Sun Netra™ X4450 Server

Just the Facts

SunWIN token #517307

July 2009

Version 1.4

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Positioning

Introduction

Server spending in the telecommunications industry is growing at a faster rate than overall server market spending. IDC expects telecom server spending to increase at a 5.4% compound annual growth rate (CAGR) from almost $7.2 billion in 2006 to nearly $9.4 billion in 2011. This growth rate is more than double the 2.2% CAGR IDC expects for the server market as a whole. This telecom server spending represents 12.9% of total server market revenue in 2006, growing to 15% by 2011. Network equipment providers (NEPs) are expected to purchase servers in support of their own IT operations at a rate slightly higher than some other industries. Server spending in this segment is expected to increase at a 9.9% CAGR through 2011. Server spending by network service providers (NSPs) will grow at almost twice the rate of the overall market, with internal IT growing close to typical market rates.

Growth opportunities are being created in a number of distinct network equipment segmentations. The largest opportunities will be in routing and switching, as well as fiber access and video infrastructure. Overall, broadband and wireless will continue to proliferate rapidly in the developing world. Progress in the demand for content, maturation of critical IPTV applications, and proven network scalability could drive carriers to accelerate deployments. Many countries still have extremely low overall penetration rates for broadband and wireless, and some of the least developed countries have relatively low penetration for voice telephony services on any platform. Key markets with huge short-term growth potential include China, India, Brazil, and Russia.

The Sun Netra X4450 server delivers dramatic performance and unmatched expandability in a 4RU 20-inch deep compact form factor making it ideal to meet the ever increasing demands of tomorrow's network infrastructure. This eco-friendly carrier-grade server can expand up to a 16-way configuration with four quad core Intel® Xeon® processors, up to 128GB of memory, and over 1TB of internal storage - a perfect choice for consolidation and virtualization.

One of the industry's most flexible and highest capacity ruggedized servers, the Netra X4450 offers a choice of multiple operating systems, 32 memory slots, 12 internal disk drives, and 10

PCI slots. This server also integrates four Gigabit Ethernet ports to provide connectivity for high-speed, high-bandwidth networking. System uptime is enhanced by redundant hot-swappable AC/DC power supplies and hot-pluggable hard disk drives. Additionally, the Sun Netra X4450 server comes with Integrated Lights Out Management (ILOM) enabling simple remote monitoring and management from anywhere on the network.

As with other Netra servers, the Netra X4450 is a NEBS Level 3 certified and ETSI compliant server making it ideal for the most demanding applications in the toughest environments. In addition to supporting the Solaris™ Operating System, the Sun Netra X4450 server also provides support for Linux and Windows operating systems offering customers unmatched flexibility, efficiency, and investment protection.

Key Messages:

- **Performance...do more with less**
    - Run a broad range of applications more efficiently and quickly

- **Expandability and Density...... headroom to grow your business**
    - Up to 32 memory slots, 10 PCI slots, and over 1TB of storage capacity in a 4RU 20-inch deep carrier-grade package.

- **Energy-efficient.....save power and cooling costs**
    - Customers can save on energy consumption, cooling cost and the environment

- **Manage and Monitor the System.....locally or remotely**
    - Integrated Lights Out Manager allows full remote KVMS functionality with video and media redirection
    -

- **Maximize Uptime**
    - Ruggedized packaging provides a high level of system reliability which helps ensure that the Sun Netra X4450 servers continue to operate under the extremes of environmental conditions.
    - Hot-swappable disk drives and power supplies make drive replacement fast and easy
    - SAS host bus adapters offer RAID choices to meet the customer's requirements

- **Multi-platform......less complexity**
    - Runs Solaris, Linux and Windows operating systems
    - Standardize on one hardware platform for all major operating systems in the network infrastructure

- Supports full-height and full-length PCI-X and PCIe cards allowing the use of legacy telecommunication cards.

- Netra based servers are used around the globe in a variety of locations including telecommunications, central offices and wireless base stations, Internet data centers, metropolitan area networks, POPs, and enterprise service provider infrastructures. The Netra X4250 reaffirms Sun's commitment to customers who invested in the Netra product line by offering a product that delivers enhanced performance/throughput, consistent form, fit, and function.

Key Product Features, Functions, and Benefits

Sun Netra X4450 Server Key Features, Functions, and Benefits

Feature	Function	Benefit
Intel Xeon Processors	• Supports the latest embedded Quad-Core Intel Xeon processors, placing up to 16 CPU cores in a single form factor	• Nearly doubles computing resources with minimal power and cooling increases
High Performance in class	• Sufficient power-envelope to support the today and tomorrow's embedded Intel Xeon processors • Delivers both 32- and 64-bit enterprise-class computing	• Provides fast performance in this class of servers • Increases performance while providing investment protection for existing 32-bit applications
Up to 128 GB of memory with ECC and ChipKill.	• Support memory-intensive applications • ECC provides automatic single-bit error correction • ChipKill allows a single DRAM chip to fail and the system will continue to run	• Improve application performance • ECC helps to ensure data integrity • improving availability • ChipKill improves system availability
Four onboard 10/100/1000-Mbps Ethernet ports	• Exceptional I/O performance and increased network reliability by providing redundancy	• Increases network efficiency, flexibility, and availability
10 PCI Slots: 6x PCIe slots for MD2 low profile cards – one of these slots is used for the SAS HBA (host bus adapter) 2x PCIe slots for full-height, full-length cards 2x PCI-X slots for full-height, full-length cards	• Allows connectivity to additional network or storage while supporting full CPU path bandwidth.	• Enables flexibility to meet evolving business and application requirements. • Full height/full length slots allow the use of legacy telecommunication cards
Redundant AC/DC power supplies with separate power cords	• A fully configured system can run on any two of the four power supplies; the third and fourth power supplies are for redundancy and load sharing	• Increase availability and helps ensure uptime of critical applications.
NEBS Level-3 certification	• Enables continuous operation in earthquake Zone 4 environments: complies with regulatory regulations for deployment in central office environments	• Maximizes availability and decreases downtime due to environmental conditions

Feature	Function	Benefit
Ruggedized enclosure with best in class serviceability	• Provides the highest levels of protection from temperature fluctuations, humidity, vibration, pollutants, or other air contaminants such as dust; resist/retard fire or other electrical hazards	• Increases reliability and availability. Minimizes downtime due to environmental conditions
Hot-swappable HDDs	• Performance for I/O-bound applications and redundancy for mission-critical data	• Increase performance and availability
Integrated DVD RW	• Ability to read and write to a removable media access device	• Enables customers to store data on a removable media access device without external storage or hard drive requirements
Runs applications on: Solaris 10 Linux (RHEL and SLES) Windows Server 2003/2008 VMware	• Run applications on industry standard platform running OS of choice	• Maximize application performance with best OS • Ease transition to 64-bit computing • Maximize IT investment by standardizing hardware to reduce required training and spares
Dry Contact Alarms	• Four programmable alarms : Critical, Major, Minor, and User. Critical, Major, and Minor alarms are to be used to denote corresponding system states while User alarm is user-definable	• Enables Telco operators to use a relay to signal fault conditions to a rack or control room panel as well as an alarm monitoring system
Integrated Lights-out Remote Management	• Remote management with full Keyboard, Mouse, Video, Storage (KVMS) • Remote media capability (floppy, CD etc.) • Full DMTF CLI • Browser UI for control of the system through a graphical interface. • IPMI 2.0 compliant for management and control • SNMP v1, v2c, v3 for system monitoring • Monitor and report system and component status on all FRUs	• All management which does not require physically touching the system can be performed remotely • Easily integrates into customer's existing management environment by supporting industry standards • ILOM is a core part of system, there is no additional charge for this functionality as with the competition
Sun Customer Ready Systems (CRS) program	• For factory-configured, pre-racked, custom Sun Netra X4450 servers, refer to the CRS program website: http://www.sun.com/crs	• Simplification and speed of system deployment

Product Family Placement

This product is a new entry in the Netra 4U product line.

• The Sun Netra X4450 server is Sun's high density NEBS x64 server which incorporates the latest embedded Quad-Core Intel Xeon processors, placing up to 16 CPU cores in a single form factor.

• It is applicable for those customers that have standardized on the X86 architecture and require support for multiple operating systems.

Feature Comparison of Sun Netra X4450 and Sun Fire™ X4450 Servers

Feature	Sun Netra X4450	Sun Fire X4450
CPU type	Embedded Quad-core Intel Xeon	Quad and Dual Core Intel Xeon
Processor speed	2.4 GHz	1.86 GHz to 2.93 GHz
Level 2 Cache	2x 3MB	2x 2MB or 2x 4MB
Memory Type	667 Mhz registered FB DIMM	667 Mhz registered FB DIMM
Max. memory	Up to 128GB	Up to 128GB
Max. internal disk drives	12x2.5" SAS	8x2.5" SAS or 6x2.5" SATA SSD
Removable media	DVD-R/W	DVD-R/W
PCI-E Slots	8 (one used for SAS HBA) Two of these are FL/FH	6 (one used for SAS HBA)
PCI-X Slots	2	None
Service Processor	Integrated LOM	Integrated LOM
Power Supplies	4 x 605W AC or DC	2 x 1050W AC
Form factor	4RU/ 20.87"	2RU/28"

Note that the above Sun Fire X4450 was EOL'd and replaced with the Next Gen Intel CPUs (Model E7400 series versus the E7300 series). The Netra version did not upgrade to the new CPUs.

Feature Comparison with Other Netra Rack Servers

Feature	Netra X4450	Netra T5440
CPU type	Quad Core Intel Xeon embedded processor	Up to 8 core (8 threads per core) UltraSPARC T2 plus
Number of CPU	4	2
Max. memory	Up to 128GB	Up to 128GB (up to 256 GB with 8GB DIMMS when available)
Max. internal disk drives	12x2.5" SAS	12x2.5"SAS SSD (coming soon)
Removable media	DVD-R/W	DVD-R/W
Interfaces	Four USB 2.0 ports, 1 x 10MB/s Ethernet & serial mgmt, one video	Four USB 2.0 ports, 1 x 10MB/s Ethernet & serial mgmt, one serial
PCI slots	2 PCI-X Slots(2x FL/FH) 8 PCIe Slots(2x FL/FH, 6x low profile – note one slot occupied by SAS HBA)	2 PCI-X Slots(2x FL/FH) 8 PCIe Slots(2x FL/FH, 6x low profile – note two slots shared with XAUI ports)
Ethernet	Quad GbE	Quad GbE Dual 10GbE from CPU
Form factor	4RU / 20.87"	4RU / 20.87"
Solaris OS version	Solaris 10, Linux, Windows, VMware	Solaris 10

Target Users

Target users are found in the following market areas:

- Network equipment providers, including wireless and wireline telecommunications infrastructures

- Service providers deploying data centers, POPs, or metropolitan area networks

- Government and military installations

- Manufacturing / Utilities

Target Applications

The Netra X4450 delivers extreme performance and flexibility with optimum power and space efficiency for the below targeted applications.

- Unified Messaging
- SoIP (Services over IP)
- Call Control
- Media and Signalling Gateways
- Operational System Support
- Home/Virtual Location registries (HLR/VLR)
- Digital Media
- Application Server
- Defense/Military /Intelligence applications include shipboard command and control, mobile weapons control and remote intelligence access servers

Selling Highlights

Market Value Proposition

The Sun Netra X4450 server combines the proven ruggedness and reliability of Sun Netra servers with industry-leading performance, efficiency, and expandability to deliver an optimal platform for consolidation. This four-socket 4RU x64 carrier-grade server supports quad core Intel Xeon processors and is ideal to meet the needs of tomorrows network infrastructures.

Do More With Less: High performing carrier-grade server helps to maximize Return On Investment.

More Headroom to Grow: More expandable in memory, storage and networking connectivity.

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 and disks lead to higher uptime. Ruggedized packaging provides a high level of system reliability which helps ensure that the Sun Netra X4450 servers continue to operate under the extremes of environmental conditions.

Investment Protection: Standardize on one hardware platform for all major operating systems in the network infrastructure. Support for full-height and full-length PCI-X and PCI-E cards allowing the use of legacy telecommunication cards. Reaffirms Sun's commitment to customers who invested in the Netra product line by offering a product that delivers enhanced performance/ throughput, consistent form, fit, and function.

Availability

The Netra X4450 server is now shipping.

Enabling Technology
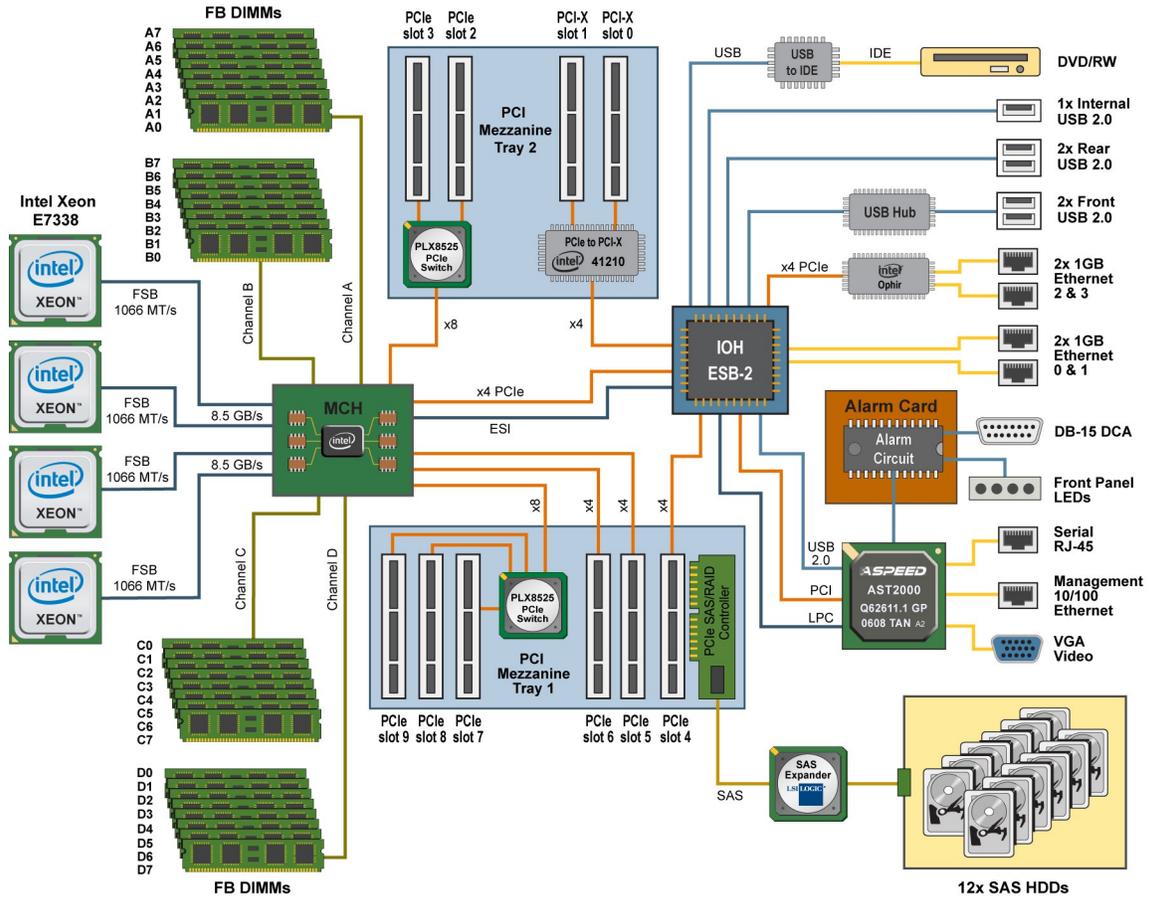
Sun Netra™ X4450 server block diagram

Technology Overview

The Sun Netra X4450 Server is a high-density, x64-based, rack-optimized servers which has the following system architectural features:

- Quad-Core Intel® Xeon® processor E7338 (embedded version)

- Ultra high density 4RU ~20" depth chassis design

- 32 memory slots that support commodity 2, and 4, Gigabyte FBDIMM modules (maximum capacity of 128 Gigabytes of system memory).

- 12x Hot-pluggable SAS Hard Disk Drive.

- Integrated Lights Out Manager

- 2 PCI-X Slots (2x FL/FH)and 8 PCIe Slots (2x FL/FH, 6x MD2 low profile, note one slot occupied by SAS HBA)

- 4x Hotplug high efficiency (92%+) AC/DC 650 watt power supplies.

- Four 10/100/1000 Ethernet RJ45 based ports

- 4 USB 2.0 ports 2-Front/2-Rear that can be used to install large capacity USB drives

- One Telco Alarm Port

Intel Xeon processor 7300 Series

The Quad-Core Intel Xeon processor 7300 series incorporate two die per processor package, with each die capable of containing two processor cores. In a Sun Netra X4450 server with four processors, this enables up to 16 execution cores in a single 4U enclosure. Some key features for the E7338 version processor used in the Sun Netra X4450 systems include on-die, 32 KB Level 1 instruction data caches per core and 3 MB shared Level 2 cache per die (6 MB Total Cache per processor) . The processors support a Dual Independent Bus (DIB) architecture with one processor on each bus, up to two processor sockets in a system. The DIB architecture provides improved performance by allowing increased FSB speeds and bandwidth. The 1066 MT/s Front Side Bus is based on a 266 MHz system clock for an 8.5 GBytes per second data transfer rate.

The Intel Xeon Processor 7300 series support Intel® Virtualization Technology for hardware-assisted virtualization within the processor. Intel Virtualization Technology is a set of hardware enhancements that can improve virtualization solutions. Intel Virtualization Technology is used in conjunction with Virtual Machine Monitor software enabling multiple, independent software environments inside a single platform.

Ultra High Density Chassis Design

Density is the cornerstone of the Sun Netra X4450 server design. The Netra X4450 is a 4U system that can house up to 16 processor cores, 128GB of memory (256GB memory when 8GB

DIMMS are available), over 1TB of internal storage (Note twice this with 300GB SAS drives when available in CY2009) with 4 GigE ports and ILOM onboard.

Remote Manageability With 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

ILOM Watchdog Timer

ILOM features a watchdog mechanism to detect and respond to system hang, should one ever occur. The ILOM watchdog is a timer that is continually reset by a user application as long as the operating system and user application are running. In the event of a system hang, the user application is no longer able to reset the timer. The timer will then expire and will perform an action set by the user, eliminating the need for operator intervention.

One of the benefits of the Netra X4450 Watchdog Timer functionality is the end-to-end coverage, from power-on-reset, through BIOS and OS boot, to user application execution. If enabled in the BIOS setup menus (default operation is disabled), the ILOM WDT will be set by initial BIOS code execution to a configurable timeout threshold. If this time limit expires before the OS can boot, start critical services, and the application begins to reset the timer, the ILOM can be configured to reset or power-off the host server, generating an alert for remote management.

Standardized IPMI management interfaces will be provided to the user application to configure and reset the ILOM watchdog function (final implementation plan is TBD).

System Architecture

Overview

The architecture of the Netra X4450 has multiple host processors connect to a Northbridge Memory Controller Hub (MCH 7300) which in turn connects to a Southbridge I/O Hub (IOH).

Front Side Bus

The Netra X4450 has multiple host processors interface to the Northbridge MCH over four Front-Side Buses (FSBs) operating at 1066MT/s. The 64-bit wide FSBs are capable of peak bandwidths of 8.5 GB/s. The Northbridge Memory Controller Hub (MCH) in turn connects to the Southbridge I/O Hub (IOH), enabling expandability along with high I/O throughput.

Northbridge

The Intel 7300, also known as Memory Controller Hub or MCH, controls up to 32 DIMM slots organized in 4 channels of 8 DIMMs each. The supported DIMM type is PC2-5300 DDR2-667 ECC FB-DIMMs and they must be populated by pair of identical DIMMs. The 7300 offers a total of 32 PCIe lanes.

Southbridge

The ESB-2 Southbridge is interconnected to the MCH using one ESI link and one PCIe link. The ESB-2 provides two built-in Gigabit Ethernet NICs going to external NIC ports 0 and 1. One Dual gigabit Intel Ophir 82571 is connected to the ESB-2 using a 4-lane PCIe link to provide two additional GigE NICs, port 2 and 3. From the ESB-2 two USB ports go to the rear of the system, one to an internal USB hub for two front accessible USB ports and one USB port is available inside the chassis for internal boot/storage USB-based devices (note: this port has not been NEB certified so is currently not supported). SAS configurations have the disk backplane connected to a PCIe HBA inserted in PCIe expansion slot 4.

Memory Subsystem

The Netra X4450 memory subsystem features four independent memory channels, with each channel supporting up to eight memory modules for up to 32 FBDIMMs per system. The system supports 667 MHz PC2-5300 DDR2 FBDIMM modules. Peak read bandwidth to the FBDIMMs is 5.3GB/s per channel, and peak write bandwidth is 2.7GB/s per channel. Memory modules feature Error Checking and Correcting (ECC) with Chipkill technology for high reliability.

AST2000

The Aspeed AST2000 combines the graphics controller and the Service Processor (SP or BMC) in one single chip, saving space and power. It is integrated on the motherboard and is powered via stand-by power to operate independently from the main system's power state. The AST2000 is connected to the ESB-2 using 2 USB ports for virtual devices and one 32-bit 33 Mhz PCI bus for data. The AST2000 provides one 10/100 MB/s Ethernet NIC and one SVGA Video port.

Design Approach

Close collaboration with design teams for follow-on SPARC and x86 based programs have resulted in the creation of system components that can readily be used either directly or as highly leveraged components by other platforms.

Expansion Slots

The Sun Netra X4450 server is well equipped with both legacy PCI-X slots, and the more current PCIe high-speed slots. The PCI slots are supported via two mezzanine PCI boards. The first PCI mezzanine board is designed on the top of the Sun Netra X4450 server motherboard and supports low profile PCIe cards only. The second PCI mezzanine board which is located near and below the first PCI mezzanine board supports full-height/full-length PCI-X and PCIe cards.

- PCIe Slots

    PCIe is a high speed, point-to-point dual simplex chip interconnect. It is designed as the next-generation system bus interconnect, replacing the aging PCI bus. The Netra X4450 supports 8 PCIe slots with the following configurations:

    - 2 x8 electrical/x16 mechanical supporting x1, x2, x4 and x8 full-height, full-length cards

    - 3 x8 electrical/x8 mechanical supporting x1, x2, x4 and x8 MD2 low profile cards

    - 3 x4 electrical/x8 mechanical supporting x1, x2, and x4 MD2 low profile cards. One of these slots is dedicated for the SAS PCIe HBA

- PCI-X Slots

    2 PCI-X full height and full length 64-bit/ 133 MHz, 3.3V slots are provided on the Sun Netra X4450 server to allow customers who need older PCI or PCI-X I/O cards to continue using the older generation of cards. They were designed to be able to support legacy telco PCI cards that are still full height and full length.

Internal Hard Disk I/O Subsystem

The Sun Netra X4450 server supports up to twelve hard disk drives. The SAS controller can support up to eight hard disk drives. In order to support all twelve disk drives a SAS expansion board with the LSISASX28 chip is designed to attach to the SAS hard disk drive board.

Disks are NEBS Certified SAS disks, 2.5-inch small form factor server grade, and are certified for 24x7 operation. Due to the small physical size of these drives and the high spindle speeds, access times to disk are extremely good. All disks are hot-pluggable.

A benefit of using small disks is that they allow designers to maximize the air intake area at the front of the server to improve airflow, further increasing environmental margins and server reliability.

Hardware RAID is supported on the Sun Netra X4450 server via SAS host bus adapters. The Netra X4450 server currently supports two SAS HBA.

- 8-port SAS host bus adapter supports RAID 0, 1, 0+1 (shipped with each standard configuration)

- 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 (available as an x-option or XATO option)

Telco Alarm Port

A DB15 connector is provide Telco alarm access to the system. The telco alarm function and connector pinouts are same as Netra 210, Netra 240, Netra 440, Netra T2000, Netra T5220, Netra X4250, and Netra T5440 systems.

Power Supplies

The Sun Netra X4450 server is equipped with a four 2+2 redundant hot-swappable power supply system. Two power supplies are sufficient to run a fully populated server, however for maximum protection against power supply failures, Sun recommends that all four power supplies be installed in the system at all times.

The power supplies are rated at 650 watts each. In normal operation, the power supplies share the power demands of the system equally. The four power supplies are independent such that any combination of two of the four 650W supplies can support the total max power requirements of a fully configured system.

Refer to the Specifications section for more information on power ratings.

Front and Back Panel Views

Operating System

Sun Netra X4450 Server Operating Systems

A world-class performance platform, the 64-bit Sun Netra X4450 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 Netra X4450 servers provide customers with more choices, within the same hardware architecture, than competing servers in its class.

Operating Systems		Quad Core Support	Factory Installed	Sold by Sun	Supported by Sun
Solaris 10 Update 4	32-bit/ 64-bit	Yes	Yes	Yes	Yes
Windows Server 2003 Standard and Enterprise Edition	32-bit/ 64-bit	Yes	No	No	Yes
Red Hat Enterprise Linux 5	32-bit/ 64-bit	Yes	No	Yes	Yes
SUSE Linux Enterprise Server 10	64-bit	Yes	No	Yes	Yes
SUSE Linux Enterprise Server 9	64-bit	Yes	No	Yes	Yes
Vmware ESX 3.0.2	64-bit	Yes	No	Yes	Yes
Windows Server 2008 Standard and Enterprise Edition	32-bit/ 64-bit	coming soon	No	No	Yes

Latest OS Information

For more information on the latest OS support for the Sun Netra X4450 Server , see
http://www.sun.com/servers/netra/x4450/os.html

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

Key Messaging

The Solaris 10 Operating System is a significant leap forward form 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 1/11th 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** (zetabyte 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 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 Intel Xeon 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 Netra X4450 Server is certified to run the Microsoft Windows Server 2003 Enterprise and Standard Edition operating systems and soon Windows 2008. 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 Netra X4450 Server will soon be 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.

Reliability, Availability, and Serviceability (RAS)

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

Reliability

- 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.

- Additional system design fundamentals and validation including certification to extreme carrier-grade NEBS and ETSI standards.

Availability

- High CPU density available with quad core combined with the small form factor of the Sun Netra X4450 servers allow redundant deployment in a compact space to increase overall service availability.

- Redundant hot-swappable power supplies allow for system service without downtime.

- Built-in quad Gigabit Ethernet ports provide redundancy.

- The system is certified to withstand single fan failure at max ambient operating conditions without degradation or loss of service. This single-fan-fail is part of the latest issue 4 of the GR-63 specs

Serviceability

- Front-accessible, hot-swappable disk drives.

- Front-accessible DVD+/-RW drive can be easily removed without opening the top cover of the chassis.

- 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 for support of CPU and Memory serviceability

- Front power switch (toggles between standby and power-on) provides easy access.

- Single-step power supply removal: Power-supplies can be serviced without sliding the servers out of the rack.

Specifications

Processor Options

Processor	Quad-Core Intel Xeon E7338 (2x3MB L2, 2.4 GHz, 1066 MHz FSB, 80W)

Main Memory

32 DIMM slots total for PC2-5300 667 MHz ECC Fully Buffered DDR2 DIMMs
System configurations up to 128 GB of memory (support for 256GB of memory when 8GB DIMMS available)

Standard/Integrated Interfaces

Network	Four 10/100/1000Base-T Ethernet ports
Network management	One dedicated 10/100Base-T Ethernet port
Serial management	One TIA/EIA-232-F asynchronous RJ45 Port
SAS	Eight channel SAS interfaces, internal access only.
USB	Two USB 2.0 ports (Front), Two USB 2.0 ports (Rear)
Video	One rear VGA connector (HD-15) for local video monitoring
Expansion bus	Six PCIe slots (MD2 low profile – note one of these slots is used for the SAS HBA) Two PCIe slots (FL/FH) Two PCI-X slots 64-bit 133 MHz (FL/FH)
Alarms	Four fail-safe, dry contact alarms (critical, major, minor and user) (DB-15)

Mass Storage and Media

Hot-swappable, 2.5" Internal disk	Twelve SAS 2.5" disk drives with add-on SAS Host Bus Adapter
Removable Media	One Slimeline slot-load DVD-R/W
External disk	Since the Netra X4450 leverages the external storage qualification from the Sun Fire X4450 please see http://www.sun.com/servers/x64/x4450/storage.jsp for more information. However, note that not all of the PCI cards listed on the website have been NEBS tested. Please see the Options section of the JTF for information on the PCI cards.

Software

Operating environment	Solaris 10 Operating System on x64, 64-bit Red Hat Enterprise Linux SUSE Linux Windows Server 2003 VMware coming soon: Windows 2008 See http://www.sun.com/servers/netra/x4450/OS.html
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	ILOM: Local and remote KVM, remote media (DVD, CD, floppy, USB) capability, browser GUI, DMTF style, CLI (in-band and out-of-band), IPMI 2.0 (in-band and out-of-band), SNMP (out-of-band only)

Physical Specifications

Description	U.S.	International
Height	6.86 inches (4RU)	174.2 mm
Width (including bezel)	17.5 inches	445 mm
Depth (maximum to PSU handles) Depth (to rear I/O)	20.87 inches 19.88 inches	530 mm 505 mm
Weight (fully configured without PCI cards)	72.6 lbs	33 kgs

Power Source Requirements

The Sun Netra X4450 server has four autoranging AC or DC power supplies. To ensure redundant operation of the power supplies, the four power inputs should be connected to separate power sources.

These are the electrical limits and ranges for the Netra X4450 server utilizing 650W power supplies.

Description	AC Specification	DC Specification
Operating input voltage range	100 to 240 VAC, 50 to 60 Hz	-48VDC or -60VDC (nominal) -40VDC to -75VDC (range)
Maximum operating input current for the PSU only	7.56A at 100 VAC (full output load 658W assuming min- efficiency at full load 87%)	18.75A at -40VDC (full output load 660W assuming min- efficiency at full load 88%)
Maximum heat dissipation	2581 BTU/hr.	2581 BTU/hr.

Description	Idle Power	100% Util Peak Power	50% Util Peak Power
Total Power of System (Watts) See configuration below	691W	955W	823W
Total Power of System (BTU/hr.) See configuration below	2357.8 BTU/hr.	3258.6 BTU/hr.	2808.2 BTU/hr.

Note the above power calculations assumed the following Netra X4450 configuration (4x Quad Core E7338 processors , 32x 4GB, DVD RW, 12x 146GB 10K RPM 2.5" SAS drive, 8-port internal SAS Host Bus Adapter, 4x AC PSUs.)

For more information please refer to the Power Calculator at
http://www.sun.com/servers/netra/x4450/calc/index.jsp

Environment Specifications

These are the environmental specifications for the Sun Netra X4450 server.

Specification	Operating	Non-Operating
Temperature	5°C to 40°C, (41°F to 104°F) Short Term -5°C to 55°C (23°F to 131°F)	-40°C to 70°C (-40°F to 158°F)
Relative Humidity	5% to 85%, noncondensing Short term: 5% to 90%, noncondensing, but not to exceed 0.024 kg water/kg dry air (0.053 lbs. water/2.205 lb. dry air)	Up to 93%, noncondensing, 40°C (104°F)
Altitude	Up to 3000 meters (9,850 feet) @40°C	Up to 12,000 meters (40,000 feet)

ETSI	EN 300 019-2-1,2,3, Class 1.2, 2.3, 3.1E ‒ Except condensing humidity ‒ Except rain
NEBS	NEBS Level 3 Certified by Telcordia
Seismic	GR-63-CORE requirements for earthquake zone 4

Acoustic Noise Emissions

These are the acoustic noise emissions of a Sun Netra X4450 server. Declared noise emissions are in accordance with ISO 9296 standards.

Description	Mode	Specification
LwAd (1 B = 10 dB)	Operating acoustic noise Idling acoustic noise	7.1 B 7.1 B

Agency Compliance Specifications

The Sun Netra X4450 server complies with the following specifications.

Category	Relevant Standards
Safety	UL/CSA-60950-1, EN60950-1, IEC60950-1 CB Scheme with all national differences, IEC825-1, 2, and CFR21 part 1040
RFI/EMC	EN55022/CISPR22 Class A, FCC CFR47 Part 15 Class A
Immunity	EN55024/CISPR24, EN61000-3-2, EN61000-3-3
Telecommunications	EN300-386
Regulatory Markings	CE, FCC, ICES-003, C-tick, VCCI, GOST-R, MIC, UL/cUL, S-mark, BSMI, CCC
Other	Restriction of Hazardous Substances (RoHS) labeled, per WEEE (Waste Electrical and Electronics Equipment) directive (2002/95/EC)

System Requirements, Configuration and Management

System Requirements

The Sun Netra X4450 servers run the Solaris 10, standard Linux distributions, Microsoft Windows Server 2003, Vmware, and soon Windows 2008 . For a list of supported OS versions, please refer to section "Netra X4450 Server Operating Systems Support"

System Configuration

The Sun Netra X4450 servers have the following standard components:

- Up to four Intel Quad Core Xeon Processors E7338

- Thirty-two memory slots supporting PC2-5300 667 MHz ECC Fully Buffered DDR2 DIMMs – Up to 128GB of main memory

- Twelve SAS Hard disk drives (with add-on SAS Host Bus Adapter)

- DVD-R/W drive

- Four 10/100/1000Base-T Ethernet ports

- Four USB 2.0 ports: two front, two rear

- 2 PCI-X Slots (2x FL/FH)and 8 PCIe Slots (2x FL/FH, 6x MD2 low profile, note one slot occupied by SAS HBA)

- 650 Watt AC or DC power supply (hot-swappable in a 2+2 redundant configuration)

- Integrated Lights Out Manager

- One 19-inch 4 and 2 post rack-mount kit

Licensing/Usage

The Sun Netra X4450 servers are shipped 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 Netra X4450 servers vary depending upon configuration. For more specific information, please refer to MTBF Tool at http://ram-server.eng

Sun Cluster Support

The Sun Netra X4450 servers are supported by Sun Cluster
For the latest information, please go to: http://suncluster.sfbay.sun.com

Origin Statement

The Netra X4450 servers have components from various countries of origin. Sub assembly manufacturing is in China and final system assembly, test, and manufacturing is in the US & UK.

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

Standard Configurations – Preconfigured Systems

The Sun Netra X4450 server run the Solaris 10 Operating System on x64 as well as standard Linux distributions, Microsoft Windows Server 2003, Enterprise and Standard Editions, VMWare, and soon Windows 2008 .

The Sun Netra X4450 server can be ordered using the configuration part numbers listed in this section. All servers ship with two or four Quad-Core Intel® Xeon® processor E7338. The processor in the Netra X4450 runs at 2.4GHz with a 2x3-MB L2 cache.

Power cords for the AC version specific to the environment or geography must be ordered as a separate line item.

All base configurations include:

• 4 RU packaging	• Two PCI-X slots (2 x FL/FH)
• Quad-Core Intel® Xeon® processor E7338 series	• One Slimline tray loaded DVD drive
• Thirty-Two memory slots supporting registered Fully Buffered DDR2/667 MHz ECC DIMMs	• Four USB 2.0 ports and one VGA port (HD-15)
• Support for Twelve SAS Hard Disk Drive	• Integrated lights out manager (ILOM) with dedicated 100BASE-T Ethernet port and RJ45 serial port
• Four onboard Gigabit Ethernet ports	• One 19 inch 4 and 2 post rackmount kit
• 8 PCIe Slots (2x FL/FH, 6x MD2 low profile, note one slot occupied by SAS HBA)	• Four 650W (2+2) hot-swappable DC or AC power supplies
• The standard configurations include the LSI SAS HBA (SG-XPCIE2SAS-I-Z)	• The base configurations include the LSI SAS expander to enable 12 HDDs regardless of HDD population.

Standard Configuration Part Numbers

Part Number	Standard Configuration Description
NX445-24240-42BD-A	2x2.4GHz 2x3MB L2 QC E7338, 4x2GB FB-DIMM, 2x146GB, DVD-RW, internal SAS card, 4x AC PSUs
NX445-24240-42BD-D	2x2.4GHz 2x3MB L2 QC E7338, 4x2GB FB-DIMM, 2x146GB, DVD-RW, internal SAS card, 4x DC PSUs
NX445-44240-82CD-A	4x2.4GHz 2x3MB L2 QC E7338, 8x2GB FB-DIMM, 4x146GB, DVD-RW, internal SAS card, 4x AC PSUs
NX445-44240-82CD-D	4x2.4GHz 2x3MB L2 QC E7338, 8x2GB FB-DIMM, 4x146GB, DVD-RW, internal SAS card, 4x DC PSUs
NX445-44240-84ED-A	4x2.4GHz 2x3MB L2 QC E7338, 8x4GB FB-DIMM, 8x146GB, DVD-RW, internal SAS card, 4x AC PSUs
NX445-44240-84ED-D	4x2.4GHz 2x3MB L2 QC E7338, 8x4GB FB-DIMM, 8x146GB, DVD-RW, internal SAS card, 4x DC PSUs

Power Cord Kits

The Sun Netra X4450 server comes standard with four power supplies. A no-charge power cord kit option must be ordered for each AC power supply. Available power cord kits include:

Part Number	Description
X386L	Australian Power cord kit,RoHS
X312L	Continental Europe Power cord kit,RoHS
X383L	Danish Power cord kit,RoHS
X384L	Italian Power cord kit,RoHS
X311L	North American/Asian Power cord kit,RoHS
X314L	Swiss Power cord kit,RoHS
X317L	UK Power cord kit,RoHS
X312E	China Power cord kit,RoHS
X312F	Argentina Power cord kit,RoHS
X332A	Taiwan Localized power cord kit, RoHS
X312G	Korea Power cord kit. RoHS
X333A-25-10-IL	Power cord, Israel, 2.5m, SI-32, 10A, C13
X333A-25-15-JP	Power cord, Japan, 2.5m, PSE 5-15, 15A, C13
X333F-25-15-JP	Power cord, Japan, 2.5m, PSE 6-15, 15A, C13
X333A-25-15-TW	Power cord, Taiwan, 2.5m, CNS10917, 15A, C13

Assemble-to-Order Configurations (ATO)

Assemble-to-Order (ATO) configurations are available now.

The listed configurations and upgrades greatly reduce the need for custom configurations.

Sun Netra X4450 Server XATO Chassis Options:

Part Number	Description	Availability
NX4450-AA-GD	Nerta X4550 AC base chassis supporting 12 HDDs and DVD	
NX4450-AD-GD	Nerta X4550 DC base chassis supporting 12 HDDs and DVD	

Options

The following options are supported by the Sun Netra X4450 server. Options that include an (X) in the part number indicate that the part can be ordered as a field-installable part or for factory integration. For example, X5179A is the field installable option, while part number 5179A, with the (X) removed, is used only when the part will be installed at the factory (ie Assemble-to-Order). For information on the drivers for the PCI cards please visit http://www.sun.com/servers/x64/x4450/optioncards.jsp

Part Number	Option Description	Maximum Number Supported	Comments
Intel E7338 processor			
(X)5179A	1x Quad-Core Intel Xeon E7338 processor 2x3MB L2, 2.4GHz, 1066 MHz FSB, 80W)	4	Min support is current 2x
Memory			
(X)6381A	4-GB PC2-5300 667MHz ECC FB-DIMM kit (2 x 2GB)	16	
(X)6382A	8-GB PC2-5300 667MHz ECC FB-DIMM kit (2x4GB)	16	
Internal Storage Devices			
(X)RA-SS2ND-146G10KZ	146-GB, 10000-rpm, 2.5-inch SAS disk drive	12	EOL
(X)RB-SS2ND-146G10K	146-GB, 10000-rpm, 2.5-inch SAS disk drive	12	
(X)RA-SS2ND-300G10K	300-GB, 10000-rpm, 2.5-inch SAS disk drive	12	
4354A-Z (same # used for the Netra X4200 M2)	Disk bay filler panel		
Internal Media Devices			
X4356A-Z	Slimline DVD RW	1	not a configurable option. Ship with every system
Racks			
Rack Kits			
X4076A	23-inch 2 post rackmount kit		
X4059A	600mmx600mm rackmount kit		
X4061A	19-inch 4 post slide mount kit		
X4041A	Cable management Arm for X4061A		Release TBD
Miscellaneous options			
X949A-4	Wago DC plug connectors, 10-pack		
X5180A	Air Filter, 10-pack		
PCIe Cards: Networking Interfaces			
X4447A-Z	(Atlas): Quad GbE (Neptune) Copper	4	NEBS Tested FULLY Supported

Part Number	Option Description	Maximum Number Supported	Comments
X7280A-2	(Northstar): Dual GbE (Intel) Copper	4	NEBS Tested FULLY Supported
X7281A-2	Dual GbE (Intel) Fiber	4	NEBS Tested FULLY Supported
X4446A-Z	(Northstar QGE): Quad GbE (Intel Ophir) Copper	4	NEBS Tested FULLY Supported
X1027A-Z	Dual 10GbE (Neptune) Fiber	2	NEBS Tested FULLY Supported
PCIe Cards:Security			
X6000A / X6099A	Sun Crypto Accelerator	1	NEBS Tested FULLY Supported
PCI-X Cards: Storage Interfaces			
SG-XPCI2FC-QF4	(Pyramid): Dual-port 4Gb/s FC – Qlogic	2	NEBS Tested FULLY Supported
SGXPCI2SCSILM320-Z	(Jasper320) : Dual-port U320 SCSI	2	NEBS Tested FULLY Supported
SG-XPCI2FC-EM4-Z	(Pyramid-E) : Dual-port 4Gb/s FC – Emulex	2	NEBS Tested FULLY Supported
PCIe Cards: Storage Interfaces			
SG-XPCIE8SAS-I-Z SG-PCIE8SAS-I-Z	(Pandora-8i): 8-Port LSI1068e SAS Internal	1	Ships with standard configurations, Required/Optional for XATO. NEBS Tested FULLY Supported
SGXPCIESAS-R-INT-Z SG-PCIESAS-R-INT-Z	(Cougar): 8-Port Intel Internal SRL SAS	1	Required/Optional for XATO. NEBS Tested FULLY Supported
(X)4079A	Netra X4450 SAS Cable Kit	1	Need to order SAS cable kit for all XATO orders using the internal SAS HBA cards. The Cougar and Prometheus card requires two cable kits
SG-XPCIE8SAS-E-Z	(Pandora): 8-Port LSI1068e SAS	4	NEBS Tested FULLY Supported
SGXPCIESAS-R-EXT-Z	(Prometheus): 8-Port Intel SRL SAS	4	NEBS Tested FULLY Supported
SG-XPCIE2FC-EM4	(Summit-E): Dual-port 4Gb/s FC – Emulex	4	NEBS Tested FULLY Supported
SG-XPCIE2SCSIU320Z	(Rhea):Dual-port U320 SCSI	4	NEBS Tested FULLY Supported
SG-XPCIE2FC-QF8-Z	(Palene): Dual port 8G b/s - Qlogic	4	NEBS Tested FULLY Supported
SG-XPCIE2FC-EM8-Z	(Palene): Dual port 8G b/s - Emulex	4	NEBS Tested FULLY Supported
SG-XPCIE2FC-QF4	(Summit): Dual-port 4Gb/s FC – Qlogic	4	NEBS Tested FULLY Supported
PCI-X Cards:Networking			

Part Number	Option Description	Maximum Number Supported	Comments

Please note that the above mentioned X-Option PCI cards have been NEBS tested or will be NEBS tested. As more cards undergo NEBS testing, they will be added to the list.

General Configuration Notes:

1. Dual processor systems can be expanded with two more processors of the identical model/speed only, e.g. 2x Quad-Core Intel Xeon E7338 processor based system can only add two more Quad-Core Intel Xeon E7338 processors. Mixing with a different processor is not supported. Systems configured with one processor or three processors are not supported.

2. Memory must be installed in pairs. Pairs of different densities may be mixed, e.g. 2x2GB and 2x4GB and can be used in the same system chassis.

3. If RAID 1 mirroring is going to be used, the drives to be mirrored must be identical in size.

4. There are two Internal SAS host bus adapter options for the Sun Netra X4450 server. The 8-port SAS host bus adapter supports RAID 0, 1, 0+1. This card ships pre-installed with each standard configuration. 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 – this card is optional and can be ordered as an x-option.

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. All XATO orders require a working configuration.

2. A minimum of two processors are required. Dual processor systems can be expanded with two more processors of the identical model/speed only, e.g. 2x Quad-Core Intel Xeon E7338 processor based system can only add two more Quad-Core Intel Xeon E7338 processors. Mixing with different processor is not supported. Systems configured with one processor or three processors are not supported. Air baffle (dam) is required for 2 CPU configs and will be added for all 2xCPU PTO and ATO configs at the factory. There will be no field available CPU airflow baffle so downgrade from 4CPU to 2CPU configurations is not supported

3. Memory must be installed in pairs. Pairs of different densities may be mixed, e.g. 2x1GB and 2x2GB and can be used in the same system chassis. There is no memory to processor ratio requirement - all memory slots can be populated in a two processor system or a four processor system.

4. A disk filler panel is required for any HDD slot not filled.

5. There are two Internal SAS host bus adapter options for the Sun Netra X4450 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 . You must order one of these cards with each system. Note that the RAID card requires two internal cables from HBA to expander while the LSI card, requires only one. So a SAS cable kit must also be ordered. Each kit has one cable so for the Raid card two kits must be ordered.

Upgrades

Upgrade Paths

Sun Netra X4450 servers are eligible for the Sun™ Upgrade Advantage Program (UAP). Through this program customers can trade-up their current Sun or non-Sun severs for a new Sun Netra X4450 server and receive a trade-in allowance that is applied as a percentage off of the list price on the new the Sun Netra X4450 server. Customers can trade-in their old systems in on a 1 for 1 server basis or consolidate many servers. . For a complete list of eligible trade-in products you can go to .http://ibb.eng/

Service and Support

Warranty Support

The Sun Netra X4450 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

Sun Service Plan

Sun Global Customer Services offers a full range of services to assist customers who deploy the Sun Netra X4450 servers. Whether it is architecture services, implementation services, or services to help customers manage the servers once released to production, Sun has the right services during every phase of the project's life cycle.

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

• SunSpectrum Service Plans: Get integrated hardware and software support.

• Sun Software Service Plans: For fundamental software services such as technical phone or web-based support and software maintenance (updates and upgrades), Sun offers two levels of service for production system software.

Why the Warranty Isn't Enough

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

SunSpectrum Service Plans

SunSpectrum service plans provide integrated hardware and Solaris™ Operating System support for Sun systems as well as comprehensive storage system support. For each Sun system, customers can choose the service plan that best fits their needs. Customers benefit from lower SunSpectrum Instant Upgrade (SIU) pricing when purchasing support at time of system sale.

More information is available at http://www.sun.com/service/support/sunspectrum.

SunSpectrum service plan highlights include:

- Integrated whole-system support

- All the essentials for one great price

- Priority service

- No "per incident" limits

- Includes Solaris™ Operating System releases and updates

- Resources for proactive system management

- A choice of four simple plans

- Proven return on investment[1]

SunSpectrum Service Plans

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

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

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[1]Based on Total Economic Impact Study by Forrester Research. This study is available at: sun.com/service/support/sunspectrum

Sun microsystems

Warranty Upgrade to SunSpectrum Service

The following table includes the part numbers and descriptions for the warranty upgrades to SunSpectrum programs for the Sun Netra X4450 servers.

Part Number	Description
IWU-NX4450-1S	Netra X4450 server upgrade to 1 year of Silver support
IWU-NX4450-1G	Netra X4450 server upgrade to 1 year of Gold support
IWU-NX4450-24-1G	Netra X4450 server upgrade to Gold support + 7X24 On-Site support for 1 year
IWU-NX4450-1P	Netra X4450 server upgrade to 1 year of Platinum support
IWU-NX4450-24-2G	Netra X4450 server upgrade to Gold support + 7X24 On-Site support for 2 years
IWU-NX4450-24-3G	Netra X4450 server upgrade to Gold support + 7X24 On-Site support for 3 years
IWU-NX4450-2G	Netra X4450 server upgrade to 2 years of Gold support
IWU-NX4450-2P	Netra X4450 server upgrade to 2 years of Platinum support
IWU-NX4450-2S	Netra X4450 server upgrade to 2 years of Silver support
IWU-NX4450-3G	Netra X4450 server upgrade to 3 years of Gold support
IWU-NX4450-3P	Netra X4450 server upgrade to 3 years of Platinum support
IWU-NX4450-3S	Netra X4450 server upgrade to 3 years of Silver support

Sun[sm] System Service Plans for Windows OS

The Sun[sm] 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[sm] System Service Plans for Windows OS for Sun Netra X4450 Server

The following are part numbers and descriptions for the warranty upgrade to Sun[sm] System Service Plans for Windows OS

Part Number	Description
IWU-NX4450W-1S	Netra X4450 Server with Windows Operating System Upgrade to 1 year of Silver support
IWU-NX4450W-1G	Netra X4450 Server with Windows Operating System upgrade to 1 year of Gold support
IWU-NX4450W-1P	Netra X4450 Server with Windows Operating System Upgrade to 1 year of Platinum support
IWU-NX4450W-2S	Netra X4450 Server with Windows Operating System Upgrade to 2 years of Silver support
IWU-NX4450W-2G	Netra X4450 Server with Windows Operating System Upgrade to 2 years of Gold support
IWU-NX4450W-2P	Netra X4450 Server with Windows Operating System Upgrade to 2 years of Platinum support
IWU-NX4450W-3S	Netra X4450 Server with Windows Operating System Upgrade to 3 years of Silver support
IWU-NX4450W-3G	Netra X4450 Server with Windows Operating System Upgrade to 3 years of Gold support
IWU-NX4450W-3P	Netra X4450 Server with Windows Operating System Upgrade to 3 years of Platinum support

Warranty Upgrade to Sun HW Only Service for the Sun Netra X4450 Server

Part Number	Description
IWU-NX4450-22-1H	Netra X4450 server upgrade to 1 year of 7x24 hardware only support with 2 hour response
IWU-NX4450-22-2H	Netra X4450 server upgrade to 2 years of 7x24 hardware only support with 2 hour response
IWU-NX4450-22-3H	Netra X4450 server upgrade to 3 years of 7x24 hardware only support with 2 hour response
IWU-NX4450-24-1H	Netra X4450 server upgrade to 1 year of 7x24 hardware only support
IWU-NX4450-24-2H	Netra X4450 server upgrade to 2 years of 7x24 hardware only support
IWU-NX4450-24-3H	Netra X4450 server upgrade to 3 years of 7x24 hardware only support
IWU-NX4450-SD-1H	Netra X4450 server upgrade to 1 year of same day hardware only support
IWU-NX4450-SD-2H	Netra X4450 server upgrade to 2 years of same day hardware only support
IWU-NX4450-SD-3H	Netra X4450 server upgrade to 3 years of same day hardware only support

Installation Service for the Sun Netra X4450 Server

Sun's exceptional support for server installation is also available for the Sun Netra X4450 server. This service can be purchased at the time of the server sale. Use the following part numbers to order the installation service.

Installation of one Sun Server, During Business Hours

Part Number	Description
EIS-4WAYWGS-E	Install 4-way Workgroup Server
EIS-2WAYWGS-5-E	Install 5 4-way Workgroup Servers
EIS-2WAYWGS-10-E	Install 10 4-way Workgroup Servers

Installation of one Sun Server, After Business Hours

Part Number	Description
EIS-2WAYWGS-E-AH	Install 4-way Workgroup Server-AH
EIS-2WAYWGS-5-E-AH	Install 5 4-way Workgroup Servers-AH
EIS-2WAYWGS-10-E-AH	Install 10 4-way Workgroup Servers - AH

For additional information about the server installation service see:

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

Services for OEM partners include plans that cover hardware only, software only, and hardware + OS. Sun also offers the Production Service Plan for OEM partners who need support for production software, and Integrated Development & Production Support, which offers both development and production software support for one annual fee. Since one of the primary causes of system failure is incorrect installation and configuration, Sun also offers OEM partners free membership in its Enterprise Installation Service program. Members receive all up-to-date builds, the latest technical and product information, alert notices and access to documentation and best practices information to ensure they can do "Sun-standard" installations. OEM partners can earn education credits equal to 2% of contract value for up to 50K per year by taking advantage of workshops and training courses available through Sun Learning Services.

HPC Quickstart Services
If you're running an HPC solution, you can accelerate its design and implementation and mitigate risk while reducing deployment time by up to 80%. Key HPC Implementation Services include:

- Application Readiness Service to prepares your HPC infrastructure for application and business readiness, and,
- Installation services for the Sun Grid Rack System with CRS Architected Solutions to gives you a solid foundation for enhanced stability and improved performance.
- Professional services for your specific implementation, configuration and migration needs.

Key optimization services include:
- Managed services to support HPC clusters and 3rd party components,
- Proactive and continued monitoring of infrastructure to mitigate risk, resolve issues and sustain desired performance levels,
- Incident response services,
- Performance analysis and fine-tuning tools,
- Control Tower Appliance with every Sun Grid Rack to facilitate installation and monitoring, and,
- Professional services to help you meet your business objectives and service level agreements.

Virtualization Services

Conquer datacenter power and space constraints while improving server utilization and system performance. By virtualizing and consolidating to the Sun platform, customers have reduced IT costs by as much as $2M/year, achieved 99.99+% availability, and more than doubled application performance. Sun Virtualization Services include:

- **Virtualization Workshop** - Assess your business needs, define milestones and resource requirements, and identify potential project risks and roadblocks,

- **Virtualization Architecture** – Identity the virtualization technology that best meets your business goals. Then, optimize your IT infrastructure and increase server utilization by performing a Performance Analysis and Capacity Planning assessment to be sure your system meets your present and future requirements.

- **Virtualization Implementaiton** – Factory integration followed by coordination of integration process by a certified Project Manager. Includes testing, cut-over process for production, knowledge transfer and recommendations for on-going management and support.

Eco Services Suite

Optimize energy usage, cooling and general datacenter environmental conditions that can impact your operational costs and your ability to deliver services reliably with eco assessment, optimization and management services. Sun Eco Service Suite offerings include:

- **Eco Assessment for Data Centers** – Assessment of existing facility conditions to identify areas in need of improvement and provide a plan for optimizing energy usage, space utilization, cooling and general environmental conditions.

- **Eco Cooling Efficiency Service for Datacenters** – Identifies misused capacity so it can be redirected to improve hardware and cooling capacity, and to increase redundancy.

- **Eco Optimization for Datacenters -** Provides periodic site assessments, cooling optimization support and remote technical support to help you plan for long-term changes to your datacenter infrastructure while keeping you up-to-date with industry changes and new energy-efficient technologies.

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.
Carrier grade	Ruggedized, rack-mountable systems with features including remote alarm capabilities, front-back cooling, front accessibility of media, rear cabling, and rugged NEBS-compliant packaging.
Chipkill	A technology developed by IBM for situations that demand high availability. It allows a system (usually CPU or motherboard) to detect problems with the computer's memory and selectively disable the problematic DIMMS.
EIDE	See ATA
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.
ECC	Error Correcting Code. A type of memory that corrects errors on the fly.
FRU	Fielf Replaceable Unit
Hot-pluggable	A feature that allows an administrator to add or remove a device such as a disk 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.
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.

![Sun microsystems logo]

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.
NEBS	Network Equipment Building Standard. A stringent standard for durability, grounding cables, and hardware interfaces specified by Telcordia Technologies (formerly Bellcore) for equipment used in Telco central offices.
PCIe	Peripheral Component Interconnect Express. Formerly known as third-generation I/O, this implementation of the PCI computer bus that uses existing PCI programming concepts and communication standards, but bases it on a much faster serial communications system.
PCI-X	Peripheral Component Interconnect Extended. A computer bus technology that increases the speed that data can move within a computer from 66 MHz to 133 MHz.
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.
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
SAS	Serial Attached SCSI. The successor to the original SCSI technology with the ability to address up to 16,256 devices per port. It also has a more reliable point-to-point serial connection at speeds of up to 3 Gbps.
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	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
– *Sun Netra X4450 Server, Just the Facts*	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	517307
– *Sun Netra X4450 Server Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web,	517308
– *Sun Netra X4450 Server Customer Presentation*	Customer Presentation	Sales Tool	SunWIN	517309
– *Sun Netra X4450 Server Technical Presentation*	Technical Presentation	Training Sales Tool	SunWIN	517310
White Papers				
- *Sun Netra X4450 Server Architecture*	White Paper	Sales Tool	SunWIN	517311
External Web Sites				
– *General information on the Sun Netra X4450 Server*	http://sun.com/servers/netra/x4450			

Competitive Information

Elevator Pitch

The Sun Netra X4450 server delivers dramatic performance and unmatched expandability in a 4RU 20-inch deep compact form factor. One of the industry's most flexible and highest capacity ruggedized servers, the Netra X4450 offers a choice of multiple operating systems, 32 memory slots, 12 internal disk drives, and 10 PCI slots. This server also integrates four Gigabit Ethernet ports to provide connectivity for high-speed, high-bandwidth networking. System uptime is enhanced by redundant hot-swappable AC/DC power supplies and hot-pluggable hard disk drives.

Key Differentiators

1. This high capacity carrier-grade server can expand up to a 16-way configuration with four quad core Intel Xeon processors, up to 128GB of memory, and over 3TB of internal storage (with 300GB HDDs), making it a perfect choice for consolidation and virtualization.

2. Ruggedized packaging and NEBS level 3 certification provides a high level of system reliability which helps ensure that the Sun Netra X4450 server continues to operate under extreme environmental conditions.

3. Additionally, the Sun Netra X4450 server comes with Integrated Lights Out Management (ILOM) enabling simple remote monitoring and management from anywhere on the network.

Competitive Positioning :

Competitive Positioning	
HP competitive offerings : Rackmount Servers	
cx2620	The Netra X4450 has multiple strengths.. its memory capacity can reach up to 128 GB today. It can support more than 1TB of total disk capacity in a 4-RU form factor. It has 4 Gbe ports on the system and can support a combination of 10 PCIe and PCI-X slots. The Netra X4450 supports full-height and full-length PCI-X and PCIe cards allowing the use of legacy telecommunication cards.
	However, the current HP carrier-grade server only offer up to 24GB of memory max with only a max storage capacity of 900GB . Likewise, it only offers 2 GbE ports on-board and 0 PCIe slots within the system.
It is not anticipated that HP will upgrade their 4U carrier-grade offering in the near future making their current product very uncompetitive moving forward.	
HP is also offering to NEBS certify their commercial servers if there is a business case	

Products→ Features ↓	Sun Netra X4450	HP CX 2620
Size RU/BW	4U	4U
Depth	20"	20"
CPU Type	Xeon	Itanium2
Number of CPUs	4	2
Mem Type	FB DIMM	DDR1 SDRAM
Max Memory	128GB	24GB
Disk Drive size	146GB/300GB	73GB-300GB 15Krpm
Disk Drive Protocol	SAS/ SSD (future)	UltraSCSI 320
Disk count	12	3
Max Internal Disk	3600GB	900GB
Hot pluggable Disk	Yes	Yes
Optical Media	DVDRW	DVDR/DVDRW
Ethernet	Quad GbE	Dual GbE
O/S support	Solaris 10, Suse, Redhat, WS, Vmware	Linux, HP UX
PCI-X Slots	2	4
PCIe slots	8	N/A
PCIe Lanes	5x8, 3x4	N/A
Max # PSU	4	2
Max PSU Power/PSU	650W	700W max
NEBS Level 3 Certified	Yes	Yes

How to Beat Your Competition:

Visit http://competitive.central (or MySales > Systems > Competitive) for a broad range of tools available to counter competitive claims.

Engage the SSC War room for competitive deal support, sscwarrom@sun.com, x86484

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