

# Sun Fire™ X4440

**2-RU 4-Socket (24-way) x64 Rackmount Server**

**Industry Leading Performance, Expandability & Power Efficiency**

## Just the Facts

**SunWIN Token # 509885**

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# Sun Fire X4440 Server Positioning

**Sun Fire X4440 = Performance, Density, and Energy Efficiency**



## What's new

**04/15/08: Announce Sun Fire X4440 RoHS Compliant Standard Configurations and XATO Options. (NOTE: these configurations and options will not RR until 04/02/08.)**

**05/13/08: Announce AMD Opteron Quad Core support**

**11/30/08: RR 8GB DIMM memory**

**12/10/08: Announce Next Generation Quad-Core Support**

**07/21/09: Announce AMD Opteron Six-Core Support**

## Introduction

The Sun Fire™ X4440 is Sun's 4-socket solution in its x64 server family powered by the AMD Opteron processor. The Sun Fire X4440 is the first and only 2-RU 4-socket AMD Opteron enterprise class x64 server available that runs Solaris, Linux, Windows and VMware. This is another example of Sun's innovative engineering delivering one of the most compelling x64 (32-bit and 64-bit) solutions in the market, the Six-Core AMD Opteron processor ready Sun Fire X4440 servers delivering world-class 32-bit and 64-bit performance in rack-mountable 2-RU form factor with Sun's rock-solid, enterprise-class capabilities and quality.

The Sun Fire™ X4440 is designed to maximize the 2RU space, giving it the capacity to handle heavy workloads. This space saver is ideal for minimizing real estate while maximizing performance, density, or scalability. Socket compatibility allows for seamless upgradability from dual-core to quad-core, expanding from 12 processing cores to 24 processing cores. The Sun Fire X4440 is highly scalable with more than 1 terabyte of internal storage, and twice the networking connectivity<sup>1</sup> compared to competitive 4-socket servers. All these features are fitted into a 2-RU form factor – half the size of all comparable 4-socket system!

The Sun Fire X4440 supports both Six-core AMD Opteron processors. AMD Opteron

<sup>1</sup> 4 ports compared to 2 ports in HP DL585 G2, HP DL585 G5, Dell PE6950, IBM x3755

processors are designed with a built-in memory controller and Direct Connect architecture. With the new quad-core processors, AMD has incorporated power saving features – Dual Dynamic Power Management, CoolCore, Core Select, and Independent Dynamic Core Technology – that raise the bar on performance and energy efficiency. AMD Smart Fetch technology helps reduce power consumption by allowing idle cores to enter a halt state. This technology has been shown to reduce system level power consumption by up to 15W.

The new AMD Opteron Six-Core CPU introduces improvements on performance. Compared to Quad-Core processors, the new AMD Operton Six-Core processor has 50% more compute cores at the same power envelop. Coherent HyperTransport 3 (cHT3) and HyperTransport (HT) Assist increase performance by improving the memory bandwidth and reducing latency. 4-Socket workloads will see improvements in database and virtualization applications.

**Running Solaris(TM), Linux, Windows and VMware Operating systems**, the Sun Fire X4440 servers allow customers to run existing 32-bit applications on the same hardware as they migrate to their choice of next generation 64-bit applications.

**The Sun Fire X4440** servers can help minimize required staff training and support as well as help reduce data center real estate and cooling needs.

The Sun Fire X4440 are general-purpose servers designed for deployment in a wide range of architectures:

- Scale-out architectures: With large memory capacity, internal storage, four Gigabit Ethernet ports and high speed PCI-Express expansion slots that enable high speed system interconnects such as fibre channel and InfiniBand, these servers are able to solve complex computing problems that require intense compute resources.
- Scale-up architectures: With up to 24 cores available, these servers are well-suited for virtualization and databases services.
- Scale-within: With their ability to run Solaris 10 Containers and VMware, Sun Fire X4440 servers are ideal platforms for consolidating multiple applications on a single platform.

In addition, these servers allow customers scale their computing resources without additional complexity with remote management solutions. The IPMI 2.0 compliant, Sun Integrated Lights Out Manager (ILOM) comes standard on all systems without extra cost, enabling the system to be managed and monitored locally or remotely. ILOM also features fault identification, allowing for quick repair while reducing down time. Full compatibility with Sun's family members eases the installation, deployment, and maintenance across Sun's x64 systems.

The Sun Fire X4440 can be leveraged with Solaris Cluster to help customers deploy mission-critical solutions with world-class performance. Solaris Cluster is a multi-system, multi-site disaster recovery solution that manages the availability of applications services and data across local, regional and vastly dispersed datacenters. The combination of Sun Fire X4440 servers and Solaris Cluster with its unique ability to leverage Solaris 10 Containers as virtual nodes offers an un-matched solution for consolidating multiple applications on a single platform and offering high availability when used in a cluster configuration. Solaris Cluster also provides in-the-box support for the market leading databases and open source databases – for more information see: <http://www.sun.com/software/solaris/cluster/index.xml>

The Sun Fire X4440 servers, when combined with Sun's rich portfolio of software, storage, service offerings, help reduce cost and complexity while accelerating time-to-revenue for data centers that run a broad range of applications including web, app, database and grid applications.

For more information see: <http://www.sun.com/servers/x64/x4440>.

## Features, Functions, and Benefits

### Sun Fire X4440 Server Key Features, Functions, and Benefits

Feature	Function	Benefit
<b>Performance</b>		
Highest Performance in class	<ul style="list-style-type: none"> <li>Sufficient power-envelope to support today and tomorrow's fastest AMD Opteron processors</li> <li>Delivers both 32- and 64-bit enterprise-class computing</li> </ul>	<ul style="list-style-type: none"> <li>Provides fastest performance in this class of servers</li> <li>Increases performance while providing investment protection for existing 32-bit and 64-bit applications</li> </ul>
Up to 24 processing cores	<ul style="list-style-type: none"> <li>Four CPU sockets</li> <li>Six Core AMD Opteron processors</li> <li>12 cores using 2 six-core processors</li> <li>24 cores using 4 six-core processors</li> </ul>	<ul style="list-style-type: none"> <li>Highly scalable performance in a single 2U form factor</li> </ul>
HyperTransport Technology and integrated 128-bit wide DDR memory controller	<ul style="list-style-type: none"> <li>Direct dual link connection between processors</li> <li>Direct connection reduces memory latency</li> </ul>	<ul style="list-style-type: none"> <li>Increases performance by up to 5%</li> <li>Optimal for workloads with higher CPU components and lower memory components</li> </ul>
RAID support	<ul style="list-style-type: none"> <li>RAID 0,1, 1E, 5, 5EE, 6, 10, 50, 60 support with add-on RAID HBA</li> <li>Expandable to over 1TB of internal storage with hot-swappable HDDs</li> </ul>	<ul style="list-style-type: none"> <li>Wide variety of RAID choices to meet every need</li> </ul>
<b>Industry Leading Reliability and Expandability</b>		
Hot-swappable HDDs	<ul style="list-style-type: none"> <li>8 HDD slots for with support to over 1TB of internal storage</li> <li>Performance for I/O-bound applications and redundancy for mission-critical data</li> </ul>	<ul style="list-style-type: none"> <li>Increase performance and availability</li> </ul>
Up to 256GB of DDR2-667 memory with ECC and ChipKill	<ul style="list-style-type: none"> <li>Support memory-intensive applications</li> <li>ECC provides automatic single-bit error correction</li> <li>ChipKill allows a single DRAM chip to fail and the system will continue to run</li> </ul>	<ul style="list-style-type: none"> <li>Improve application performance</li> <li>ECC helps to ensure data integrity</li> <li>improving availability</li> <li>ChipKill improves system availability</li> </ul>
Integrated Four Gigabit Ethernet ports	<ul style="list-style-type: none"> <li>Outstanding network I/O performance</li> <li>Increased network availability when installed in failover configurations</li> </ul>	<ul style="list-style-type: none"> <li>Increases network efficiency, flexibility, and availability</li> <li>Twice the number of GbE ports reduces the need for external switches</li> </ul>
Six 64-bit PCI-Express Expansion slots	<ul style="list-style-type: none"> <li>Allows connectivity to additional network or storage while supporting full CPU path bandwidth</li> <li>One x16 lane, four x8 lane, and one x4 lane</li> </ul>	<ul style="list-style-type: none"> <li>Enables flexibility to meet evolving business and application requirements</li> </ul>

Feature	Function	Benefit
Mezzanine card containing 2xCPU's	<ul style="list-style-type: none"> <li>• Mezzanine card complete with 2x CPU's and 16 DIMM slots</li> <li>• Direct connection between CPU's and memory</li> <li>• HyperTransport Bridge Card connection between motherboard and mezzanine card provides direct connection between all 4 CPU's</li> </ul>	<ul style="list-style-type: none"> <li>• Easy upgrade from 2-sockets to 4-sockets</li> <li>• Reduces bottlenecks by connecting all CPU cores</li> </ul>
<b>Energy Efficiency</b>		
AMD Opteron Processors	<ul style="list-style-type: none"> <li>• Supports Six-Core AMD Opteron processors, placing up to 24 CPU cores in a compact form factor</li> <li>• Future support for the 55W Six-Core AMD Opteron processor for energy conscious customers</li> <li>• Built-in memory controller</li> <li>• Integrated power saving features with Quad-Core CPU's – Enhanced PowerNow™, Dual Dynamic Power Management™, AMD CoolCore™ Technology</li> </ul>	<ul style="list-style-type: none"> <li>• Nearly doubles computing resources with minimal power and cooling increases</li> <li>• Reduces the processor energy consumption by up to 100W per system</li> <li>• Reduces bottlenecks between memory and CPU's without the need of an additional memory controller chip</li> <li>• Dynamically reduces power consumption without compromising performance</li> </ul>
<b>Operating System and Management Environment</b>		
Integrated Lights Out Manager for Remote Management	<p>Integrated Lights Out Manager (integrated LOM):</p> <ul style="list-style-type: none"> <li>• Remote management with full Keyboard, Mouse, Video, Storage (KVMS)</li> <li>• Remote media capability (floppy, CD etc.)</li> <li>• Full DMTF CLI</li> <li>• Browser UI for control of the system through a graphical interface.</li> <li>• IPMI 2.0 compliant for management and control</li> <li>• SNMP v1, V2c, V3 for system monitoring</li> <li>• Monitor and report system and component status on all FRUs</li> </ul>	<ul style="list-style-type: none"> <li>• All management which does not require physically touching the system can be performed remotely</li> <li>• Easily integrates into customer's existing management environment by supporting industry standards</li> <li>• Integrated LOM is a core part of system, there is no additional charge for this functionality as with some of the competition</li> </ul>
Runs applications on: <ul style="list-style-type: none"> <li>• Solaris 10</li> <li>• Linux (RHEL 4, RHEL 5, and SLES 10)</li> <li>• Windows Server 2003, 2008</li> <li>• VMware ESX 3.0.2, 3.0.3, 3.5</li> </ul>	<ul style="list-style-type: none"> <li>• Run applications on industry standard platform running OS of choice</li> </ul>	<ul style="list-style-type: none"> <li>• Maximize application performance with best OS</li> <li>• Ease transition to 64-bit computing</li> <li>• Maximize IT investment by standardizing hardware to reduce required training and spares</li> </ul>

## Product Family Placement

The Sun Fire X4440 server is the newest member in Sun's x64 server based on the AMD

Opteron processor. The Sun Fire X4440 server is positioned in the product lineup for customers who prefer 2-RU 4-socket servers based on the AMD Opteron processor.

## X64 Server Family Comparison

The following table compares some features of the Sun Fire X4200, Sun Fire X4600 and Sun Fire X4440 servers.

Features	Sun Fire X4200 M2 Server	Sun Fire X4600 M2 Server	Sun Fire X4440 Server
<b>Processor Architecture</b>	AMD Opteron	AMD Opteron	AMD Opteron
<b>Processor Type</b>	Quad-Core	Quad-Core	Six-Core
<b>Processor Speed</b>	1.8 GHz to 3.0 GHz	1.8 GHz to 3.2 GHz	2.4 GHz to 2.6 GHz
<b>Level 2 Cache</b>	512KB	512KB	512KB
<b>CPU Interconnect</b>	HyperTransport	HyperTransport	HyperTransport
<b>Memory Controller</b>	Embedded in processor	Embedded in processor	Embedded in processor
<b>Memory Type</b>	667 MHz unbuffered DDR2	667 MHz registered DDR2	667 MHz registered DDR2
<b>DIMM Slots</b>	8	64	32
<b>DIMMs per CPU</b>	4	8	8
<b>Max Memory</b>	64 GB	512 GB	256 GB
<b>Internal Disk</b>	4x 3.5" SATA	4x 2.5" SAS	8x 2.5" SAS or 4x 2.5" SATA SSD
<b>Onboard RAID</b>	RAID 0, 1 (LSI 1064)	RAID 0, 1 (LSI 1064)	No RAID
<b>Add-on RAID</b>	none	none	RAID 0, 1, 1E, 5, 5EE, 6, 10, 50, 60 with SAS RAID HBA
<b>Removable Media</b>	DVD-ROM, CD-RW/DVD	DVD-ROM, CD-RW/DVD	DVD+/-RW
<b>Onboard GigE</b>	Integrated 4x Gigabit Ethernet	Integrated 4x Gigabit Ethernet	Integrated 4x Gigabit Ethernet
<b>PCI-Express</b>	4x PCI-Express, 1x PCI-X	6x PCI-Express, 2x PCI-X	6x PCI-Express
<b>Service Processor</b>	Integrated LOM	Integrated LOM	Integrated LOM
<b>Redundant, Hot-Swap PSU</b>	Yes	Yes	Yes
<b>Redundant, Hot-Swap Fans</b>	Yes	Yes	Yes
<b>Depth</b>	25 in. 633.7 mm	24.8 in. 629 mm	28 in. 711.2 mm

## Key Messages

Sun Fire X4440 is a versatile system, easily upgradeable from two sockets to four sockets and expandable for all needs.

- **Performance...do more with less**
  - Run a broad range of applications more efficiently and quickly
  - Save space without compromising performance. The Sun Fire X4440 is the most dense 4-socket enterprise server compared to all tier 1 vendors. Customers can maximize floor and rack space with X4440's 2U form factor – half the size of the current industry 4 socket AMD based x64 systems.
  - Consolidate servers in a single Sun Fire X4440 system. The Sun Fire X4440 has hardware level virtualization, VMware and Xen support, and cross platform virtualization between Solaris 10 and Windows.
- **Expandability.....headroom to grow your business**
  - The Sun Fire X4440 can expand as businesses expand. Expandable from 12 to 24 cores. Socket compatibility allows the processors to be easily upgraded. Twice the networking connectivity of the similar systems in its class<sup>2</sup>.
  - The Sun Fire X4440 supports diskless to over 2TB of internal storage and expand from 4GB to 256GB of memory.
- **Energy-efficient.....save power and cooling costs**
  - Customers can save on energy consumption, cooling cost, and the environment
  - AMD Six-Core processors are integrated with power saving features – Enhanced PowerNow™, Dual Dynamic Power Management™, AMD CoolCore™ Technology, AMD Smart Fetch – optimizes performance while dynamically reducing power consumption.
- **Manage and Monitor the System locally or remotely.**
  - Integrated Lights Out Manager (integrated LOM) allows full remote KVM functionality with video and media redirection
- **Maximize uptime**
  - Enterprise-class reliability through redundant and hot-swappable power supplies and fans. Hot-swappable disk drives make drive replacement fast and easy. SAS host bus adapters offer RAID choices to meet the customer's requirements
- **Versatility with less complexity.**
  - Standardize on one hardware platform for all major operating systems in the data center. The Sun Fire X4440 runs Solaris, Linux, Windows and VMware operating systems

## Target Customers

The Sun Fire X4440 server is targeted at customers that want enterprise class x64 servers that are compact, fast, expandable and energy efficient.

## Target Markets

- Service Providers

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<sup>2</sup> Compared to HP DL585 G2/G5 and IBM x3755

- BIDW
- Database
- Finance
- Manufacturing (EDA, Oil & Gas)

## **Target Applications**

- Network Services Consolidation
- Application Server
- Virtualization and Consolidation
- Database Server
- Web Server (Large)
- Business Processing
- Decision Support
- Video Streaming

## **Market Value Proposition**

Sun Fire X4440 servers are fast, expandable and energy-efficient enterprise class x64 servers that run Solaris™, Linux, Windows and VMware operating systems.

- **Save Space With Higher Performance:** Half the size of the competitor's servers without compromising performance. Twice the number of GbE ports reduces the need for external switches
- **Do More With Less:** High performing server helps to maximize Return On Investment.
- **More Headroom to Grow:** More expandable in memory, storage and networking connectivity. Scalable from 2-socket to 4-socket and 12 processing cores to 24 processing cores.
- **Cut IT operating expenses:** More power efficient that results in power consumption and cooling cost.
- **Improve Service Levels:** High availability features such as hot swappable and redundant power supplies, fans and disks lead to higher uptime.

## **Availability**

XATO Six-Core configurations are currently available

# Enabling Technology

## Technology Overview

The Sun Fire X4440 Server is a symmetric, multiprocessor, x64-based, rack-optimized server which has the following system architectural features:

- AMD Opteron processors
- Fast and low power memory
- HyperTransport technology
- Non-volatile boot media
- Integrated Lights Out Management (ILOM) with a dedicated Service Processor

## AMD Opteron Processor

The AMD Opteron processor is part of a new computing platform that extends the ubiquitous x86 architecture to accommodate x64 64-bit processing. Formerly known as x86-64, AMD's enhancements to the x86 architecture allow seamless migration to the superior performance of x64 64-bit technology. AMD's Opteron processor was designed as CMP (Chip-level Multi-processing) from the start with Crossbar Switch and System Request Interface. This approach defines a new class of computing by combining full x86 compatibility, a high-performance 64-bit architecture, and the economics of an industry-standard processor.

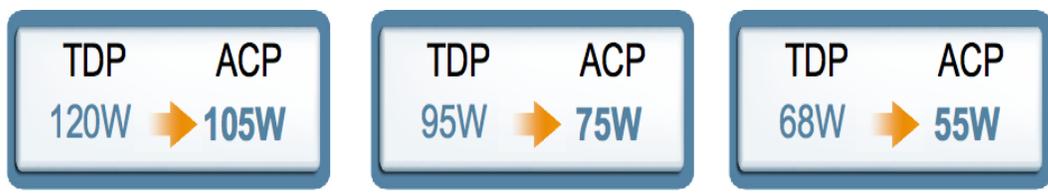


Figure 1. Power Consumption for Socket F Quad-Core AMD Processors

Socket F is not a traditional socket but a Land Grid Array (LGA). This means that there are no pins on the processor, but only small pits. These pits make contact with the slightly spring landing-points on the system board. This approach gives multiple advantages, such as a higher contact point density and better electrical properties. Socket F has 1207 lands that are used for either dual- or quad-core processors in the Sun fire X4440 server. As shown in figure 1, Dual-Core socket F processors are based on the second-generation AMD Opteron processors. Quad-core uses the same socket and can be upgraded from socket F dual-core processors. It is important to note that older "Rev E" processors are not compatible because they are 940 pin processors.

Third-generation AMD Opteron processors are quad-core Barcelona processors only. All the features associated with third-generation processors as described below and only apply to quad-core processors.

## Second-Generation (Dual-Core) AMD Opteron Processor

The Second-Generation AMD Opteron processors are native Dual-Core AMD Opteron processors with Direct Connect Architecture. AMD Opteron processors feature a common core architecture that is consistent across 1-, 2-, 4-, and 8-socket systems and is also consistent with previous AMD Opteron processors. This strategy helps Sun customers to minimize the cost of transition and maximize past investments in software and hardware optimization.

AMD Opteron processors are offered in three series: the 1000 Series (single socket), 2000 Series (up to 2 sockets), and the 8000 Series (4 to 8 sockets). The 1000 Series is built on AMD's new Socket AM2. The 2000 and 8000 Series are built on AMD's new Socket F (1207). The 8000 Series will be used exclusively in the Sun Fire X4440 server.

The AMD Opteron processor has the integrated memory controller with 144 bits (128 addressable) to main memory. Also integrated on silicon are the three Hypertransport links that service inter-process and I/O communications. The two processor cores are located next to the Crossbar and System Request Interface. These two components have been in the AMD64 architecture from the first generation processors anticipating dual- and quad-core implementation. This design maintains two distinct processor cores but does not duplicate the memory controllers or HyperTransport links. The logic of how to manage inter-process communications between the cores and system resources are all managed by the Crossbar. The Crossbar runs at full core frequency to allow data to come into the processor at full speed. The Crossbar will also manage data flow to the memory controller and other Hypertransport I/O components.

The Next-Generation AMD Opteron Processor Design for Socket F (1207) (formerly known as "Rev F") is a redesign of the original AMD Opteron (formerly known as "Rev E") design and offer the following enhancements:

- New socket design, all native dual core processors
- Consistent processor power requirements
- Supports lower power DDR2 memory technology
- Consistent socket design and power requirements planned for Quad-Core AMD Opteron processors
- AMD PowerNow! Technology
- AMD Virtualization™ support (formerly known as Pacifica)

AMD Opteron processors leverage the same proven Direct Connect Architecture and CMP (Chip-level Multi-Processing) design features of the Dual-Core AMD Opteron processors, including:

#### ***AMD64 technology***

- 64-bit operating systems to provide full, transparent, and simultaneous 32-bit and 64-bit platform application multitasking
- Runs existing installed base of 32-bit applications and operating systems at peak performance, while providing a 64-bit capable migration path
- Designed to enable 64-bit computing while remaining compatible with the vast x86 software infrastructure
- Enables a single architecture across 32- and 64-bit environments

#### ***Direct Connect Architecture***

- Helps to reduce the real challenges and bottlenecks of system architecture
- Memory is directly connected to the CPU, optimizing memory performance
- I/O is directly connected to the CPU, for more balanced throughput and I/O
- CPUs are connected directly to CPUs allowing for more linear symmetrical multiprocessing
- Integrated Memory Controller on-die DDR2 DRAM memory controller offers available memory bandwidth up to 10.7 GB/s (with DDR2-667) per processor

#### ***Integrated DDR2 Memory Controller***

- A 128-bit wide, on-chip DDR2 memory controller that supports ECC and ChipKill technologies and provides low-latency memory bandwidth which scales as processors are added
- Dedicated 1MB L2 Cache for each core

#### ***AMD HyperTransport™ Technology***

- Provides a scalable bandwidth interconnect between processors, I/O subsystems and other chipsets
- The 8000 series Opteron Processor has three coherent HyperTransport technology links providing up to 24.0 GB/s peak bandwidth per processor

### ***Quad-core upgradeability***

- AMD Opteron processors with DDR2 memory are designed to offer a seamless upgrade path from dual-core to quad-core when they are available in 2008 in similar thermal envelopes to help leverage existing investments
- Maintain the same platform at similar power efficiency

### ***AMD Virtualization™ (AMD-V™)***

- Reduces overhead by selectively intercepting instructions destined for guest environments
- Direct Connect Architecture helps guests run at near native speed
- Virtualization-aware integrated memory controller provides efficient isolation of virtual machine memory

### ***Enhanced performance-per watt***

- Energy-efficient DDR2 memory uses up to 30% less power than DDR1 and up to 58% less power than FBDIMM
- AMD PowerNow!™ technology with Optimized Power Management can deliver performance on demand while minimizing power consumption
- DDR2 platforms can upgrade to quad-core AMD Opteron processors within existing thermal bands for significantly better performance-per-watt

## **AMD HyperTransport™ Technology**

HyperTransport technology is a high-speed, low latency, point-to-point link designed to increase the communication speed between integrated circuits in computers, servers, embedded systems, and networking and telecommunications equipment. The Next-Generation AMD Opteron processor continues to use HyperTransport Technology links to provide a scalable bandwidth interconnect among processors, I/O subsystems, and other chip sets. HyperTransport Technology:

- Helps increase overall system performance by removing I/O bottlenecks typically found in Front Side Bus (FSB) architectures and efficiently integrating with legacy buses, increasing bandwidth and speed, and reducing latency of processors.
- Provides up to 8 GB/sec. bandwidth per link at 16x16 bits, 1 GHz operation, providing sufficient bandwidth for supporting new interconnects, such as PCI-Express.
- Provide significantly more bandwidth than current technologies
- Use low-latency responses and low pin counts
- Maintain compatibility with legacy PC buses while being extensible to new SNA (Systems Network Architecture) buses.
- Appear transparent to operating systems and offer little impact on peripheral drivers.
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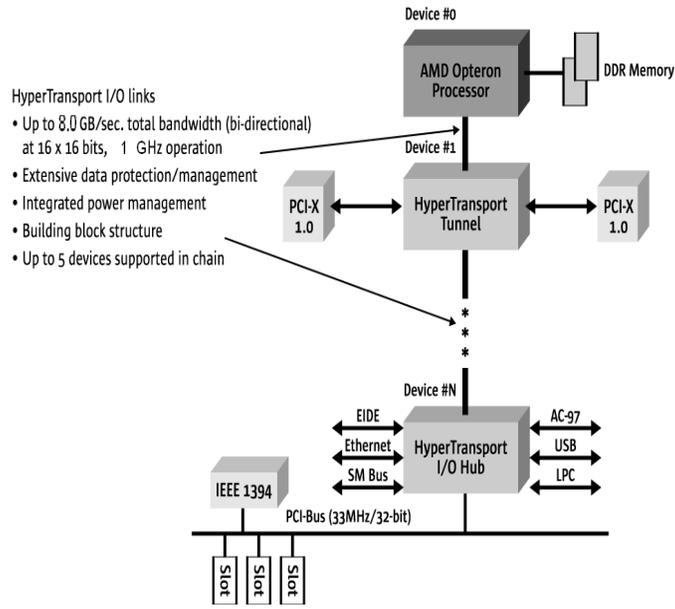


Figure 2. Sample HyperTransport Technology Interconnect Block Diagram

## Third-Generation (Quad-Core) AMD Opteron Processor

AMD's native Quad-Core Opteron processors incorporate four processor cores on a single die of silicon. The Quad-Core AMD Opteron processors are electrical-, thermal-, and socket-compatible with the Next-Generation AMD Opteron Socket F (1207) processors.

AMD's Quad-Core AMD Opteron processors go far beyond simply adding two more cores, but rather presents a "native" multi-core design where all four cores are on one piece of silicon. Quad-Core AMD Opteron processors feature Direct Connect Architecture, which means you have processors directly connected to one another, and an I/O and Memory Controller directly connected to each processor to reduce bottlenecks for better performance. Furthermore, Quad-Core AMD Opteron processors are not only the industry's first native x86 quad-core processors, they are also the first quad-core processors designed within the same thermal and power envelopes as AMD's current generation of dual-core processors.

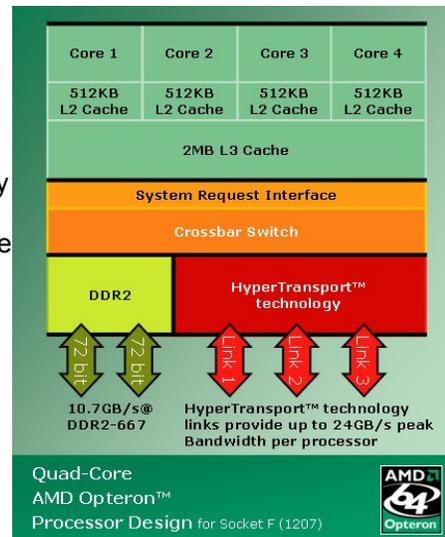


Figure 3. Third-Generation Quad-Core Processor Block Diagram

Designed from inception for the most demanding datacenters, the Quad-Core AMD Opteron processor brings significant enhancements to market in four critical areas:

### Processor Design for Energy-Efficiency

- AMD CoolCore™ technology can reduce energy consumption and heat generation by turning off unused parts of the processor. Independent Dynamic Core Technology, an enhancement to AMD PowerNow! technology, allows each core to vary its clock frequency depending on the specific performance requirement of the applications it is supporting, helping to reduce power consumption.
- Dual Dynamic Power Management (formerly called "splitplane") provides an independent power supply to the cores and to the memory controller, allowing the cores and memory controller to operate on different voltages, depending on usage.

### Investment Protection

- Quad-Core AMD Opteron processors maintain compatibility with the socket and thermal envelopes of Second-Generation AMD Opteron processors to enable a seamless upgrade path.

### Virtualization

- Virtualization is memory intensive and the Quad-Core AMD Opteron processor provides exceptional memory throughput through its integrated memory controller.
- The Sun Fire X4440 server is designed for virtualization with quad-core processors and eight memory slots per processor for memory and CPU intensive workloads.
- AMD Virtualization introduces Rapid Virtualization Indexing (formerly called "Nested Paging") and Tagged TLBs. AMD's Rapid Virtualization Indexing feature is designed to reduce the overhead penalty associated with virtualization technologies by moving the process of managing virtual memory from software to hardware, reducing the complexity of existing x86 virtualization solutions and enabling increased performance and efficiency for many virtual workloads, allowing for a higher performing, more flexible IT environment.

### High-Performance Computing

- AMD Memory Optimizer Technology increases memory throughput by up to 50% compared to

previous generations of the AMD Opteron processor.

- AMD Wide Floating Point Accelerator provides 128-bit SSE floating point capabilities, which enable each core to simultaneously execute up to four FLOPS per clock (four times the floating-point computations of previous AMD Opteron processors) for significantly improving performance in compute-intensive and workstation applications.
- AMD Balanced Smart Cache provides significant cache enhancements with 128KB L1 cache and 512KB L2 cache per core and 2MB shared L3 cache across all four cores.

## **Processor Design for Energy-Efficiency**

Power consumption continues to be one of the top concerns for managing today's datacenters. AMD Opteron processors address this concern by providing customers with industry-leading overall power-efficiency and can deliver significant performance gains over dual-core AMD Opteron processors while operating in the same thermal infrastructure. The Next-Generation AMD Opteron processors will further define a new standard in performance-per-watt with PowerNow!(TM) capabilities and energy-efficient DDR2 memory support, while maintaining a consistent maximum 95-watt thermal design power envelope. The memory capacity offered with AMD's Direct Connect Architecture, customers can have the memory performance they require with DDR2 and avoid the premature use of memory technologies that are not yet at an optimal price-to-performance ratio and that require more power. All AMD Opteron processor series - current Dual, Quad-Core, and future AMD Opteron processors - have all been designed to a consistent power requirement (thermal window).

### ***Processor Longevity***

The AMD Opteron processor socket design is planned to remain identical as AMD transitions the Next-Generation AMD Opteron processor to its upcoming Quad-Core AMD Opteron processor. Both generations of AMD Opteron processors are planned to maintain consistent processor power requirements, utilize DDR2 memory and feature an Integrated Memory Controller.

Sun servers compatible with Next-Generation AMD Opteron processor are planned to be upgradable to Quad-Core AMD Opteron processors with only processor and BIOS changes.

Consistent processor and system architecture design reduces total cost of system ownership. Less platform churn reduces application qualification and support costs. Consistent power requirements eliminate the need to reconfigure system racking or data center power.

Thermal Design Power (TDP) will continue to be leveraged for engineering thermal design maximum limits. TDP values are conservative engineering design limits and will be used by Sun engineering in the design of servers.

### ***Average CPU Power (ACP)***

ACP is a metric that offers a relevant estimation of the power consumption for Quad-Core AMD Opteron processors. ACP is determined by breaking down multiple components of power consumed within the processor, including the power dedicated to the cores, the integrated memory controller, and to HyperTransport™ technology links. ACP and TDP are both indicators of processor power. TDP refers to the thermal design power processors are capable of consuming that the specification system designers follow. AMD has referenced processor power consumption based off of TDP values to date. ACP represents a relevant wattage that reflects power consumption while running server-class enterprise workloads. ACP is a useful metric for data center operators to use when estimating power budgets to size their datacenters. TDP is more useful and relevant to system designers.

<b>AMD Opteron Processor</b>	<b>AMD Opteron Processor</b>	<b>Low Power CPU Modules HE</b>	<b>Standard Power Modules</b>	<b>Performance Optimized Power SE</b>
Dual- Core 8200 Series	TDP	68 W	95 W	120 W
Quad-Core 8300 Series	TDP	75 W	115 W	137 W
	ACP	55 W	75 W	105 W

**Figure 4. AMD Opteron Processor Power Consumption**

When discussing processor power, it is very important to read footnotes on competitive information to ensure comparisons are the same. Typically, AMD conservatively uses maximum power in their marketing materials, whereas Intel often utilizes average power or the equivalent to ACP. Sun's power calculator will use Average CPU Power (ACP) rather than Thermal Design Power (TDP). TDP values are used by Sun engineering for the design of these systems.

The Quad-Core AMD Opteron™ processor architecture contains a number of key energy efficiency improvements to reduce the amount of power consumed by our processors across a wide variety of usage scenarios and workloads. A new feature called Dual Dynamic Power Management (DDPM) provides the processors with additional power rails which are dedicated to the processor cores, to the HyperTransport technology links and internal memory controller. Separating the power rails of the cores from the internal memory controller allows each of the cores to independently adjust frequency for the given workload while also allowing for voltage changes to all the cores. This technology enables considerable power savings at the processor level during non-peak workloads. The ACP values for each power band include the power for the cores, integrated memory controller and HyperTransport™ technology links.

A consistent thermal window means a customer can migrate to the Next-Generation of a product without needing to reconfigure the quantity of servers per cabinet, add cabinets to the datacenter, or increase the power grid to the datacenter.

#### **AMD Enhanced PowerNow!™**

Enhanced AMD PowerNow!™ Technology is designed to reduce power consumption of the entire quad-core processor. The native quad-core design enables enhanced power management to address each of the four cores independently.

Dual Dynamic Power Management™ (formally “splitplane”) allows each processor to maximize the power-saving benefits of AMD PowerNow! technology without compromising performance. Dual Dynamic Power Management can reduce idle power consumption and allow for per-processor power management in multi-socket systems to decrease power consumption.

Independent Dynamic Core Technology allows each core to vary its frequency, based on the specific needs of the application. This allows for more precise power management to reduce data center energy consumption and thereby reduce total cost of ownership (TCO).

Power consumption is related to the voltage level of the voltage supply to the processor as well as the frequency of operation. General purpose systems are designed to operate at a voltage level and frequency level that meets their peak computational performance. This level of operation will consume significant amounts of power that is not useful at times when the peak processor performance is not required. Power is typically saved by reducing the supply voltage of the processor when peak performance is not needed. In this approach, the sections of the processor which are unused have the clock frequency reduced which reduces power. As shown in Figure 5, the core frequency with the dual-core CPU is locked based on the core 0 load characteristics. Core 1 will operate at the same core

frequency even though its load characteristics are low. With Independent Dynamic Core Technology, the native quad-core processor can operate each of the cores at different frequency based on the load characteristics of that particular core.

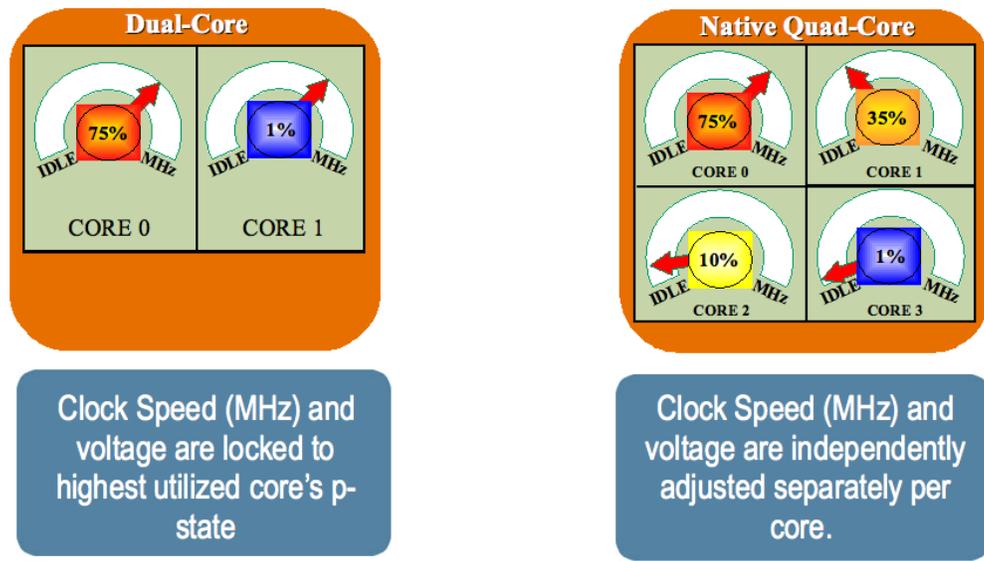


Figure 5. AMD Enhanced PowerNow! Technology – Dual core versus Quad core

**Dual Dynamic Power Management™**

This technology allows each processor to maximize the power-saving benefits of AMD PowerNow! technology without compromising performance. Dual Dynamic Power Management can reduce idle power consumption and allow for per-processor power management in multi-socket systems to decrease power consumption.

Today's AMD Opteron™ processor use a unified voltage plane for the memory controller and processor cores. AMD's Second-generation CPUs (Rev F) work in unified plane motherboards and will not offer the benefits of Dual Dynamic Power Management as described below.

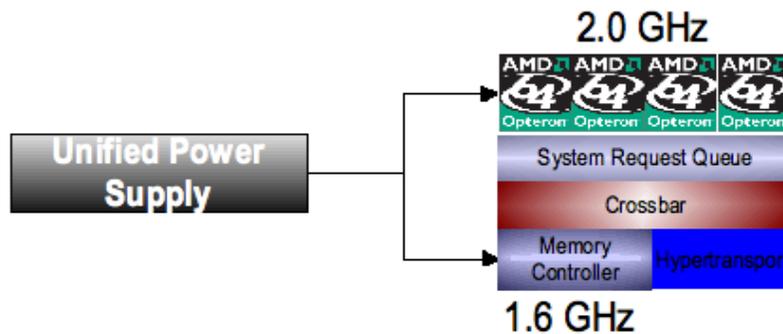


Figure 6. AMD's Unified Power Supply for Second-Generation

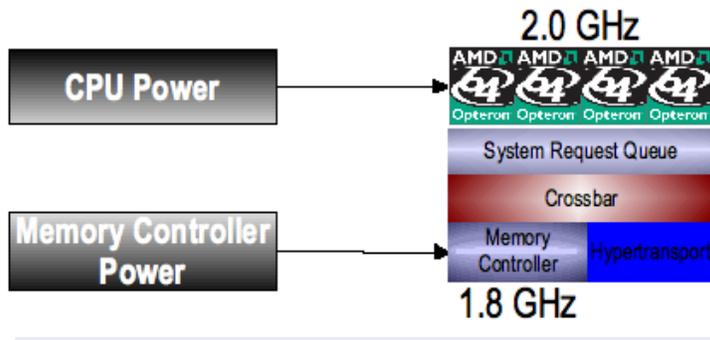


Figure 7. AMD's Independent Supply Voltage for Third-Generation

The above block diagram shows that AMD's third generation power for the CPU and Memory Controller are powered from independent voltage supplies, offering greater performance and better power management. Second-Generation AMD (Rev F) Opteron processors are still compatible with motherboards designed to support Dual Dynamic Power Management but they will deliver the same voltage to the CPU and Memory Controller power.

### High Performance Computing

Sun's high performance dual- and quad-core AMD Opteron servers are used in a host of applications including data centers, research universities, oil and gas exploration, molecular modeling, video rendering, large compute clusters, and many more. Sun's significant contribution to high performance multi-core computing is mainly due to Sun's innovative design characteristics of the system.

#### Hypertransport Dual Link

Hypertransport Dual Link refers to a two or four socket CPU system configuration in which the processors are connected by a pair of HyperTransport™ Technology links. Each link represents a HyperTransport path that runs at speeds up to 1GHz. This means that each link has up to 8GB/s available of theoretical bandwidth between each CPU and each CPU's attached controllers. With dual link the peak available bandwidth between the two processors doubles to 16GB/s – 3-5% actual system performance gain. The Sun Fire X4440 server is designed in a multi-processor configuration using four AMD's 8000 series processors. The 8000 series processor has three coherent Hypertransport links. The coherent link allows each processor to access another's memory. Dual links work together to "gang" coherent links to provide a 3-5% performance boost.

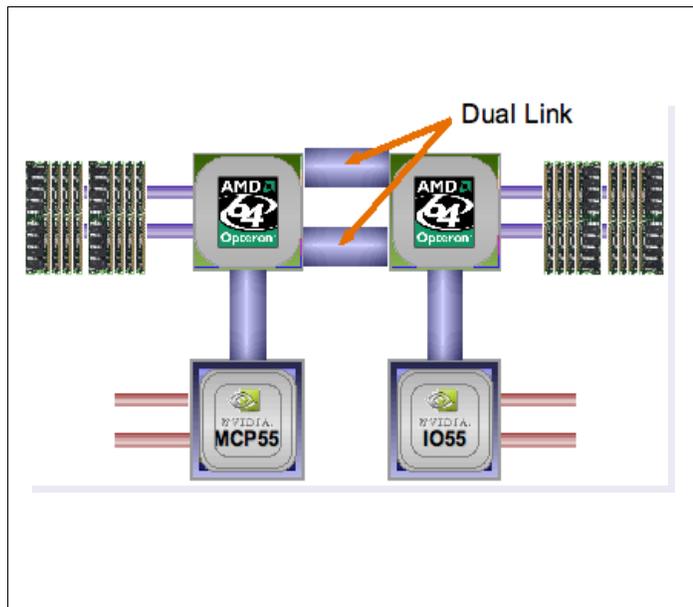


Figure 8. Dual Link HyperTransport Technology

#### Memory Technology

AMD's Opteron processors integrate a DDR memory controller directly into the processor. The memory controller is running close to the processor's core frequency and greatly increases bandwidth to the processor at significantly reduced latencies. The performance-enhancing effect is even more dramatic within an AMD Opteron multiprocessing environment, because each additional processor has its own

memory controller thereby scaling memory bandwidth within the server.

The processors in the Sun Fire X4440 sever are designed to work with Double Data Rate (DDR) SDRAM. Similar to first-generation DDR memory, DDR2 memory cells transfer data both on the rising and falling edge of the clock (a technique called "dual pumping"). The key difference between DDR and DDR2 is that in DDR2 the bus is clocked at twice the speed of the memory cells, so four words of data can be transferred per memory cell cycle. Thus, without speeding up the memory cells themselves, DDR2 can effectively operate at twice the bus speed of DDR.

The third-generation processor's monolithic design allow much faster sharing of data between all four cores, the integration of the memory controller within the processor allows for much faster data retrieval from system memory. The memory controller access external DRAM with 128-bit wide and supports up to eight (8) registered DDR DIMMs per processor on the Sun Fire X4440 sever. The available memory bandwidth for each processor is up to 10.7 GB/s (with PC2-5300 memory) when the memory bus is clocked at 333 MHz (DDR2-667). If the Sun Fire X4440 is configured with all eight DIMM slots occupied with DDR2-667 the memory buss will operate at 667MHz. Quad-core AMD Opteron processors will be eventually configured with 800MHz DDR2 DIMMs and will operate at 800MHz with four DIMMs per processor. However, with more than four 800 Mhz DIMMs, the bus clocks down to 667 Mhz.

The following diagram shows AMD's Opteron processor architecture featuring the cache controller and three stages of caches. The dedicated 128KB L1 cache with 64KB used for instructions and 64KB for data. Unlike Intel's processor it delivers 2 data loads per cycle instead of one. The latency for the L1 cache is three clock cycles with very fast access time.

The quad-core architecture also has dedicated 512KB L2 cache to eliminate conflicts common in shared caches. The L2 cache was designed for those applications that are running on a single core and use up all or most of the L3 2MB cache. This is a problem on other architectures that do not have three levels of cache because the shared cache is servicing one core and the others are starved. Processor threads running on other cores can run effectively from the L2 cache which is sized to accommodate the majority of working sets today. The Opteron processor is shown in the following diagram with four separate 512KB L2 caches. These caches are 16-way set associative, and the latency for each core to retrieve data from its L2 cache is 12 clock cycles.

The Sun Fire X4440 processor features a large, shared L3 cache that is 2MB in size. The L3 cache is shared by all cores, whether it's a dual- or quad-core processors. The L3 cache is 32-way set associative and is based on a non-inclusive victim cache architecture. The latency for any core to retrieve data from the L3 cache is less than 38 clock cycles.

The memory controller for the Sun Fire X4440 server is built directly into the Opteron 64 bit processors. Normally, memory controllers are part of the motherboard to which the processor is attached. With the memory controller built on the processor this considerably reduces the time it takes the processor to access memory, since data need only travel between the processor and the physical memory. Communication with the controller that arranges the data flow does not need to be passed outside the processor, reducing the amount of computing cycles lost while waiting for the memory to respond.

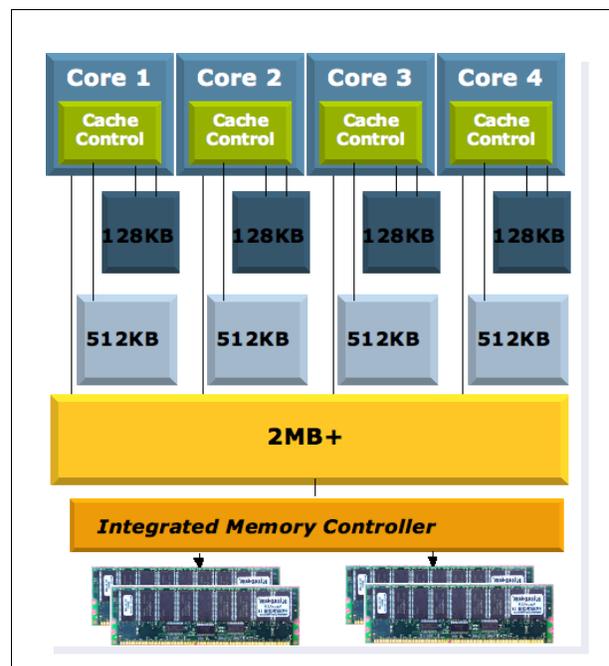


Figure 9. Third-Generation Opteron Processor Architecture

AMD has selected to support the proven technology of DDR2 memory for its Next-Generation and third-Generation Quad-Core AMD Opteron processors for both cost and technology stability reasons. DDR2 memory reduces the cost of system acquisition as DDR2 DIMMs are priced less than FBDIMM.

DDR2 memory features lower operational costs as DDR2 memory requires less power than FBDIMM. FBDIMM utilizes a first-generation memory buffer chip that draws additional power. As shown in the following table, DDR2 memory uses 30% less power<sup>1</sup> than DDR1 and DDR2 memory uses 58% less power<sup>1</sup> than FBDIMM.

Processor	Memory Type	Memory Power <sup>1</sup> (W) for 8 DIMM
Single- and Dual-Core AMD Opteron (Rev. E)	DDR1	50 W
Intel Irwindale and Paxville	DDR2	35 W
Next-Generation AMD Opteron (Rev. F)	DDR2	35 W
Intel Dempsey, Woodcrest	FBDIMM	83 W
Quad-Core AMD Opteron	DDR2	35 W
Intel Clovertown	FBDIMM	83 W

(1) Measurement based on average power of DDR1, DDR2 and FBDIMM.

Figure 10. Power Requirements for DDR and FBDIMM Technology

## AMD Virtualization™ Technology

Virtualization enables data centers to achieve higher levels of efficiency, utilization and flexibility by dividing a computer into several virtual machines or consolidating many systems onto one physical machine. AMD's Virtualization (AMD-V) technology, which takes some tasks that virtual machine managers (VMMs) perform in software, through emulation, and simplifies them through enhancements to the AMD Opteron instruction set. AMD Virtualization Technology was announced in 2004, under the code-name Pacifica, and AMD released technical details in mid-2005.

Quad-Core AMD Opteron processors with Direct Connect Architecture enable industry leading virtualization platform efficiency. Featuring AMD-V technology with Rapid Virtualization Indexing, Quad-Core AMD Opteron processors can accelerate the performance of virtualized applications and improve efficiency of switching among virtual machines. This feature will allow Sun customers to host more virtual machines and users per system to maximize the consolidation and power saving benefits of virtualization.

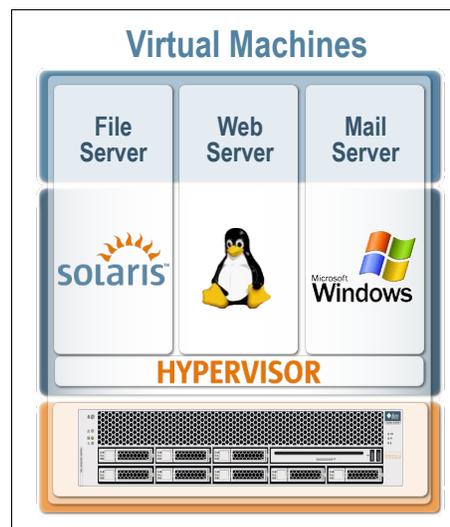


Figure 11. Virtualization on the Sun Fire X4140

Virtualization technology is a very memory intensive application that places a heavy demand on servers resources. Virtualization software must manage multiple virtual environments while still delivering application and data services to users in a timely fashion. The Sun Fire X4440 server is a natural fit because of their performance within this type of environment.

Second-Generation AMD Opteron processors improve virtualization by improving system performance and security of virtual environments. AMD Virtualization technology, consisting of hardware extensions to

the x64 system architecture, is designed to help virtualization software more efficiently run applications. These applications run in separate isolated environments and hide the complexity of hardware infrastructure to help simplify management. AMD-V leverages Direct Connect Architecture to provide fast and efficient memory handling, a must-have for memory intensive applications like virtualization.

Third-Generation AMD Opteron processors offer enhancements to AMD-V that provide a balanced approach to improve virtualization performance and enable near-native performance on virtualized applications. One of those enhancements, Rapid Virtualization Indexing (formally “nested paging”), will reduce the overhead of switching between virtual machines. This feature used by virtualization software will improve the performance of many virtualized applications. Some of the AMD-V enhancements that are built into the third-generation architecture:

- Silicon feature-set enhancements designed to improve performance, reliability, and security of existing and future virtualization environments supports more users
- Direct Connect Architecture host more virtual machines (Vms) per server
  - AMD’s Direct Connect Architecture helps improve application performance within a virtual machine. This architecture provides direct CPU-to-memory, CPU-to-I/O, and CPU-to-CPU connections to streamline server virtualization.
  - The Integrated Memory Controller is designed to improve performance on memory-intensive virtualization environments through high bandwidth, low latency, and scalable access to memory.
  - HyperTransport technology optimizes the movement of data and the sharing of resources among Vms and I/O for greater system scalability.
- Tagged Translation Look-aside Buffer for increase responsiveness in virtualization environments
  - Unique to AMD Opteron processors, the Tagged Translation Look-aside Buffer (TLB) allows for faster switching times between virtual machines by maintaining a mapping to the VMs individual memory spaces. Competing solutions can’t distinguish one VM’s memory space from another’s, resulting in additional memory management overhead and reduced responsiveness when switching between virtual machines.
- Device Exclusion Vector (DEV) for more efficient security
  - DEV performs security checks in hardware. Protecting memory access to un-authorized requests from external devices, such as disks, NICs, etc. The DEV acts like a traffic cop, controlling access to virtual machine memory based on permission, isolating virtual machines for secure operation.
  - The DEV performs these security checks in hardware, rather than software, for greater efficiency by creating Protection Domains that deny memory access for unauthorized requests from external devices, such as hard disks, network controllers, etc.
- Rapid Virtualization Indexing for better performance in a virtualization environment
  - Rapid Virtualization Indexing is an enhancement to AMD-V technology in Quad-Core AMD Opteron processors. It is designed to dramatically increase the performance of virtualized applications while enabling faster switching between virtual machines (Vms). This will allow users to host more VMs per server and maximize the benefits of virtualization. This feature will need to be support in the virtualization software and was formerly called Nested Page Tables.

## Enhanced Third-Generation (Quad-Core) AMD Opteron Processor (Shanghai)

Building on the strengths of the original Quad-Core AMD Opteron Processor (Barcelona), the enhanced Quad-Core AMD Opteron processor represents the most thermally efficient and highest performing processor from AMD. The new processor will consume approximately 20 percent less power at idle than Barcelona, and will offer 6MB of shared L3 cache as opposed to 2MB of shared L3 cache in Barcelona. Other features include AMD-V enhancements and support for DDR2-800 memory.

The enhanced Quad-Core processor can be characterized as an upgrade to the Barcelona architecture with performance improvements and reduced power consumptions. Most of the information in the Third-Generation (Quad-Core) AMD Opteron Processor still apply and only the changes to the enhanced version will be covered in this section.

### New in Shanghai

Quad-Core AMD Opteron Features "Barcelona"	New in Shanghai
65nm Technology	45nm Technology Immersion Lithography Better clock speed scaling
2MB of L3 cache	6MB of L3 cache Better performance
HyperTransport 1.0 @ 2GT/s (8GB/s)	HyperTransport 3.0 @ 4.4GT/s (17.6GB/s) Available April (not all platforms)
AMD Balanced Smart Cache	AMD Smart Fetch Allows cores to sleep while still providing full cache access
AMD-V with Rapid Virtualization Indexing	Designed for 25% fast "world switch" time Enhanced Rapid Virtualization Indexing (More Virt-Phys translation held in cache)
AMD CoolCore Technology	Extends power savings to L3 cache (L3 powered down when not in use)

Figure 12. Enhanced Shanghai features

AMD's native Quad-Core Opteron processors incorporate four processor cores on a single die of silicon. The Quad-Core AMD Opteron processors are electrical-, thermal-, and socket-compatible with the Next-, and Third-Generation AMD Opteron Socket F (1207) processors. The new Quad-Core Opterons clock frequency will be in the range from 2.3 to 2.7GHz and will fit into the same 75W thermal envelope. This is according to AMD's Average CPU Power (ACP) rating method.

AMD's 45-nm fabrication process will produce faster switching speeds at lower power levels as compared to the past generation 65-nm fabrication. Most of the additional transistors (versus Barcelona) come from the expansion of the L3 cache. The expansion from 2MB to 6MB will have performance benefits for the Sun Fire servers for many server-class workloads.

Shanghai's memory controller supports memory clock frequencies from 667MHz to 800MHz. HyperTransport 3 (HT3) support will be supported by the spring of 2009 (subject to change). The first Shanghai processors will not support HT3 and therefore Sun servers will only support HT1. Sun engineering is currently working on a full validation test of HT3 on Sun platforms and changes on system

board may be required. HT3 will double the available bandwidth for CPU-to-CPU communication in Opteron systems. With HyperTransport clock speeds up to 2.2GHz, HT3 will allow for up to 17.6 GB/s of bandwidth (the bidirectional total) per link.

## Memory Enhancements

The enhanced Quad-Core processor has 6MB of L3 cache but the same amount of L1 and L2 cache as Barcelona - as shown in the following Figure. In order to make sure its larger caches don't cause data integrity problems, AMD has built in a new feature it calls L3 Cache Index Disable. This feature allows the CPU to turn off parts of the L3 cache if too many machine-check errors occur. This capability will apparently require OS-level support and is not supported as of this writing.

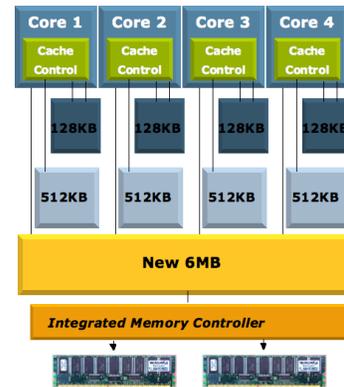


Figure 13. Shanghai memory architecture

## AMD Virtualization Enhancements

One tweak in Shanghai that affects not just the cache but the entire memory hierarchy has to do with the chip's support for nested page tables, a feature that accelerates memory address translation with system virtualization software. Shanghai maintains the same basic feature set as Barcelona, but AMD claims a reduction in "world switch time" of up to 25% for Shanghai. That means the system should be able to transition from guest mode to hypervisor mode and then back to guest mode much more quickly. Hypervisors that support the AMD-V feature set could see a marked improvement in performance in cases where virtual server performance is hampered by world-switch latency. Sun has done some Vmmark performance testing between the two Quad-Core processors with VMware ESX 3.5 and the results showed dramatic performance advantages.

Faster World Switch means that AMD has done some tuning of its world switch. A "world switch" is when CPU control passes from one Guest OS, to the hypervisor, to another Guest OS (or back to the original one). Faster switching means the CPU can get back to work on running the virtualized application.

Rapid Virtualization Index works by caching the address translations from Guest Virtual memory to Guest Physical memory to Host Physical memory. To translate between each of these states can require dozens of incremental translations. Shanghai improves Rapid Virtualization Indexing over Barcelona by caching more of these incremental address translation steps.

These virtualization enhancements can benefit by allowing Sun servers to support more users while offering best performance. These virtualization enhancements are supported in VMware Virtual Infrastructure 3.5 Update 1, Microsoft Hyper-V, and Xen.

## AMD Smart Fetch Technology

Smart Fetch is primarily a power-saving feature intended to work around the fact that AMD's caches are exclusive in nature. That is, the lower-level caches don't replicate the entire contents of the higher-level caches. In Barcelona, for instance, a completely idle core would have to continue operating, though at a lower frequency, in order to keep its caches active and their contents available. Shanghai, by contrast, will dump the contents of that core's L1 and L2 caches into the L3 cache and put the core entirely to sleep, essentially reducing its clock speed to zero. A flag (bit) is set to notify the other cores that it does not have any data they need. This can dramatically reduce idle power draw on a server. One core in the system must remain active at all times, but in a four-socket system, only a single core in one socket must stay active.

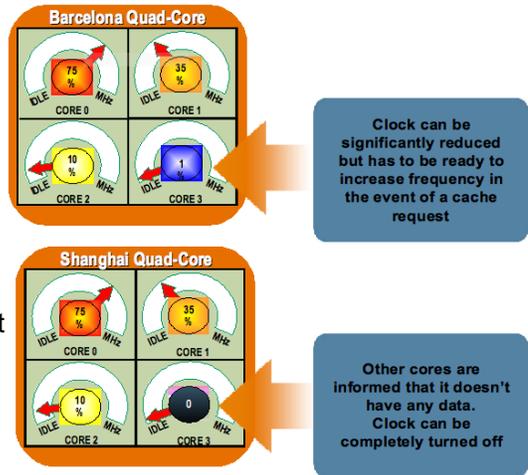


Figure 14. AMD Smart Fetch Illustration

## AMD Six-Core Opteron Processor (Istanbul)

AMD's native Six-Core Opteron processors incorporate six processor cores on a single die of silicon. Six-Core AMD Opteron processors feature Direct Connect Architecture, which means you have processors directly connected to one another, and an I/O and Memory Controller directly connected to each processor to reduce bottlenecks for better performance.

In addition to the technical enhancements found with the Shanghai processor, the Six-Core Istanbul processor introduces more performance and power efficiency improvements.

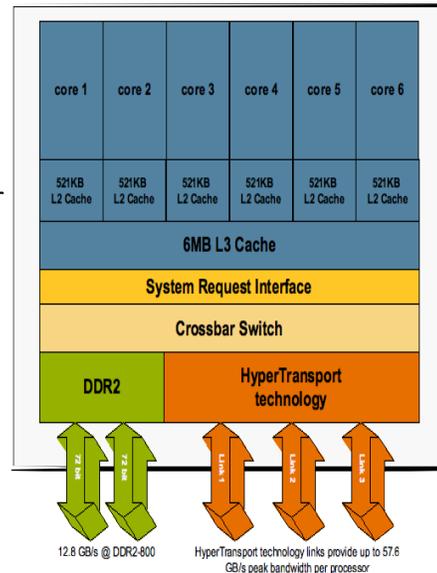


Figure 15. AMD Six-Core (Istanbul) Architecture

## What's New in Istanbul

Quad-Core AMD Opteron™ ("Shanghai") Features	Six-Core AMD Opteron™ ("Istanbul") Features
<b>Performance Enhancements</b>	
Four Cores with 45 nm Technology allow for greater frequency scaling	Six Core design delivers up to 20%-30% higher performance (Benefits primarily seen in MP systems)
Doubled Core Probe Bandwidth over "Barcelona"	HT Assist helps increase overall system performance in multi-socket systems
HyperTransport 3.0 @ up to 4.4 GT/s (17.6 GB/s)	HyperTransport 3.0 @ up to 4.8 GT/s (19.2 GB/s) per link
<b>Power Efficiency Enhancements</b>	
45 nm Technology design resulted in lower power consumption for Four Cores	Six Core design in same power envelope (105 W, 75 W, 55 W ACP)
45 nm Technology, Power Cap, Core Select and AMD Smart Fetch Technology deliver lower power consumption than "Barcelona"	APML Remote Power Management Interface (RPMI) technology preview allows for monitoring and control of platform power consumption via P-state limits

Figure 16. Istanbul Features

The new Istanbul processors adds two additional cores and fits into the same 75W thermal envelope. This is according to AMD's Average CPU Power (ACP) rating method. This Six-Core native design, which has a clock frequency between 2.1GHz to 2.6GHz, has a 20%-30% increased performance over the quad-core Shanghai processors.

The Advanced Platform Management Link (APML) is a SMBus interface between the management subsystems and platform via the CPU. The APML is comprised of the Remote Power Management Interface (RPMI) and the Precision Thermal Monitor Protocol. The APML allows users to monitor and control the platform power consumption by determining P-state limits.

### HT Assist

HT Assist improves performance by indexing the cache in each processor. Previously, the core would search each cache for the desired data. With the introduction of HT Assist, the core can simply look at the cache registry and determine if the data is there. HT Assist increases the CPU performance by reducing the probe filter traffic and removing latency from inter-processor communication. This enhancement significantly improves performance in cache sensitive, HPC, database, and virtualization workloads.

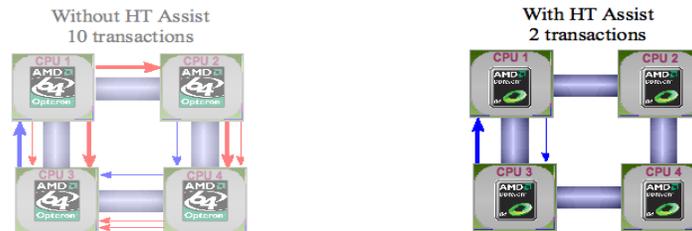


Figure 16. HT Assist

## Coherent HyperTransport 3 (cHT3)

With the introduction of Istanbul processor, the X4440 will be running at cHT3 speed, which means the CPU-to-CPU communication will be at HT3 speed while the IO communication will be at HT1 speed. HT3 will double the available bandwidth in Opteron systems. With HyperTransport clock speeds up to 2.2GHz, HT3 will allow for up to 17.6 GB/s of bandwidth (the bidirectional total) per link.

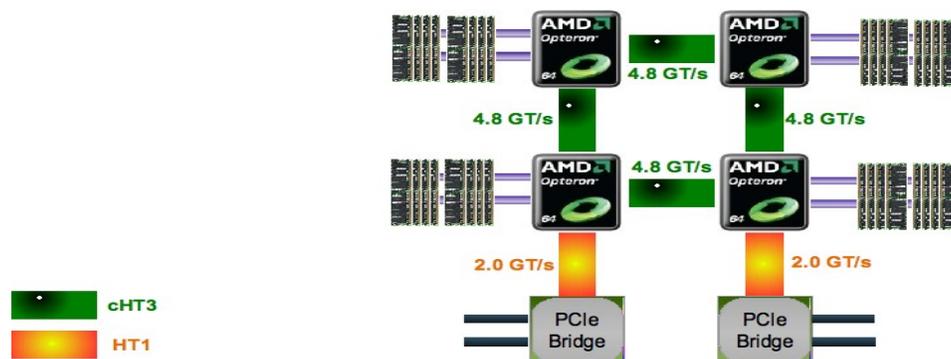


Figure 17. cHT3 Technology

## Sun Integrated Lights-Out-Manager (ILOM)

Sun Integrated Lights-out Manager is driven by an integrated system service processor that follows x86 standards. It provides for full remote KVMs (Keyboard, Video, Mouse, Storage) support together with remote media functionality. Lights-out management (LOM) is achieved using a new on-board, independently powered AST2000 service processor with its own robust, security hardened OS. ILOM provides remote administration via an intuitive browser-based GUI, DTMF CLI, remote console, SNMP V1, v2c, v3 or IPMI v2.0 protocols using the out-of-band management Ethernet, or using in-band communication through the server's operating system. With out-of-band management, the system administrator can remotely control power of the system, monitor system FRU status, and load system firmware. With in-band management, the system administrator can monitor system status and control system power down.

The Service Processor (SP) provides the following functions:

- Capability to remotely manage the server through remote keyboard, video, mouse, and storage redirection
- Extensive control and reporting over environmentals, power, hardware and BIOS/OS features
- Remote flash upgrades of system BIOS and service processor software
- Remote diagnosis of failed components allows for rapid correction
- User configurable serial console accessible via a physical port or re-directed through the management network

## Sun xVM Ops Center

Management of One to Thousands of Sun Systems

Sun xVM Ops Center software, the industry's only complete solution for virtualizing and managing your data center infrastructure for rapid and simplified discovery, OS provisioning and updates and management of multi-vendor Solaris and Linux OS-based x86 and SPARC systems. This optional software combines the benefits of N1System manager with the administration of virtualized datacenter assets by merging with Sun Connection. Sun xVM Ops Center reduces cost pressure of (server name) and improves manageability by centralizing control of heterogeneous architectures across the entire IT

infrastructure.

Sun xVM Ops Center software provides full Life Cycle management for physical, and soon virtual, data center infrastructure. Highly scalable building on the proven N1SM and Sun Connection, xVM Ops Center provides End-to-End Systems Management:

- Discover & Inventory
- Check & Provision Firmware
- Bare Metal Provision OS
- Manage Hypervisors
- Provision applications
- Automate software lifecycle/update
- Monitor HW and SW
- Compliance reporting

# System Architecture

## Overview

The Sun Fire X4440 servers features AMD's Direct Connect Architecture to connect four processors, integrated memory controllers, and I/O directly to each other. Communication between the four processors and I/O are interconnected by a dedicated 8.0 GB/sec HyperTransport link. Each processor controls 4 pairs of DIMM slots, with over 10.0 GB/sec access between processor and memory. The coherent HyperTransport link enables each processor to access the other processor's memory. The Sun Fire X4440 servers can be populated with 4GB DDR2 DIMMs utilize 8 DIMM slots per CPU to provide up to 128GB of memory.

The Sun Fire X4440 can be configured with either two or four dual-core AMD Opetron processors. Mixing of different processors or clock speeds is not supported. Memory options for the dual-core are DDR2-667 registered ECC memory installed in pairs. Supported DIMM capacity is either 1GB, 2GB, or 4GB and must be the same vendor and vendor part number for each pair. Failure to follow these configuration parameters may result in undefined behavior on systems and will produce system warnings.

The I/O architecture for the Sun Fire X4440 sever is designed to provide balanced I/O, with high bandwidth connectivity to multiple devices. Nvidia's nForce® Professional 3600 (MCP-55) and nForce® Professional 3050 (IO-55) chips provide on-board 6 independent PCIe expansion slots, quad gigabit Ethernet support, 6 USB 2.0 ports, and 8 integrated SATA disk controllers (available post RR).

The Nvidia's nForce® Professional 3600 (MCP-55) connects to CPU0 via the 1GHz Hypertransport link. The MCP-55 supports three 8-lane (X8) PCIe interconnects with a theoretical maximum bandwidth of 4GB/s. The 8-lane interconnects have connectors that are mechanically 8-lane and can operate with 1-, 4-, and 8-lane PCIe cards. The I/O hub has five available USB 2.0 ports and an additional two USB 2.0 ports dedicated to the service processor. A dedicated legacy PCI buss provides connectivity to the service processor. The MCP-55 also provides four integrated SATA disk controllers to support low-cost internal SATA storage (available post RR).

The Nvidia's nForce® Professional 3050 (IO-55) connects to CPU1 via the 1GHz Hypertransport link. There is one 4-lane, one 8-lane, and one 16-lane PCIe interconnects with a theoretical maximum bandwidth of 2, 4 and 8GB/s respectively. The 8- and 4-lane PCIe interconnects have connectors that are mechanically X8 to allow up to X8 PCIe cards. The IO-55 chip also provides four integrated SATA disk controllers to support low-cost internal SATA storage (available post RR).

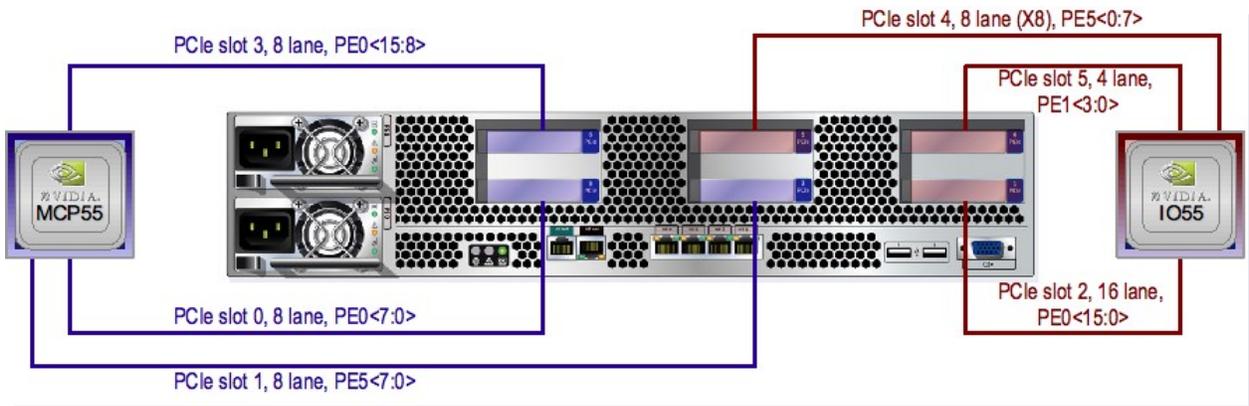


Figure 18. Nvidia's nForce Professional PCIe interconnects

On-board management for the Sun Fire X4440 server is provided by a separately-powered Aspeed AST2000 Graphics & Remote Management Processor that communicates with the two main system processors and the rest of the system. The AST2000 is a high-end remote server management processor, incorporating VGA/2D Graphics Controller, BMC Controller and KVMoIP Controller into one silicon chip. Accessible to the end user through a serial port and a dedicated 10/100 Ethernet NIC, ILOM

provides the administrator with full lights-out manageability of these servers which includes the ability to power cycle, setup, manage, monitor and maintain the system locally or remotely. ILOM supports both local and remote management, including remote KVM and media connectivity. ILOM also provides industry standard GUI and CLI interfaces. IPMI 2.0 and SNMP V1, v2c, V3 support also enable fast integration into a customer's existing monitoring schema.

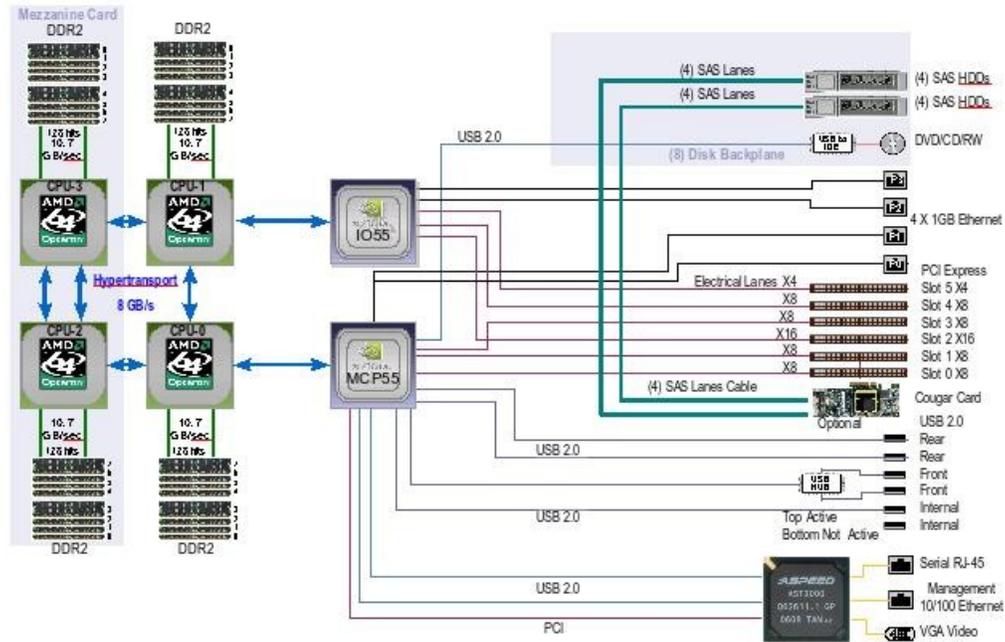


Figure 19. Sun Fire X4440 SAS Server Block Diagram

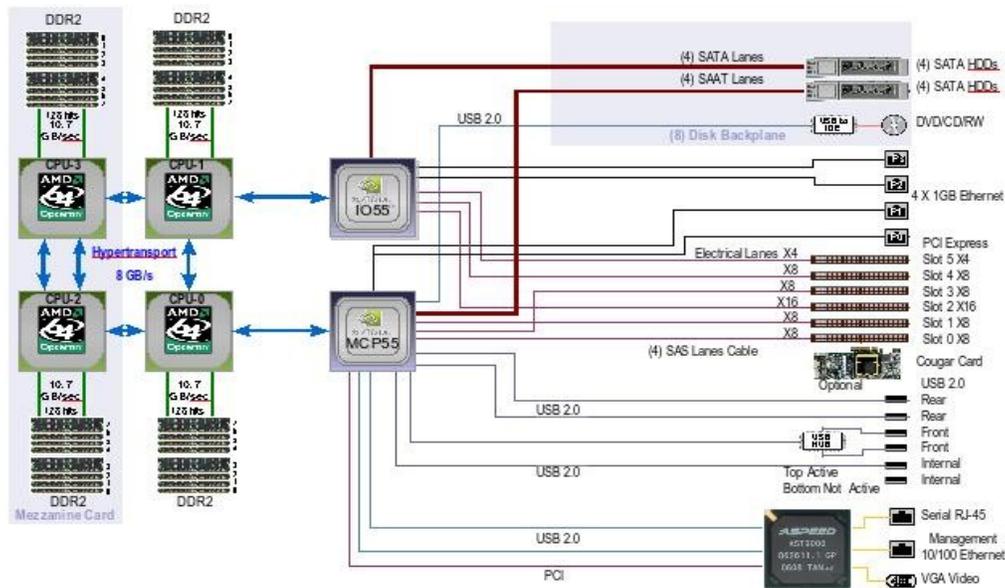
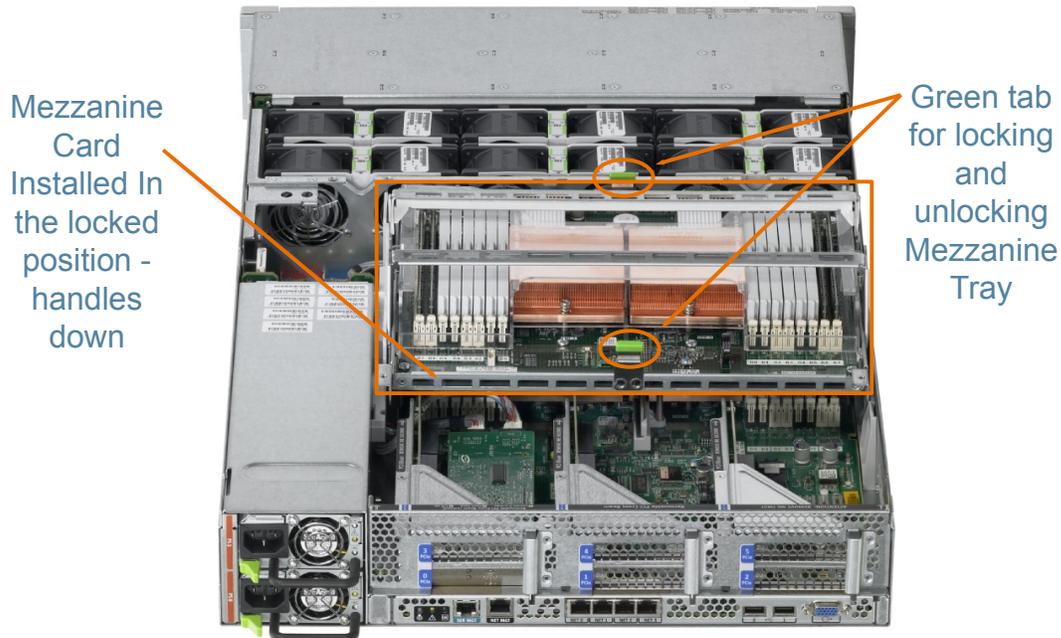


Figure 20. Sun Fire X4440 SATA Server Block Diagram (available post RR)

## The Mezzanine Board

The Sun Fire X4440 server uses the same system board as the two socket Sun Fire X4140 and X4240. The Sun Fire X4440 has an additional mezzanine board installed directly above the processors and

memory on the system board. The mezzanine board has two processors and eight DIMM slots for each processor. There are also associated circuits for ILOM, voltage regulators, and signaling devices on the mezzanine card. The mezzanine card plugs into three connectors located on the system board which provides various signals, and two Hypertransport links to CPU2 and CPU3.



**Figure 21. Sun Fire X4440 with Mezzanine Board Installed**

The motherboard and the mezzanine board each have a fault remind button that will illuminate LEDs indicating a fault with that device. Pressing the button on the mezzanine board will indicate faults only on the mezzanine module. Pressing the button on the motherboard will indicate faults only on the motherboard. If there are no problems the LEDs will not illuminate. The fault remind circuitry will function without AC power present to the system for about one minute and is powered by stored energy from a capacitor. With the top cover removed, and AC present, chassis 3.3V auxiliary voltage is present and will be used to light the LEDs when the fault remind button is pressed.

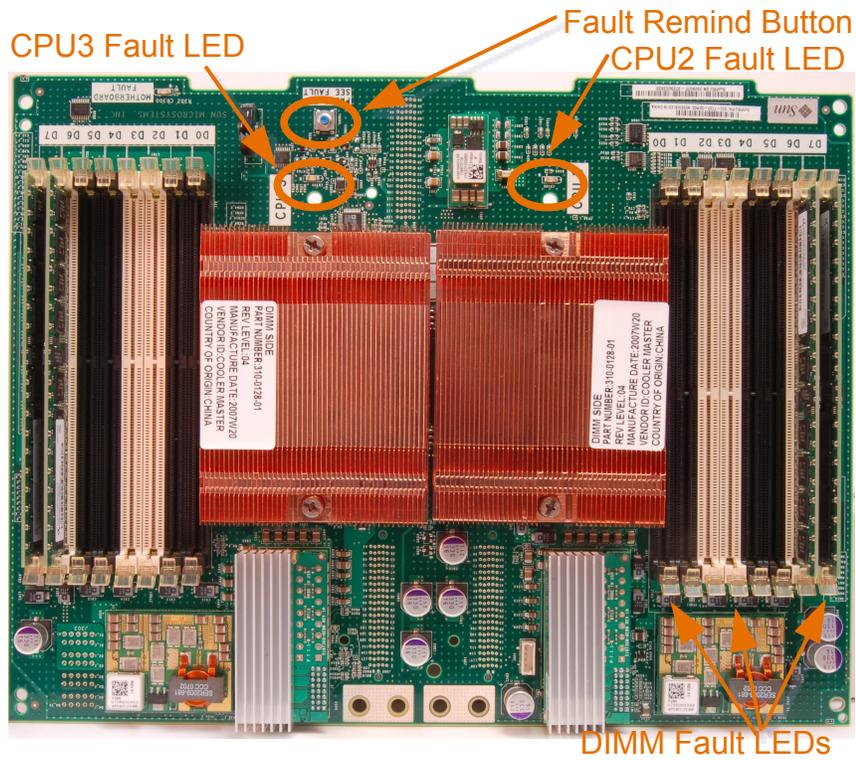


Figure 22. Sun Fire X4440 Mezzanine Board

# Reliability, Availability, and Serviceability (RAS)

## Reliability

- Software RAID 0, 1 with SATA controller onboard.
- 8-port SAS host bus adapter supports RAID 0, 1, 0+1.
- 8-port SAS SRL RAID host bus adapter has 256MB of DDR2 memory and battery-backed write cache for 72 hour backup, in addition to supporting RAID 0, 1, 10, 1E, 5, 50, 5EE, 6, 60.
- ECC memory with ChipKill supported.

## Availability

- High CPU density available with quad core combined with the small form factor of the Sun Fire X4440 servers allow redundant deployment in a compact space to increase overall service availability.
- Redundant hot-swappable power supplies and fan modules allow for system service without downtime.
- Built-in quad Gigabit Ethernet ports provide redundancy.

## Serviceability

- Front-accessible, hot-swappable disk drives.
- Front-accessible DVD+/-RW drive can be easily removed without opening the top cover of the chassis.
- Fan modules can be replaced without power down or complete removal of system from rack.
- Identical Indicator LEDs on the front and back of the chassis allow problems to be detected and isolated easily.
- A fault indicator LED stays on following a fault even if the system has been powered off (but still connected to the power source).
- Diagnostic LEDs are included on the motherboard.
- Front power switch (toggles between standby and power-on) provides easy access.
- Rack mounting slide rails for easy installation and removal of a unit are available as x-options.
- Single-step power supply removal: Power-supplies can be serviced without sliding the servers out of the rack.

# Operating System

## Sun Fire X4440 Server Operating Systems

A world-class performance platform, the 64-bit Sun Fire X4440 servers allow customers to run the operating system that best fits their needs. With a multitude of operating systems fully supported and/or certified, the Sun Fire X4440 servers provide customers with more choices, within the same hardware architecture, than competing servers in its class.

Operating Systems		Six Core Support	Factory Installed	Sold by Sun	Supported by Sun
Solaris 10 Update 7	64-bit	Yes	Yes	Yes	Yes
VMware ESX 3.0.2	64-bit	No	No	Yes	Yes
Windows Server 2003 Enterprise Edition, SP2	32-bit/ 64-bit	Yes	No	No <sup>2</sup>	Yes <sup>3</sup>
Red Hat Enterprise Linux 4, Update 5	32-bit/ 64-bit	Yes	No <sup>1</sup>	Yes	Yes
Red Hat Enterprise Linux 5	64-bit	Yes	No <sup>1</sup>	Yes	Yes
SUSE Linux Enterprise Server 10, SP1	64-bit	Yes	No <sup>1</sup>	Yes	Yes

1. Red Hat Enterprise Linux 4, SUSE Linux Enterprise Server 10, and Solaris 10 can be ordered from Sun. Support contracts are also available.
2. "Designed for Windows" designation as a certified platform.
3. Sun System Service Plans for Windows Server 2003 are available from Sun.

## Latest OS Information

For more information on the latest OS support for the Sun Fire X4440 Server, see <http://www.sun.com/servers/entry/X4440/os.html>

## Solaris 10 OS – The most advanced operating system on the planet

### Key Messaging

In a class by itself, the Solaris Operating System is a significant leap forward from the Solaris 9 OS, establishing it in a class by itself when compared to competing operating systems. It offers many innovative technologies that fundamentally change the equation for organizations needing to reduce costs, reduce complexity, and minimize risk. The new features in the Solaris 10 OS bring mainframe-quality software to even the smallest single-processor servers and provide a stepping stone into tomorrow's data center.

For CIOs and Line of Business Managers who are dissatisfied with high infrastructure costs and security vulnerabilities in their workgroup server environments, the Solaris 10 OS on x64 brings a proven, enterprise-class OS at 1/11<sup>th</sup> the cost of Microsoft and 20-60% off the cost of Red Hat over three years. The Solaris 10 OS is designed to help organizations optimize system utilization levels, deliver extreme performance and provide virtually unparalleled security – all

with relentless, around-the-clock availability.

- **Optimal Utilization** of computing systems is a priority for IT managers where server consolidation is a common approach and is improved in the Solaris environment by:
  - **Solaris Containers** enable as much a 4x increase in system utilization by helping to efficiently and securely support thousands of applications per system. Highly configurable, Solaris Containers can dynamically adjust system resources to business goals within and across Containers with the added benefit of isolating applications from each other and from system faults, so a problem in one application cannot affect the system or other applications.
  - **Solaris ZFS File System** (zettabyte file system) integrates devices, storage, and file systems structures into a single structure, simplifying file system management and providing a reliable and flexible solution that can help reduce cost, complexity, and risk.
- **Extreme Performance** is delivered with optimization for the latest UltraSPARC(R), AMD Opteron and Intel Xeon processors as well as:
  - **Dynamic Tracing (DTrace)**, designed for use live use in production situations, is a powerful tool for analyzing and diagnosing elusive problems and increasing system performance. It is non-invasive and has no system overhead when not in use, but with its pervasive coverage, root cause for intermittent system problems can be found quickly and performance gains in real-world applications have been optimized to run as much as 30 times faster.
  - **A Unified TCP/IP Stack** where the TCP and IP layers are partially merged, delivers a 30- to 50-percent improvement in network throughput with a 10- to 15-percent lower CPU load than previous Solaris OS versions.
- **Unparalleled Security** continues to be a focus as Solaris 10 OS adds significant features that can help defend against attacks by preventing unauthorized access to data and applications with:
  - **Process Rights Management** replaces the traditional UNIX(R) platform's "all or nothing" root mechanism with a fine-grained set of privileges for control over the resources and objects that processes can manipulate.
  - **Solaris Cryptographic Framework** library secures data flows by providing a set of programming interfaces for application-level and kernel-level cryptographic operations, allowing developers to utilize highly optimized cryptographic algorithms and providing transparent access to the same hardware encryption acceleration devices used by the operating system kernel.
- **Relentless Availability** – Expected in a Solaris OS environment, predictive self-healing technologies provide new levels of application availability with:
  - **Solaris Fault Manager** proactively handles system problems by removing components before failure. CPU, memory and I/O problems are diagnosed and corrected – before they can cause downtime.
  - **Solaris Service Manager** manages application software running on the system, monitoring applications and restarting entire application trees if necessary.

## Compatibility

- **Same OS—Low-End to High-End Systems.** The Solaris OS is built from a single source base and optimized to run on multiple platforms, providing customers with the same best of breed OS on SPARC, Opteron AMD64 64-bit, and x86 32-bit processor-platforms.
- **Solaris Application Guarantee Program.** This program guarantees binary compatibility between versions of Solaris OS on each platform and has been extended to include source code compatibility as well.
- **Linux Compatibility.** With unwavering support for interoperability and open standards, and a commitment to delivering customer choice, Sun has made Linux interoperability a high priority.
  - **Six Key Linux Libraries included in Solaris OS are:** Glib, Gtk+, JPEG, PNG, TIFF, and XML2
  - **Hundreds of Linux applications and libraries** are provided with the Solaris OS including the GNOME desktop.
  - **Linux Compatibility Assurance Toolkit (LinCat)** helps to simplify the process of porting Linux applications to run natively on the Solaris OS.

## Pricing/Support

Solaris 10 OS is free to end-users upon registration and is available via free download. Media kits are available for purchase. Support is available at an additional charge.

## Linux - Complementing Sun's Solaris OS Strategy

### Key Messaging

Sun, the #1 systems provider, brings a Comprehensive Systems Approach to Linux--providing customers with a full Linux solution of hardware, OS choice with Sun's value added Sun Java(TM) Enterprise System, Sun Java Desktop System, tools, and services. Sun enhances standard Linux distributions with an integrated systems offering that includes fully supported OS, x64 rack-mount servers, and the Sun Java Enterprise System that simplifies platform support for customers and partners. Sun brings added value to the system offering with faster, low-cost hardware which is the primary concern for most Linux customers seeking cost-sensitive server alternatives.

- **Choice and Platform Neutrality – “The right tool for the right job”**

Customers can choose the OS platform to best meet their server to desktop computing needs.

- With the Sun Java Enterprise System for Linux, customers can standardize on a set of Java technology-based network services across their heterogeneous infrastructure of volume x86 systems based on the Solaris OS or standard Linux to large SMP systems from Sun on x64 or SPARC processor based systems.
  - A growing line of Sun and third-party Intel Xeon and AMD Opteron processor-based servers allows Linux customers to scale to 64-bit computing
- **Systems Approach - Simplified Operations - One-Stop Linux Support**

Sun brings a complete systems approach to Linux: a value-added web services stack for the entire system, hardware, OS, tools, and applications backed by Sun's global support infrastructure.

- Delivering Linux--from leading vendors (Red Hat and SUSE Linux)--with front-line support (SUSE only) and training worldwide from Sun on x64 (Xeon and Opteron processors) hardware platforms from Sun and third parties.
- Selling the simplest and most comprehensive middleware & web services offering with Sun Java Enterprise System.
- **Optimized Java Technology – Java Everywhere – Broaden the reach of Java technology investments**
  - Sun is focused on maximizing Java technology performance benefits and stretching customers' application investments by creating a common application engine.
  - Linux and Java platform integration - Alliances with Red Hat and SUSE Linux to distribute Sun's latest Java Virtual Machine (JVM(TM) machine) included as part of the OS distributions. (The JVM software technology allows the Java 2 Software to host applications on any computer or operating system without rewrite or recompile).

## Pricing/Support

Sun resells subscriptions for Red Hat Enterprise Linux (RHEL) & SUSE Linux Enterprise Server/Desktop (SLES/D). Support includes access to either Red Hat Network or Novell Customer Center. During the support period, if any new versions of SLES/D or RHEL for AMD Opteron are made available, users with current support entitlements have access to those new versions from the maintenance sites of Red Hat and SUSE. Please see the "Services" section for more details.

## Windows OS

The Sun Fire X4440 Servers are certified to run the Microsoft Windows Server 2003 Enterprise and Standard Edition operating systems. Sun System Service Plans will be available from Sun Microsystems at an additional charge. Please see the "Services" section for more details.

## VMware OS

The Sun Fire X4440 server is ideal for running the latest virtualization technologies including Solaris Containers, VMware ESX, & Microsoft Virtual Server. The combination of Sun Fire X4440 server & VMware virtualization software enable

- Server consolidation for greater energy & space efficiencies
- Advanced business continuity for critical applications
- Streamlined multi-OS software development on high-performance Sun Fire servers
- Standardized enterprise desktop environments
- Migration of legacy OSs & applications to new hardware for increased reliability

The Sun Fire X4440 Server is certified to run VMware ESX 3.0.2 operating system. Sun System Service Plans will be available from Sun Microsystems at an additional charge. Please see the "Services" section for more details.

# Installation Data

## Sun Fire X4440 Server Specification

### Processor Options

Processor	Two or Four AMD Opteron Processors per system; <ul style="list-style-type: none"><li>• Six-Core 8425 HE (2.1GHz, 55W)</li><li>• Six-Core 8431 (2.4GHz, 75W)</li><li>• Six-Core 8435 (2.6GHz, 75W)</li><li>• Six-Core 8439 SE (2.8GHz, 75W)</li></ul>
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### Main Memory

32 DIMM slots total for DDR2-667 Registered ECC DIMMs
System configurations from 8 GB (4x2GB) to 256 GB (32x8GB) of memory

### Standard/Integrated Interfaces

Network	Four 10/100/1000Base-T Ethernet ports
Network management	One dedicated 10/100Base-T Ethernet port
Serial	One TIA/EIA-232-F asynchronous RJ45 Port
SAS	Four channel SAS interface, internal access only.
USB	Two USB 2.0 ports (Front), Two USB 2.0 ports (Rear), One USB 2.0 port (Internal)
Expansion bus	Three internal MD2 Low Profile 8-lane PCI-Express slots (all with x16 mechanical connector)

### Mass Storage and Media

Hot-swappable, 2.5" Internal disk	Up to eight SAS disk drives with add-on SAS Host Bus Adapter
Removable Media	One EIDE DVD+/-RW drive
External disk	See <a href="http://www.sun.com/servers/entry/X4440/storage.html">http://www.sun.com/servers/entry/X4440/storage.html</a>

### Software

Operating environment	Solaris 10 Red Hat Enterprise Linux 4, 64-bit Red Hat Enterprise Linux 5, 64-bit SUSE Linux 10 Professional 64-bit Windows Server 2003, Enterprise Edition, 32-bit/64-bit Windows Server 2003, Standard Edition, 32-bit/64-bit Windows Server 2008, 32-bit/64-bit VMware ESX 3.0.2 Vmware ESX 3.0.3 Vmware ESX 3.5.1 See <a href="http://www.sun.com/servers/entry/X4440/OS.html">http://www.sun.com/servers/entry/X4440/OS.html</a>
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Sun Java Enterprise System 5	Solaris 10 on X64 Operating System Standard Linux distributions
Languages	C/C++, FORTRAN, Java programming language, all other standard Sun-supported languages
Networking Software	ONC™, ONC+(TM), NFS(TM), WebNFS(TM), TCP/IP, SunLink™, OSI, MHS, IPX™/SPX, SMB technologies, and XML
Management	CLI (in-band and out-of-band), IPMI 2.0 (in-band and out-of-band), SNMP (out-of-band only)

## Power Supplies

Dual redundant, hot -swappable power supply	
UL Maximum (AC Input)	12 Amps RMS at 100 VAC
Power Supply Rating (DC output)	1050 W

## Environment

AC power	90–264 V AC (47–63 Hz)
Operating temperature/humidity (single, non-rack system)	5 °C to 35 °C (41 °F to 95 °F), 10% to 90% relative humidity, non-condensing
Nonoperating temperature/humidity (single, non-rack system)	-40 °C to 70 °C (-40 °F to 158 °F), up to 93% relative humidity, non-condensing
Altitude (operating) (single, non-rack system)	Up to 3048 m, maximum ambient temperature is derated by 1 degree C per 300 m above 900 m
Altitude (nonoperating) (single, non-rack system)	15kPa

## Acoustic Noise Emissions

Declared noise emissions in accordance with ISO 9296, A-weighted, operating and idling:	
LwAd (1B = 10dB) at max ambient	7.7 B
LpAm bystander at max ambient	65.8 dB

## Regulations

Meets or exceeds the following requirements:	
Safety	IEC 60950, UL/CSA 60950, EN60950, CB Scheme with all country differences
RFI/EMI	FCC CFR 47 Part 15 Class A, EN 55022 Class A, EN 61000-3-2, EN 61000-3-3, EN 300-386
Immunity	EN55024, EN300-386
Certifications: Safety EMC	UL/cUL, UL DEMKO, CE, BSMI, CCC, GOST-R, S-Mark CE, FCC, VCCI, ICES, C-Tick, MIC, CCC, GOST-R, BSMI Class A
Other	Complies with WEEE Directive (2002/96/EC) and RoHS Directive (2002/95/EC)

## Dimensions and Weight

Chassis	
Height	87.85 mm (3.46 in.)
Width not including ears	425.5 mm (16.75 in.)
Width including ears	443.9 mm (17.47 in.)
Depth not including PSU handle	711.2 mm (28 in.)
Depth including PSU handle	736.4 mm (28.99 in.)
Weight	28.6 kg (63 lb.) maximum assuming PCI-Express card weighs 0.12 kg (0.25 lb) each and without rack mounting slide rail kit

# System Requirements, Configuration and Management

## System Requirements

The Sun Fire X4440 servers run the Solaris 10, standard Linux distributions, Microsoft Windows Server 2003, as well as VMware operating systems. For a list of supported OS versions, please refer to section “Sun Fire X4440 Server Operating Systems Support “

## System Configuration

The Sun Fire X4440 servers have the following standard components:

- Two or four Six-core AMD Opteron processors
- Thirty-two memory slots supporting 667 MHz Registered ECC DDR2 DIMMs with 2x2GB, 2x4GB, or 2x8GB memory kits - Up to 256 GB of main memory with 8GB DIMMs
- Eight 2.5-inch SAS disk drives (with add-on SAS Host Bus Adapter) or Four 2.5-inch SATA solid state disk drives
- DVD+/-RW drive (optional)
- Four 10/100/1000Base-T Ethernet ports
- Five USB 2.0 ports: two front, two rear, one internal
- Six MD2 Low Profile 8-lane PCI-Express slots (1x16 lane, 4x8 lane, 1x4 lane)
- Redundant hot-swappable fan modules
- 1050 Watt AC power supply (hot-swappable in redundant configuration)
- Integrated Lights Out Manager (Integrated LOM) with dedicated 10/100BaseT Ethernet port
- 19-inch rack-mount kit (optional)
- Cable management arm (optional)

## Licensing/Usage

The Sun Fire X4440 servers can be ordered with the Solaris 10 and Sun Java Enterprise Server pre-installed. Solaris 10 RTU is given when the system is registered with Sun.

## MTBF Information

The MTBF (Mean Time Between Failure) for the Sun Fire X4440 servers vary depending upon configuration. For more specific information, please refer to MTBF Tool at <http://ram-server.eng>

## BTU Information

BTUs/hr for the Sun Fire X4440 servers will vary depending upon configuration.

Min BTU:

569.83 BTUs/hr at idle for Sun Fire X4440 with two Quad-Core AMD 8218HE processor (2.6GHz, 1MB, 55W), 4x1GB DDR2-667 Registered ECC DIMM, no DVD, no HDD, two power supply units.

Max BTU:

3221.06 BTUs/hr at max stress for Sun Fire X4440 with four Quad-Core AMD 8224SE (3.2GHz, 1MB, 105W), 32x4GB DDR2-667 Registered ECC DIMM, DVD+/-RW drive, eight 146GB 10K RPM 2.5" SAS drive, six 8-port internal SAS Host Bus Adapters, two power supply units.

## Power Consumption Information

Please refer to Power Calculator at <http://www.sun.com/servers/x64/X4440/calc/index.jsp>

## Rack Mounting

The Sun Fire X4440 server is 1.73 inches (44 mm) high, 16.75 inches (425.5 mm) wide and 28 inches (711.2 mm) deep. The air-flow direction is from front to back. I/O ports are located on the front and rear panels. Informational LEDs are located on the front and rear panels. Access to the power connection is at the rear of the chassis.

Every current Sun Rack is supported for in-field installation and for shipment pre-installed by Sun Customer Ready (CRS) program. Field installation in the Sun Fire Hardware Expansion Cabinet, the Sun StorEdge(TM) Array Cabinet as well as 3rd party ANSI/EIA 310-D-1992 or IEC 60927 compliant cabinets is supported with the optional Rack Mounting Slide Rail Kit (X6326A) and optional Cable Management Arm (X6324A).

The optional rack mounting slide rail kit is a 4-point mounted slide rail kit and is designed to enable Sun Fire X4440 servers to be racked in the Sun Rack 938, the Sun Rack 1038, the Sun Rack 1042 and 3rd party ANSI/EIA 310-D-1992 or IEC 60927 compliant racks. No other kits will be available to allow 2 point, front-mount, nor mid-mount configuration. The slide kit will include hardware that enables mounting to any of the following types of rack rails:

- 6 mm threaded holes
- #10-32 threaded holes
- #10 clearance holes
- square unthreaded holes per EIA and IEC standards listed above

Rack requirements to support installation are:

- rack horizontal opening and unit vertical pitch conforming to ANSI/EIA 310-D-1992 and/or IEC 60927
- four-post structure (i.e. mounting at both front and rear)
- distance between front and rear mounting planes between 610mm and 915mm (24 to 36 inches)
- clearance depth (to front cabinet door) in front of front rack mounting plane at least 25.4mm (1 inch)
- clearance depth (to rear cabinet door) behind front rack mounting plane at least 800mm (31.5inches), or 700mm (27.5inches) without cable management arm
- clearance width (between structural supports, cable troughs, etc.) between front and rear mounting planes at least 456mm (18 inches)

Please note that not all 3rd party racks meet these parameters and are not compatible with these slide rail kits. Also, some third-party rack vendors do not support a completely filled rack with this type of server, due to the amount of power required.

The Tool-less Rack Mounting Rail Kit cannot be used to mount servers prior to shipment.

## **Rack Density**

Sun Fire X4440 server rack density will vary widely based on systems installed, power distribution installation (in-cabinet, external), power source (single-phase, three-phase) and whether redundant power is required.

Best Case:

- Up to 18 Sun Fire X4440 can be mounted in the Sun Rack 938 or the Sun Rack 1038.
- Up to 20 Sun Fire X4440 can be mounted in the Sun Rack 1042 using a 60A 3 phase MPS.

Worst Case:

- Up to 17 Sun Fire X4440 can be mounted in the Sun Rack 938 or the Sun Rack 1038.
- Up to 19 Sun Fire X4440 can be mounted in the Sun Rack 1042 using a 60A 3 phase MPS.

## **Sun Cluster Support**

The support of Sun Fire X4440 servers by Sun Cluster will be announced at a later date.

For the latest information, please go to: <http://suncluster.sfbay.sun.com>

## **Origin Statement**

The Sun Fire X4440 servers have components from various countries of origin. The motherboard is manufactured in China. The power supply is from Thailand. The chassis is manufactured in Mexico. The commodity parts such as disk drivers, memory, and CPU come from a variety of countries. Final system assembly is performed in Aachen, Germany or Fremont, California, USA.

## **Hardware Global compliance**

Hardware Global compliance for this product complies with the guidelines as specified for hardware at: <http://global.eng/compliance/i18nl10nbigrules.html>

The localized documents will be located at:

<http://www.sun.com/products-n-solutions/hardware/docs/Servers/>

# Ordering Information

## Sun Fire X4440 Server RoHS Compliant Standard Configurations

Part Number	Description	Availability
<b>B16-HS2-DC-4G-JL8</b>	Sun Fire X4440: 2x Quad-Core AMD Opteron 8356 (2.3GHz, 512KB, 75W), 4x 1GB DDR2 DIMM, no HDD, no DVD, 1xPSU	RR 5/13/08 EOL 8/5/08
<b>B16-HS4-DC-16G-RD6</b>	Sun Fire X4440: 4x Quad-Core AMD Opteron 8356 (2.3GHz, 512KB, 75W), 8x 2GB DDR2 DIMM, 4x146GH 10K RPM SAS HDD, SAS RAID, DVD+/-RW, 2xPSU	RR 5/13/08 EOL 8/5/08
<b>B16-HS2-DC-8G-JL8</b>	Sun Fire X4440: 2x Quad-Core AMD Opteron 8356 (2.3GHz, 512KB, 75W), 4x 1GB DDR2 DIMM, no HDD, no DVD, 2xPSU	RR 5/13/08 EOL 8/5/08
<b>B16-HU2-BC-4G-JL8</b>	Sun Fire X4440: 2x Quad-Core AMD Opteron 8347 HE (1.9GHz, 512KB, 55W), 4x1GB DDR2 DIMM, no HDD, no DVD, 2xPSU	RR 5/13/08 EOL 8/5/08
<b>B16-HG4-BB-8G-JL8</b>	Sun Fire X4440: 4x Dual-Core AMD Opteron 8218HE (2.6GHz, 1MB, 55W), 8x 1GB DDR2 DIMM, no HDD, no DVD, 2x PSU	RR 4/2/08 EOL 8/5/08
<b>B16-HQ4-DB-16G-RD6</b>	Sun Fire X4440: 4x Dual-Core AMD Opteron 8222 (3.0GHz, 1MB, 75W), 8x 2GB DDR2 DMM, 4x146GB 10K RPM SAS HDD, SAS RAID, DVD+/-RW, 2x PSU	RR 4/2/08 EOL 8/5/08
<b>B16-HE4-EB-16G-JL8</b>	Sun Fire X4440: 4x Dual-Core AMD Opteron 8224SE (3.2GHz, 1MB, 105W), 8x 2GB DDR2 DIMM, no HDD, no DVD, 2x PSU	RR 4/2/08 EOL 8/5/08
<b>B16-HQ2-DB-4G-JL8</b>	Sun Fire X4440: 2x Dual-Core AMD Opteron 8222 (3.0GHz, 1MB, 75W), 4x 1GB DDR2 DIMM, no HDD, no DVD, 2x PSU	RR 4/2/08 EOL 8/5/08
<b>B16-HQ4-DB-16C-RD6</b>	Sun Fire X4440: 4x Dual-Core AMD Opteron 8222 (3.0GHz, 1MB, 75W), 8x 2GB DDR2-667 SR, 4x 146GB HDD, RAID HBA, DVD±RW, 2x PSU	RR 8/29/08 EOL 12/09/08
<b>B16-HU2-BC-8C-JL8</b>	Sun Fire X4440: 2x Quad-Core AMD Opteron 8347 HE (1.9GHz, 512KB, 55W), 4x 2GB DDR2-667 SR, No HDD, No DVD±RW, 1x PSU	RR 8/29/08 EOL 3/10/09
<b>B16-HS2-DC-8C-JL8</b>	Sun Fire X4440: 2x Quad-Core AMD Opteron 8356 (2.3GHz , 512KB, 75W), 4x 2GB DDR2-667 SR , No HDD, No DVD±RW, 1x PSU	RR 8/29/08 EOL 3/10/09
<b>B16-HU4-BC-16C-RD6</b>	Sun Fire X4440: 4x Quad-Core AMD Opteron 8347 HE (1.9GHz, 512KB, 55W), 8x 2GB DDR2-667 SR, 4x 146GB HDD, RAID HBA, DVD±RW, 2x PSU	RR 8/29/08 EOL 3/10/09
<b>B16-HS4-DC-16C-RD6</b>	Sun Fire X4440: 4x Quad-Core AMD Opteron 8356 (2.3GHz , 512KB, 75W), 8x 2GB DDR2-667 SR, 4x 146GB HDD, RAID HBA, DVD±RW, 2x PSU	RR 8/29/08 EOL 3/10/09
<b>B16-HT4-EC-16C-JL8</b>	Sun Fire X4440: 4x Quad-Core AMD Opteron 8360 SE (2.5GHz, 512KB, 105W), 8x 2GB DDR2-667 SR, No HDD, No DVD±RW, 2x PSU	Announce 8/5/08 EOL 12/09/08
<b>B16-ZT4-BC-16C-RD6</b>	Sun Fire X4440: 4x 8380 (2.5GHz, 4x512KB, 75W), 8x 2GB DDR2-667 SR, 4x 146GB HDD, RAID HBA, DVD±RW, 2x PSU	RR 12/10/08 EOL 7/21/09
<b>B16-ZW4-DC-16C-RD6</b>	Sun Fire X4440: 4x 8380 (2.7GHz, 4x512KB, 75W), 8x 2GB DDR2-667 SR, 4x 146GB HDD, RAID HBA, DVD±RW, 2x PSU	RR 12/10/08 EOL 7/21/09

## Sun Fire X4440 Server XATO RoHS-Compliant Chassis Options

Part Number	Description	Availability
<b>B16-AA</b>	Sun Fire X4440 Base Chassis with 4x processor sockets, 32x memory slots, 8x 2.5" disk bays, 1x DVD drive bay, 6x PCI-Express slots, 4x GigE ports, 5 USB 2.0 ports, embedded LOM, no PSU	Announce 4/15/08 RR 5/22/08
<b>B16-AB</b>	Sun Fire X4440 x64 Server: XATO base chassis package including motherboard, no DVD, no PSU, redundant fans and Service Processor. Needed for AMD Opteron 8300 series SE Processors. RoHS-5.	Announce 10/14/08 RR 10/14/08

## Power Cords

Due to regulatory requirements of other countries, Sun Fire X4440 server Standard Configurations and XATO Chassis options are required to bundle their power cord separately. These are shippable anywhere in the world.

Each Geography must select their specific Country Power cord kit as listed in table to be included with each system or chassis.

Part Number	Description
<b>X311L</b>	(US/Asia (except China)) Localized power cord kit
<b>X312E</b>	(China) Localized power cord kit
<b>X312L</b>	(Continental Europe) Localized power cord kit
<b>X314L</b>	(Switzerland) Localized power cord kit
<b>X317L</b>	(U.K.) Localized power cord kit
<b>X332A</b>	(Taiwan) Localized power cord kit
<b>X383L</b>	(Danish) Localized power cord kit
<b>X384L</b>	(Italian) Localized power cord kit
<b>X386L</b>	(Australian) Localized power cord kit
<b>X312F</b>	(Argentina) Localized power cord kit
<b>X312G</b>	(Korean) Localised power cord kit

## Sun Fire X4440 Server RoHS Compliant Options

The Sun Customer Ready Program numbers can be combined with other Sun and 3<sup>rd</sup> party products into customer-specific systems by the Sun Customer Ready Program. These servers are identical to their Standard Configuration counterparts, but require Customer Ready Program-specific part numbers for factory integration.

The following part numbers are available as X-, XATO and Customer Ready Program options

as noted for the Sun Fire X4440 servers.

<b>X-Option</b>	<b>XATO</b>	<b>Customer Ready Program</b>	<b>Description</b>	<b>Notes</b>
<b>X6310A</b>	<b>6310A</b>	<b>6310A</b>	1x Dual-Core AMD Opteron 8218 HE processor (2.6GHz, 1MB, 55W)	Announce 4/15/08 EOL 12/09/08
<b>X6311A</b>	<b>6311A</b>	<b>6311A</b>	1x Dual-Core AMD Opteron 8222 processor (3.0GHz, 1MB, 75W)	Announce 4/15/08 EOL 12/09/08
<b>X6336A</b>	<b>6336A</b>	<b>6336A</b>	1x Dual-Core AMD Opteron 8224 SE processor (3.2GHz, 1MB, 105W)	Announce 4/15/08 EOL 12/09/08
<b>X6313A</b>	<b>6313A</b>	<b>6313A</b>	1x Quad-Core AMD Opteron 8356 processor (2.3GHz, 512KB, 75W)	Announce 5/13/08 EOL 4/28/09
<b>X6340A</b>	<b>6340A</b>	<b>6340A</b>	1x Quad-Core AMD Opteron 8347 HE processor (1.9GHz, 512KB, 55W)	Announce 5/13/08 EOL 4/28/09
<b>X6337A</b>	<b>6337A</b>	<b>6337A</b>	1x Quad-Core AMD Opteron 8360 SE (2.5GHz, 512KB, 105W)	Announce 7/8/08 EOL 12/09/08
<b>X8257A</b>	<b>8257A</b>	<b>8257A</b>	1x Quad-Core AMD Opteron 8380 (2.5GHz/512KB, 75W)	Announce 12/9/08 EOL 7/21/09
<b>X8258A</b>	<b>8258A</b>	<b>8258A</b>	1x Quad-Core AMD Opteron 8384 (2.7GHz/512KB, 75W)	Announce 12/9/08 EOL 7/21/09
<b>X5356A</b>	<b>5356A</b>	<b>5356A</b>	1x Quad-Core AMD Opteron 8389 (2.9GHz/512KB, 75W)	Announce 4/28/09 EOL 7/21/09
<b>X5384A</b>	<b>5384A</b>	<b>5384A</b>	1x Six-Core AMD Opteron 8425HE (2.1GHz/512KB, 55W)	Announce August RR August
<b>X5385A</b>	<b>5384A</b>	<b>5385A</b>	1x Six-Core AMD Opteron 8431 (2.4GHz/512KB, 75W)	Announce 7/21/09 RR 7/21/09
<b>X5386A</b>	<b>5386A</b>	<b>5386A</b>	1x Six-Core AMD Opteron 8435 (2.6GHz/512KB, 75W)	Announce 7/21/09 RR 7/21/09
<b>X5387A</b>	<b>5387A</b>	<b>5387A</b>	1x Six-Core AMD Opteron 8439SE (2.8GHz/512KB, 105W)	Announce August RR August
<b>X6314A</b>	<b>6314A</b>	<b>6314A</b>	2x Dual-Core AMD Opteron 8218 HE processors (2.6GHz, 1MB, 55W) with Mezzanine card	Announce 4/15/08 EOL 12/09/08
<b>X6315A</b>	<b>6315A</b>	<b>6315A</b>	2x Dual-Core AMD Opteron 8222 processors (3.0GHz, 1MB, 75W) with Mezzanine card	Announce 4/15/08 EOL 12/09/08
<b>X6338A</b>	<b>6338A</b>	<b>6338A</b>	2x Dual-Core AMD Opteron 8224 SE processors (3.2GHz, 1MB, 105W) with Mezzanine card	Announce 4/15/08 EOL 12/09/08
<b>X6317A</b>	<b>6317A</b>	<b>6317A</b>	2x Quad-Core AMD Opteron 8356 processors (2.3GHz, 512KB, 75W) with Mezzanine card	Announce 5/13/08 EOL 4/28/09
<b>X6342A</b>	<b>6342A</b>	<b>6342A</b>	2x Quad-Core AMD Opteron 8347 HE processors (1.9GHz, 512KB, 75W) with Mezzanine Card	Announce 5/13/08 EOL 4/28/09

<b>X-Option</b>	<b>XATO</b>	<b>Customer Ready Program</b>	<b>Description</b>	<b>Notes</b>
<b>X6339A</b>	<b>6339A</b>	<b>6339A</b>	2x Quad-Core AMD Opteron 8360 SE (2.5GHz/512KB, 105W) with Mezzanine Card	Announce 7/8/08 EOL 12/09/08
<b>X8261A</b>	<b>8261A</b>	<b>8261A</b>	2x Quad-Core AMD Opteron 8380 (2.5GHz/512KB, 75W) with Mezzanine Card	Announce 12/9/08 EOL 7/21/09
<b>X8262A</b>	<b>8262A</b>	<b>8262A</b>	2x AMD Opteron 8384 (2.7GHz/512KB, 75W Quad Core) with Mezzanine Card	Announce 12/9/08 EOL 7/29/09
<b>X5360A</b>	<b>5360A</b>	<b>5360A</b>	2x AMD Opteron 8389 (2.9GHz/512KB, 75W Quad Core) with Mezzanine Card	Announce 4/28/09 EOL 7/21/09
<b>X5388A</b>	<b>5388A</b>	<b>5388A</b>	2x AMD Opteron 8425HE (2.1GHz/512KB, 55W Six Core) with Mezzanine Card	Announce August RR August
<b>X5389A</b>	<b>5389A</b>	<b>5389A</b>	2x AMD Opteron 8431 (2.4GHz/512KB, 75W Six Core) with Mezzanine Card	Announce 7/21/09 RR 7/21/09
<b>X5390A</b>	<b>5390A</b>	<b>5390A</b>	2x AMD Opteron 8435 (2.6GHz/512KB, 75W Six Core) with Mezzanine Card	Announce 7/21/09 RR 7/21/09
<b>X5391A</b>	<b>5391A</b>	<b>5391A</b>	2x AMD Opteron 8439SE (2.8GHz/512KB, 105W Six Core) with Mezzanine Card	Announce August RR August
<b>X6320A</b>	<b>6320A</b>	<b>6320A</b>	2GB memory kit with 2x1GB DDR2-667 Registered ECC DIMM	RR 4/2/08 EOL 8/5/08
<b>X6321A</b>	<b>6321A</b>	<b>6321A</b>	4GB memory kit with 2x2GB DDR2-667 Registered ECC DIMM – Dual Rank	RR 4/2/08 EOL 8/5/08
<b>X6321A-C</b>	<b>6321A</b>	<b>6321A</b>	4GB memory kit with 2x2GB DDR2-667 Registered ECC DIMM – Single Rank	Announce 8/5/08 RR 8/29/08
<b>X6322A</b>	<b>6322A</b>	<b>6322A</b>	8GB memory kit with 2x4GB DDR2-667 Registered ECC DIMM	Announce 4/15/08 RR 4/2/08
<b>X4287A</b>	<b>4287A</b>	<b>4287A</b>	16GB memory kit with 2x8GB DDR2-667 Registered ECC DIMM	Announce 8/5/08 RR 11/30/08
-	<b>6331A</b>	<b>6331A</b>	Disk bay filler panel	Announce 4/15/08 RR 4/2/08
<b>XRA-SS2CF-73G10K</b>	<b>RA-SS2CF-73G10K</b>	<b>RA-SS2CF-73G10K</b>	73GB 10K RPM 2.5" SAS disk drive	Announce 4/15/08 RR 4/2/08
<b>XRA-SS2CF-146G10K</b>	<b>RA-SS2CF-146G10K</b>	<b>RA-SS2CF-146G10K</b>	146GB 10K RPM 2.5" SAS disk drive	Announce 4/15/08 RR 4/2/08
-	<b>6332A</b>	<b>6332A</b>	DVD drive filler panel	Announce 4/15/08 RR 5/22/08
<b>X6323A</b>	<b>6323A</b>	<b>6323A</b>	DVD+/-RW drive	Announce 4/15/08 RR 4/2/08
-	<b>6334A</b>	<b>6334A</b>	1050W power supply filler panel	Announce 4/15/08 RR 5/22/08

<b>X-Option</b>	<b>XATO</b>	<b>Customer Ready Program</b>	<b>Description</b>	<b>Notes</b>
<b>X6328A</b>	<b>6328A</b>	<b>6328A</b>	Redundant hot-swappable 1050W power supply	Announce 4/15/08 RR 4/2/08
<b>X6324A</b>	<b>6324A</b>	<b>6324A</b>	Cable management arm	Announce 4/15/08 RR 4/2/08
<b>X6325A</b>	<b>6325A</b>	<b>6325A</b>	Tool-less rack mounting slide rail kit	Announce 4/15/08 RR 4/2/08
<b>X6326A</b>	<b>6326A</b>	<b>6326A</b>	Rack mounting slide rail kit	Announce 4/15/08 RR 4/2/08
-	<b>6329A</b>	<b>Use Solaris and JES -IP part #</b>	Solaris 10 and Java ES pre-install on 73GB SAS disk drives	Announce 4/15/08 RR 5/22/08
-	<b>6330A</b>	<b>Use Solaris and JES -IP part #</b>	Solaris 10 and Java ES pre-install on 146GB SAS disk drives	Announce 4/15/08 RR 5/22/08
-	<b>4282A</b>	<b>4282A</b>	X4440 Cable kit for internal SAS drives	Announce 04/15/08 RR 05/22/08
-	<b>4283A</b>	<b>4283A</b>	X4440 Cable kit for internal SATA drives	Announce 04/15/08 TBD
-	<b>4284A</b>	<b>4284A</b>	X4440 2U Air Duct for Systems with Only 2 Processors	Announce 04/15/08 RR 05/22/08
<b>X4285A</b>	<b>4285A</b>	<b>4285A</b>	Hyper-Transport Bridge Card used with Quad-Core processors	Announce 04/15/08 RR 04/24/08
<b>SG-XPCIE8SAS-I-Z</b>	<b>SG-PCIE8SAS-I-Z</b>	<b>SG-PCIE8SAS-I-Z</b>	8-port internal SAS host bus adapter	Announce 4/15/08 RR 5/22/08
<b>SGXPCIESAS-R-INT-Z</b>	<b>SG-PCIESAS-R-INT-Z</b>	<b>SG-PCIESAS-R-INT-Z</b>	8-port internal SRL RAID host bus adapter	Announce 4/15/08 RR 5/22/08
<b>SG-XPCIE8SAS-E-Z</b>	-	<b>SG-PCIE8SAS-E-Z</b>	8-port external SAS host bus adapter	Announce 4/15/08 RR 4/22/08
<b>SGXPCIESAS-R-EXT-Z</b>	-	<b>SGPCIESAS-R-EXT-Z</b>	8-port external SRL RAID host bus adapter	Announce 4/15/08 RR 4/2/08
<b>SG-XPCIE2SCSIU320Z</b>	-	<b>SG-PCIE2SCSIU320Z</b>	Ultra320 SCSI 2-port host bus adapter	Announce 4/15/08 RR 4/2/08
<b>SG-XPCIE1FC-QF4</b>	-	<b>SG-PCIE1FC-QF4</b>	4Gb single-port FC-AL PCI-Express card	Announce 4/15/08 RR 4/2/08

X-Option	XATO	Customer Ready Program	Description	Notes
SG-XPCIE2FC-QF4	-	SG-PCIE2FC-QF4	4Gb dual-port FC-AL PCI-Express card	Announce 4/15/08 RR 4/2/08
SG-XPCIE1FC-EM4	-	SG-PCIE1FC-EM4	4Gb single-port FC-AL PCI-Express card	Announce 4/15/08 RR 4/2/08
SG-XPCIE2FC-EM4	-	SG-PCIE2FC-EM4	4Gb dual-port FC-AL PCI-Express card	Announce 4/15/08 RR 4/2/08
X1236A-Z	-	1236A-Z	Dual-port 4x Infiniband host channel adapter	Announce 4/15/08 RR 4/2/08
X7280A-2	-	7280A-2	Dual Gigabit-Ethernet PCI-Express card (copper)	Announce 4/15/08 RR 4/2/08
X7281A-2	-	7281A-2	Dual Gigabit-Ethernet PCI-Express card (fiber)	Announce 4/15/08 RR 4/2/08
X4446A-Z	-	4446A-Z	Quad Gigabit-Ethernet PCI-Express card (copper)	Announce 4/15/08 RR 4/2/08
X1027A-Z	-	1027A-Z	10 Gigabit-Ethernet PCI-Express card	Announce 4/15/08 RR 4/2/08
X5558A	-	5558A	10 Gigabit-Ethernet short range Transceiver	Announce 4/15/08 RR 4/2/08
X5560A-Z	-	5560A-Z	10 Gigabit-Ethernet long range Transceiver	Announce 4/15/08 RR 4/2/08
X1106A-Z	-	1106A-Z	10 GbE 1-port SR Opln(Intel)	Announce 04/15/08 RR 04/02/08
X1107A-Z	-	1107A-Z	10 GbE 2-Port SR Opln (Intel)	Announce 04/15/08 RR 04/02/08

### General Configuration Notes:

1. Dual processor systems can be expanded with a mezzanine card of the identical model/speed only, e.g. 2X Six-Core AMD Opteron 8435 processor based system can only use the 2x Six-Core AMD Opteron 8435 processors with mezzanine card; mixing with a different processor is not supported.
2. Memory must be installed in pairs. Pairs of different densities may be mixed, e.g. 2x2GB and 2x4GB can be used in the same system chassis.
3. The internal disk drives must be of the same type: they must all be SAS drives or all be SATA drives when available.
4. The diskless standard configurations come with cable kit for SATA drives. When adding SAS drives to these diskless standard configurations, **cable kits for SAS drives must be ordered with the SAS disk drives and the SAS host bus adapter.**
5. The standard configuration with disks come with cable kit for SAS drives. If these configurations are converted to be using SATA drives, **cable kits for SATA drives must be ordered with the SATA disk**

**drives.**

6. If RAID 1 mirroring is going to be used, the drives to be mirrored must be identical in size.
7. There are two SAS host bus adapter options for the Sun Fire X4440 server. The 8-port SAS host bus adapter supports RAID 0, 1, 0+1. The 8-port SAS SRL RAID host bus adapter has 256MB of DDR2 memory and battery-backed write cache for 72 hour backup, and also supports RAID 0, 1, 10, 1E, 5, 50, 5EE, 6, 60.

**XATO Configuration Notes:**

1. XATO allows the configuration of systems to exact customer requirements. This provides the customer with a fully tested and configured system that requires little, if any, additional configuration prior to deployment.
2. A minimum of two CPU option required. Two socket systems can be expanded with a mezzanine card of the identical model/speed only, e.g. 2X Six-Core AMD 8435 Opteron processor based system can only use 2x Six-Core AMD 8435 Opteron processors with Mezzanine card, mixing with different processors is not supported.
3. Memory must be installed in pairs. Pairs of different densities may be mixed, e.g. 2x1GB and 2x2GB can be used in the same system chassis.
4. A disk filler panel is required for any hard disk drive slot that is not filled.
5. A power supply filler panel is required for any power supply slot not filled.
6. A DVD+/-RW drive or DVD filler panel is required when selecting the B16-AA base chassis.
7. A SATA or SAS configuration must be selected with each XATO order. Cables for the chosen configuration will be installed, and cables for the other configuration will be included in the accessory kit. If it SAS configuration is chosen, the SAS cables will already be installed and the SATA cables and installation guide will be in the accessory kit.

**Sun Fire X4440 PCI-Express Card Support by OS**

For the latest information on PCI-Express card support, go to <http://www.sun.com/X4440/optioncards.jsp>

<i>PCI-Express Card</i>	<i>Sun P/N</i>	<i>Max Confi g</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>	<i>VMwar e</i>
Software RAID 0,1	Onboard SATA controller	N/A	Yes	Yes	Yes	Yes	Yes
8-port Internal SAS HBA	SG-PCIE8SAS-I-Z; SG-XPCIE8SAS-I-Z	1	Yes	Yes	Yes	Yes	Yes
8-port External SAS HBA	SG-XPCIE8SAS-E-Z	3	Yes	Yes	Yes	Yes	Yes
8-port Internal SAS SRL RAID HBA	SGPCIESAS-R-INT-Z; SGXPCIESAS-R-INT-Z	1	Yes	Yes	Yes	Yes	Yes
8-port External SAS SRL RAID HBA	SGXPCIESAS-R-EXT-Z	3	Q4FY08	Q4FY08	Q4FY08	Q4FY08	Q4FY08
Ultra320 SCSI 2-port HBA	SG-XPCIE2SCSIU320 Z	4	Yes	Yes	Yes	Yes	Yes

<b>PCI-Express Card</b>	<b>Sun P/N</b>	<b>Max Confi g</b>	<b>S10</b>	<b>RHEL 4</b>	<b>SLES 10</b>	<b>Win 2003</b>	<b>VMwar e</b>
4Gb Single-Port FC-AL	SG-XPCIE1FC-QF4	3	Yes	Yes	Yes	Yes	Yes
4Gb Dual-Port FC-AL	SG-XPCIE2FC-QF4	3	Yes	Yes	Yes	Yes	Yes
4Gb Single-Port FC-AL	SG-XPCIE1FC-EM4	3	Yes	Yes	Yes	Yes	Yes
4Gb Dual-Port FC-AL	SG-XPCIE2FC-EM4	3	Yes	Yes	Yes	Yes	Yes
Dual Port 4x Infiniband HBA	X1236A-Z	2	Yes	Yes	Yes	No	TBD
Dual Port DDR Infiniband HBA	X4217A-Z	2	Yes	Yes	Yes	No	TBD
Dual Gigabit-Ethernet (copper)	X7280A-2	4	Yes	Yes	Yes	Yes	Yes
Dual Gigabit-Ethernet (fiber)	X7281A-2	4	Yes	Yes	Yes	Yes	Yes
Quad Gigabit-Ethernet (copper)	X4446A-Z	4	Yes	Yes	Yes	Yes	Yes
10 Gigabit-Ethernet (fiber)	X1027A-Z	2	Yes	Yes	No	Yes	No
10 Gigabit Ethernet SR XFP Transceiver	X5558A	N/A	N/A	N/A	N/A	N/A	N/A
10 Gigabit Ethernet LR XFP Transceiver	X5560A	N/A	N/A	N/A	N/A	N/A	N/A

## Sun Fire X4440 Storage Options

<i>Workgroup Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
<b>Sun StorageTek 2540 FC Array</b>	ST2540	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			
<b>Sun StorageTek 2530 SAS Array</b>	ST2530	SG-XPCIE8SAS-E-Z	SG-XPCIE8SAS-E-Z	SG-XPCIE8SAS-E-Z	SG-XPCIE8SAS-E-Z
<b>Sun StorageTek 1400 SAS Array</b>	ST1400	SG-XPCIE8SAS-E-Z, SGXPCIESAS-R-EXT-Z	SG-XPCIE8SAS-E-Z, SGXPCIESAS-R-EXT-Z	SG-XPCIE8SAS-E-Z, SGXPCIESAS-R-EXT-Z	SG-XPCIE8SAS-E-Z, SGXPCIESAS-R-EXT-Z
<b>Sun StorEdge 3320 SCSI (RAID)</b>	XTA3320	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z
<b>Sun StorEdge 3320 SCSI (JBOD)</b>	XTA3320	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z
<b>Sun StorEdge 3510 FC Array (RAID)</b>	XTA3510	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			
<b>Sun StorEdge 3510 FC Array (JBOD)</b>	XTA3510	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			
<b>Sun StorEdge 3120 SCSI (JBOD)</b>	XTA3120	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z	SG-XPCIE2SCSIU320Z
<b>Sun StorageTek 2510 iSCSI Array</b>	ST2510	Ethernet	Ethernet	Ethernet	Ethernet

<i>Midrange Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
<b>Sun StorageTek 6140</b>	ST6140	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			

<i>Midrange Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
<b>Sun StorageTek 6540</b>	ST6540	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			

The ST9900 High End Data Center Storage System supports a wide variety of Sun servers based on SPARC, AMD Opteron and Intel Xeon processors. Please refer to your local Sun Storage Sales or SE Specialist, and have them refer to the following documents:

- “What Works With What” document located at SunWin Token 344150
- “Feature Availability Report” document located at SunWin Token 385413

<i>Data Center Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
<b>Sun StorEdge 9985</b>	SE9985	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	TBD	TBD	TBD
<b>Sun StorEdge 9985V</b>	SE9985 V	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	TBD	TBD	TBD
<b>Sun StorEdge 9990</b>	SE9990	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	TBD	TBD	TBD
<b>Sun StorEdge 9990V</b>	SE9990 V	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	TBD	TBD	TBD
<b>Sun StorEdge 9980</b>	SE9980	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	TBD	TBD	TBD

<i>NAS Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
<b>Sun StorageTek 5220</b>	XTB5220	Ethernet	Ethernet	Ethernet	Ethernet

<i>NAS Storage Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
Sun StorageTek 5320	XTB5320	Ethernet	Ethernet	Ethernet	Ethernet

## Sun Fire X4440 Tape and Applications

<i>Standalone Tape Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
LTO2V SCSI Desktop (half height)	SG-XTAPLTO2V-D/ SG-XTAPLTO2V-R	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
DAT 72 Desktop (SCSI/USB)	SG-XTAPDAT72-D2	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
DAT 72 1U (SCSI/USB) Rackmount	SG-XTAPDAT72-R-2	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
LTO 3 Desktop (SCSI – half height new)	SG-XTAPLT03-D-2	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
LTO 3 2U Rackmount	SG-XTAPLT03-R-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
SDLT 320 Desktop (SCSI)	SG-XTAPSDLT320-D-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z
SDLT 600 Desktop (SCSI)	SG-XTAPSDLT600-D-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z	SG-XPCIE2SCSIU 320Z

Tape and library support varies by backup storage applications listed below. Please refer to your local Sun Storage Sales or SE Specialist, and have them refer to the “Library, Tape and Application” support matrix.

<i>Tape Library Options</i>	<i>Sun SKU</i>	<i>S10</i>	<i>RHEL 4</i>	<i>SLES 10</i>	<i>Win 2003</i>
Autoloader C2 (2RU) SCSI	SG-XAUTO8LTO3-C2/ SG-XAUTO16LTO3-C2/ SG-XAUTO8SDLT6-C2Z/ SG-XAUTO8LTO2-C2/ SG-XAUTO16LTO2-C2/ C2-DLTS3-SC-8-Z/ C2-DLTS4-SC-16-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z

<b>Tape Library Options</b>	<b>Sun SKU</b>	<b>S10</b>	<b>RHEL 4</b>	<b>SLES 10</b>	<b>Win 2003</b>
<b>Tape Library C4 (4RU) SCSI</b>	SG-XLIBSDLTS-C4-Z/ SG-XLIBLTOS-C4-Z,	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z
<b>Tape Library C4 (4RU) FC</b>	SG-XLIBSDLTFC-C4/ SG-XLIBLTOFC-C4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4
	SG-XLIBSDLTS-C4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4
<b>Autoloader SL24 SCSI</b>	SL24-IL2H-SCSI-Z/ SL24-IL3H-SCSI-Z/ SL24-IL3-SCSI-Z/ SL24-IL4-SCSI-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z
<b>Autoloader SL24 FC</b>	SL24-IL3-FC-Z/ SL24-IL4-FC-Z	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4
<b>Tape Library SL48 SCSI</b>	SL48-IL2H-SCSI-Z/ SL48-IL3H-SCSI-Z/ SL48-IL3-SCSI-Z/ SL48-IL4-SCSI-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z
<b>Tape Library SL48 FC</b>	SL48-IL3-FC-Z/ SL48-IL4-FC-Z	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4	SG-XPCIE1FC-QF4/ SG-XPCIE2FC-QF4/ SGXPCIE2FC-EM4/ SGXPCIE1FC-EM4
<b>StorageTek SL500 SCSI</b>	SL500-30-SCSI-Z/ SL500-50-SCSI-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z
<b>StorageTek SL500 FC</b>	SL500-30-FC-Z/ SL500-50-FC-Z	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4

<b>Tape Library Options</b>	<b>Sun SKU</b>	<b>S10</b>	<b>RHEL 4</b>	<b>SLES 10</b>	<b>Win 2003</b>
<b>High voltage to low voltage conversion kit</b>	YXSL700/180HVD-LVD	N/A	N/A	N/A	N/A
<b>SCSI to 1Gb fiber channel conversion kit</b>	YXSL180-1GB-FC	N/A	N/A	N/A	N/A
<b>SCSI to 2Gb fiber channel conversion kit</b>	YXSL180-2GBFC	N/A	N/A	N/A	N/A
<b>StorageTek L1400 SCSI</b>	SL1400MA-STK-Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z	SG-XPCIE2SCSIU3 20Z
<b>StorageTek L1400 FC</b>	SL1400-M1-STK-Z	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			
<b>Sun StorageTek SL8500 FC</b>	SL8500-BASE-LIB-Z	SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4			

<b>Tape Backup Storage Applications</b>	<b>S10</b>	<b>RHEL 4</b>	<b>SLES 10</b>	<b>Win 2003</b>
<b>Symantec (Veritas) NetBackup</b>	Client Only	Client/Server 32-bit/64-bit	Client Only	Client/Server 32-bit
<b>Sun EBS / EMC (Legato) Networker</b>	Client/Server 64-bit	Client/Server 32-bit/64-bit	Client/Server 64-bit	Client/Server 32-bit/64-bit
<b>CA BrightStor ARCserve</b>	Not supported	Client/Server 32-bit/64-bit	Client/Server 64-bit	Client/Server 32-bit/64-bit
<b>IBM TSM</b>	Client/Server 32-bit/64-bit	Client/Server 32-bit/64-bit	Not supported	Client/Server 32-bit/64-bit
<b>Symantec (Veritas) Backup Exec</b>	Not supported	Not supported	Not supported	Client/Server 32-bit
<b>HP DataProtector</b>	Not supported	Client/Server 64-bit	Client/Server 64-bit	Client/Server 64-bit
<b>BakBone NetVault</b>	Client/Server 32-bit/64-bit	Client/Server 32-bit/64-bit	Client/Server 64-bit	Client/Server 32-bit/64-bit

# Services

## Warranty Support

The Sun Fire X4440 server has a three year, next business day warranty.

Duration: 3 years Next Business Day  
 HW Coverage Hours: Business Hours  
 HW Response Times: Next Business Day  
 Delivery Method: Parts Exchange or Onsite  
 HW Phone Coverage: Business Hours  
 HW Phone Response Time: 8 hours

## 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: [www.sun.com/comparewarranty](http://www.sun.com/comparewarranty)

## SunSpectrum Service Plans

SunSpectrum Service Plans provide integrated hardware and Solaris OS support for Sun systems as well as comprehensive storage system support. For each Sun system, customers

### 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](http://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 Plan for Sun Fire X4440 Server

The following are part numbers and descriptions for the warranty upgrade to SunSpectrum Service Plan

<b>Part Number</b>	<b>Description</b>
W9D-B16-1S	Sun Fire X4440 server upgrade to 1 year of Silver support
W9D-B16-1G	Sun Fire X4440 server upgrade to 1 year of Gold support
W9D-B16-24-1G	Sun Fire X4440 server upgrade to Gold support + 7X24 On-Site support for 1 year
W9D-B16-1P	Sun Fire X4440 server upgrade to 1 year of Platinum support
W9D-B16-3S	Sun Fire X4440 server upgrade to 3 years of Silver support
W9D-B16-3G	Sun Fire X4440 server upgrade to 3 years of Gold support
W9D-B16-24-3G	Sun Fire X4440 server upgrade to Gold support + 7X24 On-Site support for 3 years
W9D-B16-3P	Sun Fire X4440 server upgrade to 3 years of Platinum support

## Sun<sup>sm</sup> System Service Plans for Windows OS

The Sun<sup>sm</sup> System Service Plans for Windows OS are designed to be flexible enough to cover most customers' requirements for support:

Highlights:

- Integrated whole-system support for Sun's X64 systems running Microsoft Windows
- All the essentials for one great price
- Priority service
- No "per incident" limits

## Warranty Upgrade to Sun<sup>sm</sup> System Service Plans for Windows OS for Sun Fire X4440 Server

The following are part numbers and descriptions for the warranty upgrade to Sun<sup>sm</sup> System Service Plans for Windows OS:

<b>Part Number</b>	<b>Description</b>
W9D-B16W-1S	Sun Fire X4440 Server with Windows Operating System Upgrade to 1 year of Silver support
W9D-B16W-1G	Sun Fire X4440 Server with Windows Operating System upgrade to 1 year of Gold support
W9D-B16W-1P	Sun Fire X4440 Server with Windows Operating System Upgrade to 1 year of Platinum support
W9D-B16W-3S	Sun Fire X4440 Server with Windows Operating System Upgrade to 3 years of Silver support
W9D-B16W-3G	Sun Fire X4440 Server with Windows Operating System Upgrade to 3 years of Gold support
W9D-B16W-3P	Sun Fire X4440 Server with Windows Operating System Upgrade to 3 years of Platinum support

## Warranty Upgrade to Sun HW Only Service for Sun Fire X4440 Server

Part Number	Description
W9D-B16-SD-1H	Sun Fire X4440 server upgrade to 1 year of same day hardware only support
W9D-B16-SD-3H	Sun Fire X4440 server upgrade to 3 years of same day hardware only support
W9D-B16-24-1H	Sun Fire X4440 server upgrade to 1 year of 7x24 hardware only support with 4 hour response
W9D-B16-24-3H	Sun Fire X150 server upgrade to 3 years of 7x24 hardware only support with 4 hour response
W9D-B16-22-1H	Sun Fire X4440 server upgrade to 1 year of 7x24 hardware only support with 2 hour response
W9D-B16-22-3H	Sun Fire X4440 server upgrade to 3 years of 7x24 hardware only support with 2 hour response

## Installation Service for Sun Fire X4440 Server

Sun's exceptional support for server installation is also available for the Sun Fire X4440 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>

## Learning Services

Sun offers a wide range of expert training services, from consulting to courseware to certification, to improve expertise and accelerate productivity, to help enable maximum uptime for IT environments, & to provide lower total cost of ownership for technology investments.

All of these courses are available at:

<https://slp.sun.com/sun>

<https://slp.sun.com/partners>

## HPC Quick Start Services

Sun provides a suite of services to help customers architect, deploy and manage their High Performance Computing (HPC) environments for faster time to deployment and with reduced risk. Our expertise includes installation, integration, training, and ongoing support of network connections, software stacks, and thousands of cores in a large-scale, high-density environment. More info.: <http://sun.com/service/hpc>

## Sun HPC Quick Start Services

### Sun HPC Quick Start Services — Implement

*Speed design, and implementation of your HPC solution*

- Reduce deployment time by up to 80%
- Prepare infrastructure for business
- Reduce risk
- Control & reduce cost
- **Key Included Services**
  - > Application Readiness Services (PS)
  - > Installation Services (EIS)
  - > Integrated Services for x4500, x4600, 8000, & 8000p servers (System Packs)
  - > Professional Services for your specific configuration & migration needs (PS)

### Sun HPC Quick Start Services — Optimize

*Accelerate the time to optimize and manage HPC solutions*

- Speed time to achieve performance goals & improvement
- Reduce risk & cost
- Maximize IT assets
- **Key Included Services**
  - > Managed Services (MS)
  - > Performance analysis and tuning to business needs (PS)
  - > Professional Services (PS)
  - > Proactive & continued infrastructure monitoring (Mgd Ops)
  - > Control Tower Appliance included (Mgd Ops)
  - > Incident Response Services (Mgd Ops)

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## 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>

# Glossary

1U or RU	One rack unit as defined by the Electronic Industries Alliances (EIA). A vertical measurement equal to 1.75 inches.
ATA	AT-Attachment. A type of hardware interface widely used to connect hard disks, CD-ROMs and tape drives to a PC.
ChipKill <sup>T</sup>	ChipKill, or advanced ECC memory, is an IBM xSeries memory subsystem technology that increases memory reliability several times over, helping to reduce the chances of system downtime caused by memory failures.
ECC	Error Correcting Code. A type of memory that corrects errors on the fly.
Ethernet 10/100/1000Base-T	The most widely used LAN access method defined by the IEEE 802.3 standard; uses standard RJ-45 connectors and telephone wire. 100Base-T is also referred to as Fast Ethernet. And 1000Base-T is also referred to as Gigabit Ethernet.
FRU	Field Replaceable Unit.
Hot-pluggable	A feature that allows an administrator to remove a drive without affecting hardware system integrity.
Hot-swappable	A feature that allows an administrator to remove and/or replace a device without affecting software integrity. This means that, while the system does not need to be rebooted, the new component is not automatically recognized by the system.
EIDE	See ATA.
IKE	Internet Key Exchange. A method for establishing a security association that authenticates users, negotiates the encryption method and exchanges the secret key. IKE is used in the IPSec protocol.
I/O	Input/output. Transferring data between the CPU and any peripherals.
IPSec	IP Security. A security protocol from the IETF (Internet Engineering Task Force) that provides authentication and encryption over the Internet. Unlike SSL, which provides services at layer 4 and secures two applications, IPSec works at layer 3 and secures everything in the network.
IPMI	Intelligent Platform Management Interface. System management architecture for providing an industry-standard interface and methodology for system management.
L2 cache	Also referred to as Ecache or External Cache. A memory cache external to the CPU chip.
MTBF	Mean Time Between Failures. The average time a component works without failure.
RAM	Random Access Memory.
SAS	Serial Attached SCSI. A serial hardware interface that allows the connection of up to 128 devices and point-to-point data transfer speeds up to 3 Gbits/sec.
SATA	Serial Attached ATA. The resulting evolution of the ATA (IDE) interface from a parallel to a serial and from a master-slave to a point-to-point architecture with data transfer speeds up to 1.5 Gb/s.
SCSI	Small Computer Systems Interface. Pronounced "scuzzy." An ANSI standard hardware interface that allows the connection of up to 15 peripheral devices to a single bus.
SNMP	Simple Network Management Protocol. A set of protocols for managing complex networks. The first versions of SNMP were developed in the early 80s. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.
X86	Refers to the Intel 8086 family of microprocessor chips as well as compatible microprocessor chips made by Intel and others.

# Materials Abstract

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

Collateral	Audience	Purpose	SunWIN Token #
<b>Sales Tools</b>			
• <i>Sun Fire X4440 Server Datasheet</i>	Customer	Sales Tool, Training	509884
• <i>Sun Fire X4440 Server Just the Facts</i>	Sales, SEs, Partners	Sales Tool, Training	509885
• <i>Sun Fire X4440 Server Customer Presentation</i>	Sales, SEs, Partners, Customer	Sales Tool, Training	509870
• <i>Sun Fire X4440 Server Technical Presentation</i>	Customer Presentation	Sales Tool, Training	509871
• <i>Sun Fire X4440 Server Sales Presentation</i>	Sales, SEs, Partners	Training	509889
• <i>Sun Fire X4440 Server Technical Whitepaper</i>	Sales, SEs, Partners, Customer	Sales Tool, Training	509874
• <i>Sun Fire X4440 Server Reviewer's Guide</i>	Customer	Sales Tool, Training	509891
<b>External Web Sites</b>			
• <i>Sun Fire X4440 Server Web Site</i>	<a href="http://www.sun.com/servers/x64/X4440">http://www.sun.com/servers/x64/X4440</a>		
<b>Internal Web Sites</b>			
• <i>Sun Fire X4440 Server Internal Web Site</i>	<a href="http://mysales.central.sun.com/public/systems/volume/X4440/">http://mysales.central.sun.com/public/systems/volume/X4440/</a>		
<b>Reseller Web Site</b>			
• <i>Sun Reseller General Information</i>	<a href="http://TBD">http://TBD</a>		

# Competitive Information

## Positioning Sun Fire X4440 server

### Elevator Pitch

Using AMD Opteron processors, the Sun Fire X4440 is the industry's ONLY 2-RU, 4-socket enterprise class x64 server that combines ultra scalability with unmatched density, making it the ideal system for virtualization and consolidation.

### Value Proposition

- Sun Fire X4440 can run a broad range of Solaris, Linux, Windows and VMware applications more efficiently and more quickly.
- Sun Fire X4440 has up to two times internal storage<sup>3</sup> and integrated networking connectivity<sup>4</sup> than other systems in the same class, leaving more headroom to grow.
- Sun Fire X4440 is energy efficient, consumes less power, requires less cooling, and reduces negative impact to the environment.
- Sun Fire X4440 comes standard with integrated Lights Out Manager for system management and monitoring at no extra cost. It also has redundant and hot-swappable components, such as cooling fans, power supplies and disk drives, that makes component swap-out fast, easy and effortless.
- Sun Fire X4440 is designed to integrate future AMD Opteron processors – HE, standard, or SE parts – and is compatible with six-core processors
- Sun Fire X4440's compact size allows customers to optimize rack density.

### Key Differentiators

- Highly expandable with twice the amount of memory and internal storage, as well as integrated networking connectivity as other systems in the same class
  - 32 memory DIMM slots (256GB of memory with 8GB DIMMs)
  - 8 internal disk drives (over 2 TB of internal storage)
  - 4 GbE ports on-board
- Extreme I/O capabilities with 6 PCI-Express slots
- Integrated Lights Out Manager comes standard at no extra cost
- RAID 0,1,5,6 capability

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<sup>3</sup> Compared to IBM x3755

<sup>4</sup> Compared to HP DL585 G2, Dell PE6950, IBM x3755

## Competitive Positioning

### HP competitive offerings

HP DL545 G5  
and HPDL585  
G6

SF X4440 has the same CPU, memory, and storage capacity as the DL585 G5 or DL585 G6 at half the size. This saves real estate in a data center. Compared to the HP DL 585 G2 and DL585 G5, customers can install more SF X4440 servers in a single rack, which allows them to save space and money by reducing the need for extra racks.

The SF X4440 offers two additional, independent 2GbE ports (4 total ports) vs. the HP DL585 G2 and DL 585 G5. When only 2GbE ports were offered with earlier x64 Servers, Sun noticed the number 1 option card sold was a dual GbE card. To obtain 4 GbE ports on an HP DL585 G2 or DL585 G5, the customer must purchase an additional Dual GbE card for their server, which costs an additional \$229. The customer must use 1 of the available PCIe slots (1 of the 7 PCIe used for just Dual GbE).

The SF X4440 is more energy efficient than the HP DL585 G2. The SF X4440 only requires a 1050W power supply to drive 4 Dual Core processors, 6 PCIe cards, 32 DIMM slots, and 8 SAS drives whereas the HP DL585 G2 requires a 1300W power supply to drive the same amount of processors, memory, and hard drives.

HP offers Eco-friendly products and services to help customers manage the power consumption of their data centers. With each product HP also provides documentation for use by end-of-life recyclers or treatment facilities. It provides the basic instructions for the disassembly of HP products to remove components and materials requiring selective treatment, as defined by EU directive 202/96/EC, Waste Electrical and Electronic Equipment (WEE).

HP sells the fact that their ProLiant systems are specifically designed for dense server environments by including lights-out technology for reduced reactive support time, fault resilient technologies for reduced downtime, and balanced performance architectures to handle greater workloads for various applications.

### IBM competitive offerings

## Competitive Positioning

### IBM x3755

The x3755 has less processing power than the SFX4440 because it does not support Six-Core AMD Opteron CPUs. The x3755 has a maximum of 16 processing cores while the SF X4440 has a maximum of 24 processing cores. This means the SF X4440 will significantly outperform the x3755.

SF X4440 has the same CPU and storage capacity as the x3755 at half the size. Compared to the x3755, Customers can install more SF X4440 servers in a single rack, allowing them to save space and money by reducing the need for extra racks.

With a smaller, compact drive size (2.5" vs. 3.5" for IBM), Sun can support twice the number of SAS drives as IBM. With the ability to host a total of 8 2.5" SAS drives, customers can achieve one or more of the following benefits: better redundancy, more RAID options, higher storage throughput given there are more spindles.

The SF X4440 offers six PCIe slots compared to four on the IBM x3755 server. The SF X4440 also offers two additional, independent 2GbE ports (4 total ports) compared the IBM x3755 (2 ports). When only 2GbE ports were offered with earlier x64 Servers, Sun noticed the number 1 option card sold was a dual GbE card. To obtain 4 GbE ports on an IBM x3755 server, the customer must purchase an additional Dual GbE card for \$269. Customers must also use 1 of the available PCIe slots. With the Dual Port Server Adapter, x3755 will have half as many PCIe slots as the SF X4440 - only 3 slot available to add in optional PCIe cards from IBM.

The SF X4440 is more energy efficient than the IBM x3755 Server. The SF X4440 only requires a 1050W power supply to drive 4 Dual Core processors, 6 PCIe cards, 32 DIMM slots, and 8 SAS drives whereas the IBM X3755 requires a 1500W power supply to drive the same amount of processors and memory, but only 4 PCIe cards and 4 SAS drives.

Every SF X4440 shipped comes standard with the Integrated Lights Out Manager. To obtain LOM functionality in an IBM x3755 server the customer must purchase the Remote Supervisor Adapter II Slimline (FSA II Slimline) for an incremental \$385. Remote systems management is not a standard feature with the IBM x3755 like it is with the SF X4440.

IBM sells at higher levels in a corporation, at times above a CIO. IBM will lose money on System x hardware when bundling with IBM middleware, storage, services or financing. IBM will sell its ability to deliver models to customers faster. IBM will use periodic web/hard drive/memory promotions to gain business. IBM will push its qualification matrix (more versions of Oses, more EMC storage, etc...) to its advantage in certain deals. IBM will use its better/longer/more-in-depth expertise in Windows/VMware to advantage to position Sun as a one dimension x86 player.

### Dell competitive offerings

## Competitive Positioning

Dell PE R905	<p>SF X4440 has the same CPU capacity as the PE R905 at half the size. Compared to the PE R905, Customers can install more SFX4440 servers in a single rack, allowing them to save space and money by reducing the need for extra racks.</p> <p>The SF X4440 is more energy efficient than the PE R905. The SF X4440 only requires a 1100W power supply to drive 4 Dual- or Quad-Core processors, 32 DIMM slots, and 8 SAS drives whereas the Dell PE R905 requires a 1100W power supply to drive the same amount of processors, memory, and storage.</p> <p>Although the Dell PE R905 has seven PCIe slots, it only has 2 x8 lanes with the remaining 5 slots as x4 lane. The SF X4440 has six PCIe slots – 1 x16 lane, 4 x8 lanes, and 1 x4 lanes. A PCIe card will be able to fit into a slot of its size or bigger. If the customer requires a x16 lane card, the Dell PE R905 will not be able to support the workload. Also, Dell PE R905 cannot support more than 2 x8 lane cards. The SF X4440 can support up to 5 x8 lane cards. Thus, customers using the Dell PE R905 will be severely limited to using a majority of x4 lane cards.</p> <p>Every SF X4440 shipped comes standard with an Integrated Lights Out Manager. To obtain LOM functionality in the Dell PE R905 server the customer must purchase the Dell Remote Access Card, 5th Generation for PowerEdge Remote Management for an incremental \$299. System management is a taxed option on a Dell PE R905, but always comes standard on a SF X4440 server.</p>
Dell PE6950	<p>SF X4440 has the same CPU capacity as the PE6950 at half the size. Compared to the PE6950, Customers can install more SFX4440 servers in a single rack, allowing them to save space and money by reducing the need for extra racks.</p> <p>SF X4440 has more memory DIMM slots, bringing the total addressable memory to 128GB, which is twice as much as Dell PE6950. What's the benefit? More available memory for memory intensive applications resulting in increased performance using those applications.</p> <p>SF X4440 offers more SAS drives than Dell's PE6950. With the ability to host a total of 8 2.5" SAS drives, customers can achieve one or more of the following benefits: better redundancy, more RAID options, higher storage throughput given there are more spindles</p> <p>The SF X4440 offers two additional, independent 2GbE ports (4 total ports) compared to the Dell PE6950 (2 ports). To obtain 4 GbE ports on an Dell PE6950, the customer must purchase an additional Dual GbE card for \$199 Card.</p> <p>The SF X4440 is more energy efficient than the PE6950. The SF X4440 only requires a 1050W power supply to drive 4 Dual- or Quad-Core processors, 32 DIMM slots, and 8 SAS drives whereas the Dell PE 6950 requires a 1570W power supply to drive the same amount of processors, but only 8 DIMM slots and just 4 SAS drives.</p> <p>Every SF X4440 shipped comes standard with an Integrated Lights Out Manager. To obtain LOM functionality in the Dell PE6950 server the customer must purchase the Dell Remote Access Card, 5th Generation for PowerEdge Remote Management for an incremental \$299. System management is a taxed option on a Dell PE6950, but always comes standard on a SF X4440 server.</p> <p>RAID 6 support is an option on X4440 Servers. Although the Dell PE6950 can support up to RAID 5, RAID 6 is not an option. The main improvement RAID 6 offers over RAID 5 is the fact that a RAID 6 configuration is capable of double-parity, allowing two separate parity stripe units to be stored on two separate spindles. This addresses one of the main problems of RAID 5 which is the extended rebuild times in the face of large size of current hard disks.</p>

## Competitive Positioning

Dell will always sell on price especially in the lower end units as this area is more price sensitive. Dell is looked at being more of a short-term investment with a higher TCO. Dell is not considered a leader in regards to support for integration and services. The PE6950 is also used in clustering for HPC applications due to the high number of flops. Specifically, Dell uses the PE 1950 in a cluster configuration and again the same issues listed above are prevelant. The Dell deals in the HPC market are more on the public sector (education/healthcare/government) side or where price is the issue and they do provide excellent support for Dell products.

Attribute	Sun Fire X4440	HP DL545 G2/ HP DL585 G5	Dell PE R905	Dell PE6950	IBM x3755
Form Factor	2U	4U	4U	4U	4U
Processor	AMD Opteron Six-Core	AMD Opteron Six-Core	AMD Opteron Six-Core	AMD Opteron Dual Core	AMD Opteron Quad-Core
Socket	4-socket	4-socket	4-socket	4-socket	4-socket
Memory	32 DIMMs (256 GB max)	32 DIMMs (256GB max)	32 DIMMs (256GB max)	16 DIMMs (128GB max)	32 DIMMs (256GB max)
Disk Drives	8x 2.5" SAS	8x 2.5" SAS	8x 2.5" SAS or 5x 3.5" SATA	5x 3.5" SAS	4x 3.5" SAS
RAID	RAID 0,1,5,6	RAID 0,1,5,6	RAID 0,1,5,6	RAID 0,1,5	RAID 0,1,5,6
GigE Ports	4	2	4	2	2
I/O Slots	6x PCIe	2xPCI-X, 7x PCIe	7x PCIe	7x PCIe	2xPCI-X, 4x PCIe, 1xHTx
Hot Swap PSU	2x 1050W	2x 910/1300W	2x 1100W	2x 1570W	2x 1500W
Hot Swap Fans	Yes	Yes	Yes	Yes	No
Lights Out Manager	Integrated LOM	iLO2	IPMI 2.0 (add-on option)	IPMI 2.0 (add- on option)	IPMI 2.0 (add-on option)
Warranty	3 Yr NBD	3 Yr NBD	3Yr NBD	3 Yr NBD	3 Yr NBD

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