L2 (Xeon 5200 5300), 2 x 6 MB L2 (
Chipset		Intel 5000X		Intel 5000X
Memory Minimum	4.00 GB	1.00 GB	4.00 GB	1.00 GB
Memory Maximum	128 GB	64 GB	128 GB	64 GB
Memory Type	FB-DIMMs	FB-DIMMs	FB-DIMMs	FB-DIMMs
Memory DIMM Sl	ots	8	16	8
Memory Protectio	n	ECC		ECC
Disk Type	SAS, Solid State	SATA, SAS	SAS, Solid State	SATA, SAS
Disk Controller		SAS 5/i		SAS 5/i
Internal Disk Bays	8	4	16	8
Bays Information	8 x hot swap HDD b 1 x media bay	ays 2.5" OR 2 x 3.5" drive bays 1 x slim line optical d	16 x hot swap HDD 1 x media bay	Maxy 2.5", 4 x 3.5" OR swap disk drive bays 1 x slim line optical d 1 x peripheral drive t with 6 x 3.5" disk ba
Disk Max Internal	2,400 GB	2,000 GB	4,800 GB	6,000 GB
RAID Support	RAID 0, 1	Optional RAID 0, 1,	R, A1 0 0 0 0 0, 1	Optional RAID 0, 1,
Hot Swap Disks	SAS	SAS & SATA	SAS	SAS & SATA
Media drive	DVD/CD-RW	Optional	DVD/CD-RW	Optional
I/O Technology	PCI Express	PCI Express, PCI-X	PCI Express	PCI Express, PCI-X
I/O Slot Types	1 x PCI Express X8 2 x PCI Express X4	2 x PCI Express x8 OR 2 x PCI-X 64-bit/133	2 x PCI Express X8 2 x PCI Express X4	2 x PCI Express x8, OR 2 x PCI-X 64-bit/133
I/O Max Slots	3	2	8	3
I/O Internal Slots	3	2	6	3
Networking	4 x Gigabit Ethernet GbE XAUI ports	Integrated dual Broa controllers with fail-o	4 x Gigabit Ethernet GbE XAUI ports	Integrated dual Broa controllers with fail-o
Dimensions	Height: 4.4 cm (1.73 Width: 42.5 cm (16. Depth: 71.4 cm (28.	Height: 4.26 cm (1.6 Width: 42.6 cm (16.7 Depth: 77.2 cm (30.3	Height: 8.8 cm (3.46 Width: 42.5 cm (16.7 Depth: 71.4 cm (28.	Height: 8.64 cm (3.4 Width: 44.43 cm (17 Depth: 74.4 cm (29.
Weight	16.55 kg (36.49 lbs)	16.3 kg (35.93 lbs) (	23.x5 lbs Maxm ()51.98 lbs)	23 kg (50.71 lbs) (M
Heat Dissipation		2,412 kj/hr (2,286 Btu/hr) (Estimated)		2,700 kj/hr (2,559 Bt
Max Power Cons	umption(4,914 CO 2e	6k7g0pWa) (5,066 CO 2e	7k50pWa) (5,670 CO 2e	7k5g0pWa) (5,670 CO 2e
Hot Swap/Redund	Yaenst/Cmoosling Fans	Yes/Yes	Yes/Yes	Yes/Yes

Hot Swap/Redundant Power Supply	Yes/Yes	Yes/Optional	Yes/Yes	Yes/Optional
Clustering	Yes	Yes		Yes
Warranty	1yr - NBD Parts [CR Year 1 Next Busines or Customer Replac If Sun determines th Sun will ship part fo Other parts replaced World Wide	3yr NBD on-site 3 Year Next Busines Business Hours Par Available US; May v	1yr - NBD Parts [CR Year 1 Next Busines or Customer Replac If Sun determines th Sun will ship part fo Other parts replaced World Wide	3yr NBD on-site 3 Year Next Busines Business Hours Par Available US; May v

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.

Selling Highlights

This section repeats some of the content from the Positioning Section: Key Messages on page 12.

We are including it in this section for those readers who want to use the "Selling Highlights" section as a concise source for key selling tactics.

Market Value Proposition

Huron CoolThreads servers based on the UltraSPARC T2 CMT processor enables IT groups to securely, reliably and eco-efficiently serve millions of new customers and communities while saving $millions, through a virtualized, environmentally responsible data center infrastructure. Underpinned by the most innovative open source processor, Operating System and middleware technology stack available, organizations benefit from greatest levels of application choice and investment protection in the industry.

- The Sun SPARC Enterprise T5120 and T5220 Servers support up to 64 threads in as little as 1U of rack space, drawing circa 400 watts of power
- The Sun SPARC Enterprise T5120 and T5220 Servers are equipped with a central processor 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 and cores, and ability to turn off clocks in both cores and memory to reduce power consumption by 50%
- The Sun SPARC Enterprise T5220 server can support: 34k simultaneous web server users, 44k email server users, 2k SAP users, 1700 Java Operations per Second all in under 450 watts of power
- The Sun SPARC T5120 server tsupports over 2.5k threads per rack
- The Sun SPARC Enterprise T5120 and T5220 Servers increase performance by scaling with

threads, rather than frequency, thereby minimizing power consumption while delivering at least 2x higher performance per watt

- The System on a Chip (SoC) design, integrates multiple cores, threads, I/O, networking and crypto onto a single processor, thereby greatly increasing performance and reliability, while reducing power, cost and parts
- The UltraSPARC T2 supports 10 industry standard, including NSA approved, security ciphers available via on-chip, integrated cryptographic accelerators. There are no additional costs, and virtually no impact to performance as all crypto activities occur at near wire-speed.
- The Sun SPARC Enterprise T5120 and T5220 Servers are designed to deliver the best levels of throughput and business agility while reducing costs via virtualization/consolidation and alleviating environmental issues. Achieved via no cost, LDoms and Solaris Containers technology
- The Sun SPARC Enterprise T5120 and T5220 Servers integrate 10Gigabit Ethernet technology directly on chip, ready for emerging generation of network-intensive services by delivering 12X higher network bandwidth, without additional cost, than competitive servers
- Lowest parts count in class, serving to reduce service interruptions through higher reliability
-

CoolThreads ™ technology lowers power costs.

Sun SPARC Enterprise T5120 and T5220 servers equipped with "CoolThreads technology" requires significantly less power than competitive systems making them substantially less expensive to operate and packing more capacity into existing datacenter facilities.

- The UltraSPARC T2 processor allows these systems to run cooler and more efficiently while delivering high output.
- The UltraSPARC T2 processor uses as little as 1.5 watts per thread.
- Power cost reductions from Sun systems engineering and the UltraSPARC T2 processor- can save enterprises millions of dollars annually, while significantly reducing carbon footprint

More performance, less space.

The Sun SPARC Enterprise T5120 and T5220 servers provide higher compute density yielding greater performance in less space, easing the space limitations that many data centers are currently experiencing.

- According to Sun's analysis, companies using UltraSPARC T2 processor-based systems can experience up to an 8:1 reduction in the number of servers.
- The Sun SPARC Enterprise T5120 and T5220 servers provide up to 64 compute threads in a single processor packing high throughput into a small footprint.

Greater application efficiency and security.

The Sun SPARC Enterprise T5120 and T5220 servers come with the Solaris 10 Operating System, which provides an efficient and secure application environment, while further increasing performance and utilization.

- The Solaris 10 OS multithreaded design takes full advantage of the Sun SPARC Enterprise T5120 and T5220 servers' CMT architecture, boosting throughput and efficiency.
- Solaris Containers and Logical Domains run multiple applications providing up to five times the industry-standard utilization.
- The Solaris 10 OS protects against both malicious external attacks and data access violations from the inside. The Process Rights Management component provides fine-grained control over the rights given to users and processes.
- The UltraSPARC 2 processor-based systems provide full binary compatibility, which make it easy for customers to run and move their applications across UltraSPARC/Solaris OS-based servers.

The Sun SPARC Enterprise T5120 and T5220 servers deliver leading performance with the greatest power and space efficiency.

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.

For the latest SWaP comparisons, refer to the Sun SPARC Enterprise T5120 and T5220 server sales presentation.

Selling Strategies

The Sun SPARC Enterprise T5120 and T5220 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 T5120 and T5220 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
- End-to-end encryption for all data communicated across the network, to ensure security, privacy and business compliance, without impacting performance or increasing costs
- 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 T5120 and T5220 servers to drive an effective Retain-Develop-Acquire selling strategy.

Retain

The first stage of selling strategies is to propose the Sun SPARC Enterprise T5120 and T5220 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 (USII) systems worldwide; most of which are running Solaris 2.6 or Solaris 8. If we assume 20% can be upgraded to CoolThreads 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, starting 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 / Try and Buy to seed the account and prove the benefits of CMT running Solaris 10.

Develop

As your installed base accounts qualify the Sun SPARC Enterprise T5120 and T5220 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 CMT are proven through the sales collateral discussed above and actual account wins, propose the Sun SPARC Enterprise T5120 and T5220 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 T5120 and T5220 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 T5120 and T5220 servers include:

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

Compatibility

Because the Sun SPARC Enterprise T5120 and T5220 servers run the Solaris 10 Operating System, they run the same applications as all other Solaris OS-based UltraSPARC servers that have been qualified for the Solaris 10 OS.

Enabling Technology

The New and Innovative UltraSPARC T2 CMT Processor

The UltraSPARC® T2 multi-core, multi-thread processor is the first chip that fully implements Sun's second generation of the Chip Multi-Threading (CMT) Initiative. The single UltraSPARC T2 chip is the central component of the Sun SPARC Enterprise T5120 and T5220 systems and is referred to as either "UltraSPARC T2 ", or simply "N2". The Sun SPARC Enterprise T5120 and T5220 system and sub-system components are fashioned around the needs and requirements of this processor. An 8 core, 1.4 GHz UltraSPARC T2 processor chip consumes a nominal 95 watts.

It has 8 FB-DIMM channels, each channel is capable of supporting 8 FB-DIMMs The processor is equipped with 1 x8 (8 lane) PCI-e bus, and 2 industry standard XAUI interfaces for dedicated 10 Gigabit Ethernet ports. Also, the chip generates a 200 signal debug port, running at speeds similar to a DDR memory bus. This debug port is routed on the motherboard to a footprint for a flex connector that allows for the connection of a debug board that breaks out these signals for connection to a logic analyzer.

The UltraSPARC T2 processor is soldered directly to the Sun SPARC Enterprise T5120 and T5220 Motherboard, a first for Sun systems. The GL771 package, designed for UltraSPARC T2, is a 1831 pin BGA style package, rather than the LGA style package of Niagara (1) and previous Sun SPARC processors.

Some of the other important features of this chip are:

UltraSPARC T2 has eight separate instances of floating point units, making a power-saving chip a very viable option for other markets, such as HPC.

Just as energy-conscious people turn off lights when they leave a room, the clock memory in UltraSPARC T2 detects idle periods in memory and disables the clock-enable signals to the FBDIMM memory until the processor requires access, which reduces power burdens.

It is the UltraSPARC T2 chip that makes the Sun SPARC Enterprise T5120 and T5220 servers exceptional. This chip provides large amount of compute performance and protection in a small footprint with a greatly reduced need for power.

System Architecture

Design Approach

The basic system feature set for the Sun SPARC Enterprise T5120 and T5220 has been highly leveraged from prior generation Sun Fire T1000 and T2000 servers, incorporating incremental technology improvements that come as part of Niagara2's feature set. Given that the UltraSPARC T2 processor is essentially a “System on a Chip” processor, the bulk of the new design effort and challenge for the Sun SPARC Enterprise T5120/5220 fell into the hands of the enclosure, power and thermal teams to optimize the packaging and operating environment surrounding the processor to deliver the best possible performance versus power/density value proposition. 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.

Issues of system serviceability from previous generation systems have been factored in to make the Sun SPARC Enterprise T5120/5220 a more service friendly platform. Some of these features include a radical reduction in system cabling, mounting the motherboard on a protective tray that easily installs into a chassis, and diagnostic Lades that provide the ability to locate any FBDIMM that is in need of replacement, even with the main power disconnected.

Product Upgrade Path

The Sun SPARC Enterprise T51205220 accommodates a variety of upgrade possibilities. Processor speed upgrades will require a motherboard exchange primarily due to the processor chip being directly attached to the motherboard PCB. This cost reduction assembly process change from placing the main processor chip in a socket to being soldered directly to the motherboard is also a first within Sun for comparable pin count processors. Upgrades to the memory system will be easy to achieve due to there being 16 FBDIMM sockets in the system with adequate DC power distribution capability and cooling to support all known legal memory configurations regardless of the original system configuration. With up to 6 x PCI-E slots and 16 x disk drives available (2U only), the system can easily accommodate customer growth requirements

Environmental Controls

The Sun SPARC Enterprise T5120/5220 takes a leap forward in terms of the ability to adapt and trade off operational power levels versus performance. The extensive Zombies implementation within the Sun SPARC Enterprise T5120/5220 provides temperature and power level indications from all critical system components. This ability to sense the operating point of the system in conjunction with the ability to regulate fan speed in addition to control of Niagara2's newly featured power throttle pins has the potential of offering a new level of environmental control that is unique to the industry.

Electrical Subsystems

The major physical components of the system include the circuit boards, the system interconnect, and the power supplies.

The Sun SPARC Enterprise T5120/5220 System Motherboard

The Sun SPARC Enterprise T5120/5220 system motherboard is a 20 layer, 17” x 12” Printed Circuit Board (PCB) with a thickness of .102”, glass to glass. It contains the Niagara2 processor, FBDIMM sockets for main memory, the service processor, disk controller, and an IO Subsystem consisting of USB, DVD control, Quad Ethernet, and two levels of PLX PCI-E expansion chips branching out to three sets of connectors into which riser cards are inserted to accept a wide range of horizontally installed third party low profile PCI-E add-in cards. The same identical motherboard may alternately be placed in either the 1U or 2U chassis.

The motherboard interconnect for the Sun SPARC Enterprise T5120/5220 has been greatly simplified over prior generation servers. Power is distributed to the motherboard through a pair of metal bus bars connected to the Power Distribution Board (PDB). A single ribbon cable connector routes all critical power control and DVD drive signalling over to the PDB. One or two mini-SAS cables connect the motherboard to the disk drive backplane, providing data access to the system hard drives.

Main Memory

The Niagara2 chip communicates directly to FBDIMM memory through high speed serial links. With a memory clock of 667MHz DDR, its four, dual channel FBDIMM memory controllers can transfer data at an aggregate rate of over 60GB/s. Sixteen FBDIMM memory locations provide sufficient board space for two rows of Forbids per channel.

Service Processor

The Sun SPARC Enterprise T5120/5220 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 top of the hardware has migrated from ALOM to ILOM – the Integrated Lights Out Manager which is also used with Sun's x64 platforms, and which provides support for more industry standard systems management protocols, enabling easier and more flexible integration with existing customer systems.

IO Subsystem

The Niagara2 incorporates a single, 8 lane PCI-E port capable of operating at 2GB/sec. in either direction. This port natively interfaces to the Sun SPARC Enterprise T5120/5220's system Input/Output (IO) devices through a series of PLX Technology PCI-E expander chips, connecting either to PCI-E card slots or to bridge devices that interface with PCI-E, such as those listed below.

Disk Controller

Disk control is managed by a single LSI Logic SAS1068E SAS/SATA controller chip that interfaces to a four lane PCI-E port.

Dual GBE

Two four lane PCI-E ports connect to two Intel Offer dual Gigabit Ethernet chips, similar to T2000, providing four 10/100/1000Mbps Ethernet connections out of the rear of the box.

USB and DVD

A one bit lane PCI-E port connects to a PLX PEX8111 PCI bridge device. A second bridge chip, a NEC UPD720101, converts the 32 bit, 33MHz PCI bus into multiple USB 2.0 ports. The Sun SPARC Enterprise T5120 and T5220's system USB interconnect is driven from these ports. In addition, the DVD is driven from yet another bridge chip that interfaces one of the USB ports to its required format.

Infrastructure Boards

All other circuit boards in the system besides the motherboard are referred to as infrastructure boards. All of these boards are capable of being used by any other platform targeted for the Jake and Elwood chassis. Most of the infrastructure boards are unique to either the 1U Jake box or the 2U Elwood box. Only one infrastructure board, the USB card, is common to both chassis sizes.

Jake Specific Infrastructure Boards

There are seven different types of infrastructure circuit boards in the Sun SPARC Enterprise T5120 configured 1U Jake chassis besides the main Sun SPARC Enterprise T5120 motherboard.

1U Power Distribution Board (PDB)

The primary function of the 501-7696 1U PDB is to distribute system power from the 650 Watt A221 AC power supplies over to the motherboard and to the disk backplane by way of the connector Card. It also carries control signals from the power supply to the motherboard as well as shuttling data and control signals from the motherboard to the connector card.

1U Connector Board

The 501-7725 1U Connector Board (also referred to as the “paddle board”) eliminates the need for many discrete cables in the Jake chassis by providing a direct card plug-in interconnect to distribute control and most data signals from the motherboard to the disk backplane, fan boards, and PDB. It also distributes power to these same boards.

1U Fan Board

The two 501-7694 1U Fan boards required by Jake provide connections for power and control for both the primary and secondary fans in the front of the chassis. No cables are required since every dual fan module plugs directly into one of these PCBs which, in turn, plugs into the Connector Board.

x16 PCI-E Riser Card

The 501-7717 x16 PCI-E Riser Card plugs directly into the motherboard. This adaptor allows a single low profile PCI-E card with up to a x16 lane form factor edge connector to be installed horizontally in the far right side of the Jake chassis, as viewed from the rear. Electrically, the PCI-E channel itself is only eight lanes wide.

x8/XAUI Riser Card

The Sun SPARC Enterprise T5120 motherboard requires two 501-7721 x8/XAUI Riser Cards. Each card has a dual, mutually exclusive use of either accepting a Sun proprietary optical/copper XAUI card or a low profile third party PCI-E card with up to a x8 lane form factor edge connector. Electrically, the PCI-E channel itself is only four lanes wide. Installed cards will be horizontal in orientation, i.e. co-planar with the motherboard.

1U 4 and 8 Disk Backplane

The 501-7699 1U 4 Disk Backplane mounts to the four disk cage located in the front of the chassis, ahead of the fan trays. Its power is delivered through the Connector Board. The disk data is delivered through a single, discrete mini-SAS cable from the motherboard. Support for an eight disk backplane option was announced in October 2008.

Front USB Panel Card

The 501-7698 Front USB Panel Card inserts directly into the disk backplane, adjacent to the DVD drive. It provides two USB 2.0 connections to the front of the box. This is the only infrastructure board common to both the Jake and Elwood chassis.

Elwood Specific Infrastructure Boards

There are nine different types of infrastructure circuit boards in the Sun SPARC Enterprise T5220 configured 2U Elwood chass besides the main Sun SPARC Enterprise T5120/5220 motherboard.

2U Power Distribution Boards (Pubs)

A set of two boards are required to provide power distribution in the Elwood chassis. The primary function of the 2U Pubs are to distribute system power from the AC power supplies over to the motherboard through a bus bar and to the disk backplane by way of the Connector Board. They also carry control signals from the power supplies to the motherboard as well as shuttling data and control signals from the motherboard over to the Connector Board.

The AC supplies plug directly into the vertical 2U PDB Mezzanine board (501-7731). The vertical mezzanine card is, in turn, connected by bus bars and a ribbon cable to a horizontal 2U PDB card, 501-7697, into which the Connector Board, motherboard bus bars, and ribbon cable are installed.

2U Connector Board

The 501-7720 2U Connector Board (also referred to as the “paddle board”) eliminates the need for many discrete cables in the Elwood chassis by providing a direct card plug-in interconnect to distribute control and most data signals from the motherboard to the disk backplanes, fan boards, and PDB. It also distributes power to these same infrastructure boards.

2U Fan Board

The two 501-7695 2U Fan boards required by Elwood provide connections for power and control for

both the primary and secondary fans in the front of the chassis. No cables are required since every dual fan module plugs directly into one of these PCBs, which, in turn, plugs into the 2U Connector Board.

x16/x8 PCI-E Riser Card

The 501-7715 x16/x8 PCI-E Riser Card is an adaptor that allows two low profile PCI-E cards to be installed horizontally in the far right side of the Elwood chassis, as viewed from the rear. The lower PCI-E card slot is provided with a x16 lane form factor edge connector. Electrically, the PCI-E channel itself is only eight lanes wide. The upper slot is both physically and electrically eight lanes wide.

x8/x8/XAUI Riser Card

The Sun SPARC Enterprise T5220 motherboard requires two 501-7719 x8x8/XAUI Riser Cards. Each of these riser cards has an upper and a lower set of connectors into which a maximum of two cards may be installed with a horizontal orientation, i.e. Co-planar to the motherboard. The lower slot provides a dual, mutually exclusive use of either accepting a Sun proprietary optical/copper XAUI card or a low profile third party PCI-E card with up to a x8 lane form factor edge connector. Electrically, the PCI-E channel itself is only four lanes wide. The upper slot has only a single function of providing a four lane PCI-E connection through an eight lane connector.

2U 8 and 16 Disk Backplane

The 501-7730 2U 8 Disk Backplane mounts to the eight disk cage located in the front of the chassis, ahead of the fan trays. Its power is delivered through the Connector Board. The disk data is delivered through two, discrete mini-SAS cables coming from the motherboard.

Support for a 16 disk backplane option was announced in October 2008.

Front USB Panel Card

The 501-7698 Front USB Panel Card inserts directly into the disk backplane, adjacent to the DVD drive. It provides two USB 2.0 connections to the front of the box. This is the only infrastructure board common to both the Jake and Elwood chassis.

Discrete System Interconnect

A majority of the system signal and power connection is accomplished though directly interconnected PCB infrastructure boards. All system connections requiring discrete cables and/or bus bars are enumerated below.

Bus Bars

Bus bars are used to route high current 12 volt DC power (plus Ground) from board to board. There are two pairs of bus bars in the Elwood chassis. The Jake chassis has only one set. What's unique to Elwood is the need to distribute the 12 volt DC power from the vertical PDB into which the main AC supplies are inserted, down to the horizontal PDB. This pair of bus bars does not appear in Jake since it has only one horizontally mounted PDB. The horizontal PDB in either chassis type requires a set of bus bars to be able to distribute 12 Volt DC power over to the motherboard.

2U PDB Ribbon Cable

A ribbon cable is required for Elwood's PDB assembly to carry the power supply's control, status, and 3.3 Volt standby signals from the vertical PDB down to the horizontal PDB. There is no equivalent cable for Jake.

Motherboard to PDB Ribbon Cable

All PDB power supply control, status, and 3.3 Volt standby power are carried over a single flexible circuit connector to the motherboard. This same connector, common to either chassis, provides an intermediate path for motherboard system I2C, DVD data, and USB signals to be routed across the PDB over to the Connector Board on their way to their final destinations.

MB to Disk Backplane mini-SAS Cable

Data between the LSI1068 disk controller chip and the hard drives is carried over a discrete cable connecting the motherboard directly to the disk backplane. A T5120 system with a 4 disk backplane only requires one cable. All other system configurations require two cables.

Power Supplies

All power supplies for the Sun SPARC Enterprise T5120/5220 with an output current of 5 Amperes or greater are standard Point Of Load (POL) third party sourced components.

Main Power Supplies

The Sun SPARC Enterprise T5120/5220 main system power supply modules provide the chassis with 12 Volts DC at current levels ranging from 50 to 80 Amperes and a modest amount of 3.3 Volt standby power. Both 1U and 2U Huron chassis feature two hot swappable AC to DC power supply bays permitting N+1 redundancy, implying that a fully configured the system can operate indefinitely using a single power supply. A second bay is provided for an additional, identical power supply to be installed for true redundancy. The second bay should not be left completely open in the case of only one supply being used due to air flow considerations. There is no inherent preference as to which bay to use when the Sun SPARC Enterprise 5120/5220 is powered by only one supply.

When both power supply bays are populated, the output current will be shared. Thus, some amount of system power will be delivered by each supply. The combined utilization level will be at an equivalent level of 50% or less of their combined maximum capacity.

T5120 (Jake Chassis) AC Supply

The Jake chassis locates its two AC/DC power supply bays side by side. The AC 720 Watt “Climate Saver” qualified supply is used by the T5120. The DC 660 Watt supply can also be used by the T5120. However, the AC and DC supplies should never be mixed within the same system.

T5220 (Elwood chassis) AC Supply

The Elwood chassis positions its two AC power supply bays on top of one another. The AC 750 Watt "Climate Saver" qualified supply has been tailored for the T5220 with an 8 disk backplane.

A larger 1100W power supply is required to support systems with 16 hard disk backplanes.

Enclosure

The enclosure form factor is as follows:

- Height: 1U = 1.746 inches; 2U = 3.49 inches
- Depth: 28.125 inches
- Width: 16.75 inches

The enclosure is designed to fit into a 29 inch envelope including including any sort of cable management arm, doors, etc.

Common Features

The Sun SPARC Enterprise T5120/5220 is the introductory platform for the new 1U Jake and 2U Elwood enclosures, which are shared by several platforms. Although the implementations differ between the 1U and 2U versions, both enclosures provide for:

- Hard disk drives – front-access, hot-swap, 2.5", using the new *Marlin* bracket
- An optical DVD disk drive – front-access, "slim" form factor, slot-load
- USB ports – front and rear access
- Serviceability LED indicators and push-button - front- and rear-access
- Fan modules – top-access, hot-swap, providing front-to-back system airflow
- Power supplies – rear-access, hot-swap
- Infrastructure boards and interconnect, leveraged across platforms
- A platform-unique motherboard.

Front Service indicators

At the front of the system is the standard set of serviceability LED indicators and push-button as defined in the VITA 40-2003 and Sun status indicator standards. The actual Lades and push-button are contained on boards within the chassis, and are viewed and/or actuated through light pipes 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** indicators

As the Sun SPARC Enterprise T5120 and T5220 system itself is not a hot-swap FRU, there is no blue **OK to Remove** indicator.

Rear Service indicators

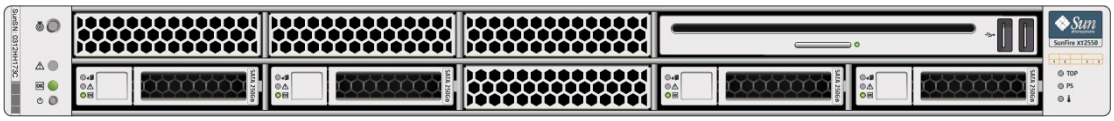
At the rear of the system are power and I/O connections, including:

- 2 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 Ethernet connectors
- Four host RJ45 Ethernet connectors
- Two USB connectors
- Single host DB9 serial port connector
- Horizontal openings for optional PCI Express / XAUI 10GbE expansion cards

T5120 Enclosure

The T5120 system uses the Jake enclosure, which is approximately 16.75" wide by 28.125" deep by 1.746" tall. The T5120 supports up to eighhard disk drives. Cooling is provided by up to six dual fan modules, arranged in two rows, located between the disk backplane and the system motherboard. Each fan module includes two 40mm fans. Power is provided by up to two power supplies, located in the left rear corner of the chassis (viewed from the rear), arranged side-by-side.

T5120 Front View:

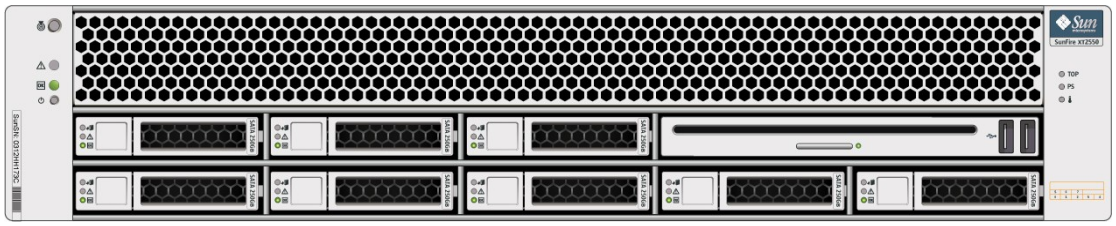


T5120 Rear View:

T5220 Enclosure

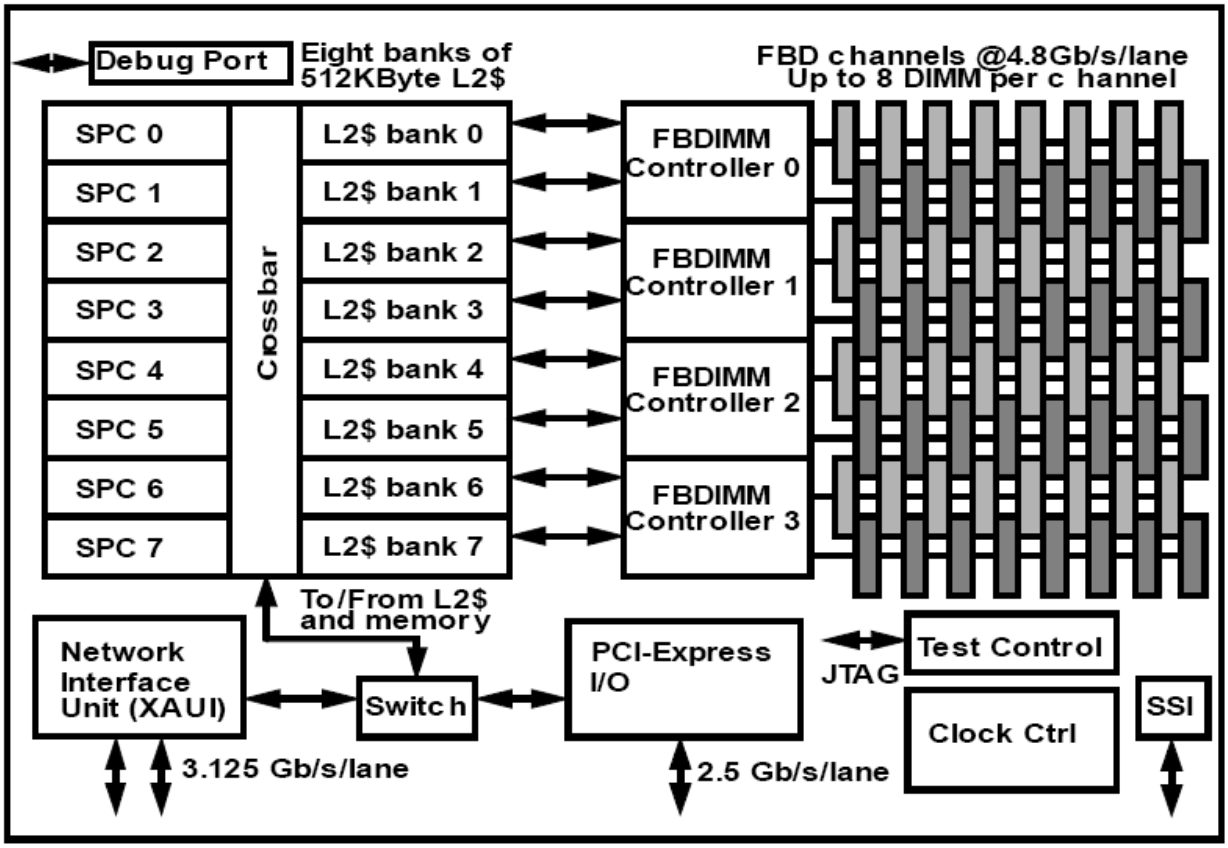
The T5220 system uses the Elwood enclosure, which is approximately 16.75" wide by 28.125" deep by 3.49" tall. The T5220 supports up to16 hard disk drives. Cooling is provided by 6 dual fan modules, arranged in 2 rows, located between the disk backplane and the system motherboard. Each fan module includes two 60mm fans. Power is provided by up to two power supplies, located in the left rear corner of the chassis (viewed from the rear), arranged in a stacked configuration.

T5220 Front View (8 disk):



T5220 Rear View:

The UltraSPARC T2 CMT Processor Block Diagram



The UltraSPARC T2 CMT Processor Chip Overview

The UltraSPARC T2 CMT processor is the basis of the Sun SPARC Enterprise T5120/5220 servers. The UltraSPARC T2 processor is based on Chip Multithreaded (CMT) technology that is optimized for highly threaded transactional processing. The UltraSPARC T2 processor improves throughput while using less power and dissipating less heat than conventional processor designs.

The UltraSPARC® T2 Processor Features

The UltraSPARC® T2 chip comes with a host of new features, including:

- Up to 8 cores @ 1.4GHz
- Up to 64 threads per CPU
- Up to 16 FB-DIMMs, 4 memory controllers
- 8 x fully pipelined Floating Point units/core
- Dual 10Gbit Ethernet and PCI-E integrated onto chip
- 4MB L2$ (16 way set-associative)
- Security co-processor per core

The UltraSPARC T2 multicore processor delivers higher performance using less space and power than any other mainstream processor on the planet. With it's no compromise eco-efficiency, low power and high performance it is more than equipped to take on the most difficult commercial and technical workloads. With the fewest parts in its class, the UltraSPARC T2 improves reliability and SLAs. It has the most open platform on the planet, with the most advanced OS AND the first to deliver zero-cost security.

The UltraSPARC T2 delivers enhancements in every dimension compared to the UltraSPARC T1, including:

- 2X Higher Throughput with:
  - 2x more threads per core
  - 2x more Internal bandwidth
- Scalability:
  - 64 threads per socket
  - Leads to multisocket designs
- Addressable Workloads:
  - FPU per core
  - 10x Floating Point throughput
- Security:
  - 10 Embedded security ciphers
  - Zero penalty security
- 10x faster networking and I/O
  - 10 GbE and PCI-E integrated onto chip
- Uptime
  - Component redundancy across all systems
- Datacenter Efficiency
  - 2x Higher Performance per Watt
  - 3-4x Swap

The Sun UltraSPARC T2 possesses the first integrated, on-chip crypto accelerators. These process at wirespeed with minimal impact to system performance and can save up to $40,000 in acquisition cost, 16 times lower power and 14 times less space versus the competition.

Performance Enhancements

The Sun SPARC Enterprise T5120 and T5220 servers running the Solaris 10 Operating System provides several new performance enhancing technologies with its sun4v architecture and multicore, multithreaded UltraSPARC T2 processor.

Some of these enhancements are:

I. A floating point unit (FPU) for each core

II. Four independent dual-channel memory controllers that use the latest fully buffered DDR2

memory technology

III. Large page optimization

IV. Reduction on TLB misses

V. Optimized block copy

VI. Improved web services performance through the kernel-level SSL proxy Solaris 10 OS feature

VII. Support for Sun’s 10 GbE (XAUI) Ethernet cards

Additional Features Information

Pre-Installed Solaris Operating System

The Sun SPARC Enterprise T5120 and T5220 Servers are preinstalled with the Solaris 10 OS, and offer the following Solaris OS 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 your networked services.

Customers can use the preinstalled Solaris 10 OS, or reinstall a supported version of the Solaris 10 OS from their network, CD, or downloaded copy. Refer to the *Sun SPARC Enterprise T5120 and T5220 Servers Product Notes* for information on the supported OS releases.

Hardware-Assisted Cryptography

The UltraSPARC T2 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 OS 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

Support for Virtualization Through Logical Domains (LDoms)

The Sun SPARC Enterprise T5120/5220 servers 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 CoolThreads™. 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 T5120/5220 server can support up to 64 logical domains.

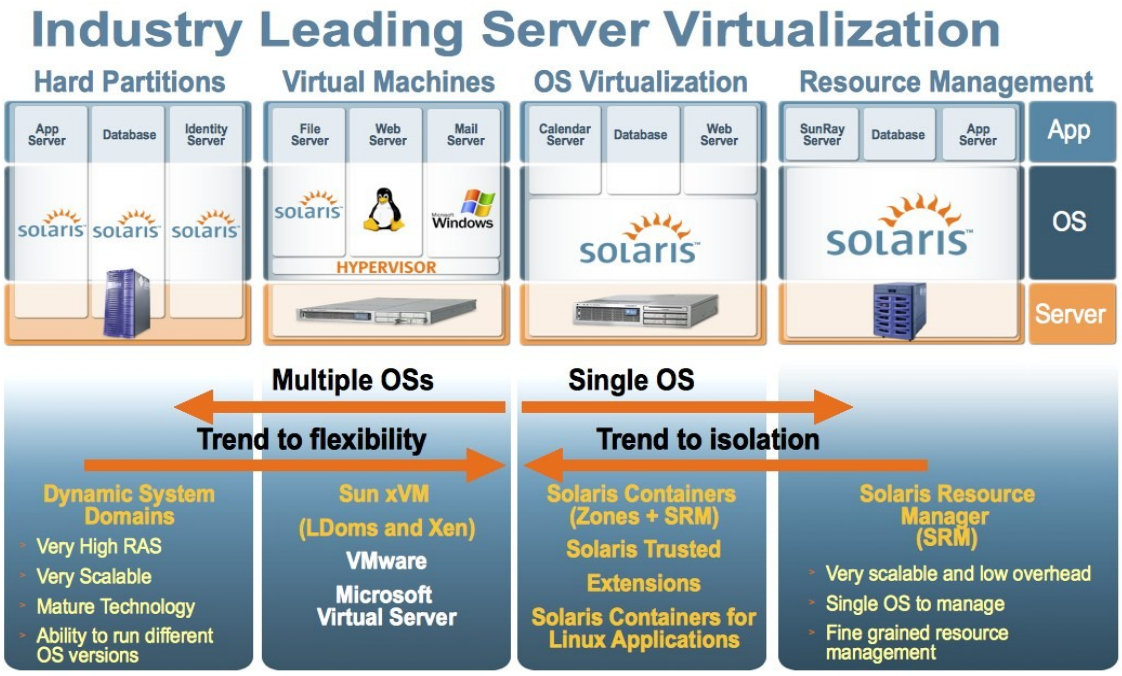


Figure 9 – Virtualization Structure

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.

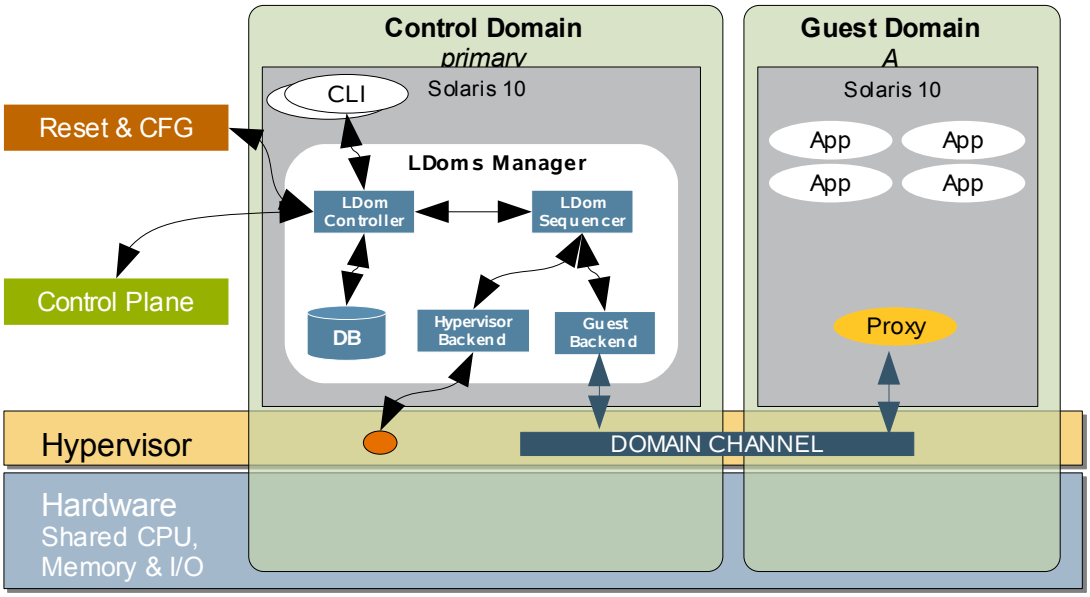
Logical domains can also host Solaris Containers to capture the isolation, flexibility, and manageability features of both technologies. By deeply integrating logical domains with both the industry-leading chip multithreading (CMT) capability of the Sun UltraSPARC® T1 and UltraSPARC® T2 processors and 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.

System Management

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 T5120/5220 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 T5120 and T5220 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)

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 T5120 and T5220 servers 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
- Hot-pluggable hard drives
- Redundant, hot-swappable power supplies (two)
- Redundant hot-swappable fan units
- Environmental monitoring
- Internal hardware drive mirroring (RAID 1)
- Error detection and correction for improved data integrity
- Easy access for most component replacements

Hot-Pluggable and Hot-Swappable Components

Sun SPARC Enterprise T5120 and T5220 servers hardware is designed to support hot-plugging of the chassis-mounted hard drives, and hot-swapping of fan units, and power supplies. By using the proper software commands, you can install or remove these components while the system is running. Hot-swap and hot-plug technology significantly increases the system's serviceability and availability by providing the ability to replace hard drives, fan units, and power supplies without service disruption.

Power Supply Redundancy

The Sun SPARC Enterprise T5120 and T5220 servers provide two hot-swappable power supplies, enabling the system to continue operating should one of the power supplies fail or if a power source fails.

Environmental Monitoring

The Sun SPARC Enterprise T5120 and T5220 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 Lades 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 Lades 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 Lades

Support for RAID Storage Configurations

You can set up hardware RAID 1 (mirroring) and hardware RAID 0 (striping) configurations for any pair of internal hard drives, providing a high-performance solution for hard drive mirroring. By attaching one or more external storage devices to the Sun SPARC Enterprise T5120 and T5220 servers, you 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 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 DIMM continues to function.

Fault Management and Predictive Self Healing

The Sun SPARC Enterprise T5120 and T5220 servers 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 T5120

and T5220 Servers.

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 T5120/5220 servers require the Solaris 10 8/07 (Update 4) Operating System at a minimum for the platform support.

The Sun SPARC Enterprise T5120/5220 systems will be delivered with a pre-installed disk image consisting of:

- Solaris 10 Update 7 (05/09) and the latest firmware will be preloaded on all PTO configurations. The pre-install image will include:
  - 259-5154-01 Solaris 10 5/09, Update 7 -IP Pre-install
  - 259-5169-01 LDoms Manager and MIB 1.2 Pre-install
  - 259-4808-01 CMT Tools 1.0 Pre-install
  - 259-4809-01 GCC 4 for SPARC Systems 4.0.4 Pre-install
  - 259-4815-01 Sun Studio 12 Pre-install
  - 259-4829-01 SYS, FW, DL, UTIL, Pre-install
  - 259-4904-01 MAI,10 GBE ETCSYS CFG
  - 259-4855-01 Live Upgrade, ABE Pre-install
- ILOM 3.0 will be included

Solaris 10 Update4 will no longer be an ATO option as of 21 July 2009.

The Solaris Operating System ATO options are:

Solaris 10 (10/08) Update 6

Solaris 10 (05/09) Update 7

Solaris 10 Update4+ patches remains the minimum supported OS, and all subsequent releases are supported.

Please refer 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, Solaris 10's ground-breaking innovations 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 of your networked services.

The Solaris 10 OS has been optimized for CoolThreads. 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 / Victoria Falls 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.

To download the software, please check the Sun Download Center (http://www.sun.com/download) and you will be looking for the Sun Management Center 3.6 Version 7 Add-on software which is the minimum version required by Sun SPARC Enterprise T5120 and T5220 servers.

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 SNMPv1, SNMPv2c and SNMPv3 to enable interoperability with all common management applications. The provision of SNMPv3 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.

To download the software, please check the Sun Download Center (http://www.sun.com/download) and you will be looking for the version beginning with SNMP Management Agent 1.5.2.

Specifications

Physical Specifications

Description	U.S. (1 RU)	International	U.S. (2RU)	International
Height	1.746 inches	44 mm	3.49 inches	88 mm
Width	16.75 inches	425 mm	16.75 inches	425 mm
Depth	28.125 inches	714 mm	28.125 inches	714 mm
Weight, approximate (without PCI cards or rack mounts)	40 lb.	18 kg	55 lb.	25 kg

Clearance for Service Access

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

Environment Specifications

These are the environmental specifications for the Sun SPARC Enterprise T5120 and T5220 servers.

Specification	Operating	Non-Operating
Temperature **Sea Level to 3000 ft (900m)** **Above 3000 ft (900m)**	• Sea level to 2953 ft. (900m): 41°F to 95°F (5°C to 35°C) • Above 2953 ft (900m): Decrease the maximum allowable temperature by 1.6°F/1000 ft (1°C/300m) IEC 60068-2-1 Test Ad, and 60068-2-2 Test Bd	-40°F to 149°F (-40°C to 65°C) IEC 60068-2-1 Test Ab and 60068-2-2 Test Bb
Relative Humidity	10 to 90% RH, 27°C maximum wet bulb (noncondensing) IEC 60068-2-56 Test Cb	93% RH, 35°C maximum wet bulb (noncondensing) IEC 60068-2-56 Test Cb
Altitude	10,000 feet (3,000m) IEC 60068-2-13 Test M, and 60068-2-41 Test Z/BM	40,000 feet (12,000m) IEC 60068-2-13 Test M
Vibration	0.15 G (z-axis), 0.10 G (x-, y-axes), 5-500Hz swept sine IEC 60068-2-6 Test Fc	0.5 G (z-axis), 0.25 G (x-, y-axes), 5-500Hz swept sine IEC 60068-2-6 Test Fc
Operating Shock	3 Gs, 11 ms half-sine IEC 60068-2-27 Test Ea	• Roll-off: 1-inch roll-off free fall, front to back rolling directions • Threshold: 25 mm threshold height at 0.75 m/s impact velocity ETE-1010-02 Rev A

Power Source Requirements:

The Sun SPARC Enterprise T5120 and T5220 servers have two autoranging power supplies. To ensure redundant operation of the power supplies, the two power cords should be connected to separate AC circuits.

Use the specifications only as a planning guide. For more precise power values, make power measurements on your specific server configuration using your planned workload.

In the tables beginning on the next page, server configurations for the Maximum Power case use 4GB FBDIMMs and 1.4GHz, 8 core processors.

Configurations that use 8GB FBDIMMs and/or 1.4GHz 8 core processors are approximately equivalent.

Please see next two pages for detailed power source requirement tables.

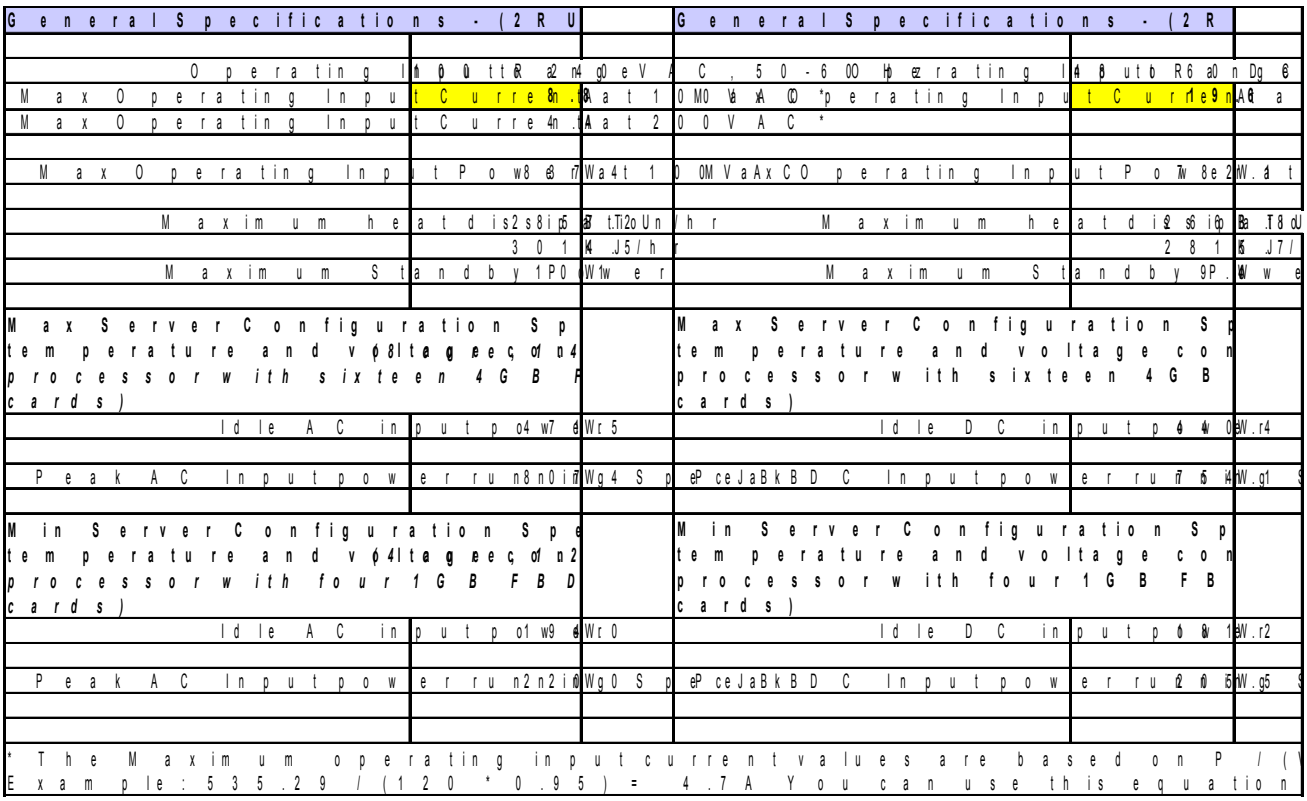
Sun SPARC Enterprise T5120 (4 disk capable) Power Specifications

General Specifications - (1 RU			General Specifications - (1 R		
Operating Input Voltage		200 to 240 VAC, 50-60 Hz	Operating Input Voltage		200 to 240 VAC, 50-60 Hz
Max Operating Input Current		6.8 A at 100 VAC	Max Operating Input Current		5.2 A at 200 VAC *
Max Operating Input Current		3.4 A at 200 VAC			
Max Operating Input Power		680 W at 100 VAC	Max Operating Input Power		1040 W at 200 VAC *
Maximum heat dissipation		2320 BTU/hr	Maximum heat dissipation		2218 BTU/hr
		2447 kJ/hr			2340 kJ/hr
Maximum Standby Power		20 W	Maximum Standby Power		18 W
Max Server Configuration System temperature and voltage (0.8 to 1.4 processor with sixteen 4 GB cards)			Max Server Configuration System temperature and voltage (0.8 to 1.4 processor with sixteen 4 GB cards)		
Idle AC input power		350 W	Idle DC input power		330 W
Peak AC Input power		1130 W	Peak DC Input power		1070 W
Min Server Configuration System temperature and voltage (0.8 to 1.4 processor with four 1 GB FBD cards)			Min Server Configuration System temperature and voltage (0.8 to 1.4 processor with four 1 GB FB cards)		
Idle AC input power		270 W	Idle DC input power		260 W
Peak AC Input power		920 W	Peak DC Input power		880 W
* The Maximum operating input current values are based on P / (					
Example: 535.29 / (120 * 0.95) = 4.7 A You can use this equation					

Sun SPARC Enterprise T5120 (8 disk capable) Power Specifications

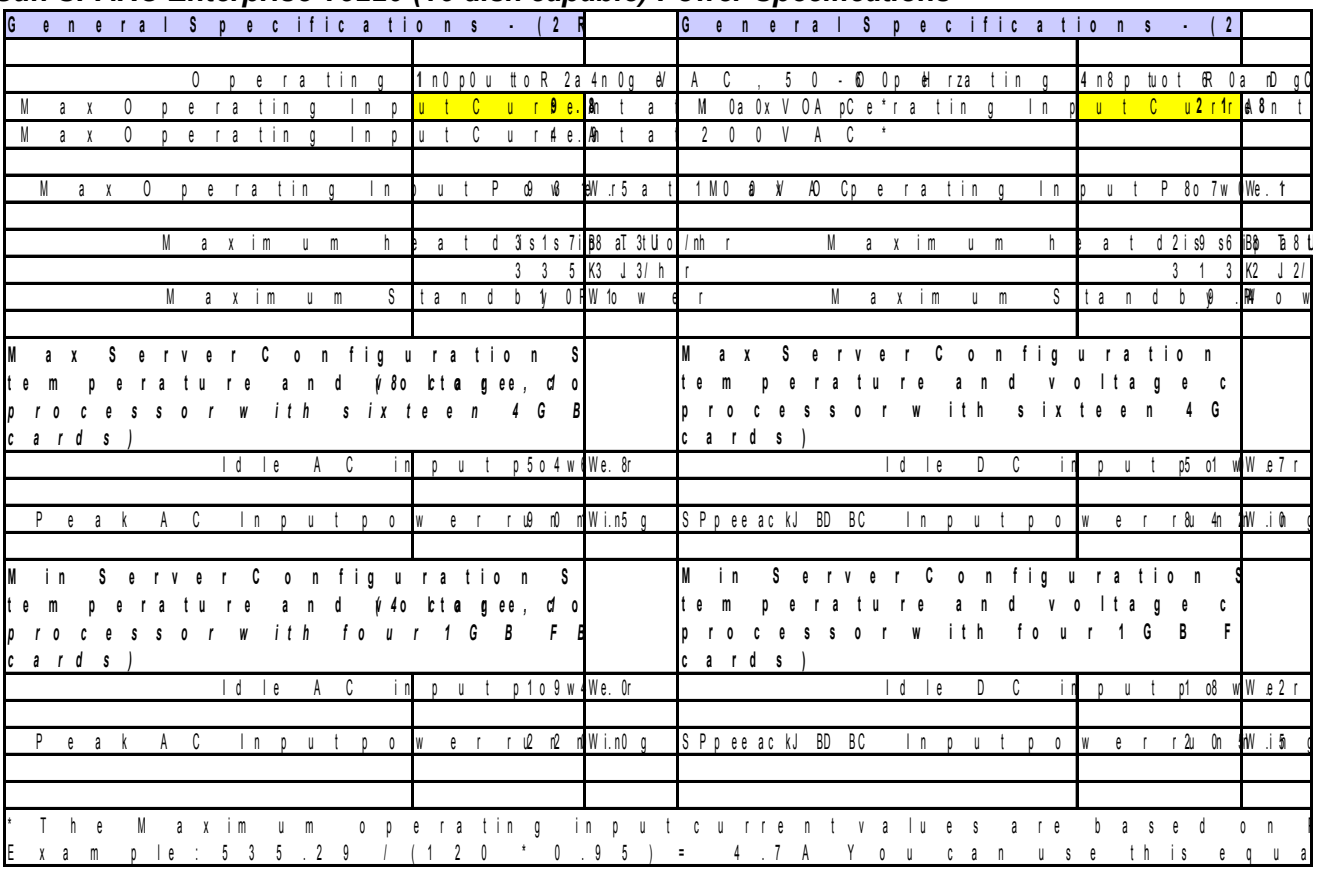
General Specifications - (1 RU			General Specifications - (1 R		
Operating Input Voltage		200 to 240 VAC, 50-60 Hz	Operating Input Voltage		200 to 240 VAC, 50-60 Hz
Max Operating Input Current		7.3 A at 100 VAC	Max Operating Input Current		5.3 A at 200 VAC *
Max Operating Input Current		3.7 A at 200 VAC			
Max Operating Input Power		730 W at 100 VAC	Max Operating Input Power		1060 W at 200 VAC *
Maximum heat dissipation		2491 BTU/hr	Maximum heat dissipation		2389 BTU/hr
		2629 kJ/hr			2521 kJ/hr *
Maximum Standby Power		20 W	Maximum Standby Power		18 W
Max Server Configuration System temperature and voltage (0.8 to 1.4 processor with sixteen 4 GB FB cards)			Max Server Configuration System temperature and voltage con processor with sixteen 4 GB cards)		
Idle AC input power		360 W	Idle DC input power		340 W
Peak AC Input power		1160 W	Peak DC Input power		1090 W
Min Server Configuration System temperature and voltage (0.8 to 1.4 processor with four 1 GB FBD cards)			Min Server Configuration System temperature and voltage con processor with four 1 GB FB cards)		
Idle AC input power		270 W	Idle DC input power		260 W
Peak AC Input power		920 W	Peak DC Input power		880 W
* The Maximum operating input current values are based on P / (V					
Example: 535.29 / (120 * 0.95) = 4.7 A You can use this equation					

Sun SPARC Enterprise T5220 (8 disk capable) Power Specifications



General Specifications - (2 RU			General Specifications - (2 R		
Operating Input Voltage Range	100 to 127 VAC, 200 to 240 VAC		Operating Input Voltage Range	100 to 127 VAC, 200 to 240 VAC	
Max Operating Input Current	8.1 A at 100 VAC		Max Operating Input Current	9.4 A at 100 VAC	
Max Operating Input Current	4.1 A at 200 VAC		Max Operating Input Current	4.8 A at 200 VAC	
Max Operating Input Power	781 W at 100 VAC		Max Operating Input Power	940 W at 100 VAC	
Maximum heat dissipation	2665 BTU/hr		Maximum heat dissipation	3201 BTU/hr	
	781 J/hr			940 J/hr	
Maximum Standby Power	11 W		Maximum Standby Power	9 W	
Max Server Configuration System temperature and voltage, one processor with sixteen 4 GB FB-DIMM cards)			Max Server Configuration System temperature and voltage, one processor with sixteen 4 GB FB-DIMM cards)		
Idle AC input power	475 W		Idle DC input power	400 W	
Peak AC Input power	1018 W		Peak DC Input power	765 W	
Min Server Configuration System temperature and voltage, one processor with four 1 GB FB-DIMM cards)			Min Server Configuration System temperature and voltage, one processor with four 1 GB FB-DIMM cards)		
Idle AC input power	190 W		Idle DC input power	160 W	
Peak AC Input power	282 W		Peak DC Input power	205 W	
* The Maximum operating input current values are based on P / (V Example: 535.29 / (120 * 0.95) = 4.7 A You can use this equation					

Sun SPARC Enterprise T5220 (16 disk capable) Power Specifications



General Specifications - (2 R			General Specifications - (2		
Operating Input Voltage Range	100 to 127 VAC, 200 to 240 VAC		Operating Input Voltage Range	100 to 127 VAC, 200 to 240 VAC	
Max Operating Input Current	8.1 A at 100 VAC		Max Operating Input Current	9.4 A at 100 VAC	
Max Operating Input Current	4.1 A at 200 VAC		Max Operating Input Current	4.8 A at 200 VAC	
Max Operating Input Power	781 W at 100 VAC		Max Operating Input Power	940 W at 100 VAC	
Maximum heat dissipation	2665 BTU/hr		Maximum heat dissipation	3213 BTU/hr	
	781 J/hr			942 J/hr	
Maximum Standby Power	10 W		Maximum Standby Power	9 W	
Max Server Configuration System temperature and voltage, one processor with sixteen 4 GB cards)			Max Server Configuration System temperature and voltage, one processor with sixteen 4 GB cards)		
Idle AC input power	454 W		Idle DC input power	357 W	
Peak AC Input power	1019 W		Peak DC Input power	765 W	
Min Server Configuration System temperature and voltage, one processor with four 1 GB FB-DIMM cards)			Min Server Configuration System temperature and voltage, one processor with four 1 GB FB-DIMM cards)		
Idle AC input power	190 W		Idle DC input power	160 W	
Peak AC Input power	282 W		Peak DC Input power	205 W	
* The Maximum operating input current values are based on P / (V Example: 535.29 / (120 * 0.95) = 4.7 A You can use this equation					

Acoustic Noise Emissions

Declared noise emissions for both the SPARC Enterprise T5120 and T5220 servers are in accordance with ISO 9296 standards.

Description	Mode	Specification (1RU)
SPARC Enterprise T5120 Server		
LwAd (1 B = 10 dB)	Operating acoustic noise Idling acoustic noise	7.0 B 7.0 B
LpAm (bystander positions)	Operating acoustic noise Idling acoustic noise	59 dB 59 dB
Description	**Mode**	**Specification (2RU)**
SPARC Enterprise T5220 Server		
LwAd (1 B = 10 dB)	Operating acoustic noise Idling acoustic noise	7.4 B 7.4 B
LpAm (bystander positions)	Operating acoustic noise Idling acoustic noise	63 dB 63 dB

Agency Compliance Specifications

The Sun SPARC Enterprise T5120 server complies with the following specifications.

Category	Relevant Standards	
Safety	UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all country deviations, IEC825-1,2 CFR21 part 1040, CNS14336, GB4943	
Ergonomics	EK1-ITB-2000	
RFI/EMC	EN55022 Class A, 47 CFR 15B Class A, ICES-003 Class A, VCCI Class A, AS/NZ3548 Class A CNS 13438 Class A	KSC 5858 Class A, GB9254 Class A, EN61000-3-2, GB17625.1, EN61000-3-3
Immunity	EN55024 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4	IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11
Regulatory Markings	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, MIC, UL/cUL, UL/S-mark, CCC	

The Sun SPARC Enterprise T5220 server complies with the following specifications.

Category	Relevant Standards	
Safety	UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all country deviations, IEC825-1, 2, CFR21 part 1040, CNS14336, GB4943	
Ergonomics	EK1-ITB-2000	
RFI/EMC	EN55022 Class A 47 CFR 15B Class A ICES-003 Class A VCCI Class A AS/NZ3548 Class A CNS 13438 Class A	KSC 5858 Class A GB9254 Class A EN61000-3-2 GB17625.1 EN61000-3-3
Immunity	EN55024 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4	IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11
Regulatory Markings	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, BSMI, MIC, UL/cUL, UL/, UL/S-mark, CCC	

Ordering Information

Note: All standard configurations (PTOs) for Sun SPARC Enterprise rackmount server are being retired by an announcement on Feb. 2, 2010. The last order date is May 7, 2010 and last shipment date is August 6, 2010.

A new table, primarily for PCIe adapters, is now included and covers all SPARC CMT rackmnount servers.

The previous ordering section for ATO and X-options, primarily PCIe adapters, may be found in the Appendix.

As of July 2009, the following changes have been made to the Sun SPARC Enterprise T5120/T5220:

- Solaris 10 Update 7 (05/09) and the latest firmware will be preloaded on all PTO configurations.
- The pre-install image will include:
  - 259-5154-01 Solaris 10 5/09, Update 7 -IP Pre-install
  - 259-5169-01 LDoms Manager and MIB 1.2 Pre-install
  - 259-4808-01 CMT Tools 1.0 Pre-install
  - 259-4809-01 GCC 4 for SPARC Systems 4.0.4 Pre-install
  - 259-4815-01 Sun Studio 12 Pre-install
  - 259-4829-01 SYS, FW, DL, UTIL, Pre-install
  - 259-4904-01 MAI,10 GBE ETCSYS CFG
  - 259-4855-01 Live Upgrade, ABE Pre-install
- ILOM 3.0 will be included

Solaris 10 Update4 will no longer be an ATO option as of 21 July 2009.

The Solaris Operating System ATO options are:

Solaris 10 (10/08) Update 6

Solaris 10 (05/09) Update 7

Solaris 10 Update4+ patches remains the minimum supported OS, and all subsequent releases are supported.

- The 1GB FBDIMM has been eliminated as an option, Sun support will continue
- **Note –** FB-DIMMs that run on 1.5V are not supported in the T5120/5220 servers. An FB-DIMM that runs on 1.5V is sometimes noted with an *LV* on the part number label. Do not install such FB-DIMMs in these servers.
- The 1.2Ghz 8 core CPU is available for ATO configurations only
  - We plan to EOL the 8 core 1.2GHz entirely in one quarter from the announcement of the new systems
- There is an internal DVD drive transition from a PATA to SATA interface
  - These servers will have a new HDD label showing "SATA DVD" identifier

- There are new T5120 and T5220 disk backplanes
- There are 1.6GHz CPU-based PTO and ATO configurations
- **T5120 8 disk backplane cannot be utilized with a 1.6 GHz CPU**
- The T5220 has a "Climate Saver" 750 watt Power Supply Unit
  - The currently shipping Power Supply Unit was EOLd on the day of the new system announcement
- Documentation has been updated to reflect these changes

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.

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

Note: Not all X-options are available as ATO options for factory integration.

Part Number	**Description 1U**	
SECPADF1Z	4 core, 32 threads, 1.2 Ghz, 8 GB (4 x 2 GB), 4 disk capable, 2 x 146 disks, 2 x 720 PSU, DVD	***Last order May 7, 2010***
SECPFEF3Z	8 core, 64 threads, 1.4 Ghz, 16 GB (8 x 2 GB), 4 disk capable, 2 x 146 disks, 2 x 720 PSU, DVD	***Last order May 7, 2010***
Part Number	**Description 2U**	
SEDPADF1Z	4 core, 32 threads, 1.2 Ghz, 8 GB (4 x 2 GB), 8 disk capable, 2 x 146 disks, 2 x 750 PSU, DVD	***Last order May 7, 2010***
SEDPFFF1Z	8 core, 64 threads, 1.4 Ghz, 32 GB (16 x 2 GB), 8 disk capable, 2 x 146 disks, 2 x 750 PSU, DVD	***Last order May 7, 2010***
SEDPGJF1Z	8 core, 64 threads, 1.6 Ghz, 64 GB (16 x 4 GB), 8 disk capable, 2 x 146 disks, 2 x 750 PSU, DVD	***Last order May 7, 2010***

Standard features for these PTO configurations include:

- *1 X UltraSPARC T2 Processor (1.2Ghz 4 core, 1.4Ghz 8 core or 1.6Ghz 8 core) Service Processor memory 128 MB*
- *4 1Gb (10/100/1000MBs) Ethernet ports*
- *Integrated Lights Out Manager (ILOM) with dedicated 100Base-T (10/100MBs) Ethernet port and serial management port.*
- *1 DVD+/-RW, 8x, SATA, Slimline, slot loaded drive*
- *3 PCI-E slots (1RU),1x dedicated PCI-E 8-lane LP, 2x shared XAUI/PCI-E 4-lane*
- *6 PCI-E slots (2RU), 2x dedicated PCI-E 8-lane LP, 2x dedicated PCI-E 4-lane LP, 2x shared XAUI/PCI-E 4-lane*
- *4 USB ports, 2 front and 2 back*

- *1 DB9 Serial port*
- *2 Redundant Hot plug AC Power Supplies*
- *Redundant Hot plug fans(N+1)*
- *2x 146 GB SAS disks to accommodate the Operating System and mirroring*
- *1 year, Next Business Day on-site replacement Warranty for the Hardware.*
- *1 standard (tools required) rack mount kit with cable management arm*
- *No charge line item for one power cord for each power supply must be ordered*
- *Solaris 10 (05/09),Update 7 plus patches and the following pre-loaded Sun software:*
  - *Sun Studio 12*
  - *Logical Domains Manager and MIB 1.2*
  - *GCC for SPARC Systems Version[4.0.4]*
  - *CMT Developer Tools Version[1.0]*

ATO (Assemble-to-Order) Configurations

ATO provides custom configurations that have been pre-assembled and pre-tested within the factory. Certain limitations apply, and configuration rules will be enforced by the configurator.

The ATO system sales order must include:

- One Base Configuration, 1U or 2U (includes chassis, motherboard with 1x CPUs)
- One Disk Backplane
- Memory: Min 4 DIMMs All memory is selected in quantities of 4 (2 sets containing 2 FBDIMMs in each set with a minimum of 2 GB each)
- Minimum One Hard Disk Drive or One Solid State Drive
- One Operating System/software pre-install
- Minimum One Power Supply
- One power cord for each power supply (no charge Xoption)

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

- Additional memory
- Additional disks
- PCIe and/or XAUI adapters, from a subset of those supported
- DVD+/-RW device
- Rackmount kit
- Cable management arm

ATO Configuration Process Steps

Step 1: *Specify the ATO base configuration:*

Each ATO base config includes chassis, motherboard, infrastructure boards, and other common components.

We plan to EOL the 8 core 1.2GHz CPU entirely in one quarter from the announcement of the new systems.

ATO Option	Description - 1U	Comments
SECAA143Z	T5120 (1U) ATO base config, 4 core 32 threads, 1.2Ghz	
SECAC143Z	T5120 (1U) ATO base config, 8 core 64 threads, 1.2Ghz	*Last order May 7, 2010*
SECAF143Z	T5120 (1U) ATO base config, 8 core 64 threads, 1.4Ghz	
SECAG143Z	T5120 (1U) ATO base config, 8 core 64 threads, 1.6Ghz	
ATO Option	**Description - 2U**	**Comments**
SEDAA143Z	T5220 (2U) ATO base config, 4 core 32 threads, 1.2Ghz	
SEDAC143Z	T5220 (2U) ATO base config, 8 core 64 threads, 1.2Ghz	*Last order May 7, 2010*
SEDAF143Z	T5220 (2U) ATO base config, 8 core 64 threads, 1.4 Ghz	
SEDAG143Z	T5220 (2U) ATO base config, 8 core 64 threads, 1.6 Ghz	

Step 2: *Select disk backplane:*

- Four or eight disk backplane for the T5120
- Eight disk or sixteen disk backplane for the T5220 (16 HDD requires new (1100w) Power Supply Unit that is selected separately.
- Disk backplanes are NOT field upgradable, and are not available as Xoptions.

ATO Option	Description	Comments
SECY9BA2Z	4 disk backplane for 1U only	
SECY9BB2Z	8 disk backplane for 1U only (not available with 1.6 GHz)	
SEDY9BB2Z	8 disk backplane for 2U only	
SEDY9BC2Z	16 disk backplane for 2U only (requires 1100W AC Power Supply Unit)	

Step 3: Select memory:

- A functioning T5120/5220 server requires a minimum memory of 4GB utilizing 4 x 1GB DIMMs.
- However, Sun has discontinued a 1GB FBDIMM option.
- Only Sun Certified FB-DIMMs should be used in the Sun SPARC Enterprise T5120 (1RU) and T5220 (2RU) platforms.
- All memory are selected in quantities of 4 (2 sets containing 2 FB-DIMMs in each set)

- Current memory size options are 2 GB, 4GB and 8 GB FB-DIMMs.
- Configuration rules will not allow the mixing of FB-DIMM sizes.
- There has to be a memory configuration of 4, 8, or 16 FBDIMMs.
- A 12 FB-DIMMs configuration is NOT supported.
- There are a maximum of 16 available memory slots that can be populated in any Huron server.
- There are a maximum of 8 memory option sets consisting of 2 DIMMs per set
- FB-DIMM Configuration Guidelines must be followed

FB-DIMM Configuration Guidelines

Use the following guidelines with TABLE 5-1, FIGURE 5-2 and FIGURE 5-3 when installing, upgrading, or replacing FB-DIMMs:

- There are a total of 16 slots that support industry-standard FB-DIMMs.
- Supported FB-DIMM capacities are 1 GByte, 2 GByte, 4 GByte, and 8 GByte.
- Valid quantities of FB-DIMMs are 4, 8 or 16.
- All FB-DIMMs in the server must be the same capacity.
- All FB-DIMMs in a branch must have the same part number.

Note – FB-DIMMs that run on 1.5V are not supported in this server. An FB-DIMM that runs on 1.5V is sometimes noted with an *LV* on the part number label. Do not install such FB-DIMMs in this server.

When Upgrading Memory

When adding memory to the server, ensure that you follow all of the guidelines.

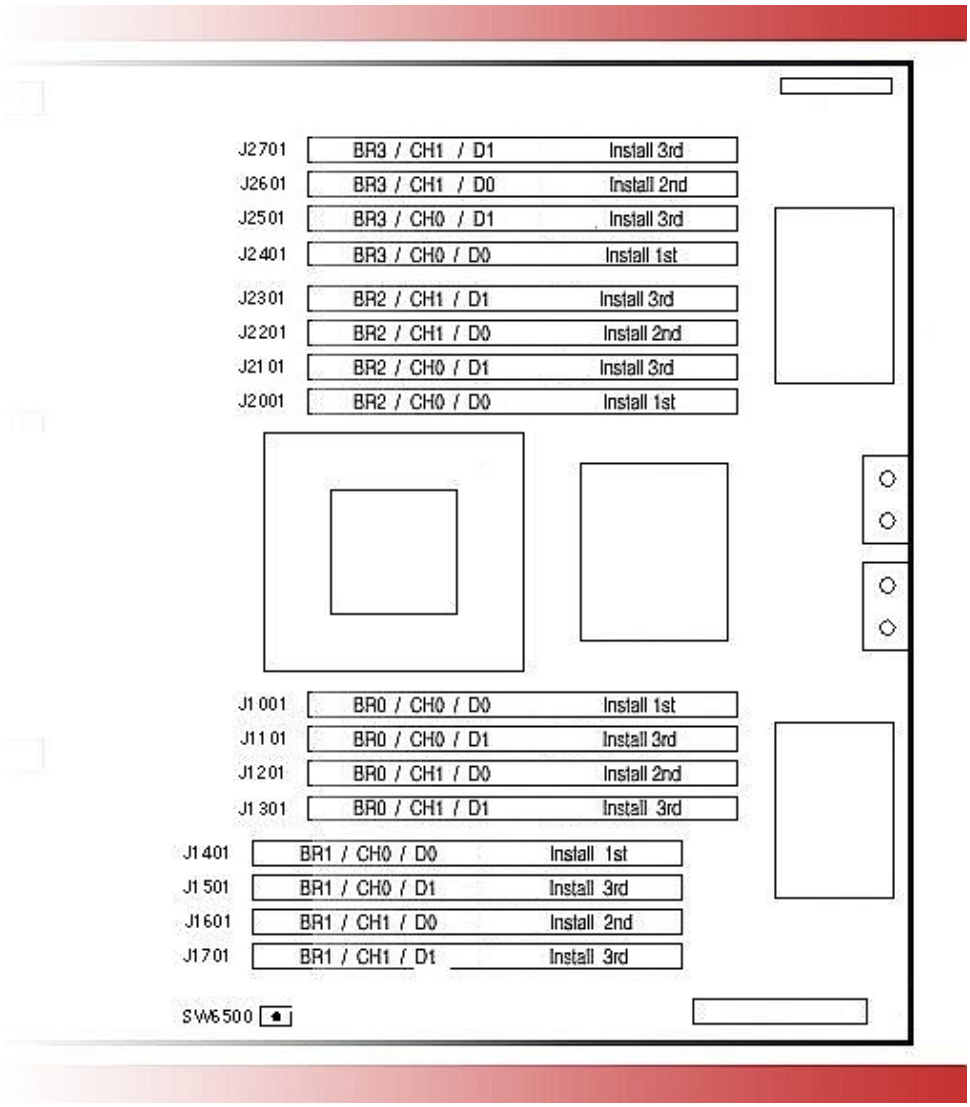
You might need to move some of the original FB-DIMMs to ensure that all FB-DIMMs in a branch have the same part number.

When Replacing Faulty FB-DIMMs

Ensure that the replacement FB-DIMM has the same part number as the FB-DIMM you are removing.

- If you are unable to obtain an FB-DIMM with the same part number, you might need to replace all the FB-DIMMs in the branch to ensure that all have the same part number.

FIGURE 5-2 Motherboard FB-DIMM Slots



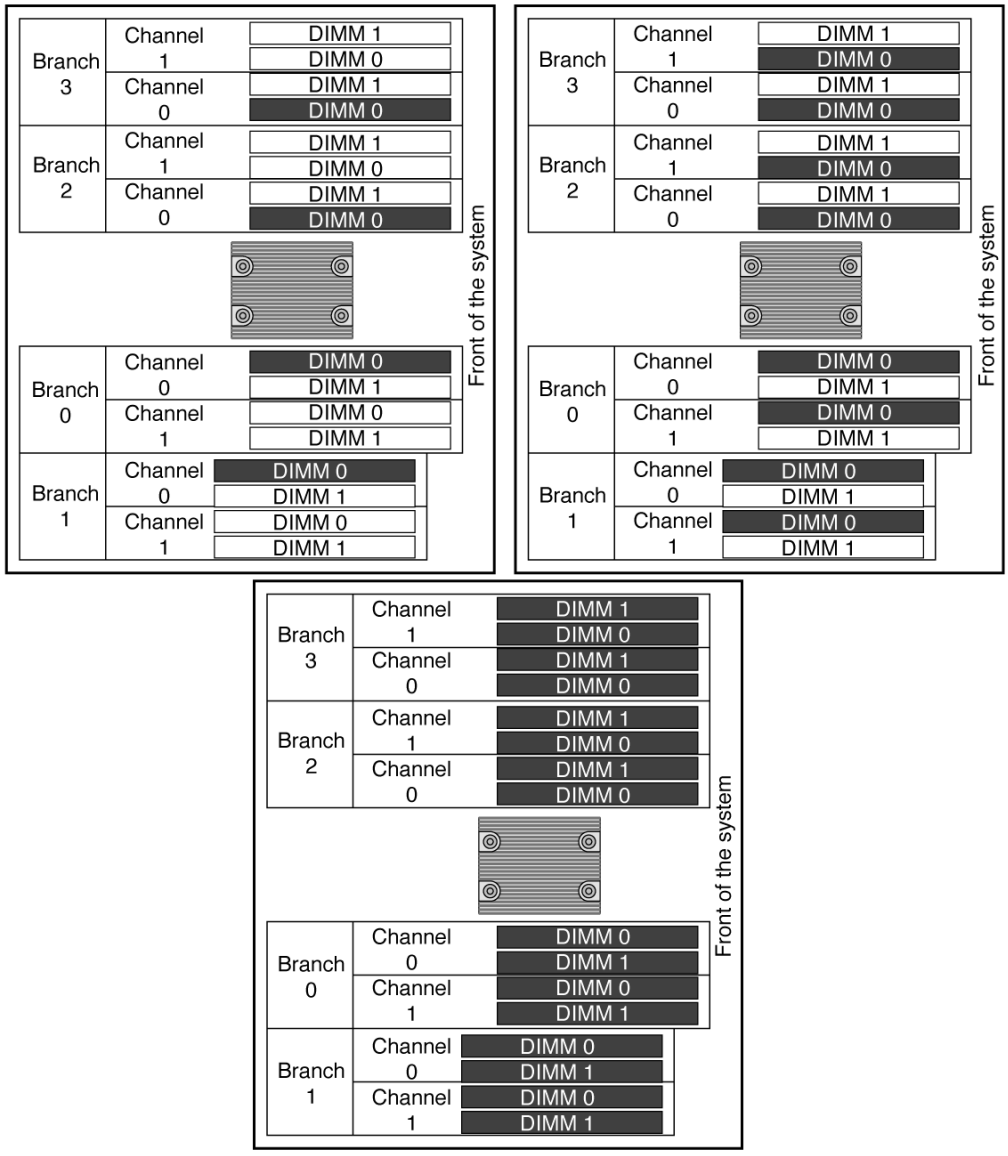
	For Each FB-DIMM slot: BR = Branch, CH = Channel, D = DIMM
1	Branch 3 FB-DIMM slots
2	Branch 2 FB-DIMM slots
3	Branch 0 FB-DIMM slots
4	Branch 1 FB-DIMM slots
5	FB-DIMM fault locator button **Note -** When pressed, if an FB-DIMM is faulty, an LED on the motherboard near the faulty FB-DIMM is lit for a few minutes.

TABLE 5-1 maps FB-DIMM locations with FB-DIMM FRU names. The FRU name is displayed in memory faults. Use this table to identify the motherboard location of an FB-DIMM FRU name.

TABLE 5-1 FB-DIMM Reference

Branch	Channel	FRU Name	Motherboard FB-DIMM Connector	FB-DIMM Installation Order
Branch 3	Channel 1	/SYS/MB/CMP0/BR3/CH1/D1	J2701	3
		/SYS/MB/CMP0/BR3/CH1/D0	J2601	2
	Channel 0	/SYS/MB/CMP0/BR3/CH0/D1	J2501	3
		/SYS/MB/CMP0/BR3/CH0/D0	J2401	1
Branch 2	Channel 1	/SYS/MB/CMP0/BR2/CH1/D1	J2301	3
		/SYS/MB/CMP0/BR2/CH1/D0	J2201	2
	Channel 0	/SYS/MB/CMP0/BR2/CH0/D1	J2101	3
		/SYS/MB/CMP0/BR2/CH0/D0	J2001	1
Branch 0	Channel 0	/SYS/MB/CMP0/BR0/CH0/D0	J1001	1
		/SYS/MB/CMP0/BR0/CH0/D1	J1101	3
	Channel 1	/SYS/MB/CMP0/BR0/CH1/D0	J1201	2
		/SYS/MB/CMP0/BR0/CH1/D1	J1301	3
Branch 1	Channel 0	/SYS/MB/CMP0/BR1/CH0/D0	J1401	1
		/SYS/MB/CMP0/BR1/CH0/D1	J1501	3
	Channel 1	/SYS/MB/CMP0/BR1/CH1/D0	J1601	2
		/SYS/MB/CMP0/BR1/CH1/D1	J1701	3

FIGURE 5.3 FB-DIMM Motherboard Layouts for Quantities of 4, 8, and 16 FB-DIMMs



1 4 FB-DIMM configuration

2 8 FB-DIMM configuration

3 16 FB-DIMM configuration

ATO Option	Description	Comments
SESY2B2Z	4 GB Memory Expansion option (2 x 2 B), (1.8 v,)	
SESY2C1Z	8 GB Memory Expansion option (2 x 4 GB), (1.8 v,)	
SESY2D1Z	16 GB Memory Expansion option (2 x 8 GB), (1.8 v,)	

Step 4: Select at least one disk drive:

- Minimum of one hard disk drive or one solid state drive.
- The maximum number of SAS disk drives is determined by the selected disk backplane.
- The maximum number of Solid State Drives supported:
  - T5120 = 4 for the four and eight disk backplanes.
  - T5220 = 8 for the eight and 16 disk backplanes.
- SAS and Solid State drives may be mixed within a system based on the above maximum quantities.
- SAS and SATA (when available) drives may not be mixed within a system.
- Sun Cluster has announced support with Solid State Drives as a boot device on the Sun SPARC T5120 and T5220.
- At time of publication, Sun Marketing part number SGPCIESAS-R-INT-Z – the SAS Eight Port , RAID PCI-Express HBA is not supported with solid state drives.
- Each unused HDD slot must be filled with a disk filler panel, added automatically by the Configurator.

ATO Option	Description	Comments
SESY3C11Z	HDD, 146 GB 10K RPM 2.5" SAS	Common with T5x40 servers
SESY3A21Z ***retired***	HDD, 73 GB 15K RPM 2.5" SAS	Common with T5x40 servers, ***retired***
SESY3G11Z	300 GB, 10K RPM, 2.5", SAS with Marlin bracket	Common with T5x40 servers
SESY3Y11Z	32 GB, 2.5" SATA solid state disk drive with Marlin bracket	Common with T5x40 servers

Step 5: Select an operating system and pre-install software stack:

Customers must select a version of the Solaris operating system to be pre-installed on the system. This pre-install image is identical to the packages in the PTO configurations.

ATO Option	Description	Comments
SESY9SD1Z	Solaris 10 U6 (10/08), plus patches, Sun Studio 12 Logical Domains Manager 1.0.3, Logical Domains MIB 1.0.1 U1 (Note: U1 provides bug fixes/patches that allow it to work with Logical Domains Manager 1.0.2) GCC for SPARC Systems Version[4.0.4] CMT Developer Tools Version[1.0]	
SESY9SF1Z	Solaris 10 U7 (05/09), *Sun Studio 12, Logical Domains Manager and MIB 1.2, GCC for SPARC Systems Version[4.0.4],CMT Developer Tools Version[1.0]*	
SESY9SG1Z	Solaris 10 U8 (10/09), *Sun Studio 12, Logical Domains Manager and MIB 1.3, GCC for SPARC Systems Version[4.0.4],CMT Developer Tools Version[1.0]*	***Effective Feb. 16, 2010***

Step 6: Select power supplies:

- All ATO systems require at least one power supply.

- It is recommended that two power supplies be selected for redundancy, but it is not a functional requirement in the configurator for AC PSUs.
- A filler panel is required if only one PSU is selected, and will be added automatically by the configurator.
- If a DC PSU is selected, two power supplies are required.

ATO Option	Description	Comments
SECY9PS41Z	AC “Climate Saver” Power supply for T5120 (1U) 720W	
SEDY9PS32Z	AC “Climate Saver”Power Supply for T5220 (2U) - 750W	
SEUY9PS51Z	AC Power Supply for T5220 (2U) - 1100W	
SESY9PS21Z	DC Power supply for T5120 (1U) – 660W	
SESY9PS61Z	DC Power supply for T5220 (2U) – (1200W)	

Step 7: Select power cords

The customer is required to select ONE no charge country-specific power cord for EACH power supply.

These are delivered as no-cost X-options.

X311L	AC Power Cord U.S./Asia
X312L	AC Power Cord Continental Europe
X312E	AC Power Cord China
X386L	AC Power Cord Australia
X312F	AC Power Cord Argentina
X317L	AC Power Cord U.K
X314L	AC Power Cord Switzerland
X384L	AC Power Cord Italy
X383L	AC Power Cord Denmark
X312G	AC Power Cord Korea
X332A	AC Power Cord Taiwan
X332T	Pwrcord,INTL,4.0m,IEC309-IP44,10A,C13
X340L	Powercord,N.A./Asia,4.0m,L6-20P,15A,C13
X333A-25-15-JP	Pwrcord,Japan,2.5m,PSE 5-15,15A,C13
X333F-25-15-JP	Pwrcord,Japan,2.5m,PSE 6-15,15A,C13
X333A-25-10-IL	Pwrcord,Israel,2.5m,SI-32,10A,C13
X9237-1-A	Pwrcord,Jumper,1.0m,C13,13A,C14
X9238-1-A	Pwrcord,Jumper,2.5m,C13,13A,C14

Step 8: Select optional components:

- Items below are not required, but are offered as configured options (installed in the factory). Minimum

quantity for all below options is zero.

- Filler panels will be added automatically by the Configurator as needed.
- Maximum quantities will be enforced by the Configurator.

ATO Option	Description	Max quantity 1U	Max quantity 2U
SESY9DV2Z	SE T5xx0 DVD, 8X, RW SATA	1	1
SESY9RK1Z	Slide rail kit – standard (requires tools) – select only one rail kit per system	1	1
SESY9RK2Z	Slide rail kit – Express Rails (tool-less) – select only one rail kit per system	1	1
SESY9CA1Z	Cable Management Arm – works with either rail kit listed above	1	1

Additional options in table below

ATO and X-options Available

Legend

- ATO option followed by X-option under part numbers.
- 'Xn' indicates n adapters/devices supported via X-options; 'An' indicates n adapters/devices supported via ATO options. Quantity may be dependent upon configuration, i.e. disk backplane selected, memory riser cards, etc., in which case the number may be omitted.

Option	Description	T5120	T5220	T5140	T5240	T5440	
Memory							
SESY2B2Z SESX2B2Z	4 GB memory option consisting of 2 - 2 GB FB-DIMMs	A/X	A/X	N/A	N/A	A/X	
SESY2C1Z SESX2C1Z	8 GB memory option consisting of 2 - 4 GB FB-DIMMs	A/X	A/X	N/A	N/A	A/X	
SESY2D1Z SESX2D1Z	16 GB memory option consisting of 2 - 8 GB FB-DIMMs	A/X	A/X	N/A	N/A	A/X	
SESY2C4Z SESX2C4Z	8 GB memory option, (2 x 4 GB) 800 Mhz, extended ECC, for 1.6 Ghz T5440 only	N/A	N/A	N/A	N/A	A/X	
SESY2B3Z SESX2B3Z	4 GB memory option consisting of 2 - 2 GB FB-DIMMs, low voltage	N/A	N/A	A/X	A/X	N/A	
SESY2C3Z SESX2C3Z	8 GB memory option consisting of 2 - 4 GB FB-DIMMs, low voltage	N/A	N/A	A/X	A/X	N/A	
SESY2D3Z SESX2D3Z	16 GB memory option consisting of 2 - 8 GB FB-DIMMs, low voltage	N/A	N/A	A/X	A/X	N/A	
SEUY2MM2Z SEUX2MM2Z	Memory mezzanine Kit – adds 16 FB-DIMM slots for T5240 – 1.55 v capable	N/A	N/A	N/A	A1/X1	N/A	
Disk Drives							
SESY3A11Z SESX3A11Z	73 GB, 2.5”, 10,000 RPM, SAS drive with Marlin bracket	EOL	EOL	EOL	EOL	N/A	
SEVY3A11Z SEVX3A11Z	73 GB, 2.5”, 10,000 RPM, SAS drive with Nemo bracket	N/A	N/A	N/A	N/A	EOL	
SESY3A21Z SESX3A11Z	73 GB, 2.5”, 15,000 RPM, SAS drive with Marlin bracket	EOL	EOL	EOL	EOL	N/A	
SEVY3A21Z SEVX3A11Z	73 GB, 2.5”, 15,000 RPM, SAS drive with Nemo bracket	N/A	N/A	N/A	N/A	EOL	
SESY3C11Z SESX3C11Z	146 GB, 2.5”, 10,000 RPM, SAS drive with Marlin bracket	A/X	A/X	A/X	A/X	N/A	
SEVY3C11Z SEVX3C11Z	146 GB, 2.5”, 10,000 RPM, SAS drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
SESY3G11Z	300 GB, 2.5”, 10,000 RPM, SAS drive	A/X	A/X	A/X	A/X	N/A	

SESX3G11Z	with Marlin bracket						
SEVY3G11Z SEVX3G11Z	300 GB, 2.5”, 10,000 RPM, SAS drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
SESY3K11Z SESX3K11Z ***Future***	600 GB, 2.5”, 10,000 RPM, SAS drive with Marlin bracket	A/X	A/X	A/X	A/X	N/A	
SEVY3K11Z SEVX3K11Z ***Future***	600 GB, 2.5”, 10,000 RPM, SAS drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
Disk Backplanes							
SECY9BA2Z	4 disk backplane for T5120 only	A1	N/A	N/A	N/A	N/A	
SECY9BB2Z	8 disk backplane for T5120 only (not available with 1.6 GHz)	A1	N/A	N/A	N/A	N/A	
SEDY9BB2Z	8 disk backplane for T5220 only	N/A	A1	N/A	N/A	N/A	
SEDY9BC2Z	16 disk backplane for T5220 only (requires 1100 W AC Power Supply Unit)	N/A	A1	N/A	N/A	N/A	
SETY9BA2Z	4 disk backplane for T5140 only	N/A	N/A	A1	N/A	N/A	
SETY9BB2Z	8 disk backplane for T5140 only	N/A	N/A	A1	N/A	N/A	
SEUY9BB2Z	8 disk backplane for T5240 only	N/A	N/A	N/A	A1	N/A	
SEUY9BC2Z	16 disk backplane for T5240 only	N/A	N/A	N/A	A1	N/A	
Sold State Disks (SSDs)							
SESY3Y11Z SESX3Y11Z	32 GB, 2.5" SATA solid state disk drive with Marlin bracket	A/X	A/X	A/X **Note**	A/X **Note**	N/A	
SEVY3Y11Z SEVX3Y11Z	32 GB, 2.5" SATA solid state disk drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
SESY3Y21Z SESX3Y21Z ***Future/TBD***	50 GB, 2.5" solid state disk drive with Marlin bracket	A/X	A/X	A/X **Note**	A/X **Note**	N/A	
SEVY3Y21Z SEVX3Y21Z ***Future/TBD***	50 GB, 2.5" solid state disk drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
SESY3Y31Z SESX3Y31Z ***Future/TBD***	??? GB, 2.5" solid state disk drive with Marlin bracket	A/X	A/X	A/X **Note**	A/X **Note**	N/A	
SEVY3Y31Z SEVX3Y31Z ***Future/TBD***	??? GB, 2.5" solid state disk drive with Nemo bracket	N/A	N/A	N/A	N/A	A4/X4	
Removable Media/DVD							
SESY9DV2Z SESX9DV2Z	SE T5xx0 DVD, 8X, RW SATA	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SEVY9DV1Z SEVX9DV1Z	DVD ±R/W, 8x, slimline, slot-loaded drive, PATA interface	N/A	N/A	N/A	N/A	A1/X1	

Rackmount Kit and Cable Management Arm							
SESY9RK1Z SESX9RK1Z	Slide rail kit – standard (requires tools) – select only one rail kit per system	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SESY9RK2Z SESX9RK2Z	Slide rail kit – Express Rails (tool-less) – select only one rail kit per system	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SESY9RK3Z SESX9RK3Z ***Future***	Slide rail kit, extended length – (requires tools) – select only one rail kit per system	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SESY9RK4Z SESX9RK4Z ***Future***	Slide rail kit, extended length – Express Rails (tool-less) – select only one rail kit per system	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SEVY9RK1Z SEVX9RK1Z	Rackmount/rail kit, tools required for installation	N/A	N/A	N/A	N/A	A1/X1	
SESY9CA1Z SESX9CA1Z	Cable Management Arm	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SEVX9CA1Z SEVX9CA1Z	Cable management arm assembly, snap-in assembly	N/A	N/A	N/A	N/A	A1/X1	
PCI Adapters							
Storage Adapters							
SG-PCIE1FC-QF8-Z SG-XPCIE1FC-QF8-Z	8 Gb Fibre Channel, PCIe HBA, Qlogic, Single Port	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE2FC-QF8-Z SG-XPCIE2FC-QF8-Z	8 Gb Fibre Channel, PCI-e HBA, Qlogic, Dual Port	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE1FC-EM8-Z SG-XPCIE1FC-EM8-Z	8 Gb Fibre Channel, PCIe HBA, Emulex, Single Port	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE2FC-EM8-Z SG-XPCIE2FC-EM8-Z	8 Gb Fibre Channel, PCIe HBA, Emulex, Dual Port	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE1FC-QF4 SG-XPCIE1FC-QF4	4 Gb Fibre Channel, PCIe single port, Qlogic	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE2FC-QF4 SG-XPCIE2FC-QF4	4 Gb Fibre Channel, PCIe dual port, Qlogic	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE1FC-EM4 SG-XPCIE1FC-EM4	4 Gb Fibre Channel, PCIe single port, Emulex	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE2FC-EM4 SG-XPCIE2FC-EM4	4 Gb Fibre Channel, PCIe dual port, Emulex	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE2SCSIU320Z SG-XPCIE2SCSIU320Z	Ultra 320 SCSI, dual port, PCIe adapter	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
SG-PCIE8SAS-E-Z SG-XPCIE8SAS-E-Z	SAS, 8 port, PCIe, Pandora	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
PCIe Storage Accelerators							
TA-FAS-S3IE96GB XTA-FAS-S3IE96GB	96 GB solid state Flash Accelerator 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 (Aura)	A2/X2 **Note**	A5/X5 **Note**	A2/X2 **Note**	A2/X2 **Note**	A8/X8 **Note**	

Link Card to I/O Expansion Module							
SELX8LK1Z	Copper connection kit from a PCIe slot in the host to an I/O Expansion Module. Includes two adapter cards and one 4m, dual-path, copper cable	X1	X1	X2	X2	X4	
RAID Controller							
SG-PCIESAS-R-INT-Z SGXPCIESAS-R-INT-Z	SAS Eight Port , RAID PCI-Express HBA (Solid State Drives are not supported with this optional card)	A1/X1	A1/X1	A1/X1	A1/X1	N/A	
SG-PCIESAS-R-EXT-Z SGXPCIESAS-R-EXT-Z	SAS, 8-port, external RAID controller	A1/X1	A1/X1	A1/X1	A4/X4	A2/X2	
SECX9SA1Z	Cable X-option kit for installation of internal RAID card – 1U	X1	N/A	N/A	N/A	N/A	
SECY9SA3Z	Internal SAS Cable Kit T5120 4 disk HDD (71cm) for install of internal RAID card – 1U	A1	N/A	N/A	N/A	N/A	
SECY9SA4Z	Cable Kit for installation of internal RAID card T5120 8 disk HDD (60cm)– 2U	A1	N/A	N/A	N/A	N/A	
SEDY9SA2Z SEDX9SA2Z	Cable Kit for installation of internal RAID card T5220 8 OR 16 disk HDD (71cm), (67cm)	N/A	A1/X1	N/A	N/A	N/A	
SETY9SA3Z	Cable Kit for installation of internal RAID card – 1U, 4 disk	N/A	N/A	A1	N/A	N/A	
SETY9SA4Z	Cable Kit for installation of internal RAID card – 1U, 8 disk	N/A	N/A	A1	N/A	N/A	
SEUY9SA2Z	Cable Kit for installation of internal RAID card – 2U, 8 or 16 disk	N/A	N/A	N/A	A1	N/A	
Network Adapters							
7280A-2 X7280A-2	Gb Ethernet, dual port, UTP, low-profile, Northstar	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
7281A-2 X7281A-2	Gb Ethernet, dual port, MMF, low-profile, Northstar	A3/X3	A6/X6	A3/X3	A6/X6	A8/X8	
1027A-Z X1027A-Z	10 Gb Ethernet, PCIe Dual Port, Low Profile, Atlas – requires one of the following 2 transceivers:	A3/X3	A3/X3	A2/X2	A4/X4	A4/X4	
5558A X5558A	Transceiver for Atlas/XAUI - 10 GE SR XFP Transceiver for base board for short reach	A3/X3	A3/X3	A2/X2	A4/X4	A4/X4	
5560A-Z X5560A-Z	Transceiver for Atlas/XAUI - 10 GE LR XFP Transceiver for base board for long reach	A3/X3	A3/X3	A2/X2	A4/X4	A4/X4	
1106A-Z 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.	A2/X2	A4/X4	N/A	N/A	A4/X4	

	(Oplin)						
1107A-Z 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)	A2/X2	A4/X4	N/A	N/A	A4/X4	
1109A X1109A ***Future***	10 Gb Ethernet PCIe dual port, (Niantic)	A3/X3	A3/X3	A2/X2	A4/X4	A4/X4	
2129A X2129A ***Future***	Short range transceiver plus twin copper cable for X1109A	A3/X3	A3/X3	A2/X2	A4/X4	A4/X4	
4447A-Z X4447A-Z	Gigabit Ethernet, quad port, PCIe, (copper), Atlas	A2/X2	A5/X5	A2/X2	A5/X5 **Note**	A8/X8	
XAUI Adapters							
SESY7XA1Z SESX7XA1Z	10 GbE XAUI card - Fiber (at RR) – requires one of the following transceivers:	A2/X2	A2/X2	A2/X2	A2/X2	A2/X2	
SESY7XT1Z SESX7XT1Z	Transceiver for Atlas/XAUI- 10 GE SR XFP transceiver for base board for short reach (20 to 300 meters)	A2/X2	A2/X2	A2/X2	A2/X2	A2/X2	
SESY7XT2Z SESX7XT2Z	Transceiver for Atlas/XAUI - 10 GE LR XFP transceiver for base board for long reach (2 to 10 Kilometers), multimode	A2/X2	A2/X2	A2/X2	A2/X2	A2/X2	
InfiniBand Adapters							
1236A-Z X1236A-Z	InfiniBand, dual port, 4x, host channel adapter – low-profile	A3/X3 EOL	A6/X6 EOL	A3/X3 EOL	A6/X6 EOL	N/A	
4237A X4237A ***Future - March***	InfiniBand dual port, 4x QDR PCIe LP	A3/X3	A6/X6	A3/X3	A6/X6	A6/X6	
Other Adapters							
6000A X6000A	Crypto accelerator 6000	A1/X1	A2/X2	A1/X1	A2/X2	A2/X2	
Graphic Interfaces							
3000A X3000A	XVR-300, x8, PCIe, low-profile, graphics adapter	A1/X1	A1/X1	A3/X3	A4/X4	A4/X4	

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.

I/O Expansion Unit

The Sun External I/O Expansion Unit provides additional PCIe connectivity by multiplexing one adapter, installed in the Sun SPARC Enterprise T5120 or T5220 server, to many adapters through 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
- The Sun SPARC Enterprise T5120 supports one I/O boat per system and the Sun SPARC Enterprise T5220 supports two I/O boat per system.
- A link to an I/O boat consists of a pair of link cards and connecting cable. One link card is installed in a PCI-Express I/O slot in the T5120 or T5220. The other link card is installed in the LINK slot of the I/O boat.
- The x8 slots only should be used for the attachment of link cards:
- The Sun SPARC Enterprise T5120 has (1) x8 slot which can only support (1) link card
- The Sun SPARC Enterprise T5220 has (2) x8 slots which can support (2) link cards.
- The x4 slots should NOT be used for the link cards
- 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 T5120 and T5220 server to which the External I/O Expansion Module is attached rather than the component in the External I/O Expansion Module itself.
- Customers must select two power cords per I/O Box, not per I/O Boat

Ordering

Begin by selecting a 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 an I/O Boat and a link card/connection kit from the section entitled '*Post-sales Additions'— Field Upgrades* below

Part Number	Description	Comments
Required: Select base unit, chassis and I/O Boat		

SENY8BE1Z	External I/O Expansion Unit - PCIe Base
	
	A 4 Rack Unit External I/O Expansion Unit for servers, includes:
	• Base chassis with 2 high-efficiency power supplies/fan units and status LEDs
	• 1 PCI-Express “boat” and 6 “smart adjust” hot pluggable carriers for x8 or smaller PCI-Express cards
	• Filler panels as needed.
	• Sun “Getting Started Guide”
	• Sun Packaging
	• Ship Kit containing:
	  • Cable Management bracket (1)
	  • Rack mount kit (1)
	
	Note: This part number is not allowed for sale in Taiwan. Instead, 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 the T5120 (One I/O boat) or T5220 (Two I/O boats), 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 the T5120 or T5220
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 Additions – Field Upgrades

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 the T5120 or T5220, 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 the T5120 or the T5220

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

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	Tested but not recommended and not supported

***Note:** As the X1027A-Z is a high-throughput adapter, it is encouraged that it be installed in its own PCIe slot within the host/server rather than sharing a single host PCIe slot with other adapters sharing the same I/O Boat.

Any adapters that are not listed above have not been tested and are not supported.

These are the Sun Spectrum Instant Upgrade (SIU) parts for the **T5120** in the following table:

IWU-T5120-4-1G	Sun SPARC Enterprise T5120 4-core server Upgrade to 1 year of Gold support.
IWU-T5120-4-1P	Sun SPARC Enterprise T5120 4-core server Upgrade to 1 year of Platinum support.
IWU-T5120-4-1S	Sun SPARC Enterprise T5120 4-core server Upgrade to 1 year of Silver support.
IWU-T5120-4-24-1G	Sun SPARC Enterprise T5120 4-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5120-4-24-2G	Sun SPARC Enterprise T5120 4-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5120-4-24-3G	Sun SPARC Enterprise T5120 4-core server Upgrade to Gold Support + 7X24 On-Site Support for 3 Years.
IWU-T5120-4-2G	Sun SPARC Enterprise T5120 4-core server Upgrade to 2 years of Gold support.
IWU-T5120-4-2P	Sun SPARC Enterprise T5120 4-core server Upgrade to 2 years of Platinum support.
IWU-T5120-4-2S	Sun SPARC Enterprise T5120 4-core server Upgrade to 2 years of Silver support.
IWU-T5120-4-3G	Sun SPARC Enterprise T5120 4-core server Upgrade to 3 years of Gold support.
IWU-T5120-4-3P	Sun SPARC Enterprise T5120 4-core server Upgrade to 3 years of Platinum support.
IWU-T5120-4-3S	Sun SPARC Enterprise T5120 4-core server Upgrade to 3 years of Silver support.
IWU-T5120-6-1G	Sun SPARC Enterprise T5120 6-core server Upgrade to 1 year of Gold support.
IWU-T5120-6-1P	Sun SPARC Enterprise T5120 6-core server Upgrade to 1 year of Platinum support.
IWU-T5120-6-1S	Sun SPARC Enterprise T5120 6-core server Upgrade to 1 year of Silver support.
IWU-T5120-6-24-1G	Sun SPARC Enterprise T5120 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5120-6-24-2G	Sun SPARC Enterprise T5120 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5120-6-24-3G	Sun SPARC Enterprise T5120 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 3 Years.
IWU-T5120-6-2G	Sun SPARC Enterprise T5120 6-core server Upgrade to 2 years of Gold support.
IWU-T5120-6-2P	Sun SPARC Enterprise T5120 6-core server Upgrade to 2 years of Platinum support.
IWU-T5120-6-2S	Sun SPARC Enterprise T5120 6-core server Upgrade to 2 years of Silver

	support.
IWU-T5120-6-3G	Sun SPARC Enterprise T5120 6-core server Upgrade to 3 years of Gold support.
IWU-T5120-6-3P	Sun SPARC Enterprise T5120 6-core server Upgrade to 3 years of Platinum support.
IWU-T5120-6-3S	Sun SPARC Enterprise T5120 6-core server Upgrade to 3 years of Silver support.
IWU-T5120-8-1G	Sun SPARC Enterprise T5120 8-core server Upgrade to 1 year of Gold support.
IWU-T5120-8-1P	Sun SPARC Enterprise T5120 8-core server Upgrade to 1 year of Platinum support.
IWU-T5120-8-1S	Sun SPARC Enterprise T5120 8-core server Upgrade to 1 year of Silver support.
IWU-T5120-8-24-1G	Sun SPARC Enterprise T5120 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5120-8-24-2G	Sun SPARC Enterprise T5120 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5120-8-24-3G	Sun SPARC Enterprise T5120 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 3 Years.
IWU-T5120-8-2G	Sun SPARC Enterprise T5120 8-core server Upgrade to 2 years of Gold support.
IWU-T5120-8-2P	Sun SPARC Enterprise T5120 8-core server Upgrade to 2 years of Platinum support.
IWU-T5120-8-2S	Sun SPARC Enterprise T5120 8-core server Upgrade to 2 years of Silver support.
IWU-T5120-8-3G	Sun SPARC Enterprise T5120 8-core server Upgrade to 3 years of Gold support.
IWU-T5120-8-3P	Sun SPARC Enterprise T5120 8-core server Upgrade to 3 years of Platinum support.
IWU-T5120-8-3S	Sun SPARC Enterprise T5120 8-core server Upgrade to 3 years of Silver support.

These are the Sun Spectrum Instant Upgrade (SIU) parts for the **T5220** in the following table:

IWU-T5220-4-1G	Sun SPARC Enterprise T5220 4-core server Upgrade to 1 year of Gold support.
IWU-T5220-4-1P	Sun SPARC Enterprise T5220 4-core server Upgrade to 1 year of Platinum support.
IWU-T5220-4-1S	Sun SPARC Enterprise T5220 4-core server Upgrade to 1 year of Silver support.
IWU-T5220-4-24-1G	Sun SPARC Enterprise T5220 4-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5220-4-24-2G	Sun SPARC Enterprise T5220 4-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5220-4-24-3G	Sun SPARC Enterprise T5220 4-core server Upgrade to Gold Support +

	7X24 On-Site Support for 3 Years.
IWU-T5220-4-2G	Sun SPARC Enterprise T5220 4-core server Upgrade to 2 years of Gold support.
IWU-T5220-4-2P	Sun SPARC Enterprise T5220 4-core server Upgrade to 2 years of Platinum support.
IWU-T5220-4-2S	Sun SPARC Enterprise T5220 4-core server Upgrade to 2 years of Silver support.
IWU-T5220-4-3G	Sun SPARC Enterprise T5220 4-core server Upgrade to 3 years of Gold support.
IWU-T5220-4-3P	Sun SPARC Enterprise T5220 4-core server Upgrade to 3 years of Platinum support.
IWU-T5220-4-3S	Sun SPARC Enterprise T5220 4-core server Upgrade to 3 years of Silver support.
IWU-T5220-6-1G	Sun SPARC Enterprise T5220 6-core server Upgrade to 1 year of Gold support.
IWU-T5220-6-1P	Sun SPARC Enterprise T5220 6-core server Upgrade to 1 year of Platinum support.
IWU-T5220-6-1S	Sun SPARC Enterprise T5220 6-core server Upgrade to 1 year of Silver support.
IWU-T5220-6-24-1G	Sun SPARC Enterprise T5220 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5220-6-24-2G	Sun SPARC Enterprise T5220 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5220-6-24-3G	Sun SPARC Enterprise T5220 6-core server Upgrade to Gold Support + 7X24 On-Site Support for 3 Years.
IWU-T5220-6-2G	Sun SPARC Enterprise T5220 6-core server Upgrade to 2 years of Gold support.
IWU-T5220-6-2P	Sun SPARC Enterprise T5220 6-core server Upgrade to 2 years of Platinum support.
IWU-T5220-6-2S	Sun SPARC Enterprise T5220 6-core server Upgrade to 2 years of Silver support.
IWU-T5220-6-3G	Sun SPARC Enterprise T5220 6-core server Upgrade to 3 years of Gold support.
IWU-T5220-6-3P	Sun SPARC Enterprise T5220 6-core server Upgrade to 3 years of Platinum support.
IWU-T5220-6-3S	Sun SPARC Enterprise T5220 6-core server Upgrade to 3 years of Silver support.
IWU-T5220-8-1G	Sun SPARC Enterprise T5220 8-core server Upgrade to 1 year of Gold support.
IWU-T5220-8-1P	Sun SPARC Enterprise T5220 8-core server Upgrade to 1 year of Platinum support.
IWU-T5220-8-1S	Sun SPARC Enterprise T5220 8-core server Upgrade to 1 year of Silver support.

IWU-T5220-8-24-1G	Sun SPARC Enterprise T5220 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 1 Year.
IWU-T5220-8-24-2G	Sun SPARC Enterprise T5220 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 2 Years.
IWU-T5220-8-24-3G	Sun SPARC Enterprise T5220 8-core server Upgrade to Gold Support + 7X24 On-Site Support for 3 Years.
IWU-T5220-8-2G	Sun SPARC Enterprise T5220 8-core server Upgrade to 2 years of Gold support.
IWU-T5220-8-2P	Sun SPARC Enterprise T5220 8-core server Upgrade to 2 years of Platinum support.
IWU-T5220-8-2S	Sun SPARC Enterprise T5220 8-core server Upgrade to 2 years of Silver support.
IWU-T5220-8-3G	Sun SPARC Enterprise T5220 8-core server Upgrade to 3 years of Gold support.
IWU-T5220-8-3P	Sun SPARC Enterprise T5220 8-core server Upgrade to 3 years of Platinum support.
IWU-T5220-8-3S	Sun SPARC Enterprise T5220 8-core server Upgrade to 3 years of Silver support.

1.

Service and Support

Warranty

The Sun SPARC Enterprise T5120 and T5220 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 T5120 and T5220 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 Plans

Sun Services offers a full range of services to assist customers who deploy the Sun SPARC Enterprise T5120 and T5220 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 go 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 Instant Upgrade (SIU) pricing when purchasing support at time of system sale. The Sun System Pack allows customers a discount of 3% on their Sun SPARC Enterprise T5120 and T5220 purchase when the

Sun Spectrum Instant Upgrade is sold at the time of purchase. The following allowance codes are available for this discount:

More information is available at

http://sun.com/systempacks

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

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

Warranty Upgrade to SunSpectrum Service

The following table includes the part numbers and descriptions for the warranty upgrades to SunSpectrum programs for the **Sun SPARC Enterprise T5120 servers**.

Part Number	Description
Four Core Server Upgrades	
IWU-T5120-4-1P	1-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-1S	1-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 4-core server

IWU-T5120-4-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 4-core server
IWU-T5120-4-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 4-core server
Six Core Server Upgrades	
IWU-T5120-6-1P	1-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-1S	1-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 6-core server
IWU-T5120-6-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 6-core server
Eight Core Server Upgrades	
IWU-T5120-8-1P	1-year upgrade to SunSpectrum Platinum℠ program for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-24-1G	1-year upgrade to SunSpectrum Gold℠ program 24x7 for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-1S	1-year upgrade to SunSpectrum Silver℠ program for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5120 8-core server
IWU-T5120-8-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5120 8-core serve
IWU-T5120-8-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5120 8-core server

The following table includes the part numbers and descriptions for the warranty upgrades to SunSpectrum programs for the **Sun SPARC Enterprise T5220 servers**.

Part Number	**Description**
Four Core Server Upgrades	
IWU-T5220-4-1P	1-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-1S	1-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 4-core

	server
IWU-T5220-4-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 4-core server
IWU-T5220-4-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 4-core server
Six Core Server Upgrades	
IWU-T5220-6-1P	1-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-24-1G	1-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-1S	1-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 6-core server
IWU-T5220-6-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 6-core server
Eight Core Server Upgrades	
IWU-T5220-8-1P	1-year upgrade to SunSpectrumSM program for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-24-1G	1-year upgrade to SunSpectrum GoldSM program 24x7 for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-1G	1-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-1S	1-year upgrade to SunSpectrum SilverSM program for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-2P	2-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-24-2G	2-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-2G	2-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-2S	2-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-3P	3-year upgrade to SunSpectrum Platinum for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-24-3G	3-year upgrade to SunSpectrum Gold 24x7 for Sun SPARC Enterprise T5220 8-core server
IWU-T5220-8-3G	3-year upgrade to SunSpectrum Gold for Sun SPARC Enterprise T5220 8-core serve
IWU-T5220-8-3S	3-year upgrade to SunSpectrum Silver for Sun SPARC Enterprise T5220 8-core server

Post Warranty Support for Sun SPARC Enterprise T5120 and T5220 Servers

The following services are available for post warranty support:

- SunSpectrum Platinum program

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

Installation Service for Sun T5120 and T5220 Servers

Sun's exceptional support for server installation is also available for the Sun SPARC Enterprise T5120 server. This service can be purchased at the time of the server sale. Use the following part numbers to order the installation service.

Part Number	Description
EIS-2WYWGS-E	Install 2-way Workgroup Server
EIS-2WYWGS-E-AH	Install 2-way Workgroup Server-AH
EIS-2WYWGS-5-E	Install 5 2-way Workgroup Servers
EIS-2WYWGS-5-E-AH	Install 5 2-way Workgroup Servers-AH
EIS-2WYWGS-10-E	Install 10 2-way Workgroup Servers
EIS-2WYWGS-10-E-AH	Install 10 2-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

The Online Support Center

NOTE: This service may change once IBIS is implemented.

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

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

For more information on the above support offerings, visit:

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

Education and Learning Solutions

Sun SPARC Enterprise T5120/T5220

A new web-based course for the Sun SPARC Enterprise T5120/T5220 systems will be available soon. Course number: WET-6093

This course is an 8-hour web-based training course. It is accompanied by a self-paced lab, where students can remotely connect to a Huron server to conduct lab training exercises and by a post test so that students can test their knowledge. Note: self-placed labs are new training offerings from

Learning Services and is the first course. Traditionally self-paced training has been knowledge-based only, which means the course transfers knowledge but there is not a skills component. This will be the first time students will have the opportunity to also practice skills in a self-paced environment.

This course is available at:

https://slp.sun.com/sun

https://slp.sun.com/partners

Professional Services

Internal resources can be found at: http://mymarketing/professionalservices

Key Services for Consideration with the Sun SPARC Enterprise T5120 and T5220 systems.

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

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.

Application Migration Service

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

http://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=6047

Application Readiness Service

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

http://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=2627

Consolidation and Virtualization Services Suite

NOTE: The new virtualization services will not be available until December 2007. However the Consolidation Suite is currently available.

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

http://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=6644

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://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=6790

Performance Analysis & Capacity Planning Service
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://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=5895

Dynamic Infrastructure Suite

A complete set of technology and services that assist in the creation of an agile and secure web services environment.

http://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=7097

Reference Implementation Service for Data Centers

Speeds ROI and maximizes availability, manageability and security of mission-critical systems by leveraging architecture design expertise, tested configurations, the latest technology features and best practices for implementation and integration of data center solutions.

http://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=5272

iRunBook Service

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://mymarketing.central.sun.com:81/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=3663

Connected Services

Provision new systems. Manage updates and configuration changes with Sun Connection, the Solaris and Linux life cycle management tool.

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

Managed Services

Interim Operations Management
A short-term (3-12 months) customized service providing on-site management of data center's IT operations.

http://www.sun.com/service/managedservices/interimops.xml

Glossary

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

Materials Abstract

These are the external Urls for each server:

Sun SPARC Enterprise T5120 server: http://sun.com/t5120

Sun SPARC Enterprise T5220 server: http://sun.com/t5220

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

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
• Sun SPARC Enterprise Server T5120 and T5220, Just the Facts	Reference Guide (this document)	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
• FBDIMM Configuration Guidelines	Reference Guide	Technical Guide	SunWIN, Reseller Web, COMAC	548355
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
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

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Solution Brief				
CoolTools Solution Brief	Solution Brief	Sales Tool	SunWIN	483449
Web Tier Advantage Solution Brief	Solution Brief	Sales Tool	SunWIN	492087
Sun Web Server Encryption Solution	Solution Brief	Sales Tool	www.sun.com/zerocost	
Sun Message Security for Brightmail	Solution Brief	Sales Tool	www.sun.com/messagesecurity	
External Web Sites • Sun SPARC Enterprise T5120	Sun SPARC Enterprise T5120 server: http://sun.com/t5120			
• Sun SPARC Enterprise T5220	Sun SPARC Enterprise T5220 server: http://sun.com/t5220			
• Logical Domains (LDoms)	Logical Domains (LDoms): http://sun.com/ldoms			
• For detailed documentation	• All Sun SPARC Enterprise T5120 documentation is located at:http://docs.sun.com/app/docs/coll/t5120 • All Sun SPARC Enterprise T5220 documentation is located at:http://docs.sun.com/app/docs/coll/t5220			

Appendix

Previous version of ATO and X-option ordering

- Select optional components:
  - Items below are not required, but are offered as configured options (installed in the factory). Minimum qty for all below options is zero.
  - Filler panels will be added automatically by the Configurator as needed.
  - Maximum quantities will be enforced by the Configurator.

ATO Option	Description	Max quantity 1U	Max quantity 2U
SESY9DV2Z	SE T5xx0 DVD, 8X, RW SATA	1	1
SESY9RK1Z	Slide rail kit – standard (requires tools) – select only one rail kit per system	1	1
SESY9RK2Z	Slide rail kit – Express Rails (tool-less) – select only one rail kit per system	1	1
SESY9CA1Z	Cable Management Arm – works with either rail kit listed above	1	1
Storage interfaces			
SG-PCIE1FC-QF4	Qlogic, 4Gbps PCIe single port Fibre Channel	3	6
SG-PCIE2FC-QF4	Qlogic, 4Gb PCIe dual port Fibre Channel	3	6
SG-PCIE1FC-EM4	Emulex, 4Gb, PCIe single port Fibre Channel	3	6
SG-PCIE2FC-EM4	Emulex, 4Gb PCIe dual port Fibre Channel	3	6
SG-PCIE2SCSI U320Z	U320 SCSI, PCIe dual port (X-option on effective Nov. 24, 2009)	3	6
SG-PCIE8SAS-E-Z	SAS, 8 port, PCIe (X-option on effective Nov. 24, 2009)	3	6
RAID controller			
SGPCIESAS-R-INT-Z	SAS Eight Port , RAID PCI-Express HBA (Solid State Drives are not supported with this optional card)	1	1
SECY9SA3Z	Internal SAS Cable Kit T5120 4 disk HDD (71cm) for installation of internal RAID card – 1U	1	0

ATO Option	Description	Max quantity 1U	Max quantity 2U
SECY9SA4Z	Cable Kit for installation of internal RAID card T5120 8 disk HDD (60cm)– 2U	0	1
SEDY9SA2Z	Cable Kit for installation of internal RAID card T5220 8 OR 16 disk HDD (71cm), (67cm)		
Networking interfaces			
7280A-2	Northstar Dual Port GigE UTP Low-profile	3	6
7281A-2	Northstar Dual Port GigE MMF Low-profile	3	6
1236A-Z	IB HBA Dual Port 4x IB host channel adapter – low-profile	3	6
Graphics			
3000A	XVR-300 low-profile, PCIe x8 Graphics card	1	1
XAUI			
SESY7XA1Z	10 GbE XAUI card - Fiber (at RR) – requires one of the following transceivers:	2	2
SESY7XT1Z	Transceiver for Atlas/XAUI- 10 GE SR XFP Transceiver for base board for short reach (20 to 300 meters)	2	2
SESY7XT2Z	Transceiver for Atlas/XAUI - 10 GE LR XFP Transceiver for base board for long reach (2 to 10 kilometers)	2	2

X-options:

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

Option	Description	Comments
Memory		
SESX2B2Z	4GB Memory Expansion (2x2GB) 2nd Generation (1.8v)	
SESX2C1Z	8GB Memory Expansion (2x4GB) (1.8v)	
SESX2D1Z	16GB Memory Expansion (2x8GB), (1.8v, x4)	
Disk Drives		
SESX3C11Z	HDD, 146GB 10K RPM 2.5” SAS	Common with T5x40 servers.
SESX3A21Z	HDD, 73GB 15K RPM 2.5” SAS	Common with T5x40 servers.

SESX3G11Z	300 GB, 10K RPM, 2.5”, SAS with Marlin bracket	Common with T5x40 servers	
SESX3Y11Z	32 GB, 2.5" SATA solid state disk drive with Marlin bracket	Common with T5x40 servers	
Power Supplies			
SECX9PS41Z	AC “Climate Saver” Power supply for T5120 (1U) 720W		
SEDX9PS32Z	AC “Climate Saver”Power Supply for T5220 (2U) - 750W		
Removable Media/DVD			
SESX9DV2Z	SE T5xx0 DVD, 8X, RW SATA	Common with T5x40 servers. Limit 1 per system	
Rackmount kits and Cable Management			
SESX9RK1Z	Slide rail kit – standard (requires tools)	Common with T5x40 servers Comes standard with PTO configs	
SESX9RK2Z	Slide rail kit – Express Rails (tool-less)	Common with T5x40 servers	
SESX9CA1Z	Cable Management Arm	Common with T5x40 servers Comes standard with PTO configs	
PCI Adapters – for latest information, reference updated PCI support matrix at http://wikis.sun.com/display/PlatformIoSupport/Home			
		Max quantity 1U	**Max quantity 2U**
Storage Interfaces			
SG-XPCIE1FC-QF4	Qlogic, 4Gb PCIe single port	3	6
SG-XPCIE2FC-QF4	Qlogic, 4Gb PCIe dual port	3	6
SG-XPCIE1FC-EM4	Emulex, 4Gb, PCIe single port	3	6
SG-XPCIE2FC-EM4	Emulex, 4Gb PCIe dual port	3	6
SG-XPCIE2SCSI U320Z	U320 SCSI, PCIe dual port	3	6
SG-XPCIE8SAS-E-Z	SAS, 8 port, PCIe	3	6
RAID			
SGXPCIESAS-R-EXT-Z	SAS 8 port RAID controller (external) – availability TBD	1	1
SGXPCIESAS-R-INT-Z	SAS Eight Port , RAID PCI-Express HBA Requires card option AND cable kit option (below), and must be installed by an authorized Sun services representative (Solid State Drives are not supported with this optional card)	1	1
SECX9SA1Z (See Odering information Below)	Cable Xoption Kit for installation of internal RAID card – 1U	1	0
SEDX9SA2Z (See Odering information Below)	Cable Xoption Kit for installation of internal RAID card – 2U	0	1

SECY9SA3Z (See Odering information Below)	Cable ATO option T5120 4 disk HDD (71cm) for factory integration ONLY	1	0
SECY9SA4Z (See Odering information Below)	Cable ATO option T5120 8 disk HDD (60cm) for factory integration ONLY	1	0
SEDY9SA2Z(See Ordering info below)	Cable ATO option T5220 8 (71cm) OR 16 disk HDD (67cm) for factory integration ONLY	0	1
Networking Interfaces			
X7280A-2	Northstar Dual Port GigE UTP Low-profile	3	6
X7281A-2	Northstar Dual Port GigE MMF Low-profile	3	6
X1236A-Z	IB HBA Dual Port 4x IB host channel adapter – low-profile	3	6
X4447A-Z	Atlas PCIe quad port GigE (copper) **Notes:** T5120 - 2 Atlas cards supported, avoid slot 1 T5220 with 8 HDD - 5 Atlas cards supported, avoid slot1 T5220 with 16 HDD - 4 Atlas cards supported, avoid slot 1 and slot 4	2	5 ***See Notes***
X1027A-Z	Atlas PCIe dual port 10GigE adapter card, fiber – requires one of the following 2 transceivers for each port	3	3
X5558A	Transceiver for Atlas – 10 GbE SR XFP transceiver for short reach (20 to 300 meters)		
X5560A-Z	Transceiver for Atlas – 10GbE LR XFP transceiver for long reach (2 to 10 kilometers)		
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) **Note:** Two/four in any combination of X1106A-Z or X1107A-Z	2	4
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) **Note:** Two/four in any combination of X1106A-Z or X1107A-Z	2	4
Crypto			
X6000A	Sun Crypto Accelerator 6000	1	2
Graphics			
X3000A	XVR-300 PCIe x8 graphics accelerator (availability TBD)	1	1
X4240A	XVR-300 PCIe x16 graphics accelerator	1	1
XAUI cards			
SESX7XA1Z	XAUI single port 10GigE adapter card, fiber – requires one of the following 2 tranceivers	2	2
SESX7XT1Z	Transceiver for XAUI – 10 GbE SR XFP transceiver for short reach (20 to 300 meters)		
SESX7XT2Z	Transceiver for XAUI – 10 GbE LR XFP transceiver for long reach (2 to 10 kilometers)		