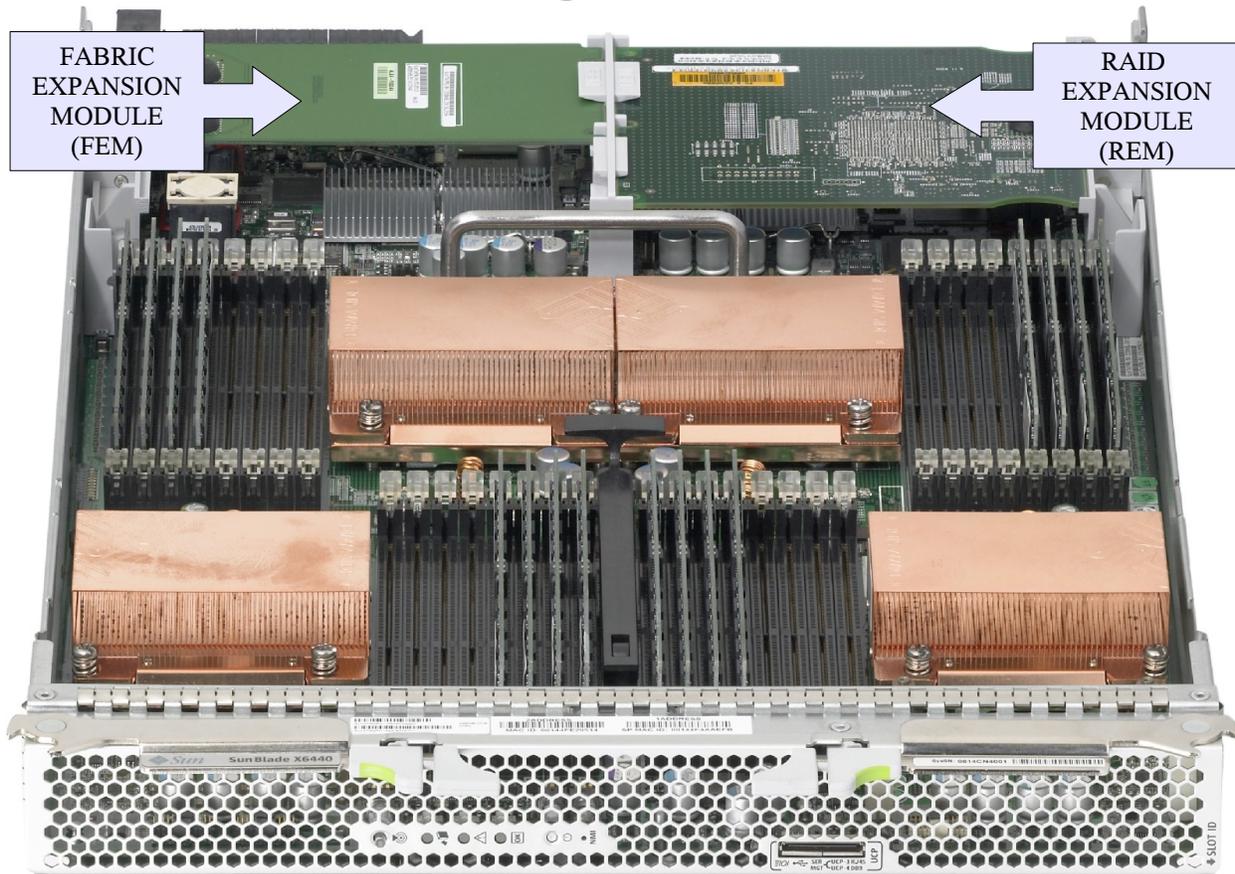


# Sun Blade™ X6440 Server Module (Pegasus+)



- Multi-Core Opteron Power delivering the best of both rackmount and blade systems
  - strategically designed for I/O intensive workloads requiring unrivaled reliability, availability & serviceability with no compromises

**Just the Facts**  
**SunWIN Token # 517107**

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Product documentation can be found at: <http://docs.sun.com/app/docs/prod/blade.svr#hic>

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# Introduction to the Sun Blade X6440 Server Module

The Sun Blade X6440 server module is a four-socket, enterprise-class datacenter engine that can provide major savings in cooling and power. The X6440 is the first four-socket AMD Opteron Server Module for use in the Sun Blade 6000 & 6048 Modular Systems. With this system, based on the Six-Core AMD Opteron processors (aka "Istanbul"), it's ideal for consolidating IT infrastructures or Web service farms. Because these blades scale easily, with support for massive amounts of I/O and memory they can run the broadest range of configurations and applications, providing flexibility that protects customer investments and supports their future business growth.

The Sun Blade X6440 server module is an enterprise workhorse, powered by the highest performing Six-Core AMD Opteron processors and featuring one of the largest memory support (up to 256 GB) on the market. When combined with its massive I/O capacity (142 Gb/se), this four-socket blade server becomes ideal for running a wide variety of applications, ranging from the Web to the edge and the application tiers, horizontal consolidation, databases and high performance technical computing (HPC). The Sun Blade X6440 server module is the frontrunner for applications that demand the highest memory performance and excellence in floating-point calculations. Leveraging power efficient processors and DDR2 memory, the diskless Sun Blade X6440 server module runs cooler than rival products using competitive x64 processor & memory technologies. In addition, the X6440 Server Module utilizes the modular chassis hot-swappable and hot-pluggable components helping to enhance the system's availability and serviceability, while streamlined, transparent management further reduces costs by allowing for decreased complexity and easy integration into existing datacenter environments.

## Target Markets:

- Primary:
  - High Performance Technical Computing (HPC)
  - Web Infrastructure
  - Back Office (CRM, ERP, DIDW)
- Secondary:
  - Manufacturing
  - Energy
  - Healthcare
  - Retail

## Target Applications:

- HPC/Grid computing
- Server Virtualization & Consolidation
- Web Servers
- Application Servers
- Databases, like Oracle 9iRAC or 10g, MySQL
- Network/IT services (Security, DNS, proxy, caching)
- Floating Point workloads

## Value Proposition:

- Large memory configurations - up to 256 GB of memory per server module
- Industry leading DIMM count (32 DIMM slots) providing large memory footprints using cost-efficient 2GB or 4GB DIMMs

Example:

4-socket blade – 128GB memory requirement		
Sun Blade X6440	HP BL685c G5	IBM LS42
32 DIMM slots	16 DIMM slots	16 DIMM slots
4GB DIMMs x 32 = <b>\$6,400</b> (memory cost)	8GB DIMMs x 16 = <b>\$14,392</b> (memory cost)	Max memory = 64 GB
*Note: Calculations based on memory list prices posted as of June 2009		

- Highest performing Six-Core AMD Opteron processor technology
- Operating system flexibility: run the Solaris™ 10 Operating System x64, Linux, Windows, or VMware
- One of leading I/O capacity & flexibility (Blade unique I/O – no I/O ports go unused, change individual blade I/O personality on the fly)
- Easy installation and service with cutting-edge modular design

## Sun Blade X6440 Server Module Highlights

- Part of the Sun Blade 6000 Modular System family, offering up to double the memory (32 DIMM slots) and up to 2.7x the I/O capacity (142Gbps) of competing servers
- Supported in the Sun Blade 6000 and Sun Blade 6048 Modular System chassis
- Features the Six-Core Opteron processors for the most demanding workloads
- Coherent HyperTransport3 and HyperTransport Technology Assist to increase performance and power efficiencies

Note: The Sun Blade X6440 server module implements coherent HT3, since the HT3 rate is only between the links that connect the processors. For more information, please see the Enabling Technologies Section.

- Dual Dynamic Power Management (split-plane), providing improved performance and power management
- Supports large memory configurations with cost efficient 2GB or 4GB DIMMs
- One of the largest X64 blade server memory footprint in the industry - 256GB with 8GB DIMMs
- Operating system flexibility — runs the Solaris 10 Operating System x64, Linux (RedHat & SUSE), Windows, or VMware
- Sun Blade transparent management - direct management of each server module, for seamless integration into existing management infrastructures
- Shared (blade chassis) infrastructure designed for superior availability, with no fans or power supplies on the blades

For more information please go to the following URL: <http://www.sun.com/servers/blades/>

# Feature Function Benefit

<i>Feature</i>	<i>Function</i>	<i>Benefit</i>
<b>Modular Design without compromising performance or scalability</b>		
<ul style="list-style-type: none"> <li>Up to 10 Sun Blade X6440 Server Modules per Sun Blade 6000 Modular System</li> <li>Up to 48 Sun Blade X6440 Server Modules per Sun Blade 6048 Modular System (12 per shelf)</li> </ul> <p>*Note: Qty. 8 X6440 Server Modules can be safely powered on in the Sun Blade 6000 Chassis with full N+N power supply redundancy. Installing greater than 8 X6440 Server Modules in a Sun Blade 6000 Chassis will require turning off power supply redundancy in the chassis CMM. For additional guidance please refer to the Component Level Power Consumption section located towards the back of this document.</p>	<ul style="list-style-type: none"> <li>Sun Blade X6440 Server Modules have (configuration dependent);               <ul style="list-style-type: none"> <li>Four six-core Opteron processors (24 cores)</li> <li>Up to 256GB ECC Registered DDR2 memory (using 8GB DIMMs )</li> <li>Up to 142Gbs I/O via:                   <ul style="list-style-type: none"> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to NEM slots = 64Gb/s</li> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to EM slots = 64 Gb/s</li> <li>4 (3Gb/s ea.) SAS Interfaces = 12Gb/s</li> <li>2 Gigabit Ethernet links = 2Gb/s</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>high-performance, high capacity</li> <li>Easy expansion</li> <li>Reducing moving parts (diskless) increases reliability, availability &amp; serviceability</li> <li>Unprecedented I/O &amp; memory capacity in a blade server</li> </ul>
<ul style="list-style-type: none"> <li>I/O communications with (up to 2) PCIe ExpressModules<sup>(TM)</sup> (EMs)</li> </ul>	<ul style="list-style-type: none"> <li>Up to two industry-standard (PCI-SIG) form factor, hot-pluggable ExpressModules (per server module)               <ul style="list-style-type: none"> <li>Fibre Channel (dual port)</li> <li>InfiniBand (dual port)</li> <li>Combination EM:                   <ul style="list-style-type: none"> <li>dual port GbE &amp; dual port FC</li> </ul> </li> <li>Gigabit Ethernet:                   <ul style="list-style-type: none"> <li>dual or quad port</li> </ul> </li> <li>10 Gigabit Ethernet (dual port)</li> <li>Serial Attached SCSI (SAS)</li> </ul> <p><a href="http://www.sun.com/servers/blades/optioncards.jsp">http://www.sun.com/servers/blades/optioncards.jsp</a></p> </li> </ul>	<ul style="list-style-type: none"> <li>Provides “granular” I/O for each server module</li> <li>Individual servers have their own flexible I/O personality</li> <li>Industry Standard I/O options, no vendor lock-in</li> <li>Highly serviceable &amp; upgradeable – customer replaceable modules</li> <li>No mezzanine or daughter cards required for ExpressModule I/O communications               <ul style="list-style-type: none"> <li>Change blade I/O personality on-the-fly</li> </ul> </li> </ul>

<i>Feature</i>	<i>Function</i>	<i>Benefit</i>
<ul style="list-style-type: none"> <li>I/O communications with (up to) 2 PCIe Network Express Modules (NEMs)</li> </ul> <p>*Note: The (4) external facing SAS ports on the Sun Blade 6000 10GbE Multi-Fabric Network Express Module and Sun Blade 6000 Multi-Fabric Network Express Module are not used at this time. The NEMs contain a SAS expander (internal to the respective NEM) that connects server modules to intra-chassis SAS disks such as the Sun Blade 6000 Disk Module.</p>	<ul style="list-style-type: none"> <li>Up to two hot-pluggable NEMs per <b>Sun Blade 6000 Modular System:</b> <ul style="list-style-type: none"> <li>Gigabit Ethernet (CU) 10-port Passthru Network Express Module</li> <li>Sun Blade 6000 Multi-Fabric Network Express Module with 10x 1 GbE pass-thru ports, 4 miniSAS x4 ports (future use) (aka NEM+) *see note to left re. SAS</li> <li>Sun Blade 6000 Virtualized NEM 10-Port 1 GbE + 4-port SAS + 2 port 10GbE</li> </ul> </li> <li>Up to eight (single height) hot-pluggable NEMs per <b>Sun Blade 6048 Modular System:</b> <ul style="list-style-type: none"> <li>Sun Blade 6048 Gigabit Ethernet (CU) 12-port Passthru Network Express Module</li> <li>Sun Blade 6048 QDR InfiniBand Switched NEM</li> </ul> </li> </ul> <p><a href="http://www.sun.com/servers/blades/options/cards.jsp">http://www.sun.com/servers/blades/options/cards.jsp</a></p>	<ul style="list-style-type: none"> <li>Convenient, chassis-wide “bulk” network I/O packaging</li> <li>Highly-serviceable – hot-pluggable, customer replaceable modules</li> </ul>
<ul style="list-style-type: none"> <li>Compact Flash</li> </ul>	<ul style="list-style-type: none"> <li>OS boot support</li> </ul>	<ul style="list-style-type: none"> <li>Enhances security – non removable media</li> <li>Reduces power &amp; cooling requirements</li> <li>Requires less physical space than HDDs, result = more space for DIMMs and processors. This makes the X6440 ideal for HPC applications</li> </ul>
<b>Enterprise RAS</b>		

<i>Feature</i>	<i>Function</i>	<i>Benefit</i>
<ul style="list-style-type: none"> <li>Hot-pluggable modules</li> </ul>	<ul style="list-style-type: none"> <li>Server Modules, EMs &amp; NEMs are all hot-pluggable</li> <li>Server Modules leverage hot pluggable chassis infrastructure components:               <ul style="list-style-type: none"> <li>Power Supply Modules</li> <li>Cooling Fans</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Ease of serviceability and minimized downtime</li> <li>Greater efficiency using shared infrastructure</li> </ul>
<b>Management Environment</b>		
<ul style="list-style-type: none"> <li>Server Module - Lights-out Remote Management</li> </ul>	<p>Sun Integrated Lights Out Manager (ILOM):</p> <ul style="list-style-type: none"> <li>Remote management with full Keyboard, Mouse, Video, Storage (KVMS) redirection</li> <li>Remote media capability (floppy, DVD, CD etc.)</li> <li>DMTF style CLI</li> <li>Browser-based 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>Primary point of management for each Server Module</li> <li>All management which does not require physically touching the system can be performed remotely</li> <li>All chassis-level data such as PSU and fan data is available through the Server Module's ILOM interface.</li> <li>ILOM is a core part of Server Module, there is no additional charge for this functionality as there is with the competition.</li> <li>Integrates with third party management systems.</li> <li>Manageable with Sun xVM Ops Center 1.0 and above.</li> <li>Management consistency with Sun's x64 servers.</li> </ul>

<i>Feature</i>	<i>Function</i>	<i>Benefit</i>
<ul style="list-style-type: none"> <li>Infrastructure Lifecycle Management via. SUN's xVM Ops Center</li> </ul>	<ul style="list-style-type: none"> <li><b>Server Discovery &amp; Inventory Management</b> - Automatically scans and identifies servers across the network, even when powered off, which enables faster deployment and management of IT assets.</li> <li><b>Firmware and Bare Metal Server Provisioning</b> - Delivers automatic and "hands off" installation of bare-metal operating systems, RPMs and firmware, bringing new efficiencies to IT departments.</li> <li><b>Patch Management &amp; Updating</b> - Provides up-to-date patch management tools for Red Hat, SUSE and the Solaris OS, offering organizations greater control over their datacenter plans and minimizing downtime. In addition, unique patch simulation capabilities remove uncertainty when customers apply updates.</li> <li><b>Managing &amp; Monitoring</b> - Securely and remotely manages users and heterogeneous datacenter assets, and proactively resolves problems by monitoring critical parameters, improving the security and stability of systems.</li> <li><b>Compliance Reporting</b> - Provides an up-to-date view into the system state, patch status, and software portfolio, which helps with quick and accurate reporting and compliance validation.</li> </ul>	<ul style="list-style-type: none"> <li>Enables the rapid discovery and provisioning of groups of bare metal systems</li> <li>Reduces total cost of ownership of Sun systems, lowering Administrator overhead by offering grouping functionality and centralized control of all systems in the datacenter</li> <li>Additional xVM Ops Center information can be found at: <a href="http://www.sun.com/software/products/xvmopscenter/index.jsp">http://www.sun.com/software/products/xvmopscenter/index.jsp</a></li> </ul>

**Sun Blade Server Module Operating System Support**  
For the latest OS support details please refer to <http://www.sun.com/servers/blades/os.jsp>

<i>Feature</i>	<i>Function</i>	<i>Benefit</i>
Support for: * Solaris 10 *Red Hat Enterprise Linux (32/64) *SUSE Linux Enterprise Server (64) * Microsoft Windows Server 2003 (32/64) * Microsoft Windows Server 2008 (32/64) * VMware Virtual Infrastructure ESX/ESXi  For more information on the supported OSes, please see the "Sun Blade X6240 Server Module Operating System" section below.	<ul style="list-style-type: none"> <li>• Run applications on industry standard platform utilizing OS of choice</li> <li>• Run multiple OS environments within the same chassis</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>

Always refer to the formal product documentation for guidance prior to performing hot-swap or hot-plug activities. <http://docs.sun.com/app/docs/prod/blade.svr#hic>

\* Note: Some Operating Systems may not support booting from Compact Flash media. It is advisable to verify whether or not the desired OS supports booting from Compact Flash media.

## Sun Blade X6440 Server Module Product Placement

The Sun Blade 6000 Modular Systems (6000 & 6048 Chassis), with their ability to support up to 10 (note: current maximum qty. 8 X6440 server modules per 6000 chassis if PSU redundancy is required) or 48 Sun Blade Server Modules respectively are the second and third members of a new product line of modular servers from Sun Microsystems. In 2007, the Sun Blade 6000 Modular System was introduced to the market. The Sun Blade 6000 Modular Systems are designed for “scale-out” computing environments with distinctive performance density, price/performance, availability and application fit characteristics.

Although the blade platforms differ in architecture from Sun's other x64 servers, the Sun Blade Modular Systems share many of the Sun x64 rackmount server's industry-leading features and industry-standard components. In particular, the Sun Blade Modular System platforms lend themselves to “scale-out” computing environments while the Sun x64 rackmount systems tend to fit a broader range of general computing needs. The Sun Blade Modular Systems bring a level of I/O throughput, modularity and serviceability not found in rack-mount servers, yet the Sun Blade Modular Systems and Sun x64 rackmount systems complement each other in a data center environment with their shared operating system and transparent systems management environments.

The Sun Blade X6440 Server Module with its 24 compute cores, 32 DIMM slots and 142Gb/s of I/O capacity is positioned to take blades to a higher level in the data center. The X6440 leverages the Six-Core AMD Opteron processor technology to run the most demanding enterprise business and database applications, HPC, server consolidation and virtualization workloads with Solaris, Linux, VMware and Windows within Sun Blade 6000 or 6048 Modular System chassis.

The most common applications for Sun Blade X6440 server modules include the following:

- Demanding enterprise business applications and Databases:
  - Enterprise-class databases (Oracle, Oracle 10g Grid, DB2, SQL, MySQL etc.)
  - Business Intelligence & Data Warehouse
  - Business Processing
- High Performance Technical Computing (HPC) that requires high-end x86 floating point compute and high I/O capability:
  - Government & Education
  - Financial Services
  - Oil & Gas
  - Structural Analysis
  - Crash Test Simulation
  - Seismic Analysis
  - Life Sciences
- Server Consolidation & Virtualization:
  - E-mail, File and Print
  - Infrastructure Servers (LDAP, DHCP, DNS, etc.)
  - Database & Web Servers

# Sun Blade X6nnn Server Module Feature Comparison

The following tables compare a subset of features of the Sun Blade X6240 & X6440 Server Modules. Comparisons at the chassis level (Sun Blade 6000 & 6048 chassis) can be found in chassis specific Just The Facts “JTF” documents. In addition, detailed information on the Sun Blade X6nnn Server Modules can be found in their respective JTF documents. See the Materials Abstract section in the rear of this document for guidance.

\*Note: Since product feature sets change very frequently you should validate system product comparisons with data found at [www.sun.com](http://www.sun.com).

Features	Sun Blade X6240 (Gemini+) Server Module	Sun Blade X6440 (Pegasus+) Server Module
Processors per Server Module	2 Six-core Processors or Quad-core processors	4 Six-core processors or Quad-core processors
Cores per Server Module	12 (Six-core) and 8 (Quad-core)	24 (Six-core) and 16 (Quad-core)
Processor Models / Speed	Six-Core (45nm) AMD Opteron processors (aka Istanbul): 2427 (2.2 GHz) -- 75 W, 6M L3 Cache 2431 (2.4 GHz) – 75W, 6M L3 Cache 2435 (2.6 GHz) – 75W, 6M L3 Cache  Enhanced Quad-Core (45nm) AMD Opteron processors (aka Shanghai): 2376HE (2.3 GHz) -- 55 W, 6M L3 Cache 2380 (2.5 GHz) – 75W, 6M L3 Cache 2384 (2.7 GHz) – 75W, 6M L3 Cache 2389 (2.9 GHz) - 75 W, 6M L3 Cache	Six-Core (45nm) AMD Opteron processors (aka Istanbul): 8431 (2.4 GHz) – 75W, 6M L3 Cache 8435 (2.6 GHz) – 75W, 6M L3 Cache  Enhanced Quad-Core (45nm) AMD Opteron processors (aka Shanghai): 8380 (2.5GHz) – 75W, 6M L3 cache 8384 (2.7GHz) – 75W, 6M L3 cache 8389 (2.9 GHz) - 75 W, 6M L3 cache
Processor Interconnect	Coherent HyperTransport™3 @ 19.2 GB/s (full duplex) Note: 19.2 GB/s between processors only.	Coherent HyperTransport™3 @ 19.2 GB/s (full duplex) Note: 19.2 GB/S between processors only.
Maximum memory per Server Module	16 DIMM slots Up to 128 GB	32 DIMM slots Up to 256 GB
Memory type	DDR2-667/PC2-5300 ECC registered DIMMs (16 DIMMs @ 667MHz)	DDR2-667/PC2-5300 ECC registered DIMMs (32 DIMMs @ 667MHz)
Internal HDDs	Up to four SAS (2.5”) HDDs hot-plug / hot-swap (Marlin brackets)	Diskless
Internal SSD	Up to four SATA SSD hot-plug / hot-swap (Marlin brackets)	Diskless
Integrated RAID	RAID Expansion Module (REM) required for SAS HDD support	External RAID via. RAID Expansion Module (REM)

Features	Sun Blade X6240 (Gemini+) Server Module	Sun Blade X6440 (Pegasus+) Server Module
Maximum Ethernet Connections (production Ethernet network)	Up to 10 GbE ports: (per Server Module) 8 ports via. (2) quad port EMs 2 ports via. (2) NEMs	Up to 10 GbE ports: (per Server Module) 8 ports via. (2) quad port EMs 2 ports via. (2) NEMs
Expansion Slots  *Note: I/O support is chassis dependent	<ul style="list-style-type: none"> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to NEM slots = 64Gb/s</li> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to EM slots = 64Gb/s</li> <li>4 (3Gb/s ea.) SAS Interfaces = 12Gb/s</li> <li>2 Gigabit Ethernet links = 2Gb/s</li> </ul>	<ul style="list-style-type: none"> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to NEM slots = 64Gb/s</li> <li>2 (x8) PCI Express<sup>(R)</sup> busses connected to EM slots = 64 Gb/s</li> <li>4 (3Gb/s ea.) SAS Interfaces = 12Gb/s</li> <li>2 Gigabit Ethernet links = 2Gb/s</li> </ul>
Removable media	Remote re-direct	Remote re-direct
Service Processor	Yes, ILOM	Yes, ILOM
In-band Mgt.	IPMI v2.0 via KCS driver SNMP OS-resident agent	IPMI v2.0 via KCS driver SNMP OS-resident agent
Out-of-band Mgt.	IPMI v2.0, DMTF CLI, SNMP- v1, v2c, v3, Web GUI	IPMI v2.0, DMTF CLI, SNMP- v1, v2c, v3, Web GUI
Remote management features	Remote Keyboard, Video, Mouse (KVM), Video redirection, Remote media functionality, Remote power control remote access to BIOS, remote FRU status, monitoring. Logging, role-based access control	
System management paths	Dedicated management 100BaseT connections via CMM, Server Module (front) serial access port	
Rack Density	Per 42U Rack: (4x SB6000 Chassis)  Six-Core: 40 Two Socket Server Modules 80 Six-Core processors 480 Total Cores	Per 42U Rack: (4x SB6000 Chassis)  40 Four Socket Server Modules 160 Six-Core processors 960 Total Cores  *Note: Qty. 8 X6440 blades can be powered on in the Sun Blade 6000 Chassis with full N+N power supply redundancy. Installing greater than 8 X6440 blades in a Sun Blade 6000 Chassis will require turning off power supply redundancy in the chassis CMM. For additional guidance please refer to the Component Level Power Consumption section located further back in this document.
	Per Sun Blade 6048:  48 Two Socket Server Modules 96 Six-Core processors 576 Total Cores	Per Sun Blade 6048:  48 Four Socket Server Modules 192 Six-Core processors 1,152 Total Cores
Server Module Dimensions	Height = 1.75in (44.45mm) / Width = 12.88in (327.15mm) / Depth = 19.56in (496.82mm)	

Features	Sun Blade X6240 (Gemini+) Server Module	Sun Blade X6440 (Pegasus+) Server Module
Weight: Empty Server Module	~13.75lbs (6.23kg) (no processors, no DIMMs, no REM, no FEM, no CF, no HDD)	~16.0lbs (7.26kg) (no processors, no DIMMs, no REM, no FEM, no CF)
Weight: Fully Configured Server Module	~17.41lbs (7.90kg) (2 processors, 16 DIMMs, 1 REM, 1FEM, 1 CF, 4 HDDs)	~17.41lbs (7.90kg) (2 processors, 16 DIMMs, 1 REM, 1FEM, 1 CF, 4 HDDs)
Power supplies	There are no power supplies in the blades. The blades rely on the power infrastructure provided by the chassis within which it resides.	
OS Support	See <a href="http://www.sun.com/servers/blades/os.jsp">http://www.sun.com/servers/blades/os.jsp</a> for latest operating system support for each product	

# Enabling Technologies

## Technology Overview

The Sun Blade X6440 Server Module is supported in the Sun Blade 6000 and Sun Blade 6048 Modular Systems. The Sun Blade 6000 Modular System is a rack mounted, chassis based solution supporting up to ten Sun Blade Server Modules. The Sun Blade 6048 Modular System is a unibody designed chassis supporting up to 48 Sun Blade Server Modules. The X6440 Server Modules feature the following technologies:

- AMD (3<sup>rd</sup> Generation) Opteron processors
  - 8435 and 8431 Six-Core AMD Opteron Processors (6M L3 cache)
    - Coherent HyperTransport3
    - HyperTransport Technology Assist
  - 8354 Quad-Core processors (2M L3 cache) (ATO only)
  - 8380, 8384 & 8389 enhanced Quad-Core processors (6M L3 cache)
- Direct Connect Architecture
- HyperTransport™
- PCI Express<sup>(R)</sup> (PCIe)
- Integrated Lights Out Management (iLOM) with dedicated Service Processor
- Sun xVM Ops Center

## AMD™ Opteron™ (2<sup>nd</sup> Generation) Dual Core processor Features

\*Note: Although the Sun Blade X6440 Server Modules do not support AMD Opteron Dual Core processors the information contained within this section is provided as background information.

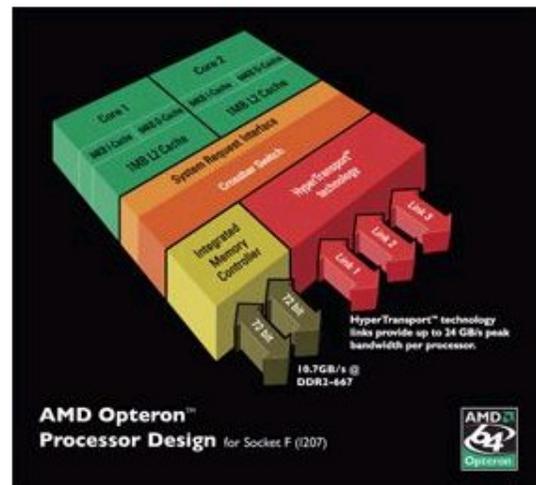
The previous generation two-socket Sun Blade X6220 server module utilized the 2<sup>nd</sup> Generation Opteron (dual-core) processors (aka “Santa Rosa”).

The AMD Opteron Dual Core processor is part of a computing platform that extends the ubiquitous x86 architecture to accommodate x64 64-bit processing. 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 economies of industry-standard processors.

### Major enhancements over legacy x86 include:

- Sixteen 64-bit general-purpose integer registers that quadruple the general-purpose register space available to applications and device drivers as compared to x86 systems.

- Sixteen 128-bit XMM registers for enhanced multimedia performance to double the register space of any current SSE/SSE2 implementation.
- A full 64-bit virtual address space with 40 bits of physical memory addressing and 48 bits of virtual addressing that can support systems with up to 256 terabytes of physical memory.
- 64-bit operating systems to provide full, transparent, and simultaneous 32-bit and 64-bit platform application multitasking.
- A 128-bit wide, on-chip DDR memory controller that supports ECC and ChipKill technologies and provides low-latency memory bandwidth which scales as processors are added.



AMD Opteron Dual Core processor Design

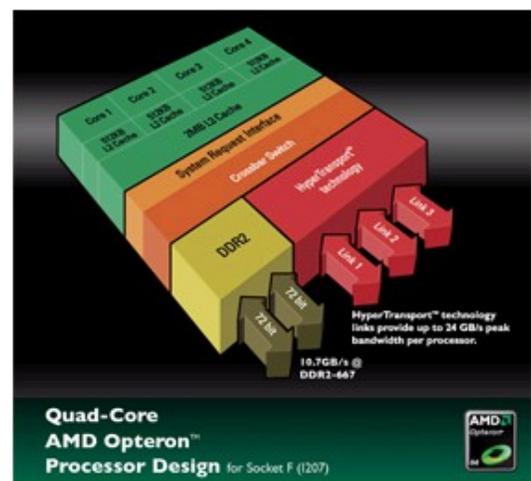
### Dual Core specifics:

- Each core has dedicated 1MB L2 Cache
- Both cores share the memory controller and HyperTransport interconnects
- Performance characterization of single-core based systems have revealed that the Memory and HyperTransport bandwidths are under-utilized even while running high-end server workloads

## AMD Opteron (3<sup>rd</sup> Generation) Quad Core processor Features:

### Opteron Quad Core major enhancements & features:

- **Double the number of compute cores over 2<sup>nd</sup> Generation Dual Core Opteron processors**
- **Native Quad-Core processing:**
  - AMD Quad-Core Opteron processors feature a “native” multi-core design. All four cores are on one piece of silicon, which helps enhance “core-to-core” communication versus other vendor's solutions which piece two dual-core die together into a single package.
- **Enhanced AMD PowerNow!™ technology with Independent Dynamic Core Technology & AMD CoolCore™ Technology:**
  - Independent Dynamic Core Technology, which enables variable clock frequency for each core, depending on the specific performance requirement of the applications it is supporting, helping to reduce power consumption
  - AMD CoolCore™ technology, which can reduce energy consumption by turning off unused parts of the processor
- **Dual Dynamic Power Management™ (DDPM™) technology:**
  - Also known as split-plane technology. DDPM provides an independent power supply to the cores and to the memory controller, allowing the cores and memory controller to operate on different



AMD Opteron Quad Core processor Design

voltages, depending on usage

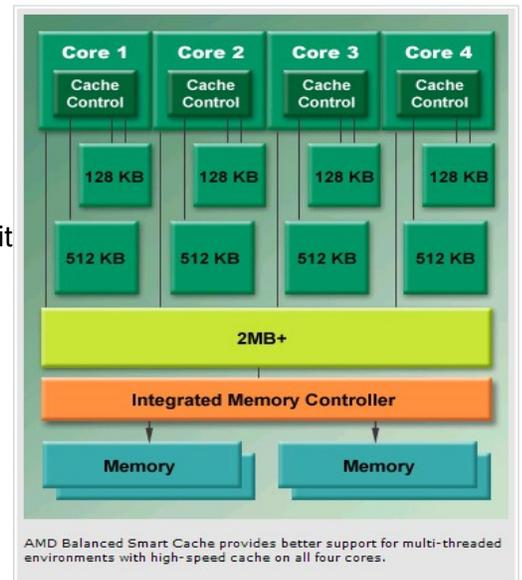
- Separate power planes for the cores and the memory controller allow power to be distributed efficiently and use different voltages to increase memory controller operational frequencies by up to 200MHz for increased throughput and processor performance.
- Memory controllers can continue to run at high frequency even while the cores throttle back — maintaining NUMA high-bandwidth performance.
- This can increase throughput while allowing under used cores to reduce frequency and voltage levels to decrease platform power consumption and noise generation.

- **Additional Quad Core performance enhancements:**

Quad-Core AMD Opteron processors feature out-of-order load execution and enhanced branch prediction, in addition to the capabilities listed below.

- **AMD Balanced Smart Cache:**

- For Optimum Multi-Threaded Application Support, AMD Balanced Smart Cache provides exceptional support for multi-threaded environments with high-speed cache on all four cores:
  - Dedicated 64K L1 data cache to handle data quickly and efficiently
  - Dedicated 64K L1 instruction cache can load two 128-bit instructions per cycle
  - Dedicated 512K L2 cache to improve core efficiency and minimize latency
  - Shared 2MB L3 cache to facilitate data transfer and improve performance
  - **\*Note: enhanced Quad-Core AMD Opteron™ processors (Shanghai) contain 6MB (shared) L3 cache**



- **Memory Optimizer Technology:**

- For Increased Memory Performance, designed to match the increased demands of quad-core processing, AMD Memory Optimizer Technology can improve memory throughput by up to 50% over same-frequency Second-Generation AMD Opteron processors through a series of innovations:
  - 128-bit memory channel can be divided into two independent 64-bit memory channels for improving memory bandwidth
  - Larger memory buffers for increased throughput
  - Write bursting to minimize read/write transitions for greater throughput
  - Optimized DRAM paging algorithm to intelligently predict and retrieve data needed from main memory for greater throughput
  - Core prefetchers fetch data directly to L1 cache to decrease latency and to spare L2 bandwidth

- **Wide Floating-Point Accelerator:**

- For Dramatically Improved Floating-Point Performance, 128-bit SSE floating-point capabilities enable each processor to simultaneously execute up to four floating-point operations per core (four times the floating-point computations of Second-Generation AMD Opteron processors) to significantly improve performance on compute-intensive floating-point applications.
- The floating-point accelerator also includes these features:
  - 128-bit floating-point pipeline
  - Doubled instruction and data delivery mechanisms compared to Second-Generation AMD Opteron processors
  - Support for misaligned SSE operations
- **AMD Virtualization™ with Rapid Virtualization Indexing:**
  - AMD Virtualization™ introduces Rapid Virtualization Indexing (formerly called “Nested Paging”) and Tagged TLBs (Translation Look-aside Buffers).
  - Rapid Virtualization Indexing feature is designed to reduce the overhead penalty associated with virtualization technologies by:
    - Allowing the management of virtual memory in hardware instead of software
    - Reducing the complexity of existing x86 virtualization solutions
    - Enabling increased performance and efficiency for many virtual workloads

## Direct Connect Architecture

- All AMD Opteron processors feature AMD’s Direct Connect Architecture, which can improve overall system performance and efficiency by reducing the bottlenecks inherent in traditional FSB (front side bus) architectures.
- With Direct Connect Architecture, there are no front-side buses. Instead, the processors, memory controllers and I/O are directly connected to each processor.

## HyperTransport™ Technology

The AMD Opteron processor with integrated-in HyperTransport technology links provides a scalable bandwidth interconnect among processors, I/O subsystems, and other chipsets.

HyperTransport technology interconnects:

- Help increase overall system performance by removing I/O bottlenecks and efficiently integrating with legacy buses, increasing bandwidth and speed, and reducing latency of processors.
- Provide up to 8 GB/sec. bandwidth per link at 16 x 16 bits, 1 GHz operation, providing sufficient bandwidth for supporting new interconnects.

Additional Quad-Core enhancement details can be located here:

[http://www.amd.com/us-en/Processors/ProductInformation/0,,30\\_118\\_8796\\_15223,00.html](http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_15223,00.html)

## Six-Core AMD Opteron Processors:

### Six-Core AMD Opteron Processors

Both Sun Blade X6240 and X6440 server modules support the Six-Core AMD Opteron

Processors which were announced by AMD on June 1, 2009. The Six-Core AMD Opteron processor occupies the same footprint as the enhanced Quad-Core AMD Opteron processor, and is based on the Direct Connect Architecture, which drastically improves the overall system performance and efficiency by connecting memory controllers and I/O directly to each processor.

The key features of the Six-Core AMD Opteron processors are the following:

- Six cores
- HyperTransport technology (HT) assist
- Increased HT3 bandwidth (Note: Sun Blade X6240 server module implements Coherent HT3. Please see below)
- AMD-P power management technologies
- AMD-Virtualization™ (AMD-V™) technology
- Same power/thermal ranges as Quad-Core AMD Opteron™ processors
- 20%-50%\* higher performance than Quad-Core AMD Opteron processor in the same power band

(Source: AMD's website, June 2009)

**The following features help boost performance:**

- Six Cores: Provides better performance and power efficiency when running multi-threaded applications
- HyperTransport Technology Assist (HT Assist): Improves the performance of the cache sensitive applications such as virtualization, database and HPC by reducing cache probe traffic between processors
- HyperTransport 3.0 Technology (HT3): Helps improve the overall system balance and provides better scalability by increasing the interconnect rate from 2 GT/s to a maximum of 4.8 GT/s.

**The following AMD-P features enable better power efficiency and management:**

- AMD CoolCore[™] technology: Helps reduce energy consumption by enabling users to turn off the unused parts of the processor
- AMD Smart Fetch Technology: Helps reduce power consumption by allowing cores not being used to enter the "halt" state so that it can draw less power
- Dual Dynamic Power Management[™] Technology: Enables better management of power by enabling each core and memory controller to be powered by different power source so that they can be operated at different voltage levels
- Enhanced Power Now[™]! Technology: Uses Independent Dynamic Core Technology to help reduce power consumption by enabling each core to vary its clock frequency so that they can operate at the clock frequency required by their applications
- Integrated DDR2 DRAM Memory Controller: Enables the use of low-power, energy efficient DDR2 memory. Also incorporates memory RAS to reduce system downtime and to increase system reliability.

### **The following AMD-V features enable better virtualization:**

- Rapid Virtualization Indexing and Tagged-TLB: Helps decrease latency, improve performance, and run more virtual machines on the system by allowing the translation of virtual to physical memory addresses in hardware instead of software.
- Extended Migration: Allows higher availability by enabling the movement of a virtual machine between two servers running AMD Opteron™ processors on many virtualization software solutions.

For more details on the Six-Core AMD Opteron Processors, please see the following AMD web site: <http://www.amd.com/us/products/server/six-core-opteron/Pages/six-core-opteron.aspx>

### **Coherent HyperTransport3**

The Sun Blade X6240 server module implements Coherent HT 3 as opposed to the full HT3. The full HT3 speed of 19.2 GB/s is achieved only between the links that connect processors, and does not extend to links that connect processors to the nVIDIA MCP55 & IO55 controllers. The links between the processors and the nVIDIA MCP55 & IO55 controllers still operate at the HT speed of 8 GB/s. To achieve a full HT3, nVIDIA MCP55 & IO55 controllers will have to be replaced by chipsets that support HT3.

### **Other Unsupported Six-Core AMD Opteron Processor Features**

Currently, the following Six-Core AMD Opteron processor features are not supported by the Sun Blade X6240 server module:

- AMD CoreSelect - cannot be supported based on the current BIOS
- Power Cap - cannot be supported based on the current BIOS
- AMD-Vi - requires different chipsets
- AMD RPMI - ILOM and the motherboard layout need to be changed to support the I2C device that can be read by ILOM

### **PCI Express<sup>(R)</sup> (PCIe) Technology**

PCI Express technology is an inexpensive but highly scalable, switched, point-to-point interconnect that maintains complete software compatibility with PCI while increasing I/O bandwidth up to 128 Gb/s per port.

PCIe maintains compatibility by retaining the OSI transaction layer as defined by the PCI specification thus allowing vendors to leverage their existing PCI software.

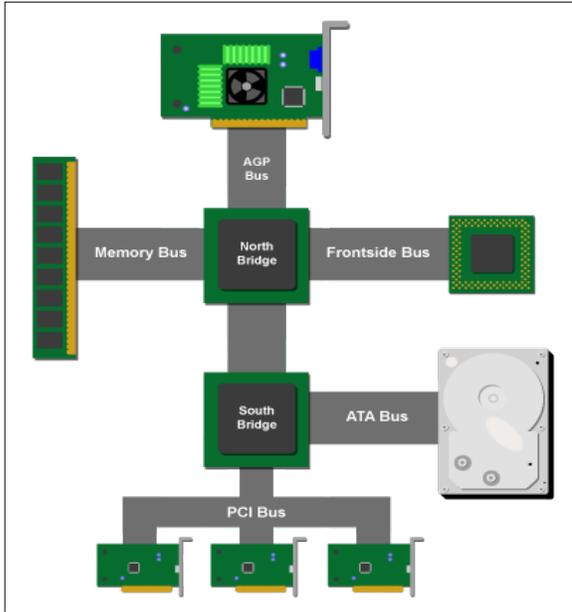
In addition to moving from a shared-bus architecture to a point-to-point switched architecture, PCIe accomplishes the increase in bandwidth with the concept of “lanes” that can be aggregated into x1, x2, x4, x8, and even x16 lanes. Consisting of 4 pins each, each lane is bi-directional and has a data delivery transfer rate of 2Gb/s in each direction for a total of 4 Gb/s per lane. Each x8 lane provides up to 32Gb/s of I/O bandwidth. This represents a four-fold increase over PCI-X running at 133MHz.

PCI Express also:

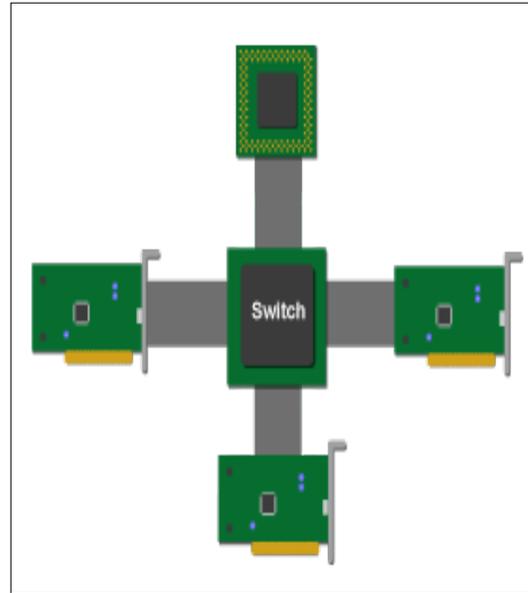
- Simplifies I/O with the utilization of one architecture for multiple purposes eliminating the need for AGP, PCI-X and Hublink
- Provides an adaptable, layered architecture that can grow in bandwidth while

maintaining software computability

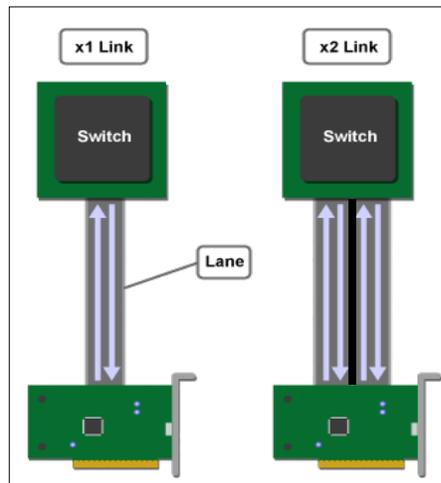
- Adds new capabilities with i/o-synchronous data transfers that provide Quality of Service (QOS) operations
- Eases use with hot-plug and hot-swap capabilities, that once supported by operating systems, will simplify upgrade and service tasks.



*PCI - Shared Bus Architecture*



*PCI Express - Point to Point Switch Architecture*



<i><b>PCI TECHNOLOGY</b></i>	<i><b>BUS SPEED</b></i>	<i><b>BUS WIDTH</b></i>	<i><b>BANDWIDTH</b></i>	<i><b>COMMENTS</b></i>
PCI	33 MHz	32 bit	133 MB/s	Shared Bus – Half Duplex
	33 MHz	64 bit	266 MB/s	
	66 MHz	32 bit	266 MB/s	
	66 MHz	64 bit	532 MB/s	
PCI-X	66 MHz	64 bit	512 MB/s	Shared Bus – Half Duplex
	100 MHz	64 bit	800 MB/s	
	133 MHz	64 bit	1 GB/s	
	266 MHz	64 bit	2 GB/s	
PCI Express			Encoded / Unencoded	Switched point to point - Full Duplex
		x1	5 Gbps / 4 Gbps (500 MB/s)	
		x2	10 Gbps / 8 Gbps (1 GB/s)	
		x4	20 Gbps / 16 Gbps (2 GB/s)	Sun Blade X6440 Server Modules
		x8	40 Gbps / 32 Gbps (4 GB/s)	
		x12	60 Gbps / 48 Gbps (6 GB/s)	
		x16	80 Gbps / 64 Gbps (8 GB/s)	

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

Sun's Integrated Lights-out Manager is driven by an integrated system service processor residing in the Sun Blade Server Modules that follows x86 standards. ILOM provides full remote KVMs (Keyboard, Video, Mouse, Storage) support together with remote media functionality. Lights-out management (LOM) is achieved using an on-board, independently powered service processor with its own robust, security hardened OS. ILOM provides remote administration via an intuitive browser-based GUI, DTMF style 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 facilitates rapid correction
- User configurable serial console accessible via a physical port or re-directed through the management network

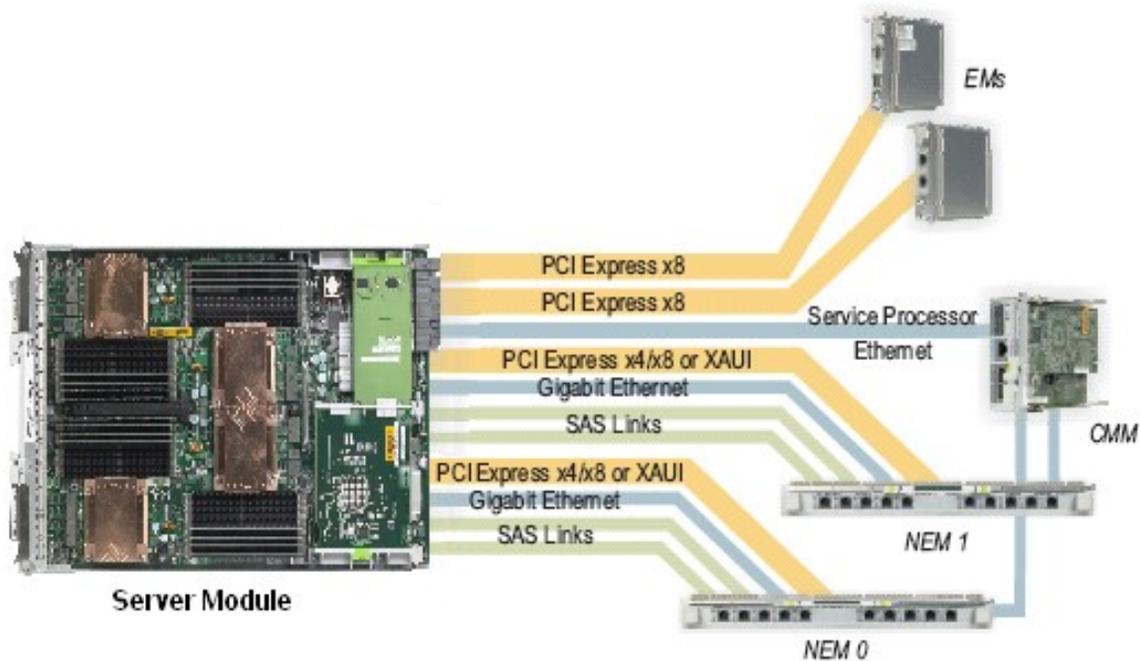
## Sun Blade 6000 & 6048 Chassis Midplane Technology

In order for a Sun Blade X6440 Server Module to be functional it must reside within a Sun Blade 6000 or Sun Blade 6048 Chassis. Therefore, it is important to understand each chassis Midplane & I/O design points.

\*Note: The following information is a high-level description of the Sun Blade 6000 & 6048 Chassis midplane, for in-depth Sun Blade 6000 Chassis information please refer to the materials abstract section found in the back of this document.

In essence, the passive midplanes in the Sun Blade 6000 and 6048 modular systems are a collection of wires and connectors between different modules in the chassis. Since there are no active components, the reliability of these printed circuit boards is extremely high — in the millions of hours, or hundreds of years. The passive midplane provides electrical connectivity between the server modules and the I/O modules.

All modules, front and rear, with the exception of the power supplies and the fan modules connect directly to the passive midplane. The power supplies connect to the midplane through a bus bar and to the AC inputs via a cable harness. The redundant fan modules plug individually into a set of three fan boards, where fan speed control and other chassis-level functions are implemented. The front fan modules that cool the PCIe ExpressModules each connect to the chassis via blind-mate connections.



The main functions of the midplane include:

- Providing a mechanical connection point for all of the server modules
- Providing 12 VDC from the power supplies to each customer-replaceable module
- Providing 3.3 VDC power used to power the System Management Bus devices on each module, and to power the CMM
- Providing a PCI Express interconnect between the PCI Express root complexes on each server module to the EMs and NEMs installed in the chassis
- Connecting the server modules, CMMs, and NEMs to the chassis management network

Each server module is energized through the midplane from the redundant chassis power grid. The midplane also provides connectivity to the I2C network in the chassis, letting each server module directly monitor the chassis environment, including fan and power supply status as well as various temperature sensors. A number of I/O links are also routed through the midplane for each server module (see figure above), including:

- Two x8 PCI Express links connect from each server module to each of the dedicated EMs
- Two x8 PCI Express links connect from each server module, one to each of the NEMs
- Two gigabit Ethernet links are provided, each connecting to one of the NEMs
- Four Serial Attached SCSI (SAS) links are also provided, with two connecting to each NEM

### Leading I/O Capacity

The Sun Blade 6000 family of Modular Systems provide extensive I/O capabilities and a wealth of I/O options, allowing Sun Blade Modular Servers to be used for applications that require significant I/O throughput:

- Up to 142Gbps of I/O capacity is provided on each Sun Blade Server Module, delivered through 32 lanes of PCI Express I/O, as well as multiple gigabit Ethernet and SAS links. Each server module delivers its I/O to the passive midplane and the I/O devices connected to it in the Sun Blade 6000 chassis or Sun Blade 6048 shelf.
- Two hot-plug PCI Express ExpressModules (EM) slots are dedicated to each server module

(20 per Sun Blade 6000 chassis or 24 per Sun Blade 6048 shelf) for granular blade I/O configuration.

- Network Express Modules (NEMs) provide bulk I/O across multiple server modules and aggregate I/O functions. Sun Blade 6000 and 6048 modular systems supply up to two NEMs, each with a PCI Express x8 or XAUI connection, gigabit Ethernet connection, and two SAS link connections to each server module.

For more granular information, please see each chassis' respective Just the Facts document:

- Sun Blade 6000 Modular System JTF, SunWin #: 494859
- Sun Blade 6048 Modular System JTF, SunWin #: 517106

The Sun blade X6440 Server Module is supported in the current (PCIe 1.1 based) Sun Blade 6000 (A90-A) and 6048 (B22-B) chassis as well as the next generation chassis which are based on the PCIe 2.0 (aka PCIe Gen2) technology. Although the next generation Sun Blade 6000 (A90-B) and 6048 (B22-D and B22-C<sup>5</sup>) chassis' midplanes are based on the PCIe 2.0 technology, the Sun Blade X6440 server module will still run in these next generation chassis. However, since the Sun Blade X6440 server module I/O is based on the PCIe 1.1 technology, the bandwidth across the passive midplane of the next generation chassis will also be at the PCIe 1.1 speed.

The Sun Blade server modules, EMs, and NEMs, that are currently shipping are fully compatible with the Sun Blade 6000 and 6048 chassis' with the PCIe 2.0 midplanes. In order to achieve the PCIe 2.0 levels of throughput, Sun blade server modules, EMs and NEMs must all be based on the PCIe 2.0 technology. As of today, the only EM that is based on the PCIe 2.0 technology is the Sun Blade (qMirage) QDR IB-HCA PCI-e 2.0 EM. The other current EMs and NEMs are all based on PCIe 1.1 technology, and they are not capable of providing PCI 2.0 levels of throughput. Additional EMs based on the PCIe 2.0 technology are expected to become available in the 2<sup>nd</sup> half of CY09. Keep in mind that even when PCI 2.0 modules become available, they will have to be utilized in a chassis that is using a PCIe 2 midplane to realize PCIe 2.0 bandwidth capabilities. In other words, the installed Sun blade server and the midplane dictates the performance of the I/O. So, if you run Gen1 products in a Gen2 midplane you will achieve Gen1 speeds. For additional guidance see the tables below.

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5 B22-C is currently only for pre-approved HPC orders, B22-D is the standard configuration (Gen2) 6048 Chassis

**Table:** Data path from Sun Blade Server Module to Chassis Midplane to EM => I/O Speed



<i>Sun Blade Server Module</i>	<i>Sun Blade Chassis Midplane</i>	<i>PCIe ExpressModule</i>	<i>I/O Speed</i>
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 ExpressModule	PCIe 2.0
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 QDR IB HCA EM	QDR (40 Gb/s)
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 1.1 ExpressModule	PCIe 1.1
PCIe 1.1 Server Module	PCIe 2.0 Midplane	PCIe 2.0 ExpressModule	PCIe 1.1
PCIe 2.0 Server Module	PCIe 1.1 Midpane	PCIe 2.0 ExpressModule	PCIe 1.1

\*Note: ExpressModules based on PCIe 2.0 technology are expected to become available in the 2<sup>nd</sup> half of CY09.

**Table:** Data path: From Sun Blade Server Module to Chassis Midplane to NEM => I/O Speed



<i>Sun Blade Server Module</i>	<i>Sun Blade Chassis Midplane</i>	<i>Network Express Module</i>	<i>I/O Speed</i>
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 NEM	PCIe 2.0
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 1.1 NEM	PCIe 1.1
PCIe 1.1 Server Module	PCIe 2.0 Midplane	PCIe 2.0 NEM	PCIe 1.1
PCIe 2.0 Server Module	PCIe 1.1 Midplane	PCIe 2.0 NEM	PCIe 1.1

# Sun Blade X6440 Server Module I/O

The Sun Blade X6440 server module leverages the Independent I/O design of the Sun Blade Modular System chassis within which it resides.

The Sun Blade Modular System's Independent I/O was designed so that all Server Module I/O passes through the chassis' passive mid-plane and out through hot-pluggable I/O modules that are connected to the customers network(s) of choice. With this Independent I/O modular design, customers have the flexibility of picking and choosing the I/O module that best meets their networking needs.

For example, a customer may currently be using a dual port Gigabit Ethernet ExpressModule, but as the need for a 10 Gigabit Ethernet arises in the future, the customer can easily replace the Gigabit Ethernet ExpressModule with the 10 Gigabit Ethernet ExpressModule. Replacing ExpressModules is simple and fast, since all I/O modules are hot-pluggable and accessible from the rear of the chassis. This means customers don't even have to physically touch the Sun Blade X6440 server module to perform this I/O upgrade. The Sun Blade X6440 server modules are disaggregated from their associated I/O Modules.

I/O modules are available in two different form factors:

- PCIe ExpressModules (EMs)
- Network Express Modules (NEMs)

NEMs provide "chassis wide" I/O. NEMs should be used when all of the server modules within a chassis require the same network interface. For blade unique I/O requirements, EMs should be used.

## PCIe ExpressModules (EM)

If individual server modules require different types of I/O, then the ExpressModules must be used. With EMs, each server module can satisfy its unique I/O requirement. EMs are available to support the following networking technologies:

### Gigabit Ethernet (GbE):

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual Port Gigabit Ethernet MMF (fiber) ExpressModule	PCIe 1.1			X7283A-Z
Quad Port (x4) Gigabit Ethernet (copper) ExpressModule, OEM from Intel	PCIe 1.1		Intel	X7284A-Z

### Combination GbE / Fibre Channel (FC):

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual port GbE & Dual Port FC	PCIe 1.1	Elara	Emulex	SG-XPCIE2FCGBE-E-Z
Dual Port GbE & Dual Port FC	PCIe 1.1	Elara	Qlogic	SG-XPCIE2FCGBE-Q-Z

## Fibre Channel:

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual Port 4Gb FC	PCIe 1.1		Emulex	SG-XPCIE2FC-EB4-Z
Dual Port 4Gb FC	PCIe 1.1		Qlogic	SG-XPCIE2FC-QB4-Z

## Ten Gigabit Ethernet:

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual Port 10GbE PCIe ExpressModule w_SFP support	PCIe 1.1		Intel 82598	X1108A-Z

## InfiniBand:

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual Port 4x (10Gb/s) InfiniBand	PCIe 1.1		Mellanox	X1288A-Z
Dual Port Double Data rate (DDR) InfiniBand	PCIe 1.1	Mirage	Mellanox ConnectX	X4216A-Z
Dual Port Quad Data Rate (QDR) InfiniBand	PCIe 2.0	qMirage	Mellanox ConnectX	X4219A-Z

## Serial Attached SCSI (SAS):

<i>Description</i>		<i>Code name</i>	<i>OEM</i>	<i>X-Option</i>
Dual Port 12Gb SAS	PCIe 1.1	Mimas	LSI	SG-XPCIE8SAS-EB-Z

The Independent I/O design of the Sun Blade Modular System Chassis' provide maximum flexibility in fabric network support. A maximum of 2 EMs can be used per Server Module. For a current list of available EMs , please see <http://www.sun.com/servers/blades/optioncards.jsp>

Leveraging standard PCI Express I/O architecture specifications, the PCIe ExpressModules are hot pluggable and easily serviceable from the rear of the chassis. In addition, Sun's blade server architecture is the only blade server architecture that allows for individual I/O choice per blade. Competing designs force customers into homogeneous blade I/O configurations due to their switched or pass-thru module designs that force all mezzanine adapters (installed within the blades) to be of the same kind.

## Network Express Modules (NEMs)

NEMs are supported in all Sun Blade Chassis. However, NEMs are chassis specific. NEMs designed for the Sun Blade 6000 Chassis will not work in the Sun Blade 6048 Chassis and vice versa. NEMs provide the same I/O capabilities across all the server modules installed in a given chassis, simplifying connectivity. The main choices of NEM interconnects are:

For a list of available NEMs for the different Sun Blade Modular Systems, please see <http://www.sun.com/servers/blades/optioncards.jsp>.

For certain NEMs, a Fabric Expansion Module (FEM) or RAID Expansion Module (REM) must be installed within the server module to establish an interface with that particular NEM. For the Sun Blades X6440 server module, the following table summarizes the FEMs and REMs that are required for interoperability with particular NEMs.

<b>X6440 Network Express Module Options:</b>				
<b>NEM Rules:</b>				
If the Server Module is to be installed in a Sun Blade 6000 Modular System Chassis, the chassis supports a maximum of two single height NEMs. If a NEM is double height, then you can only have one double height NEM per chassis.				
<i>Description</i>	<i>NEM X-option</i>	<i>NEM XATO</i>	<i>FEM</i>	<i>REM</i>
Sun Blade 6000 GbE 10-port Pass-Thru Network Express Module.	X4250A	N/A	Nothing Required	Nothing Required
Sun Blade 6000 Multi-Fabric Network Express Module with 10x 1 GbE pass-thru ports, 4 miniSAS x4 ports.	X4212A	N/A	Nothing Required	(X)4607A* (X)4620A*
Sun Blade 6000 Virtualized NEM 10-port 1GbE + 4-port SAS + 2 port 10GbE  Required: Short Reach SFP+ optical module p/n: X5561A-Z	X4238	N/A	(X)4263A	(X)4607A* (X)4620A*

For Sun Blade 6048 Modular System Chassis				
Sun Blade 6048 GbE 12-port Pass-Thru Network Express Module.	X4731A	N/A	N/A	N/
SunBlade 6048 IB switched network express module 72 port, 4xQDR Infiniband double-height leaf switch combined w/24 passthru RJ45 GigE ports.NEM contains (2)36-port QDR IB switches that are coupled to the Blade HCA ports, 24 4xQDR switched downlinks. 30external 4xports are consolidated into 10 12x CXP connectors for use w/either 12x-12x cable or 12x-4x 3-way splitter cable. Short "jumper" cable avail. to increase the number of links between the switch chips in large CLOS configurations	X5500A	N/A	(X)4239A	N/A
* Note: Since the (4) external facing SAS ports on Sun Blade 6000 Multi-Fabrice NEM and the Sun Blade 6000 Virtualized NEM are not used this time, a REM is required, only if customer is planning to use the Sun Blade 6000 Disk Module.				

### Fabric Expansion Modules (FEMs):

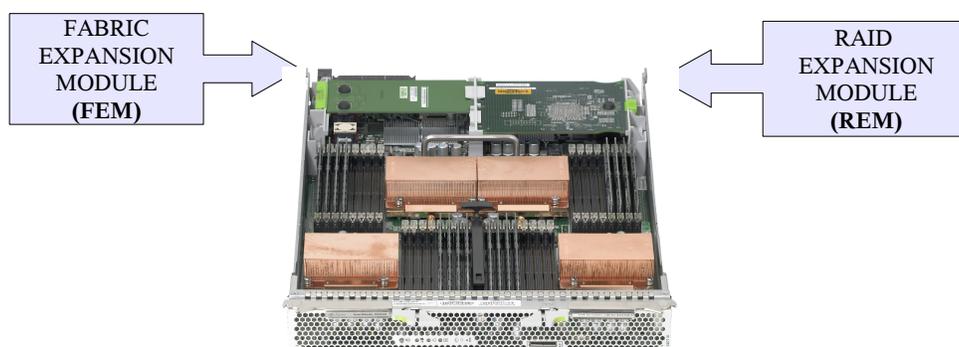
In order to communicate through various (but not all) Network Express Module supported fabric protocols there may be a requirement for inclusion of a Fabric Expansion Module **within the Server Module** as an interface to the NEM. Please refer to the Ordering & Part Number Information section for additional guidance.

<i>Description</i>	<i>ATO (Factory Integration)</i>	<i>X-Option</i>
Passthru FEM (aka Hunter): Required for P+ and G+ to work with (original) NEM-IB NEM (Sun Blade 6048 double height) Switched InfiniBand (PT GbE) NEM (P/N X5196A-Z) & also NEM++ (Hydra)	4263A	X4263A
IBFEM: Sun Blades - (IB DDR FEM) Dual Data Rate InfiniBand-Host Channel Adapter PCI-Express Gen 2 Fabric Expansion Module (FEM). Required for P+ & G+ to work with Sun Blade 6048 InfiniBand QDR Switched Network Express Module (QNEM)	4239A	X4239A

## RAID Expansion Modules (REMs):

Sun Blade X6440 Server Modules are diskless. They do not support the use of internal HDDs. Connectivity to external storage can be achieved by various methods. Attachment to external storage via technologies such as Ethernet, InfiniBand, Fibre Channel etc. can be facilitated with the use of EMs or NEMs that support the required protocol.

If RAID support is required, a RAID Expansion Module will have to be installed **within the Serve Module**. REMs communicate through the midplane to NEM slots. Please refer to the Ordering & Part Number Information section for additional guidance.



The REMs supported by the Sun Blade X6440 is shown in the following table:

<i>Description</i>	<i>ATO (Factory Integration)</i>	<i>X-Option</i>
Sun Blade RAID 0/1 RAID Expansion Module II (REM), supports 254 SAS addresses (aka Jackal 2)	4607A	X4607A
Sun Blade RAID Expansion Module adapter, REM form factor, 256MB of cache and battery back-up. (aka Coyote)	4620A	X4620A

# Sun Blade X6440 Server Module Design

## Sun Blade X6440 Server Module

The Sun Blade X6440 Server Module is designed to maximize performance and provide unprecedented I/O throughput while maximizing reliability and serviceability. Each Sun Blade X6440 Server Module contains 4 processor sockets. The X6440 Server Module currently supports configurations with all four processor sockets populated. Each Server Module features four high-performance Six-Core AMD Opteron processors interconnected by dedicated 19.2 GB/sec Coherent HyperTransport links. Each processor controls 4 pair (8 DIMMs) of DDR2 DIMM slots with 10.6 GB/sec access between processor and memory.

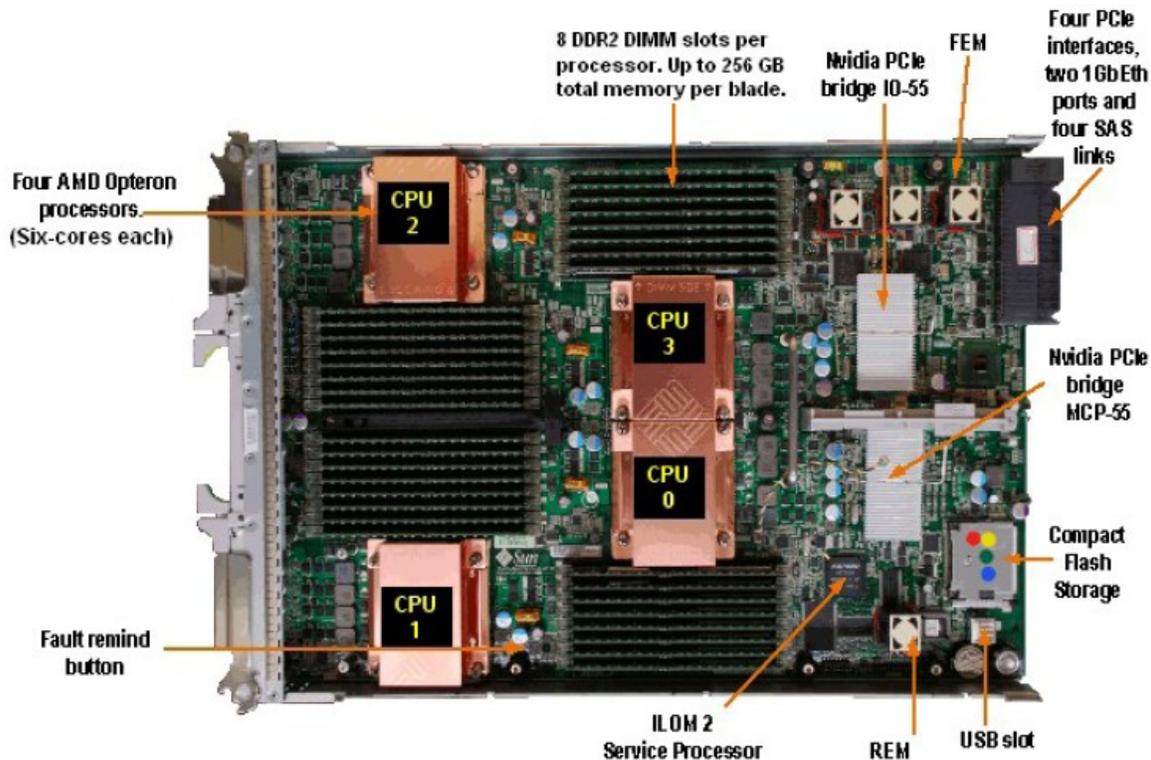
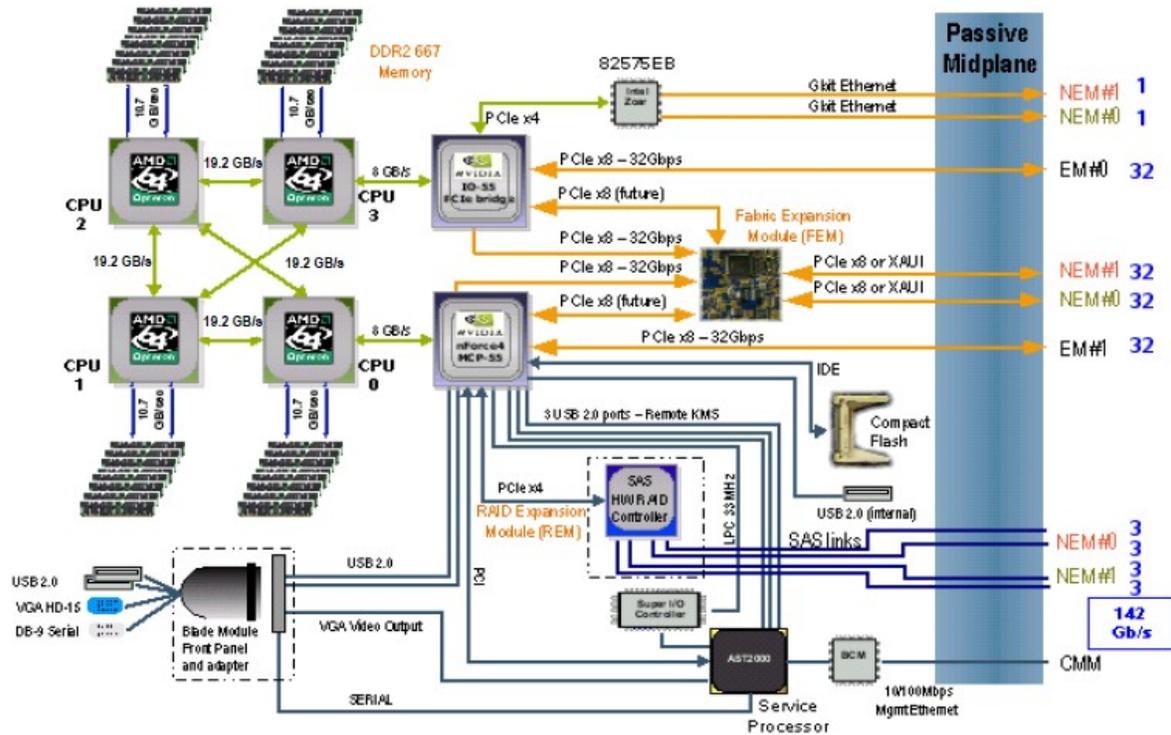
Through HyperTransport3, the processors can access each others memory. A four processor Sun Blade X6440 Server Module populated with 8GB DIMMs supports 256GB of DDR2-667MHz, PC2-5300 ECC Registered memory.

I/O connectors provided on the front of the Server Module include a dedicated DB-9 serial connection to the on board Service Processor (SP), 2 USB 2.0 ports, and a VGA Video connection to an onboard AST2000 chip. Attachment to these I/O connectors is facilitated via dongle cable. The X6440 supports the (3-port) dongle cable (X-Option P/N X4622A).

The architecture of the Sun Blade X6440 Server Module is designed to provide expansive I/O capacity and flexibility with the use of PCI Express (PCIe) technology. At the core of this capability is the Sun Blade X6440's four (x8) and two (x4) PCIe links providing 142Gb/s of throughput.

In addition, the Sun Blade X6440 Server Module was “design optimized” for six-core. The Server Module fully supports the features that went into the Six-Core AMD Opteron processors such as coherent HT3, HT Assist, AMD-V technology, AMD-V, and Dual Dynamic Power Management technology (aka split plane).

# Sun Blade X6440 Server Module Block Diagram:



## Memory DIMMs

Each processor has eight associated DIMM slots, arranged by two-DIMM pairs. This DIMM pairing supports the AMD Opteron's dual-channel performance feature, wherein the processors can access the DIMMs two at a time as though they formed a single logical DIMM. The effective width of the data path to the DIMM is doubled, allowing the processors to move data 128-bits at a time using two 64-bit DIMMs.

The Sun Blade X6440 Server Module supports all 32 DIMMs (8 per installed processor) running at 667MHz.

Memory DIMMs must be installed in identical pairs (from the same manufacturer and in the same capacity) for 128-bit ECC and maximum performance.

DIMM pair 0 (DIMMs 0 and 1) is the pair furthest from the respective processor and shaded blue, while DIMM pair 3 (DIMMs 6 and 7) is the pair closest to the processor and is shaded black. DIMMs are customer-replaceable units (CRUs).

Located on the system board is a "fault button" which is used to locate failed components (processors, DIMMs etc.) within the Server Module. This button is utilized to locate a failed component after the Server Module has been removed from the chassis.

### General Memory Configuration Notes:

Memory Restrictions:

- Memory must be installed in matched pairs. Although it is technically possible to install pairs of different density DIMMs (e.g. 2x 2GB DIMMs and 2x 4GB DIMMs), symmetry is best for memory performance (e.g. for 16GB total memory you should have 2x 2GB DIMMs in the first pair of memory slots associated with each of the four processors).
- In addition, the 2GB Memory DIMMs supported in the Sun Blade X6440 Server Modules consist of 1Gb DRAM chips and are single rank. The 4GB and 8GB Memory DIMMs supported in the Sun Blade X6440 Server Modules consist of 1Gb DRAM chips and are dual rank DIMMs. Mixing Dual rank and Single rank DIMMs within the same Server Module should be avoided as it is likely to result in a significant performance degradation.

### Server Module Management

Management in legacy blade platforms has typically either been lacking, or administrators have been forced into adopting unique and platform-specific management infrastructure. To address this issue, the Sun Blade 6000 and 6048 modular systems provide a wide range of flexible management options.

Sun Blade Modular System have a tiered management architecture that allows system management to be aggregated at the Sun Blade Chassis level or at the Sun Blade Server Module if preferred.

Server Module management (ILOM) can be accessed directly via the serial port located on the front of the Server Module or via the Chassis Monitoring Module (CMM) management network. There is complete management consistency with Sun Fire rackmount servers. In addition, there is support for Sun xVM Ops Center and 3<sup>rd</sup> party system managers.

To enable access via the ILOM web interface, unique IP addresses for each CMM and Server Module SP are assigned during the initial system setup.

Optional chassis-level management is provided by the CMM's ILOM and is accessible via the CMM management network port or serial port on the CMM.

## **Chassis Monitoring Module (CMM)**

The Chassis Monitoring Module (CMM) is the primary point of management of all shared chassis components and functions, providing a set of management interfaces. Each server module contains its own service processor, giving it similar remote management capabilities to other Sun servers. Through their respective Lights Out Management service processors, individual server modules provide IPMI, HTTPs, CLI (SSH), SNMP, and file transfer interfaces that are directly accessible from the Ethernet management port on the Chassis Monitoring Module (CMM). Each server module is assigned an IP address (either manually, or via DHCP) that is used for the management network.

### **CMM Network Functionality**

A single CMM is built into each Sun Blade 6000 chassis and Sun Blade 6048 shelf, and is configured with an individual IP address assigned either statically or dynamically via DHCP. The CMM provides complete monitoring and management functionality for the chassis (or shelf) while providing access to server module management functions. In addition, the CMM supports HTTP and CLI “pass-thru” interfaces that provide transparent access to each server module. The CMM also provides access to each server module via a single serial port through which any of the various LOM interfaces can be configured. The CMM's management functions include:

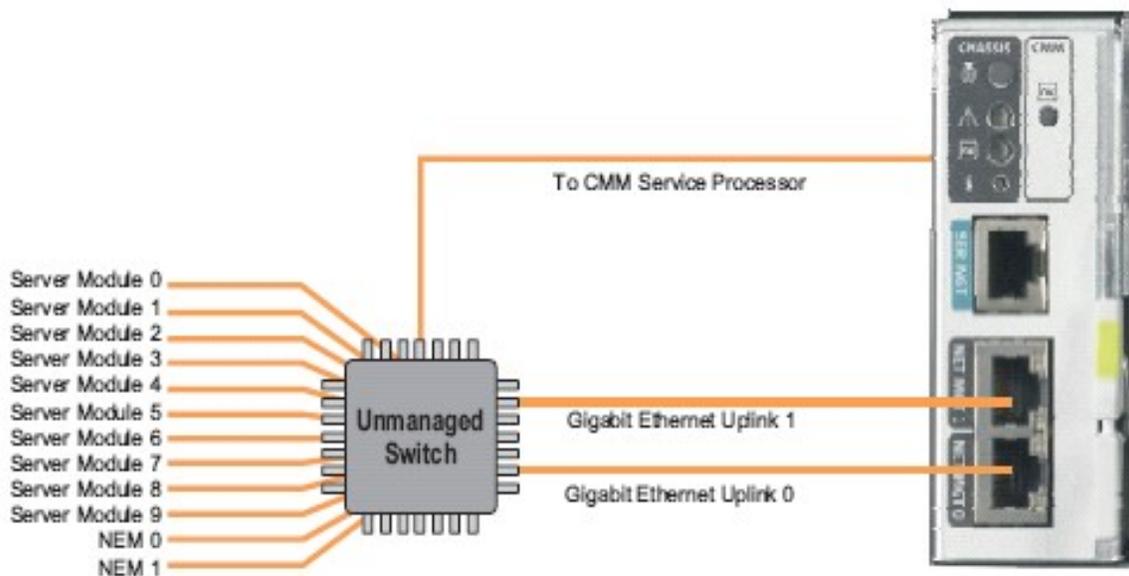
- Implementation of an IPMI satellite controller, making the chassis environmental sensors visible to the server module's BMC functions
- Direct environmental and inventory management via CLI and IPMI interfaces
- CMM, ILOM, and NEM firmware management
- Pass-through management of blades using IPMI, SNMP, and HTTP links along with command line interface (CLI) SSH contexts

The management network internal to the CMM joins the local management processor on each server module to the external management network through the passive midplane.

### **CMM Architecture**

A portion of the CMM functions as an unmanaged switch dedicated exclusively to remote management network traffic, letting administrators access the remote management functions of the server modules. The switch in the CMM provides a single network interface to each of the server modules and to each of the NEMs, as well as to the service processor located on the CMM itself. The diagram shown below provides an illustration and a block-level diagram of the Sun Blade 6000 CMM. The Sun Blade 6048 NEM has a different form factor but provides the same functionality.

The CMM's functionality provides various management functions, including power control of the chassis as well as hot-plug operations of infrastructure components such as power supply modules, fan modules, server modules, and NEMs. The CMM acts as a conduit to server module LOM configuration, allowing settings such as network addresses and administrative users to be configured or viewed.



The functions of the X6440 Service Processor is independent of the operating system, so that the same level of manageability is provided regardless of the choice of OS. The SP is available for Server Module management even when the Server Module is powered off, but the chassis is powered on.

Accessible to the end user through a serial port and a 10/100/1000 BaseT network management port on the CMM, ILOM provides the administrator with full lights-out manageability of the Server Module. This includes the ability to power cycle, setup, manage, monitor and maintain the system locally or remotely. In addition, administrators can obtain chassis status information via each Server Module's ILOM Service Processor, removing the need for any chassis-level monitoring and control. ILOM supports both local and remote management, including remote KVMs over IP and direct KVM and media connectivity via the two USB 2.0 ports and the AST2000 video port. 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 system monitoring schema.

## More Efficient Cooling With Sun Cooling Doors

The next generation Sun Blade 6048 Chassis with PCIe 2.0 midplane has been modified to enable mounting of the Sun Cooling Door 5200 (water) or the Sun Cooling Door 5600 (refrigerant) as the cooling mechanism for the Sun Blade 6048 Chassis. The Sun Cooling Door 5200 or 5600 provides a cooling capacity of up to 35 KW per Sun Blade 6048 Chassis, and eliminates the need for data centers having to use additional cooling devices such as the in-row coolers which took up more datacenter space. With Sun Cooling Doors, customers can now cool the Sun Blade 6048 Modular System in more efficient way, and save of up to 1/3 of the datacenter space. Please see the Figure below for a photos of Sun Cooling Door 5200 and 5600.

Some of the key points of the Sun Cooling Door are:

- Provides cooling without the need for electrical fans
- Provides cooling capacity of 35 KW (depending on various factors), and capable of removing almost all of the heat generated by the system
- Provides cooling using either chilled water or refrigerant
- Mounts to the rear of the Sun Blade 6048 Chassis

For more information, please refer to the Sun Cooling Door Just the Facts documents:

- Sun Cooling Door 5200 JTF, SunWin #: 553674
- Sun Cooling Door 5600 JTF, SunWin #: 553678



Sun Glacier Door 5600  
(Uses Refrigerant)



Sun Glacier Door 5200  
(Uses Water)

**Figure:** Sun Cooling Door 5600 (top) and 5200 (bottom)

## Sun Blade X6440 Server Module Operating System Support

A world-class performance platform, the Sun Blade Modular system allows customers to run the operating system(s) that best fits their needs.

Operating Systems	Supported
Solaris 10 5/08 x64	Yes
RHEL 4.6 (64-bit)	Yes
Windows 2003 ENT/SE (32/64-bit)	Yes
SLES 10 SP2 (64-bit)	Yes
VMware ESX 3	Yes
RHEL 5.1 (64-bit)	Yes
SLES9 SP4 (64-bit)	Yes
RHEL 4.6 (32-bit)	Yes
Win 2008 Dcenter (incl. Std/Ent) – 64/32 bit	Yes
Vmware ESX 3i	Yes
SLES 10 SP2 w/XEN	Yes
Solaris 10 6/08	Yes
Open Solaris	Targeting Q1Fy010
RHEL 4.7 (32-bit / 64-bit)	Yes
RHEL 5.2 (64-bit)	Yes
RHEL 5.3 (64-bit)	Yes
RHEL 4.8 (32-bit / 64-bit)	Yes
ESX & ESXi 3.5 U4	Yes
ESX & ESXi 4.0 (K/L)	Targeting Q1Fy010
Solaris 10 U7 x64	Yes
RHEL 6 (64-bit)	Targeting Q3 FY010
SLES 10 SP3 (64-bit) (& also w/XEN)	Targeting Q2Fy010
SLES 11 (64-bit) (&also w/XEN)	Yes
Windows Svr 2008 R2	Targeting Q2Fy010

## **Latest OS Information**

For the latest OS support information please see

**<http://www.sun.com/servers/blades/os.jsp>**

\* Note: Some Operating Systems may not support booting from Compact Flash media. It is advisable to verify whether or not the desired OS supports booting from Compact Flash media.

# Reliability, Availability, Serviceability (RAS) Features

For current RAS measurement information please refer to: <http://ras4sun.sfbay/>

## Reliability

- Simplicity of design with the AMD Opteron processors and HyperTransport requires less components and thus provides higher reliability
- ECC memory with ChipKill support
- Leveraging chassis infrastructure means fewer moving parts on the server modules
  - No Fans on Server Modules
  - No Power Supplies on Server Modules

## Availability

- Chassis Level High Availability features:
  - Redundant hot-plug / hot-swap Power Supply Modules. Power Supply fans are independent of power supplies and keep running in the event of power supply failure
  - Redundant hot-plug / hot-swap Fan Modules with dual fans

## Serviceability

- Modularity increases serviceability and reduces time to resolution.
- Front-accessible, hot-plug / hot-swap disk drives.
- A fault indicator LED stays on following a fault even if the system has been powered off (but still connected to the power source).
- A fault remind button on the server modules that holds a charge during removal for identification of failed processor and DIMM modules even after Server Module is removed from the chassis..
- Diagnostic LEDs are included on the Server and I/O Modules and replaceable components.
- Remote KVM & Storage re-direct support enables “off site” diagnostics
- Chassis Level Serviceability Features:
  - Single-step power supply removal: Power-supplies can be serviced without sliding the servers out of the rack.
  - Direct-access Fan Modules can be replaced without power down or complete removal of system from rack.
  - Hot-pluggable I/O with NEMs and EMs.
  - Indicator LEDs on the front and back of the chassis allow problems to be detected and isolated easily.

# System Specifications

## Physical Dimensions and Weight:

X6440 Server Module - Weight & Dimensions	
Subassembly & Miscellaneous Component Weights	
Weight	~16.00lbs (7.26kg): No processors, No DIMMs, No CF, No FEM, No REM ~18.12lbs (8.22kg): 4 processors w/heatsinks, 32 DIMMs, 1 CF, 1 PT FEM, 1 REM
HxWxD	Height = 1.75in (44.45mm) x Width = 12.88in. (327.15mm) x Depth = 19.56in. (496.82mm)

## Regulatory Compliance

Sun Blade X6440 Server Modules comply with the following Sun Microsystems and agency regulatory standards.

Category	Standard
Product Safety	
	cUR approved to UL 60950-1 and C22.2 No. 60950-1
	CE Marked to European Union Low Voltage Directive 2006/95/EC
	CB Report IEC 60950-1 ; including all amendments and full worldwide deviations
	GOST Certification at system chassis level
	China CCC Mark for power supply only (system is exempt since it is rated greater than 1300W)
	CE Declaration of Conformity
	Argentina S-Mark for power supply only (system exempt due to class of product)
Laser Product & Optical I/O	
	FCC Registration to Code of Federal regulations 21 CFR 1040-Lasers
	TUV approval to IEC 60825-1 Safety of Laser Products
	Canadian Radiation Emitting Devices Act REDR C1370
Electromagnetic Interference	
	47 CFR 15B (Code of Federal Regulations, Part 15, Subpart B) Class A
	CE Marked to European Union EMC Directive 2004/108/EC, Class A
	VCCI Class A
	Industry Canada ICES-003 Class A
	AS/NZ 3548 (Australia/New Zealand) at system chassis level
	CNS 13438 (Taiwan)
	GOST Certification at system chassis level
	Korean MIC Certification
Immunity	
	EN55024:1998 per EMC Directive 2004/108/EC
	IEC 61000-4-2 Electrostatic discharge immunity test

<b>Category</b>	<b>Standard</b>
	IEC 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test
	IEC 61000-4-4 Electrical fast transient/burst immunity test
	IEC 61000-4-5 Surge immunity test
	IEC 61000-4-6 Immunity to conducted disturbances, induced by radio-frequency fields
	IEC61000-4-8 Power frequency magnetic field immunity test
	IEC 61000-4-11 Voltage dips, short interruptions, and voltage variations immunity tests
	GOST Certification at system chassis level
	Korean MIC Certification
Line Distortion	
	EN 61000-3-2 per EMC Directive EEC 2004/108/EC
Voltage fluctuations and flicker	
	EN 61000-3-3 per EMC Directive EEC 2004/108/EC

# Sun Blade X6440 Server Module Specifications

## Sun Blade Server Module options – basic information

Sun Blade X6440 Server Module	The Sun Blade X6440 Server Modules support qty. 4 Six-Core AMD Opteron (8435 and 8431, both via ATO only) or qty. 4 enhanced Quad-Core AMD Opteron (8380 (LOD=Aug 09)), 8384, 8389 (via ATO only)) processors and 32 DIMM (DDR2-667) slots. The X6440 Server Modules are diskless. The X6440 Server Module (standard configurations) comes with 16GB Compact Flash and a Passthru FEM included. Qty. 8 X6440 Blades can be safely powered on in the Sun Blade 6000 Chassis with full N+N power supply redundancy. Installing greater than 8 X6440 blades in a Sun Blade 6000 Chassis will require turning off power supply redundancy in the chassis CMM. Up to 48 X6440 Server Modules can be powered on in the Sun Blade 6048 Chassis. The Sun Blade X6440 Server Modules can coexist within the Sun Blade 6000 and 6048 chassis with all supported Server Modules regardless of processor technologies.
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### Sun Blade X6440 (Pegasus+) processor Options:

\*The values shown in the table below are “per processor” based.

<i>Processor Model</i>	<b>8380</b>	<b>8384</b>	<b>8389</b> (ATO Only)	<b>8431</b> (ATO only)	<b>8435</b> (ATO only)
<i>Processor “Family”</i>	Shanghai			Istanbul	
<i>Core Count</i>	4	4	4	4	4
<i>Core Speed</i>	2.5GHz	2.7GHz	2.7GHz	2.4 GHz	2.6GHz
<i>Int. Mem Ctrl. Speed</i>	2.0GHz	2.2GHz	2.2GHz	2.2GHz	2.2GHz
<i>L2 Cache (dedicated – per core)</i>	512 KB (per core)	512 KB (per core)	512 KB (per core)	512 KB (per core)	512 KB (per core)
<i>L3 Cache (shared)</i>	6 MB (shared)	6 MB (shared)	6 MB (shared)	6 MB (shared)	6MB (shared)
<i>Wattage</i>	75 W	75 W	75 W	75 W	75 W
<i>Status</i>	LOD=8/14/09	EOL = 7/21/09	EOL = 7/21/09	Active (ATO)	Active (ATO)

\*Note: For additional processor specific information please reference:

<http://www.amdcompare.com/us-en/opteron/>

\*Note: processor availability is subject to change, you should refer to official product announcements for current status.

## Sun Blade X6440 Server Module Main Memory

8 DIMM slots per populated processor socket, 32 DIMM slots total per X6440 Server Module, **DDR2-667 / PC2-5300** ECC registered DIMMs (128 bit plus ECC databus). Up to 256GB memory using 8GB DIMMs. (All DIMMs are supported running @ 667MHz. Single rank and dual rank memory should not be mixed.

Standard (PTO) X6440 Server Module memory configurations range from 16GB up to 32GB. All PTO configurations use 2GB (single rank) DIMMs. Optional memory kits can be installed in various increments. Maximum memory = 256GB when 8GB DIMMs are used. All DIMMs are supported running @ 667MHz. Single rank and dual rank memory should not be mixed.

## Sun Blade X6440 Standard/Integrated Interfaces

I/O Expansion Bus	Four PCIe interfaces via midplane to NEMs and EMs
Network	Up to Two 10/100/1000Base-T Ethernet ports via midplane to (2) NEMs and Eight additional GbE ports via. (2) quad-port GbE EMs.
Network management	One 10/100 Ethernet port connection via midplane to CMM
Serial	One TIA/EIA-232-F asynchronous DB-9 Port
USB	Two USB 2.0 ports
Video	AST2000, VGA connector

## Sun Blade (X6220, X6240 & X6440) Storage:

	X6440
Internal disk	Diskless *Note: Compact Flash is supported
External disk	See <a href="http://www.sun.com/servers/blades/storage.jsp">http://www.sun.com/servers/blades/storage.jsp</a>

## Software

Operating environment	See the section on Sun Blade X6440 Server Module Operating System Support  For the most current Operating System support matrix please refer to: <a href="http://www.sun.com/servers/blades/os.jsp">http://www.sun.com/servers/blades/os.jsp</a>  * Note: Some Operating Systems may not support booting from Compact Flash media. It is advisable to verify whether or not the desired OS supports booting from Compact Flash media.
Sun Java Enterprise System™	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	Browser UI (HTTP/HTTPS), DMTF/CLP based CLI (SSH and Serial), IPMI 2.0 (Host access through KCS and remote), SNMP for Monitor and Control (SNMP V1, V2C, V3), Remote KVMs (redirected Keyboard Video Mouse and Storage through a JAVA Application), Chassis Monitoring/Management supporting UI drill down (CLI and Browser UI), Fault Management
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# System Requirements and Operational Details

## Server Module Options

The Sun Blade X6440 (standard configuration) PTO Server Modules contain the following standard components (model dependent):

- Four Six-Core AMD Opteron Processors
  - Six-Core AMD Opteron Model 8435 processor, 2.6GHz, 75W, 6M L3 Cache
  - Six-Core AMD Opteron Model 8431 processor, 2.4GHz, 75W, 6M L3 Cache
- Four Enhanced Quad-Core AMD Opteron Processors
  - Quad-Core AMD Opteron Model 8380, 2.5GHz, 75W, 6M L3 Cache
  - Quad-Core AMD Opteron Model 8384 2.7GHz, 75W, 6M L3 Cache
  - Quad-Core AMD Opteron Model 8389 2.9 GHz, 75W, 6M L3 Cache
- Eight DIMM slots per processor supporting DDR2-667 MHz PC2-5300, Registered ECC DIMMs. Each X6440 can support up to 256GB of main memory using 8GB DIMMs.
- PCI Express bus interfaces via midplane connections:
  - 6 PCIe interfaces on the X6440 Server Modules:
    - 4 of the interfaces are PCIe x8
    - 2 of the interfaces are PCIe x4
- Two USB 2.0 ports
- AST2000 Video, VGA connector
- Serial Port, DB9 connector
- ILOM Service Processor with dedicated 10/100BaseT Ethernet port

## Component Level Power Consumption

Power consumption levels for specific components (processors, memory etc.) will vary greatly based on their individual utilization levels (idle, busy etc.).

The intent of power calculators is to provide guidance for estimating the electrical and heat loads for chassis racking and facilities planning purposes.

\*Note: In order to power on >8 X6440 server modules in a SB6000 chassis, Power Supply redundancy has to be turned off in the CMM. This is due to the (currently hard coded) "power provisioning" request made by the X6440 blade when it is inserted. The blade requires that 647W is provision-able to it in order to turn on. So, doing the math ...  $647W \times 8 = 5176W$  ... this is within the 5600W "power supply redundancy safe" range. Blade # 9 takes the provisioning requirement to  $(5176W + 647W) 5823W$ . This exceeds the 5600W "power supply redundancy safe" range.

However, there is a scenario that warrants mentioning here. If we can determine what the actual maximum power consumption is likely to be for your specific configuration (use the on-line Sun Blade 6000 power calculator) and we discover that the actual maximum power consumption is likely to be less than 5600W, then we are more or less OK.

Scenario explained:

In order to power on >8 X6440 server modules the customer has to set PSU redundancy to

'non redundant' mode in the SB6000 chassis CMM (due to the currently hard coded power provisionable requirement). This allows all 10 X6440 server modules to be powered on (without PSU redundancy).

If one of the PSUs becomes inactive, all of the “then running” blades will continue to run fine because the actual power consumption requirements of these blades is satisfied by one PSU.

The caveat is that if the customer decided to restart the blades with just one PSU active, then they wouldn't be able to power up all 10 blades. They would have to ensure that the second PSU was active and still make sure that the chassis CMM is set to 'non-redundant' mode.

For specific configuration power measurements, please refer to the on-line Power Calculators as shown below.

The intent of power calculators is to provide guidance for estimating the electrical and heat loads for chassis racking and facilities planning purposes.

Note: The Sun Blade 6048 Modular System does not have the issue referenced above.

## Sun Blade Modular System CMM Power Configurator

This calculator uses the rules that the CMM and service processor in the blades have to calculate how many servers can be powered in a chassis based on the configuration of the blades, the number of power cords and the number of power supplies in the chassis. It has now been updated to include all servers and the storage blade. A new section has been added to determine how many blades can fit in a chassis when mixing and matching different blades in a SB6000 or a SB6048 shelf.

Sun Blade Modular System CMM power configurator: SunWin # 539275

## MTBF Information

MTBF (Mean Time Between Failure) for the various Sun Blade Server Modules vary from configuration to configuration depending on variable components. MTBF information is based on calculations and best estimates. Due to potential outside influences that may be beyond the ability of Sun Microsystems to accurately estimate there is no guarantee that each individual system or component will attain the level of performance as indicated.

For specific MTBF information please refer to MTBFTool located at: <http://ras4sun.sfbay/>

## Origin statement

The Sun Blade X6440 Server Module contains components from various countries of origin as shown below:

<i>Sun Blade X6440 Server Module Components</i>	<i>Country Of Origin</i>
All major board assemblies	China
All final tests & assemblies	USA and UK
Front & Rear Indicator Module boards	China
Mechanicals (metal & plastics) & Rear Fan Modules	China
Cables	Mexico and China
PCBA FABs	China

## **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 & Part Number Information**

The Sun Blade X6440 server module (blade) is supported in both the Sun Blade 6000 and 6048 Modular Systems, and it must be installed within either the Sun Blade 6000 or 6048 Chassis' to receive power, cooling & I/O connectivity.

Please refer to the Sun Blade 6000 Modular System (SunWIN Token # 494868) or Sun Blade 6048 Modular System (SunWIN Token # 517110) order menus for detailed guidance on ordering Sun Blade X6440, a Sun Blade 6048 chassis and chassis specific components.

# X6440 Services & Warranty Information

## Warranty Support

The Sun Blade X6440 Server Module server has a three year, next business day warranty.

Duration:	3 years Next Business Day, Based On the Life of the Chassis
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

The warranty period for the blade servers is three years -- the same as the chassis. If blade servers are put in service after the original chassis has been in service, the new blade servers have their own three year warranty period.

\*Note: Service entitlements are based on the chassis. In the case where a customer requires warranty service on a blade server that is in warranty, but installed in a chassis that is out of warranty, the customer will need to explain the situation when requesting warranty service. If the blade chassis is under an active service contract, the blade servers within the chassis are covered as well.

The Sun Blade Modular Systems come with a 3-year next business day hardware warranty. Upgrading to Same Business Day (SBD) or 7x24 is economical due to chassis-based service pricing where one price covers the cost of all components within the chassis. It's the same price, whether you buy one server module or ten, and whatever mix of I/O modules, memory and disk you select. If you add more modules later, they're covered under the existing chassis contract for the duration of that contract.

## 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

For Sun Blade Constellation family products, the Service Contract is written against the chassis (Sun Blade 6000 or 6048 chassis). This contract covers everything installed in the chassis.

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

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 at: [www.sun.com/service/support/sunspectrum](http://www.sun.com/service/support/sunspectrum)

SunSpectrum Service Plan Highlights:

- Integrated whole-system support, *including the operating system*
- All the essentials for one great price
- Priority service
- No "per incident" limits
- Includes Solaris Operating System releases and updates
- Resources for proactive system management
- A choice of four simple plans
- Proven return on investment \* 1

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

<b>SunSpectrum Service Plans</b>				
<b>Features</b>	<b>Platinum Service Plan</b> Mission-critical Systems	<b>Gold Service Plan</b> Business-critical Systems	<b>Silver Service Plan</b> Basic System Support	<b>Bronze Service Plan</b> Self-Maintenance Support
<b>Telephone and Online Technical Support</b>	24/7 Live transfer	24/7 Live transfer	8-8, M-F Live transfer	8-5, M-F 4hr response
<b>One-stop Interoperability Assistance</b>	Yes	Yes	No	No
<b>Hardware Service Coverage</b>	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
<b>Solaris™ Releases</b>	Yes	Yes	Yes	Yes
<b>On-demand Solaris™ Updates</b>	Yes	Yes	Yes	Yes
<b>Online System Admin Resources</b>	Yes	Yes	Yes	Yes
<b>Support Notification Services</b>	Yes	Yes	Yes	Yes
<b>SunSpectrum™ eLearning Library</b>	Yes	Yes	Yes	Yes
<b>System Health Check Subscription</b>	Yes	No	No	No
<b>Additional Services for Qualifying Sites</b>	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 <a href="http://sun.com/service/support/localinfo.html">sun.com/service/support/localinfo.html</a>			
<ul style="list-style-type: none"> <li>• Availability of specific features, coverage hours and response times may vary by location or product.</li> <li>• Response times are determined by customer-defined priority. The response times shown are for service requests designated by the customer as "Priority 1."</li> <li>• 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.</li> </ul>				

## Warranty Upgrade to SunSpectrum Service Plan for Sun Blade X6440 Server Module Server

The following are part numbers and descriptions for the warranty upgrade to the recommended level of SunSpectrum Service Plan for the Sun Blade 6000 and Sun Blade 6048 modular systems:

Part Number	Description
IWU-A90-3S	Upgrade to 3 year SunSpectrum Silver for Sun Blade 6000
IWU-SB-6048-3S	Upgrade to 3 year SunSpectrum Silver for Sun Blade 6048

**Note:** Other support options and contract terms are available. Please refer to the Sun Blade 6000 and Sun Blade 6048 modular system Ordering Guides for more information.

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

The Sun 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

Features	Premium Service Plan (Mission Critical Systems)	Global Service Plan (Business Critical Systems)	Standard Service Plan (Same Day Support)	Basic Service Plan (Non-Critical 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
Hardware Service Coverage	24/7 2hr onsite	8-8, M-F 4hr onsite	8-5, M-F 4hr onsite	Replacement Parts 2nd Business Day
Online System Admin Resources	Yes	Yes	Yes	Yes
Support Notification Services	Yes	Yes	Yes	Yes

\* Availability of specific features, coverage hours and response times may vary by location and/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".

## Warranty Upgrade to Sun System Service Plans for Windows OS for Sun Blade X6440 Server Module Server

For Sun Blade Constellation family products, the Service Contract is written against the chassis (Sun Blade 6000 or 6048 chassis). This contract covers everything installed in the chassis.

The following are part numbers and descriptions for the warranty upgrade to the recommended level of Sun System Service Plans for Windows OS for the Sun Blade 6000 and Sun Blade 6048 modular systems:

Part Number	Description
IWU-A90W-3S	Upgrade to 3 year Silver for Sun Blade 6000
IWU-SB-6048W-3S	Upgrade to 3 year Silver for Sun Blade 6048

**Note:** Other support options and contract terms are available. Please refer to the Sun Blade 6000 and Sun Blade 6048 modular system Ordering Guides for more information.

## Warranty Upgrade to Sun HW Only Service for Sun Blade X6440 Server Module Server

Part Number	Description
IWU-A90-SD-3H	Upgrade to 3 year Sun HW Only SBD for Sun Blade 6000
IWU-A90-24-3H	Upgrade to 3 year Sun HW Only 7x24 for Sun Blade 6000
IWU-A90-22-3H	Upgrade to 3 year Sun HW Only 7x24, 2-hour response for Sun Blade 6000
IWU-SB-6048-SD-3H	Upgrade to 3 year Sun HW Only SBD for Sun Blade 6048
IWU-SB-6048-24-3H	Upgrade to 3 year Sun HW Only 7x24 for Sun Blade 6048
IWU-SB-6048-22-3H	Upgrade to 3 year Sun HW Only 7x24, 2-hour response for Sun Blade 6048

**Note:** Other support options and contract terms are available. Please refer to the Sun Blade 6000 and Sun Blade 6048 modular system Ordering Guides for more information.

## Installation Service for Sun Blade X6440 Server Module Server

Sun's exceptional support for server installation is also available for the Sun Blade X6440 server module, at the chassis level. This service can be purchased at the time of the server sale. Use the following part numbers to order the installation service for the Sun Blade 6000 and Sun Blade 6048 modular systems.

Part Number	Description
EIS-SB6000-1-E	Sun Blade 6000 Install
EIS-SB6000-1-E-AH	Sun Blade 6000 Install, After Hours
EIS-SB6000-E	Sun Blade 6000 Install
EIS-SB6000-E-AH	Sun Blade 6000 Install, After Hours
EIS-SB6048-48	Install SB-6048 and up to 48 Blade Servers
EIS-SB6048-48-AH	Install SB-6048 and up to 48 Blade Servers, After Hours
EIS-SB6048-24	Install SB-6048 and up to 24 Blade Servers
EIS-SB6048-24-AH	Install SB-6048 and up to 24 Blade Servers, After Hours

For additional information about the server installation service see:

<http://www.sun.com/service/install/offerings.jsp>

## 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>

## Professional Services

### Sun Virtualization Suite of Services

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

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

<http://www.sun.com/service/virtualization/>

### Sun Eco Services Suite

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

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

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

### Sun i-Runbook Service

The Sun i-Runbook service creates a knowledge power-base for organizations, allowing the entire IT team to find the vital information they need to manage the data center using the latest Sun preferred practice advice from a central source – accessed within seconds via a simple web interface. To learn more, visit: <http://www.sun.com/service/irunbook/index.jsp>.

### Sun HPC Services

Sun offers an array of services geared to help customers architect, deploy, support and manage their High Performance Computing (HPC) environments for faster time to deployment and with reduced risk.

>Sun HPC Quick Start Services

<http://www.sun.com/service/hpc>

>Sun Datacenter Express Services

<http://www.sun.com/service/dcexpress>

>Sun Single Point of Contact (SPOC) Service

<http://www.sun.com/service/managedspoc>

### Sun Managed Services

With Sun Managed Services, customers choose the components of their infrastructures they would like Sun to manage. We take it from there, building and administering solutions that tightly align IT with their business strategy. It's a hands-on approach, but one that always leaves customers choice, flexibility, control, and the ability to adapt as their businesses grow or change.

Learn more about Sun Managed Services:

<http://www.sun.com/service/managedservices/index.jsp>

# Glossary

Glossary of Terms	
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™	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.
CLI	Command Line Interface
DTMF	Dual Tone Multi-Frequency. The system used by touch-tone telephones. DTMF assigns a specific frequency (consisting of two separate tones) to each key so that it can easily be identified by a microprocessor.
ECC	Error Correcting Code. A type of memory that corrects errors on the fly.
EM	ExpressModule
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.
FEM	Fabric Expansion Module
FRU	Field Replaceable Unit.
Hot-plug	Describes a component that is safe to remove or insert while the system is running. Typically, the system must be rebooted before the newly inserted hot-plug component is configured into the system. Not all hot-pluggable components are hot swappable. You should always refer to the formal product documentation for guidance prior to performing a hot-plug activity.
Hot-swap	Describes a component that can be installed or removed by simply pulling the component out and putting a new component into a running system. The system either automatically recognizes the component change and configures it, or requires user interaction to configure the system. However, in neither case is a reboot required. All hot-swappable components are hot-pluggable, but not all hot-pluggable components are hot-swappable. You should always refer to the formal product documentation for guidance prior to performing a hot-swap activity.
I/O	Input/output. Transferring data between the processor and any peripherals.
iLOM	Integrated Lights Out Management
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.
KVMS	Keyboard Video Mouse Storage
L2 cache	Also referred to as Ecache or External Cache. A memory cache external to the processor chip. The AMD Opteron processor integrates 1 MB of L2 cache per processor.
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol. A set of protocols for accessing information directories. LDAP is based on the standards contained within the X.500 standard, and supports TCP/IP.
MTBF	Mean Time Between Failures. The average time a component works without failure.
NEM	Network Express Module
PCI	Peripheral Component Interconnect . A high-speed parallel bus originally designed by Intel to connect I/O peripherals to a processor.

Glossary of Terms	
PCI Express	PCIe. Peripheral Computer Interconnect Express. An evolutionary version of PCI that maintains the PCI software usage model and replaces the physical bus with a high-speed (2.5 Gb/s) serial bus serving multiple lanes.
PCI-SIG	The organization that develops and manages the PCI Local Bus specification. PCI Special Interest Group.
PSU	Power Supply Unit – also referred to as Power Supply Module
REM	RAID Expansion Module
RKVMS	Remote Keyboard Video Mouse Storage
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.
TCP/IP	Transmission Control Protocol over Internet Protocol. Pronounced as separate letters. TCP is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data.
SSH2	Secure Shell is a program to log into another computer over a network, to execute commands in a remote machine, and to move files from one machine to another. It provides strong authentication and secure communications over insecure channels.
USB 2.0	USB 2.0 is an external differential point-to-point serial bus that provides data rates up to 480 Mb/s. USB 2.0 is an extension of USB 1.1 that uses the same cables and connectors.

# Materials Abstract

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

Collateral	Audience	Purpose	SunWIN Token #
<b>Internal Web Sites</b>			
Sun Blade 6000 & 6048 Modular Systems - Onestop	<a href="https://onestop.central.sun.com/hw/sb6000/index.shtml?menu">https://onestop.central.sun.com/hw/sb6000/index.shtml?menu</a>		
Sun Blade Constellation System - Onestop	<a href="https://onestop.central.sun.com/hw/constellation_system/">https://onestop.central.sun.com/hw/constellation_system/</a>		
Sun Blade 6000 Modular System System Handbook	<a href="http://sunsolve.central.sun.com/handbook_internal/Systems/SunBlade6000/SunBlade6000.html">http://sunsolve.central.sun.com/handbook_internal/Systems/SunBlade6000/SunBlade6000.html</a>		
Sun Blade 6048 Modular System System Handbook	<a href="http://sunsolve.central.sun.com/handbook_internal/Systems/SunBlade6048/SunBlade6048.html">http://sunsolve.central.sun.com/handbook_internal/Systems/SunBlade6048/SunBlade6048.html</a>		
<b>Product Literature</b>			
Sun Blade 6000 Chassis Datasheet	Customers	Sales Tool, Training	494864
Sun Blade 6048 Chassis Datasheet	Customers	Sales Tool, Training	517108
Sun Blade 6000 & 6048 Modular Systems Architecture whitepaper	Customers	Sales Tool, Training	494863
Sun Services for the Sun Blade 6000 and 8000 Modular Systems Data Sheet	Customers	Sales Tool, Training	473170
<b>Sales Tools</b>			
Sun Blade Systems Customer Presentation	Customers	Sales Tool, Training	470907
Sun Constellation System FAQ	Sales, SEs, Partners	Training	507128
Sun Blade Systems Sales guide	Sales, SEs, Partners	Sales Tool, Training	470906
Sun Blade 6048 Order Menu	Sales, SEs, Partners	Sales Tool, Training	517110
Sun Blade 6000 Order Menu	Sales, SEs, Partners	Sales Tool, Training	494868
Sun Blade 6000 and 6048 Technical Training Presentation	Sales, SEs, Partners, Customers	Sales Tool, Training	494866
Sun Blade 6000 Modular System JTF	Sales, SEs, Partners	Sales Tool, Training	494859
Sun Blade 6048 Modular System JTF	Sales, SEs, Partners	Sales Tool, Training	517106
<b>Competitive Information</b>			
Beating IBM BladeCenter With Sun Blade Modular Systems	Sales, SEs	Sales Tool, Training	481725
Beating HP with Sun Blade Modular Systems	Sales, SEs	Sales Tool, Training	475748
Beating Dell PowerEdge 1955	Sales, SEs	Sales Tool, Training	475749
Beating Dell m1000e Blade System	Sales, SEs	Sales Tool, Training	529878
<b>External Web Sites</b>			
Sun Blade Modular Systems Web Site	<a href="http://www.sun.com/servers/blades/index.jsp">http://www.sun.com/servers/blades/index.jsp</a>		
Sun Blade 6000 Family Web Site	<a href="http://www.sun.com/servers/blades/6000/">http://www.sun.com/servers/blades/6000/</a>		
Sun Blade 6000 Chassis Web Site	<a href="http://www.sun.com/servers/blades/6000chassis/">http://www.sun.com/servers/blades/6000chassis/</a>		
Sun Blade 6048 Chassis Web Site	<a href="http://www.sun.com/servers/blades/6048chassis/">http://www.sun.com/servers/blades/6048chassis/</a>		
<b>Reseller Web Site</b>			
Sun Reseller General Information	<a href="http://reseller.sun.com">http://reseller.sun.com</a>		

# Competitive Information

## Sun Proprietary—Confidential: Internal Use Only

Competitive beat sheets are posted regularly to <http://competitive.central>. These reports contain information about competitor's products, the strengths and weaknesses of the Sun Blade Modular Systems versus competitors' products, and positioning information.

A summary of the Sun Blade X6440 Server Module vs. the leading (4 socket Opteron) competition is shown below.

**\*Note: Since product feature sets change very frequently you should validate any non Sun Blade X6440 Server Module product comparisons with data found at each competitor's respective website.**

## Sun Blade X6440 Server Module vs. (4 socket) Opteron Blade Server Competition

	 Sun microsystems	 hp	 DELL	 IBM
				
	Sun Blade X6440	HP BL685c G6	Dell M905	IBM LS42
6-Core Opteron	Yes	Yes	No	No
DIMM Slots	32	32	24	16
Disk Drives	Diskless / CF	2x SAS / SATA	2x SAS	2x SAS / SSD
Hot plug Disks	N/A	Yes	Yes	Optional
I/O Exp. Slots	4x PCIe (x8)	5x PCIe (x8)	4x PCIe (x8)	1x PCI-X, 1x PCIe (x8)
TFLOPS / rack*	12 TFLOPS	8 TFLOPS	8 TFLOPS	10.5 TFLOPS**
I/O Capacity	142 Gb/s	160 Gb/s	136 Gb/s	42 Gb/s
Blade unique I/O	Yes	No	No	No

IBM Does Not Yet Support Six-Core Opteron

**Up to 2x DIMMS, 3x the I/O, More Compute Power, The Most Flexible I/O**

\* Sun Blade 6048, HP C7000, IBM BladeCenter E, DELL M1000e Chassis & 2.7GHz processors used for TFLOPS/rack calculation purposes

\*\* Anticipated with 6-Core AMD Opterons

## Product Availability

The Sun Blade X6440 Server Module is available today.

# Miscellaneous

## Revision History

<i>Revision Date</i>	<i>Changes</i>
6/19/09	<ul style="list-style-type: none"><li>* Added 2389 and 8389 processors to the comparison table</li><li>* Removed Ordering Guide Section</li><li>* Removed the section on SB6000 and SB 6048</li><li>* Removed X6220 form the Comparison table</li><li>* Added a section on Sun Cooling Door</li><li>* Updated the section I/Os - EMs and NEMs</li><li>* Removed X6220 in the System Spec section</li><li>* Updated the FFB table</li><li>* Added supported FEM and REM in " SB X6440 Server Module I/O" section.</li><li>* Updated the "System Specification" section</li></ul>
7/01/09	<ul style="list-style-type: none"><li>* Added Six-Core AMD Opteron Processor information to the Enabling Technologies Section.</li><li>* Where applicable, included the six-core information.</li><li>* Updated the competitive section</li></ul>