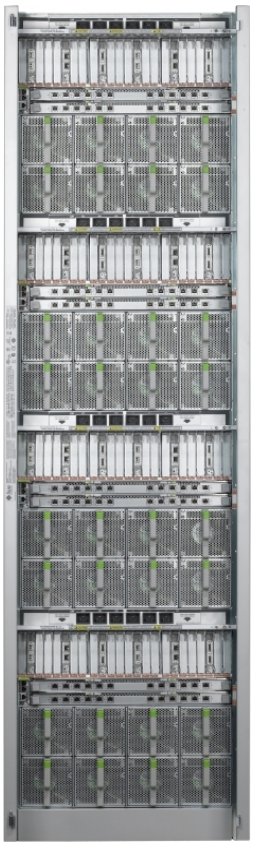
Sun Blade™ 6048 (Gen 2) Chassis

The most compute-dense blade server platform on the planet

Front



Rear

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Sun Blade 6048 Chassis

Introduction

The new Sun Blade 6048 Chassis (P/N B22-C & B22-D) has been enhanced with many new features including support for the new Sun Cooling Doors (model 5200 (water) and model 5600 (refrigerant)). The Sun Cooling Doors provide a cooling capacity of up to 35 kW per door (compare to 5 kW with traditional raised floor cooling) and remove up to 100% of the heat generated by the Sun Blade 6048 modular system, resulting in a much more efficient method of cooling the Sun Blade 6048 Modular System. Additional Sun Cooling Door information can be found at http://www.sun.com/servers/cooling. Note that the Sun Cooling Doors are not supported with the original Sun Blade 6048 (Gen 1) Chassis (P/N B22-B).

The enhanced Sun Blade 6048 chassis also features a new passive midplane that is based on the PCI Express (PCIe) 2.0 technology. The previous version of the Sun Blade 6048 chassis included a passive midplane that was based on the PCIe 1.1 technology. By implementing the PCIe 2.0 technology, the enhanced Sun Blade 6048 chassis has essentially doubled the I/O bandwidth through its passive midplane. This enables the enhanced Sun Blade 6048 chassis to deliver the much higher network performance that's required by customers in the general HPC market segment. Note that the Gen 1 Sun Blade 6048 chassis (B22-B) can be upgraded to support PCIe 2.0 technology (midplane upgrade kit P/N B22-B-MP-UPGKIT), however the upgraded Gen 1 chassis still cannot support the Sun Cooling Doors.

The 6048 Chassis is the only "unibody" designed chassis/rack in the industry. The term "unibody" is borrowed from the automotive industry and accurately describes the 6048 chassis due in part to the fact that it is actually 4 separate blade chassis unified as a rack that consumes approximately the same footprint as standard 42U racks.

Like the Sun Blade 6000 Chassis, the Sun Blade 6048 Chassis shares a similar modular architecture featuring separate hot-pluggable compute, I/O, networking, system management and infrastructure (Power Supply and Fan) modules.

The System delivers incredible scalability and configuration flexibility with up to 48 hot-pluggable server modules (blades) that utilize the Intel Xeon, AMD Opteron, and Sun UltraSPARC CMT architectures.

The Sun Blade 6048 chassis leverages PCIe ExpressModules to provide each server module with its own unique I/O personality for Gigabit Ethernet, 10Gigabit Ethernet, Fibre Channel, InfiniBand and SAS communications. Network Express Modules (NEMs) allow all server modules in a shelf to be configured with common "shelf-wide" I/O. Leveraging these two modular I/O technologies provides maximum flexibility in support of I/O communications.

In addition, the Sun Blade 6048 is the first chassis to offer an (optional) Sun Blade(TM) 6048 InfiniBand QDR Switched Network Express Module that allows communication over InfiniBand between the server modules at a Quad Data Rate up to 80 Gb/s bandwidth (full-duplex) per server connection and also enables the server modules to communicate to an external InfiniBand fabric in a non-blocking architecture. The InfiniBand QDR Switched NEM is currently supported with the Sun Blade X6440 & Sun Blade X6275-IB Server Modules.

The modular nature of the architecture delivers improved density compared to competing blade and rackmount platforms while providing higher serviceability, efficiency and reliability. The

modular nature of all Sun Blade Chassis provide customers with high-performance solutions in chassis laden with enterprise-class RAS features that can improve IT efficiency and responsiveness while lowering TCO.

Power and cooling in the chassis is configured redundantly and serviceability is enhanced because all serviceable components are modular, hot-swappable and externally accessible. Remote management capabilities are integrated into the chassis to provide full monitoring capabilities of the power and cooling infrastructure and to offer complete control of the compute elements within the chassis.

As is the case with all of the Sun Blade Modular Systems, the Sun Blade Server Modules are manageable like discrete rackmount servers and feature state-of-the-art remote management capabilities with fault identification and management features provided by Sun ILOM (Integrated Lights Out Manager) that reside on each Server Module's dedicated service processor. By utilizing ILOM features and the (optional) Sun xVM Ops Center software, customers can take advantage of state-of-the-art remote automation that integrates at the data center level. Zero-touch capabilities managed through a variety of interface options combined with full binary compatibility with other family members simplifies the installation, deployment, and maintenance of systems. The Chassis Monitoring Modules (CMMs), one per shelf, provide system management capabilities at the chassis and server service processor levels with CMM ILOM .

The enhanced Sun Blade 6048 chassis is offered as a PTO (P/N B22-D) product and as an XATO (P/N B22-C) product. Initially, the XATO (B22-C) offering will be restricted to pre-approved HPC orders, and will only support Sun Blade X6270 and X6275 server modules. In the XATO offering, Sun Blade X6275 and X6270 server modules, EMs, NEMs, and filler panels will be inserted into a Sun Blade 6048 chassis at the factory, and the entire unit will be shipped to customers as an integrated Sun Blade 6048 modular system.

The PTO and XATO Sun Blade 6048 chassis pretty much contain the same components. The main difference between the two offerings is that the PTO offering ships with filler panels in place of actual components whereas the XATO ships with components pre-installed in place of filler panels. The common components between the two offerings are as follows:

- 8x 8400W power supply modules (2 per shelf), with integrated fans (N+N redundancy)
- 32 redundant rear fan modules (8 per shelf)
- 4 chassis monitoring modules (1 per shelf)
- 2 dongles with adapters (per chassis)

1 passive midplane (based on PCIe 2.0 technology) for electrical and high-speed interconnect of modules and chassis infrastructure (per shelf)

The standard PTO configuration (B22-D) ships with the following additional filler panels:

- 47 Server Module, 8 Network Express Module (NEM), 96 PCIe ExpressModules (EM)

Weighing on average 500lbs less than conventional rack/chassis combinations, the 6048 “unibody” chassis is the same footprint of a standard 42U rack and enables the deployment of extremely high density server configurations. It can power, cool and hold up to forty eight server modules in a single chassis, making it an ideal platform for server consolidation, providing up to 71% more compute power in the same footprint as the competition.

Overall, the Sun Blade 6048 Chassis, when combined with Sun Blade server modules creates a Modular System that is an ideal platform for high density compute environments using proven and open technologies.

Highlights

- **Higher Cooling Capacity And Floorspace Efficiency:**

  The (Gen 2) Sun Blade 6048 Chassis contains modifications from the Gen 1 chassis allowing it to accommodate mounting the Sun Cooling Door 5200 (water) or Sun Cooling Door 5600 (refrigerant) as the chassis rear door. With Sun Cooling Door 5200 or 5600, customers get a more reliable and quieter method of cooling the Sun Blade 6048 Modular System since they do not use any electrical fans. Both cooling door models can provide a cooling capacity of up to 35 kW per Sun Blade 6048 Modular System. By leveraging either cooling door customers can reduce or eliminate the need for additional cooling mechanisms such as legacy in-row coolers which require valuable data center space. Compared to in-row coolers, customers can save up to 1/3 of their data center floorspace by using the Sun Cooling Door model 5200 or 5600. Exact cooling capacity of each door depends upon the following factors: airflow, air and coolant temperatures, coolant flow rate, relative humidity. Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis provide support for the cooling doors.

- **High Network Performance:**

  The Sun Blade 6048 chassis passive midplane implements the PCIe 2.0 technology, which provides up to twice the speed of the PCIe 1.1 technology (which is utilized in the 1st generation 6048 chassis midplane). PCIe 2.0 based server modules such as Sun Blade X6275 and X6270, and PCIe 2.0 based EMs and NEMs will be required in order to fully realize the speed enhancements available with the PCIe 2.0 enhanced midplane.

Scalability:

The Sun Blade 6048 chassis is a building block that offers the ability to scale from a single server module to 48 server modules in a single rack, providing up to 71% more compute cores in the same amount of space as competing blade server products and up to 129% more compute cores than conventional 1U rackmount servers. As the compute node portion of the Sun Constellation System, it can scale to a cluster size of 13,824 nodes. So, whether you are looking for solutions ranging from departmental clusters to super computers, this remarkable system offers the flexibility and versatility to meet your needs.

- **Versatility:**

  The Sun Blade 6000 and 6048 are the only chassis' in the marketplace supporting all three major volume CPU architectures. Intel Xeon, AMD Opteron and SPARC-based modular blade servers are all supported in these chassis. Sun has support to match this with a Heterogeneous Service package complete with Support Services, Connected Services and Management Services that span SPARC, Intel and AMD processors and Solaris, Windows, VMware and Linux OS. Multivendor support from Sun -- with one point of contact -- greatly reduces management and support complexity. In addition, multiple different Operating Systems can be running concurrently on server modules within the Sun

Blade 6048 Chassis.

By supporting all three major volume processor architectures, SPARC, AMD Opteron, Intel Xeon and a wide variety of popular enterprise Operating Systems , the Sun Blade modular systems support the broadest range of enterprise software applications.

With up to 9 memory DIMM slots per CPU (up to double the memory of competing blade servers), customers can use lower costs memory DIMMs and effectively cut the blade server acquisition costs in half. With up to 2x the memory capacity and up to 2x the I/O bandwidth of competing rackmount servers or blades, demanding applications, such as server virtualization and HPC workloads can now be deployed effectively on Sun Blade Modular Systems today and into the future. The system's modular design has the power, cooling and I/O head room to support future generations of technology.

- **Power Efficiency and RAS:**

  Power and cooling in the system is configured redundantly in the chassis and serviceability is enhanced because all hot-swap components are accessible from outside the chassis.

  Higher efficiency levels are achieved by using fewer, more efficient power supplies to energize the 48 servers in the chassis.

  By allowing flexible configuration of the power supply modules (5600W or 8400W support depending on the number of input circuits used) customers can configure their chassis to meet the workload requirements of their servers today with room to grow to meet their future workload requirements.

- **Industry standard technologies:**

  Leveraging industry standard technologies including the processors for the server modules and open I/O standards such as PCI Express makes the Sun Blade 6048 modular system an open, industry standard solution for the implementation of super computing clusters and scalable compute environments.

  The use of industry standard technologies reduces the time to deploy solutions because no specialized “proprietary” expertise is needed.

  In addition, the remote management interfaces of the chassis and blades are industry standard which allow easy and seamless integration to existing environments. Some of these standards include IPMI, SNMP, SSH, HTTPS among others.

- **Transparent Management:**

  Sun Blade's transparent management architecture enables customers to easily integrate Sun Blade Modular Systems into their existing datacenter management environment and eliminates layers of unnecessary (and costly) complexity. By avoiding extra layers of chassis level management complexity, customers favorite datacenter management tools from Sun or 3rd parties can be used to manage Sun Blade Modular systems as well as their existing infrastructure. Unlike the complex chassis management approach of competing blade solutions, Sun Blade Modular Systems do not require vendor specific proprietary management tools to utilize chassis management features.
  - Sun Integrated Lights Out Manager (ILOM). Resides on embedded service processor with dedicated 100BaseT Ethernet port, SNMP, SSH, IPMI 2.0, full KVM over IP and

remote media (redirect) capabilities.

- Sun xVM Ops Center Software. This is a highly scalable, unified management platform for physical and virtual environments. Sun xVM Ops Center can be used to manage multi-platform x64 and SPARC systems distributed throughout a global datacenter and it integrates with existing toolsets. Ready to facilitate many aspects of compliance reporting (ITIL) and datacenter automation, Sun xVM Ops Center enables management of thousands of systems simultaneously.

- **Independent Industry Standard I/O:**

  Sun Blade Modular System's Independent I/O design provides industry standard based I/O that is easier to install and service than competing products. The flexible design of the Sun Blade Modular Systems delivers the most I/O capacity of any blade server for performance and future growth. Sun is the only vendor to support true industry standard I/O in their blade architectures. HP, IBM and Dell blades require proprietary mezzanine I/O cards. Industry standards drive innovation up and costs down.

  The Sun Blade Modular Systems leverage the PCI Express standard I/O architecture. PCI SIG standard based PCIe ExpressModules enable I/O modules to be hot plugged and easily serviceable from the rear of the chassis. In addition, this is the only blade 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 modules that force all mezzanine adapters within the blades to be of the same kind.

  Virtualization and enterprise applications (like databases) require large amounts of I/O. With virtualization, more virtual machines on a single system drives increased demand for network bandwidth capacity from the system. The Sun Blade Modular System's Independent I/O provides up to 2x the I/O of other blades on the market. To support future multi-core processors, each additional core will demand additional I/O capacity. The Sun Blade Modular System's Independent I/O capacity delivers performance today and investment protection for tomorrow's multi-core technologies.

- **Sun Services Round Out This Complete Customer Solution:**

  Sun has a complete portfolio of services designed to reduce datacenter operating costs, mitigate migration risks, and accelerate the time to system deployment. Sun's unique chassis-based service pricing means customers pay one price for support no matter what type or how many blades are installed in the blade chassis, saving customers real money. Sun provides heterogeneous blade support, customers are free to chose any combination of Solaris/Linux/Windows/Intel/AMD and rely on a single vendor for service, reducing complexity. Simply put, Sun services ensure our customers' success with blade technology.

Target Markets:

- High Performance Computing

Product Placement

The Sun Blade Modular Systems are designed for “scale-out” computing environments with distinctive performance density, price/performance, availability and application fit characteristic.

- **Sun Blade Modular Systems – Chassis Model Comparison**

Chassis Model	*Sun Blade 6000 (Gen 2) P/N: A90-B*	*Sun Blade 6048 (Gen 2) P/N: B22-D (PTO) and B22-C (XATO)*
	• PCIe 2.0 midplane • Support next generation UltraSPARC T1/T2, Opteron and Xeon processors • Up to 960 cores per 42U rack • Modular Design • 100 percent of active components hot-plug and redundant (power, fans, I/O, Mgt.) • Power and cooling N+N redundant power supply units • Common power and cooling • I/O- Industry-standard PCI Express mid-plane • Two PCIe EMs per blade • Two NEMs per chassis • Integrated storage backplane	• PCIe 2.0 midplane • Support for Sun Blade(TM) 6048 InfiniBand QDR (Quad Data Rate) Switched Network Express Module • Support for Sun Cooling Door 5200 and 5600 - Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis provide support for the cooling doors. • Efficient rack/chassis unibody design • Support next generation UltraSPARC T1/T2, Opteron and Xeon processors • Up to 1152 cores per chassis • Modular Design • 100 percent of active components hot-plug and redundant (power, fans, I/O, Mgt.) • Power and cooling N+N redundant power supply units • Common power and cooling • I/O- Industry-standard PCI Express mid-plane • Two PCIe EMs per blade • Two (single height) Network Express Modules per shelf • Integrated storage backplane

Chassis Model	*Sun Blade 6000 (Gen 2) P/N: A90-B*	*Sun Blade 6048 (Gen 2) P/N: B22-D (PTO) and B22-C (XATO)*
Application Fits	• HPC – 1 & 2 socket economy; performance density (4 socket blades are also supported) • Back office – IT infrastructure, Database, Multi-tier ERP & Business Intelligence • Web Application-network and web services, consolidation	• HPC: Government, Education, Financial Services, Oil & Gas, Structural Analysis, Crash Test Simulation, Seismic Analysis, Life Sciences • Quad Data Rate InfiniBand NEM support
Height	• 10U	• 2073.8mm / 81.6 inches (approximately same height as 42U racks)
Server Modules per Chassis	• 10	• 48 (12 per shelf)
PCIe 2.0 Midplane	• Yes	• Yes
PCIe ExpressModules	• 20	• 96 (24 per shelf)
Network Express Modules	• 2	• 8 (2 single height NEMs per shelf)
Chassis Monitoring Modules	• 1 (STD)	• 4 STD (1 per shelf)
Chassis per 42U Rack	• 4	• Unibody design – includes 4 shelves
Server Modules Per 42U Rack	• 40	• 48 (12 per shelf)
Separate Front Fan Modules	• Fans are integrated within power supply modules	• Fans are integrated within power supply modules
Rear Fan Modules	• 6	• 32 (8 per shelf)

Chassis Model	*Sun Blade 6000 (Gen 2) P/N: A90-B*	*Sun Blade 6048 (Gen 2) P/N: B22-D (PTO) and B22-C (XATO)*
Support for Sun Cooling Door	• No	• Yes • Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis provide support for the cooling doors.
Power Interface Modules	• 1	• 4 (1 per shelf)
Power Cords	• 4	• 24 (8400W mode, 6 per shelf) • 16 (5600W mode, 4 per shelf)
Power Supply Modules	• 4	• 8 (2 per shelf)
Power Redundancy	• 1+1	• 1+1 (per shelf)
Power Redundancy Envelope	• 5600W	• 8400W (per shelf)
Additional Chassis Information	• SB6048 http://www.sun.com/servers/blades/6048chassis/ • SB6000 http://www.sun.com/servers/blades/6000chassis/	

Features, Functions & Benefits:

• *Feature*	• *Function*	• *Benefit*
Modular Design without compromising performance or scalability		
• Up to 48 Server Modules	• Pick from a selection of SPARC, Opteron and Xeon based server modules	• Choice of 3 processor architectures running up to 5 different operating systems (even more with Server Virtualization) in the same modular system blade enclosure • High-performance, high capacity (best-in-class memory / HDD / SSD support) • Easy expandability • Minimal moving parts increases reliability • Unprecedented I/O capacity and memory support in two and four socket modular blade servers
• Hot-pluggable computing components	Server Modules, EMs, NEMs, Power Supply Modules and Chassis Monitoring Modules (CMMs) are all hot-pluggable	• Eases installation, provisioning, serviceability and greatly reduces time to repair (TTR)
Higher Cooling Capacity		
• Support for Sun Cooling Door 5200 and Sun Cooling Door 5600 • Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis	- Provides cooling without the need for noisy electrical fans that are susceptible to failure - Provides cooling capacity up to 35 KW which is capable of removing almost all of the heat generated by the system - Provides cooling using either chilled	• Energy efficient way of cooling which is more efficient and quiet than the traditional cooling methods • Efficient way of cooling a system without the traditional data center raised floor and AC

• *Feature*	• *Function*	• *Benefit*
provide support for the cooling doors.	water or refrigerant - Mounts to the rear of the Sun Blade 6048	• Enable customers to pick the technology that best meets their data center infrastructure and cooling needs • Saves 1/3 of the floor space by eliminating the need for traditional larger cooling systems such as in-row coolers
High Performance I/O		
• Support for PCIe 2.0	Provides a PCI Express 2.0 interconnect between the server modules and the ExpressModules and Network Express Modules installed in the chassis	• Faster interconnect (PCIe 2.0) for the Sun Blade 6048 Modular Systems • Enables support for the Sun Blade 6048 InfiniBand QDR Switched Network Express Module
Management Environment		
• Infrastructure Lifecycle Management	• Sun xVM Ops Center: • end-to-end virtual and physical lifecycle management, • Discover and inventory hardware and software assets • Check and provision firmware • Provision an operating system to bare metal or to Vms • Update guest operating systems no matter where it's running, in physical servers or virtual machines • Analyze, advise, and automatically update systems	• Helps in the rapid discovery and OS provisioning of groups of bare metal systems • Reduces total cost of ownership, lowering Administrator overhead by offering grouping functionality and centralized control of all systems in the datacenter

• *Feature*	• *Function*	• *Benefit*
	• Manage complete lifecycle of physical and virtual machines • Generate compliance reports	

• Chassis Monitoring Module (CMM)	• Chassis Monitoring and Management:
	  • IPMI 2.0 compliant for management and control
	  • LDAP Authentication
	  • Secure protocols (SSH2)
	  • Serial access via CMM
	  • Full DMTF CLI
	  • Browser UI for control of the system through a graphical interface.
	  • SNMP v1, V2c, V3 for system monitoring
	  • Monitor and report system and component status on all FRUs
		• Access to server module monitoring and management from the CMM
		• Manageable via N1 System Manager and 3rd party managers
		• Complete management consistency with Sun x64 rackmount servers

Server Module OS Support Flexibility		
• Support for:Solaris 10 OS • Red Hat Enterprise Linux Advanced Server 4 and 5 • SUSE Linux Enterprise Server 9, 10, 11 (64bit) • VMware ESX Server • Windows Server 2003 and 2008 (Standard & Enterprise Editions) • Note: Not all blades support the same OS' you should confirm blade specific OS support prior to deployment:	• Run applications on industry standard platform with preferred OS • Run multiple OS environments within the same chassis	• Maximize application performance with best OS • Ease transition to 64-bit computing • Maximize IT investment by standardizing hardware to reduce required training and spares

• *Feature*	• *Function*	• *Benefit*
http://www.sun.com/servers/blades/os.jsp		
Flexible I/O & Power		
• Maximum I/O flexibility, non-existent in competing blade server architectures	• Different types of I/O can be assigned per Server Module	• Deploy different applications on different blades within the same chassis: Industry standard PCIe ExpressModules allow one to mix applications that require different I/O configurations within the same chassis. Unlike other blade servers, each Server Module has unique, externally accessible, hot-pluggable I/O adapters
• Externally accessible and flexible I/O, non-existent in competing blade server architectures	• Improved serviceability	• Unlike other blade servers, I/O modules are externally accessible and hot-pluggable.
• N+N Hot-Swappable Power Supply Modules	• May be configured to support either 8400W or 5600W • Power Supply fans are wired independent of Power Supplies • High-efficiency (87% at 100% load)	• Use only the power you need now • Investment protection for the future • Reliability and Availability • Hot-Pluggable and Hot-Swappable with plugs/cords independent of Power Supply Modules • Enough power to support the fastest processors and robust memory footprints • Fans continue to run in the event

• *Feature*	• *Function*	• *Benefit*
		of Power Supply Module failure • Greater energy efficiency than rackmount power supplies

***Note:** Always refer to the formal product documentation for guidance prior to performing hot-swap or hot-plug activities.

Documentation for all Sun Blade Server products can be found online at: http://docs.sun.com/app/docs/prod/blade.srvr#hic

For information on the latest OS support for the Sun Blade Server Modules , see http://www.sun.com/servers/blades/os.jsp

Enabling Technologies

PCI Express(R) (PCIe) 2.0 Technology

The Sun Modular 6048 Chassis' passive midplane has been upgraded from PCI Express (PCIe) 1.1 to PCI 2.0. PCI 2.0 is a follow-on to PCIe 1.1, and each PCIe 2.0 lane has twice the speed of PCIe 1.1. PCIe 2.0 x1 link has an aggregate throughput of 4Gb/s. With PCIe 2.0, it is possible to have an aggregate bandwidth of up to 128 Gb/s (for x16). The table below summarizes the different PCIe attributes.

PCIe 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 (for PCIe 2.0 x16). 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 4Gb/s (for PCIe 2.0) in each direction for an aggregate bandwidth of 8 Gb/s (for PCIe 2.0) per lane. Each x8 lane provides up to 64Gb/s of I/O bandwidth.

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.

Table : PCI Technologies

PCI TECHNOLOGY	*BUS WIDTH*	*BANDWIDTH*	*COMMENTS*
PCI Express 1.1		8b/10b 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)	
	x8	40 Gbps / 32 Gbps (4 GB/s)	
	x16	80 Gbps / 64 Gbps (8 GB/s)	
PCI Express 2.0		8b/10b Encoded / Unencoded	Switched point to point - Full Duplex
	x1	10 Gbps / 8 Gbps	
	x2	20 Gbps / 16 Gbps	
	x4	40 Gbps / 32 Gbps	
	x8	80 Gbps / 64 Gbps	
	x16	160 Gbps / 128 Gbps	

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

Sun's Integrated Lights-out Manager provides direct management function of the respective x64 server blade much like a standalone server. Runs 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 environmental, 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

*Note: SPARC server module T6300 uses ALOM as integrated Lights-Out manager. Additional ILOM information can be found here: http://www.sun.com/systemmanagement/ilom.jsp

Sun's xVM Ops Center

Optional Sun xVM Ops Center software provides comprehensive infrastructure life cycle management for Sun systems, delivering an efficient way to manage multiple systems across the datacenter while simplifying management tasks, reducing repetition, and lowering the TCO of Sun SPARC & x64 systems. This software enables rapid discovery and provisioning of groups of bare metal Sun Blade Server Modules.

By utilizing ILOM features and the Sun xVM Ops Center software, customers can take advantage of state-of-the-art remote automation that integrates at the data center level. Zero-touch capabilities managed through a variety of interface options combined with full binary compatibility with other family members simplifies the installation, deployment, and maintenance of systems. The Chassis Monitoring Modules (CMMs), one per shelf, provide system management capabilities at the chassis and server service processor levels with CMM ILOM. Additional xVM Ops Center information can be found at http://www.sun.com/software/products/xvmopscenter/index.jsp

Key xVM Ops Center highlights:

- Integrated lights out physical and virtual system management
- Enterprise class scalability to manage small to large multi-site data centers
- Increased resource utilization by automating the provisioning of software environments
- Ensuring application availability through dynamic workload management
- Automated patching with patented intelligent dependencies management technology
- Comprehensive monitoring capabilities of virtual and physical machines
- Detailed out-of-the box reports to enable better security and compliance
- Simplified, context-driven user interface

Chassis Midplane Technology

The Sun Blade 6048 Chassis now supports PCIe 2.0 technology. For more details, please see the "PCIe 2.0 Technology" section listed above.

The Sun Blade 6048 Chassis design incorporates four passive midplanes, one per shelf, which provide the electrical interconnect between the following components:

- Sun Blade Server Modules
- Chassis Monitoring Module (CMM)
- PCIe ExpressModules (EMs) & Network Express Modules (NEMs)
- Power Supply Modules & Fan Modules

In addition to electrical connectivity between these components the passive midplane also functions as a high-speed interconnect between the Server Modules, EMs, NEMs and CMMs residing in the chassis. The midplane supports 32 PCIe 2.0 lanes per Server Module (384 PCIe lanes total per shelf) with a full duplex differential pair (4 wires) allotted to each lane. The 32 PCIe 2.0 lanes are divided with 8 lanes routed to each of the two NEM slots and 8 lanes to each of the two EM slots assigned to individual Server Modules.

Connectivity for the chassis management network is also provided by the midplane. The management network is a single plane and allows the CMM to manage the Server Modules and two NEMs in addition to controlling the Power Supply Modules, fan modules, and various system indicators.

The Sun Blade 6048 chassis I/O is architected using PCIe 2.0 technology. All I/O is disaggregated from the Server Modules with four PCIe interfaces (per Server Module) allocated to either of two PCIe EMs or the two NEMs.

The enhanced Sun Blade 6048 chassis with its midplane based on the PCIe 2.0 technology enables the Sun Blade X6275 and X6270 server modules to fully leverage their PCIe 2.0 links at 2.0 speeds, thereby doubling the bandwidth that is provided in the previous generation Sun Blade 6048 chassis.

The Sun Blade server modules, EMs, and NEMs, that are currently shipping are fully compatible with the enhanced Sun Blade 6048 chassis with the PCIe 2.0 midplane. In order to achieve the PCIe 2.0 levels of throughput, EMs and NEMs must 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 PCIe 2.0 EM. As for the Sun Blade 6048 IB QDR Switched NEM, its 40 Gb/s throughput is not dependent on the midplane PCIe technology, since it leverages IB signaling across the midplane. However, the other current EMs and NEMs are all based on PCIe 1.1 technology, and as such they are not capable of providing PCIe 2.0 levels of throughput. Additional EMs based on PCIe 2.0 technology are expected to become available in the 2nd half of CY09. Keep in mind that even when PCIe 2.0 modules become available, they will have to be utilized in a chassis that is using a PCIe 2.0 midplane to realize PCIe 2.0 bandwidth capabilities. In other words, the installed midplane dictates the performance of the I/O. So, if you run PCIe 2.0 products in a PCIe 1.1 midplane you will achieve PCIe 1.1 speeds. PCIe 1.1 products run at PCIe 1.1 speeds in PCIe 2.0 midplane.

For additional guidance see the tables below.

Table 1: Data path from Sun Blade Server Module to Chassis Midplane to EM => I/O Speed

Sun Blade Server Module	*Sun Blade Chassis Midplane*	*PCIe ExpressModule*	*I/O Speed*
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 EM	PCIe 2.0
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 QDR IB EM	QDR (40 Gb/s)
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 1.1 EM	PCIe 1.1
PCIe 1.1 Server Module	PCIe 2.0 Midplane	PCIe 2.0 EM	PCIe 1.1

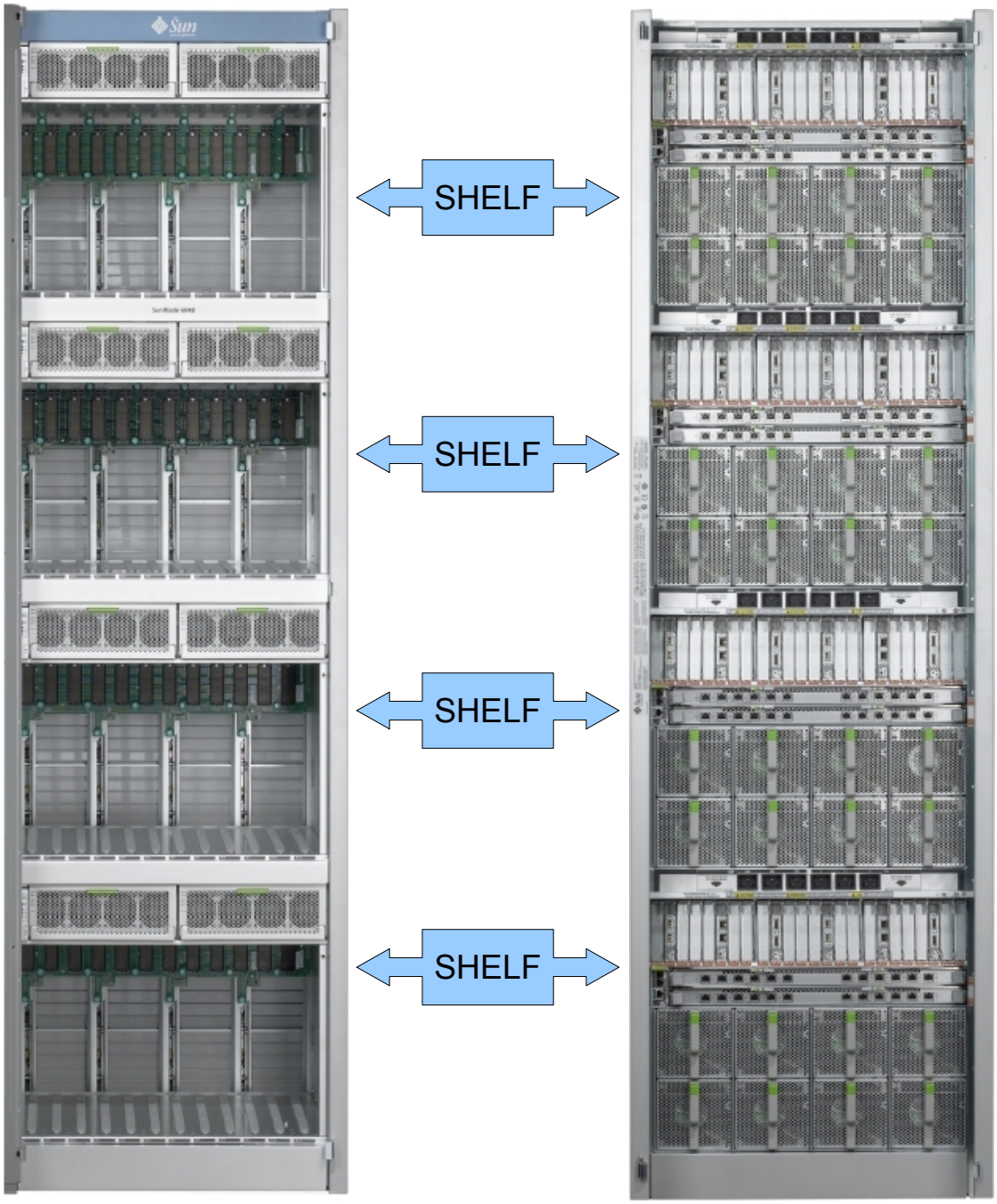
*Note: Additional ExpressModules based on PCIe 2.0 technology are expected to become available in the 2nd half of CY09.

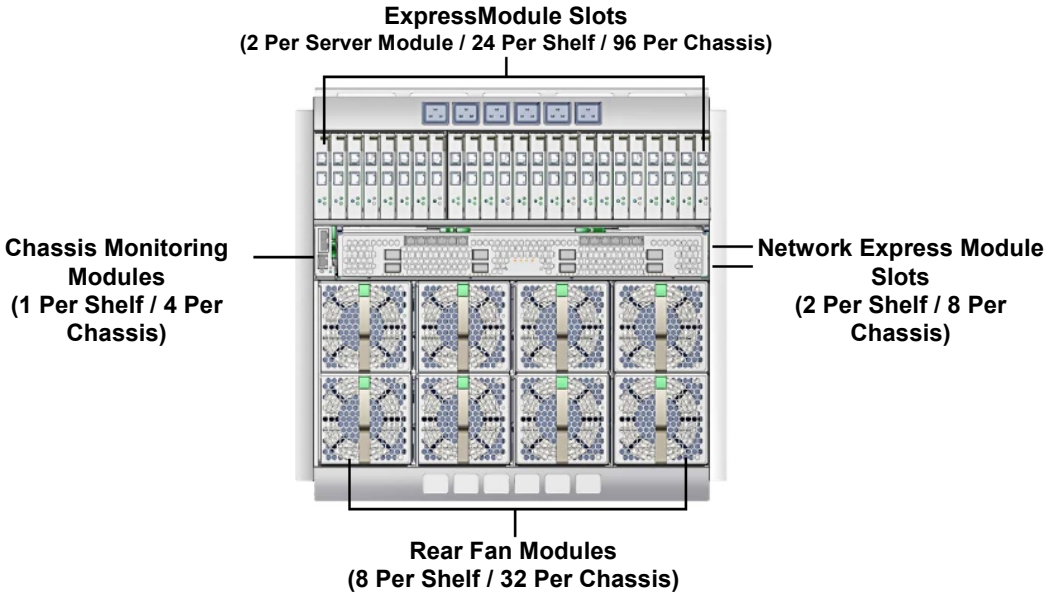
Table 2: Data path: From Sun Blade Server Module to Chassis Midplane to NEM => I/O Speed

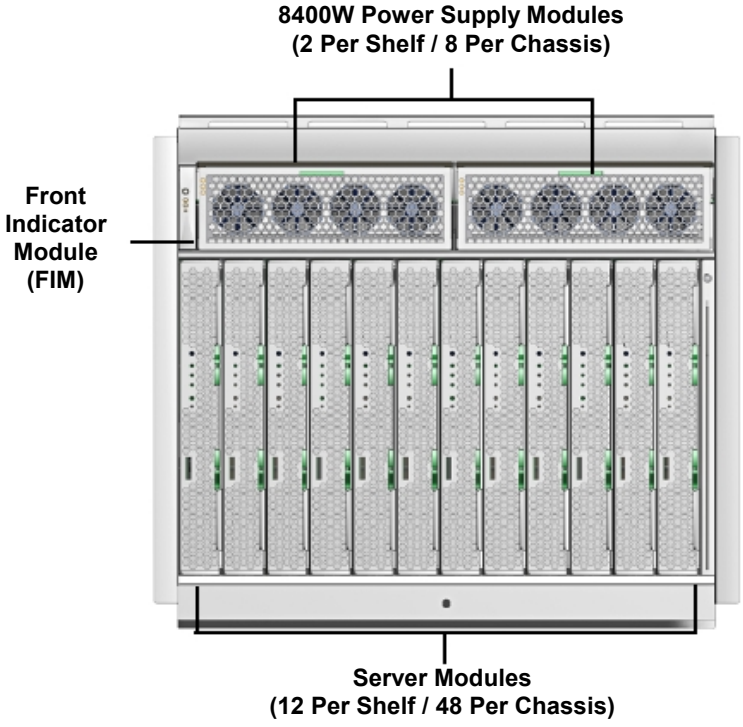
Sun Blade Server Module	*Sun Blade Chassis Midplane*	*Network Express Module*	*I/O Speed*
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 2.0 NEM	PCIe 2.0
PCIe 2.0 Server Module	PCIe 1.1 or 2.0 Midplane	SB6048 QDR IB NEM [6]	QDR IB rate (40 Gb/s)
PCIe 2.0 Server Module	PCIe 2.0 Midplane	PCIe 1.1 NEM	PCIe 1.1
PCIe 1.1 Server Module	PCIe 2.0 Midplane	PCIe 2.0 NEM	PCIe 1.1

6 Since the SB6048 QDR IBNEM leverages IB signaling across the midplane, the only relevant spec is the InfiniBand (IBTA 1.2) specification.

Major Chassis Components



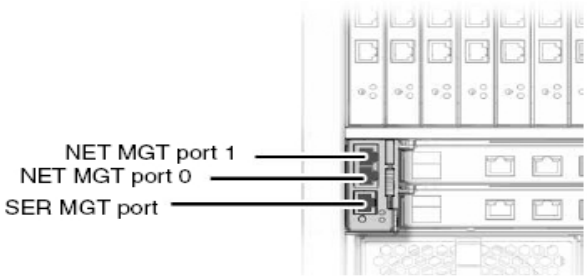

ExpressModule Slots
(2 Per Server Module / 24 Per Shelf / 96 Per Chassis)
Chassis Monitoring Modules
(1 Per Shelf / 4 Per Chassis)
Network Express Module Slots
(2 Per Shelf / 8 Per Chassis)
Rear Fan Modules
(8 Per Shelf / 32 Per Chassis)


8400W Power Supply Modules
(2 Per Shelf / 8 Per Chassis)
Front Indicator Module (FIM)
Server Modules
(12 Per Shelf / 48 Per Chassis)

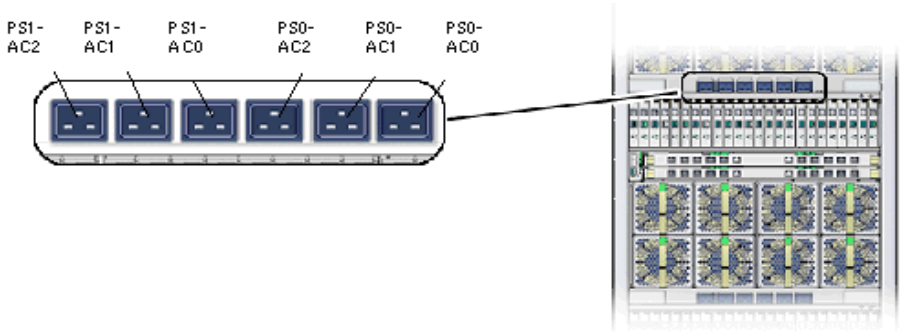
Power Supply Module Removed

Integrated Fan Module Removed

PCI Express ExpressModule (EM)



Chassis Monitoring Module (CMM)



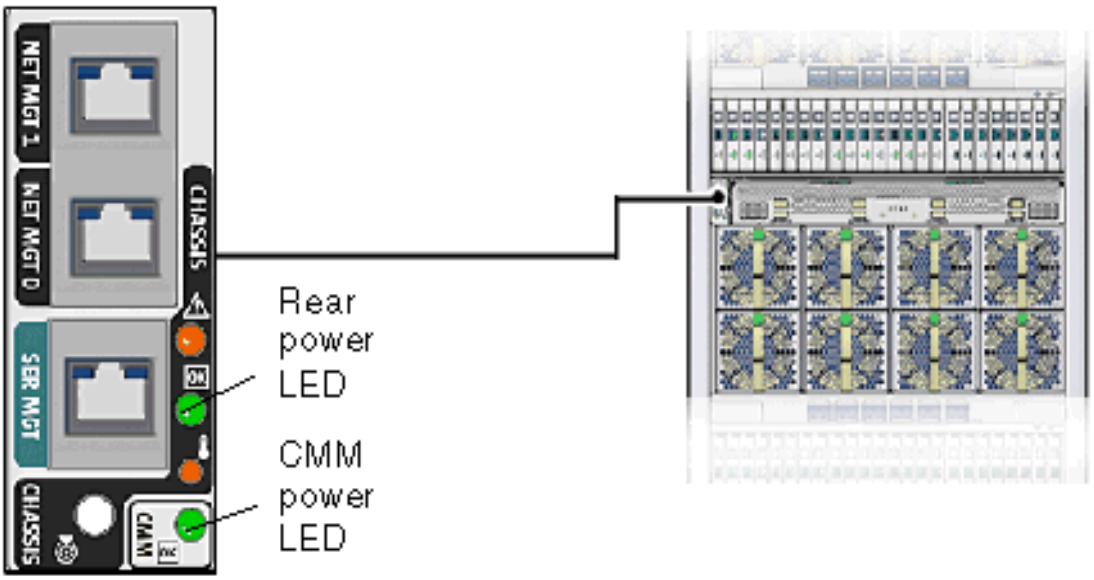
AC Power Inlets:

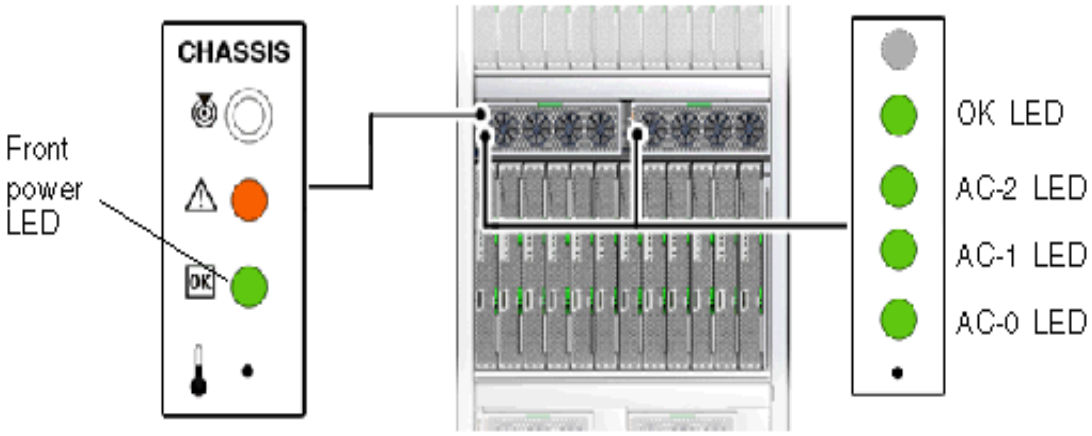
6 Per Shelf / 24 Per Chassis (8400W Configuration)

4 Per Shelf / 16 Per Chassis (5600W Configuration)

Network Express Module (NEM)

***Note: The NEM shown here is a double height NEM. This NEM requires 2 NEM Slots**


NET MGT 1
NET MGT 0
SER MGT
CHASSIS
CMM
Rear
power
LED
CMM
power
LED


CHASSIS
OK
Front
power
LED
OK LED
AC-2 LED
AC-1 LED
AC-0 LED

Chassis I/O & Server Module Options

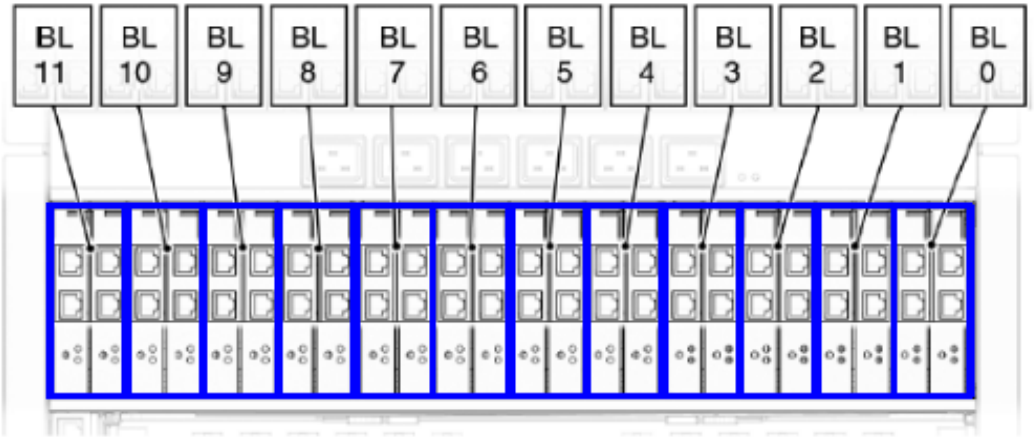
PCIe ExpressModules (EMs)

PCIe ExpressModules (EMs) reside at the top each of the of the four shelves in the Sun Blade 6048 chassis and are easily accessible from the rear. Two EM slots are connected to each Server Module via the chassis midplane for a total of 96 EMs per Sun Blade 6048 chassis. The EMs are a hot-pluggable PCI-SIG (special interest group) industry standard form factor with up to 64 Gbps of I/O per module (using PCIe2 x8 PCIe lanes, PCIe2 Server Module and a PCIe2 EM) providing customers a broad selection of industry standard I/O options without vendor lock-in.

For the latest I/O module information (including datasheets) please visit the two URLs shown below:

http://www.sun.com/servers/blades/iomodules/

http://www.sun.com/servers/blades/optioncards.jsp



Server Module (BL) Slot - EM Slot/Port Relationship

(2 ExpressModules Per Server Module)

Server Module	BL 11	BL 10	BL 9	BL 8	BL 7	BL 6	BL 5	BL 4	BL 3	BL 2	BL 1	BL 0
EM slots	EM 11.0 EM 11.1	EM 10.0 EM 10.1	EM 9.0 EM 9.1	EM 8.0 EM 8.1	EM 7.0 EM 7.1	EM 6.0 EM 6.1	EM 5.0 EM 5.1	EM 4.0 EM 4.1	EM 3.0 EM 3.1	EM 2.0 EM 2.1	EM 1.0 EM 1.1	EM 0.0 EM 0.1
Server Module to ExpressModule Assignments												

Fibre Channel ExpressModules:

- **PCIe Fibre Channel ExpressModule (Emulex):**
  P/N SG-XPCIE2FC-EB4-Z
  http://www.sun.com/storagetek/storage_networking/hba/4gb/expressmodule/
- **PCIe Fibre Channel ExpressModule (Qlogic):**
  P/N SG-XPCIE2FC-QB4-Z
  http://www.sun.com/storagetek/storage_networking/hba/4gb/expressmodule/

Fibre Channel / Gigabit Ethernet "Combo" ExpressModules:

- **Sun StorageTek Dual 4Gb Fibre Channel Dual GbE ExpressModule HBA:**
  P/N SG-XPCIE2FCGBE-Q-Z (Qlogic)
  http://www.sun.com/storagetek/storage_networking/hba/dual/index.xml
- **Sun StorageTek Dual 4Gb Fibre Channel Dual GbE ExpressModule HBA:**
  P/N SG-XPCIE2FCGBE-E-Z (Emulex)
  http://www.sun.com/storagetek/storage_networking/hba/dual/index.xml

InfiniBand ExpressModules:

- **Sun Blade QDR IB HCA PCIe 2.0 Express Module: P/N X4219A-Z**
  http://www.sun.com/products/networking/infiniband/ibhcapciemodule/
- **Sun Dual Port 4x IB Host Channel Adapter PCIe Express Module:**
  P/N X1288A-Z
  http://www.sun.com/products/networking/infiniband/ibhcapciemodule/
- **Sun PCI Express Dual-Port Double Data Rate InfiniBand Host Channel Adapter:**
  P/N X4216A-Z
  http://www.sun.com/products/networking/infiniband/ibhcapciemodule/index.xml

Gigabit Ethernet ExpressModules:

- **Sun PCI-Express Dual Port Gigabit Ethernet ExpressModule:**
  P/N X7283A-Z (Intel)
  http://www.sun.com/products/networking/ethernet/sundualgigethernetpm/
- **Sun Multithreaded Quad Port Gigabit Ethernet Networking ExpressModule:**
  P/N X7287A-Z (Sun Neptune)
  http://www.sun.com/products/networking/ethernet/sunx8quadgigethernet/index.xml
- **Sun x4 PCI-Express Quad Port Gigabit Ethernet ExpressModule:**
  P/N X7284A-Z
  http://www.sun.com/products/networking/ethernet/sunquadgigethernetpcie/index.xml

Ten Gigabit Ethernet ExpressModules:

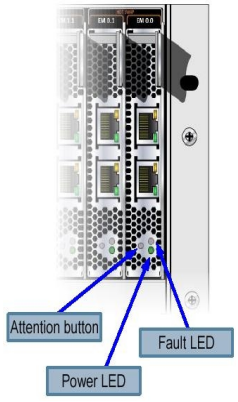
- **Sun Multithreaded 10 GbE (Gigabit Ethernet) Networking ExpressModule: P/N X1028A-Z (Sun Neptune)**
  http://www.sun.com/products/networking/ethernet/10gigethernet/index.xml
- **Sun 10 GbE with Intel 82598EB 10 Gigabit Ethernet ExpressModule**: **P/N X1108A-Z**
  http://www.sun.com/products/networking/ethernet/10gigethernetintel/index.xml

SAS ExpressModules:

- **Sun StorageTek SAS ExpressModule Host Bus Adapter: P/N SG-XPCIE8SAS-EB-Z**
  http://www.sun.com/storagetek/storage_networking/hba/sas/index.xml

ExpressModule Indicators & Buttons:

Indicators	*LED State*	*Description*
Power LED	ON	Module in use
	Slow Blink (After Attention Button is pressed for 5 seconds)	OFF = EM is ready for removal ON = EM removal process failed. The EM is now back to normal/in-use state
	OFF	EM is not in use
Fault LED	ON	Fault due to PCIe training error or power fault
Attention Button	Pushing the Attention Button initiates removal process and begins slow blink indicator as described above	



ExpressModule Indicators

ExpressModule Port Indicators

The Gigabit Ethernet, Fibre Channel and InfiniBand ExpressModules all use unique port indicators as shown below.

- The **Fibre Channel ExpressModule** port indicators specify link connection speed.

Fibre Channel EM Port Color	*Connection Speed*
Yellow	4 Gbps
Green	2 Gbps
Amber	1 Gbps

The following table provides detailed information on each of the port indicators.

FC EM – LED state	*Description*
Power Off	No LED on. The port has no power.
Power On (*during* firmware initialization)	The Yellow, Green, and Amber LEDS are on continuously. The port is powered on and the firmware is initializing or has been initialized.
Power On (*after* firmware initialization)	The Yellow, Green, and Amber LEDS flash in unison continuously. The port is powered up and the driver is initialized.
Beacon Mode	The Yellow and Amber LEDS flash in unison continuously. The port is in beacon mode.
Firmware Fault	The Yellow, Green, and Amber LEDS flash sequentially continuously. The port has a firmware fault.
Link Up State	The Yellow, Green, or Amber LED flashes continuously. The port is in a link up state for its respective connection rate.

- The **InfiniBand ExpressModule** has two indicators for each port:
  - Physical Link indicator
  - Logical Link indicator

The following table provides detailed information on each of the port indicators.

Item	*Color*	*Description*
Physical Link Indicator	Green	This indicator illuminates when the port is enabled, that is, the InfiniBand driver is successfully attached to the port

Item	*Color*	*Description*
Logical Link Indicator	Amber	This indicator illuminates when the port is in an UP state and blinks when there is traffic on the port.

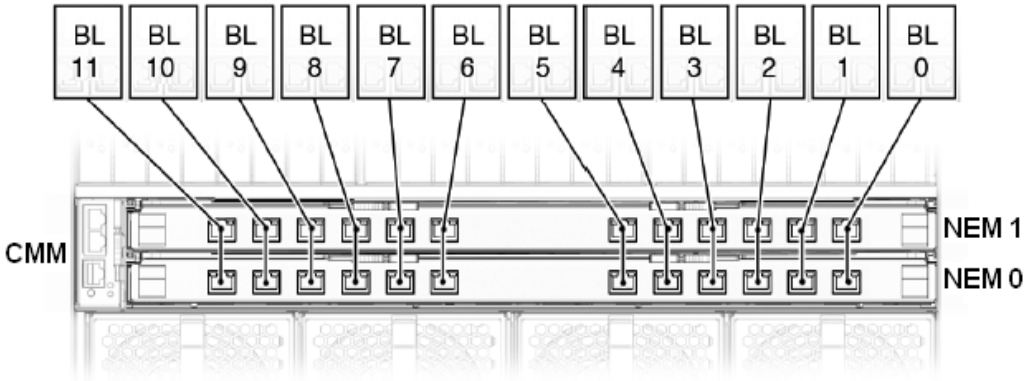
Network Express Modules (NEM)

Network Express Modules (NEM) are an additional I/O option available for the Sun Blade 6048 Modular System. The Sun Blade 6048 Chassis supports up to eight single-height NEMs (2 per shelf). Server Modules connect to the NEMs via the midplane. NEMs are designed to provide "bulk" or aggregated (shelf wide, common) I/O options. NEMs appear as standard PCIe adapters to the Server Modules OS'. When looking at a NEM from the rear of the chassis, Server Module 0 NICs are on the right and move through Server Module 11's NICs all the way to the left. In addition, network interfaces are assigned by the OS' from top to bottom.

For additional information please visit the two URLs shown below:

http://www.sun.com/servers/blades/iomodules/

http://www.sun.com/servers/blades/optioncards.jsp



Server Module (BL) Slot - NEM Slot/Port Relationship

(2 NEM Ports Per Server Module)

- **Sun Blade(TM) 6048 InfiniBand QDR Switched Network Express Module: P/N X5500A**
  - Feature:
    - The industry's only chassis-integrated leaf switch supporting Quad Data Rate (QDR) InfiniBand and providing passthrough Gigabit Ethernet connection to each server.
    - Offers 30 ports of 4x QDR and 24 ports of Gigabit Ethernet — for unparalleled scalability, resiliency, and throughput in a highly cost-effective form factor.
    - Supported with the Sun Blade X6440 & Sun Blade X6275(IB) Server Modules

  Please see below for for more information on Sun Blade 6048 IB QDR Switched NEM

- **Sun Blade 6048 GbE 12-port Pass-Thru Network Express Module (NEM12): P/N X4731A**
    - Features:
        - The Sun Blade 6048 Gigabit Ethernet 12-port Passthru Network Express Module provides one gigabit ethernet port per Server Module. Each NEM12 occupies one NEM slot, enabling one to configure up to two per shelf (up to 8 per 6048 unibody chassis).

Sun Blade 6048 IB QDR Switched NEM

Ideal for High Performance Computing (HPC), the Sun Blade 6048 QDR InfiniBand Switched Network Express Module offers 30 ports of 4x QDR and 24 ports of Gigabit Ethernet — for unparalleled scalability, resiliency, and throughput in a highly cost-effective form factor. The Sun Blade 6048 QDR IB Switched NEM minimizes cabling as well as costs, while easing management, enhancing reliability, and speeding time to solutions.

The Sun Blade 6048 IB Switched NEM is part of the Sun Blade 6048 modular system, offering flexibility, performance, and superior investment protection to help improve HPC datacenters' efficiency and utilization. When combined with the Sun Blade 6048 IB QDR Switched NEM, the Sun Blade 6048 modular system provides 30 ports of QDR connectivity and 24 ports of Gigabit Ethernet — driving supercomputing to unprecedented levels of scale and versatility while eliminating I/O bottlenecks.

The consolidation and power efficiency of the Sun Blade 6048 IB QDR Switched NEM are only part of how it boosts the power of the Sun Blade 6048 modular system. The Sun Blade 6048 IB Switched NEM also helps the system grow to meet future needs, offering investment protection as well as an innovative solution that can scale up from enterprise clustering to high-performance computing with 24 ports of Gigabit Ethernet and support for up to four Sun Blade 6048 IB QDR Switched NEMs per Sun Blade 6048 chassis, delivering 1,536 Gbps of throughput per Sun Blade 6048 IB QDR Switched NEM.

Key points:

- The industry's only chassis-integrated leaf switch supporting Quad Data Rate (QDR) InfiniBand and providing passthrough Gigabit Ethernet connection to each server.
- Ideal for high-performance compute clusters, clustered databases, InfiniBand (IB) grid architectures, and storage solutions
- Unprecedented scalability — enables support for over 5,184 node clusters, providing industry leading scalability critical to petascale deployments
- Compact design to maximize chassis utilization
- Increased resiliency to allow connectivity of up to eight ultra-dense QDR switches
- 3:1 reduction in cabling to simplify cable management
- Designed to support varied topologies including "Fat Tree" and mesh topologies.

Specifications:

- Form factor: Occupies two NEM slots in each shelf of the Sun Blade 6048 modular system, with up to four NEMs supported per chassis
- Supported platform: Sun Blade 6048 modular system, Sun Blade X6440 & Sun Blade X6275(IB) Server Modules

- Compatibility: InfiniBand specifications: IBTA v1.2
- Fabric Management: Host-based Subnet Manager
- Connections: Ten 12x InfiniBand CXP connectors carry three 4x connections each, for a total of 30 individual 4x QDR connections, each with active cable circuitry support as well as local and remote cable present detection and cable serial number detection
- Twenty four Gigabit Ethernet RJ-45 connections, supporting cables up to 60m in length.
- Throughput: Single-data-rate 8 Gbps per server, double-data-rate 16 Gbps per server, quad-data-rate 32 Gbps per server — aggregate throughput 1,536 Gbps

External Storage Support

Server Modules installed within the Sun Blade 6048 Chassis communicate with external storage devices via. associated ExpressModules or Network Express Modules.
Please check the following URL for the latest external storage support matrix:**http://www.sun.com/servers/blades/storage.jsp**

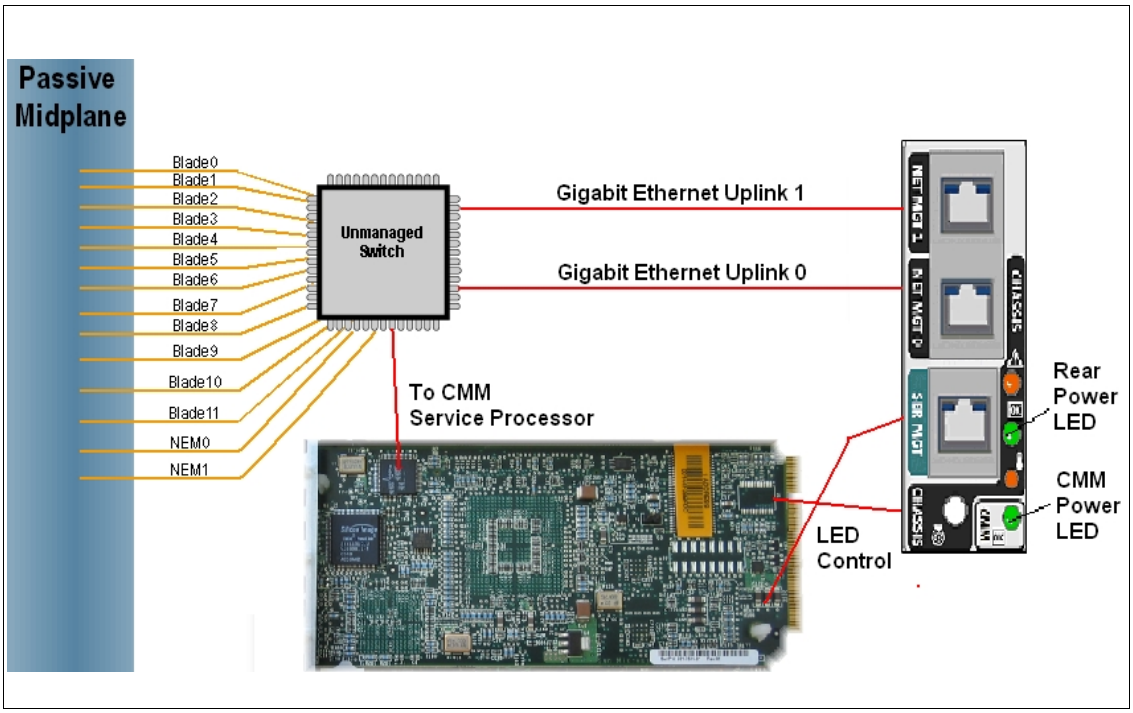
Chassis Monitoring Module (CMM)

Each Sun Blade 6048 Chassis shelf has a singe chassis management module. The CMM supports comprehensive management features consistent with rackmount servers.

The version of the ILOM used in the Sun Blade X6270 and X6275 server modules has the capability of reporting the maximum power that will be consumed by the respective server module based on its configuration. The ILOM will take a power inventory and use that information to determine the overall power that will be consumed by the Sun Blade X6270 and X6275 server modules. The maximum power consumption value is then reported to the Chassis Monitoring Module (CMM) to enable system administrators to carry out accurate power budgeting.

Main features:

- Chassis level status and configuration
- Comprehensive management features:
  - LDAP Authentication
  - Secure protocols (SSH2)
  - All functions available via through SSH, CLI
  - Monitoring and control all fans
  - Monitoring all power supplies
  - Supports switched system management through an un-managed switch to the 12 blades, 2 NEMs and local service processor Ethernet
  - Provides 2 GbE ports for external access
  - Provides 1 RS232 port to intialize local service processor
  - State less to allow for hot swap
  - Easy integration into Sun and /or 3rd party management infrastructures



All functions are accessible through CLI with future plan to go to web-based GUI. The CMM ILOM can perform the following functions:

- Chassis Environment Monitor and Control of Power Supply, temperature, and fan status
- FRU inventory – Server Modules, NEMs, Power Supplies, CMM
- Connect to service processor of all FRU and view their status
- NEM control (including hot-plug functions)

There are 2 ways to access the CMM: serial port or Ethernet port. A terminal or a laptop with terminal emulation software can telnet into the CMM ILOM via a serial cable with RJ45 connector. Alternatively, a SSH client can access to CMM ILOM through the NET MGT 0 port on the chassis rear panel. Default IP of CMM ILOM address can assigned by a DHCP server that is configured to accept a new MAC address (default mode) or use CLI through serial console to locate the assigned IP address.

CMM is located in the rear of the chassis; adjacent to Network Express Modules. It has a LED display panel to show chassis level activities. The display panel is replicated in the front left upper left corner for the front of the chassis for ease of monitoring.

The LED read out table

LED Indicator Name	*Color*	*Description*
CMM OK	Green	This LED provides these indications: • Steady On – Lights when it is safe to remove the associated CMM from the system. • Off – The CMM is not ready for removal.
Chassis Locate	White	This LED provides these indications: • Blink- Help yo to locate a specific system in the data center • Off – Norma operating mode
Chassis Fault	Amber	This LED provides these indications: • Steady On – Service Action Required summary for all FRU and CRU • Off – No service required.
Chassis Power/OK	Green	This LED provides these indications: • Steady On – Normal operation power on • Blink – Changing status like booting • Off – Chassis is not powered on
Chassis Thermal Status	Amber	This LED provides these indications: • Steady On – Lights when ambient temperature for the chassis is above the acceptable range • Off – Normal operating mode

Supported Sun Blade Server Modules

The following Server Modules are fully supported in the Sun Blade 6048 Chassis. For additional Server Module information please refer to the applicable product URLs as shown in the table.

*Note: Only the Sun Blade X6440 & Sun Blade X6275(IB) Server Modules are supported in a shelf that contains the QDR InfiniBand Switched NEM (X)5500A.

Model	*Processor Sockets / Type*	*URL*
Sun Blade X6240	2 / AMD Opteron	http://www.sun.com/servers/blades/x6240/
Sun Blade X6440	4 / AMD Opteron	http://www.sun.com/servers/blades/x6440/
Sun Blade X6250	2 / Intel Xeon	http://www.sun.com/servers/blades/x6250/
Sun Blade X6450	4 / Intel Xeon	http://www.sun.com/servers/blades/x6450/
Sun Blade X6270	2/ Intel Xeon 5500 processors	http://www.sun.com/servers/blades/x6270/
Sun Blade X6275	4/ Intel Xeon 5500 processors Note: 2 sockets per compute node	http://www.sun.com/servers/blades/x6275/
T6300	1 / SUN UltraSPARC T1	http://www.sun.com/servers/blades/t6300/
T6320	1 / SUN UltraSPARC T2	http://www.sun.com/servers/blades/t6320/
T6340	2 / SUN UltraSPARC T2	http://www.sun.com/servers/blades/t6340/

For information on the latest OS support for the Sun Blade Server Modules , see http://www.sun.com/servers/blades/os.jsp

More Efficient Cooling With Sun Cooling Doors

The enhanced (Gen 2) 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 (Gen 2) Chassis. The Sun Cooling Door 5200 or 5600 provides a cooling capacity of up to 35 kW per Sun Blade 6048 (Gen 2) Chassis, and greatly reduces or eliminates the need for data centers having to use additional cooling devices such as in-row coolers which can take 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 below for a photos of Sun Cooling Door 5200 and 5600. Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis provide support for the cooling doors.

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 (Gen 2) 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)

Sun Blade 6048 Chassis Specification

Sun Blade 6048 (Gen 2) Chassis Specifications

Features	*Sun Blade 6048 (Gen 2) Chassis*
Support for Sun Cooling Doors	Enables Sun Cooling Door 5200 and 5600 to be mounted as the rear door. Note: The Sun Cooling Doors are not supported with the Sun Blade 6048 (Gen 1) Chassis (P/N B22-B). Only the Gen 2 (B22-C & B22-D) Chassis provide support for the cooling doors.
PCIe 2.0	Passive midplane implemented with PCIe 2.0 technology
# Server Modules	Up to 48
CPU density	Up to 1152 cores per unibody chassis
Memory density	Up to 12288GB (12TB) per unibody chassis (48 Server Modules w/256GB memory ea.)
Ethernet density (production Ethernet network)	Up to 480 GbE ports (per chassis) 384 ports via. (96) Quad Port GbE EMs 96 ports via. (8) 12 port GbE NEMs
PCIe ExpressModules (EM)	Hot-pluggable Up to 96 EMs per chassis (24 per shelf, 2 per Server Module) ExpressModules: • Sun Blades QDR IB HCA EM (PCIe 2.0 based) • Gigabit Ethernet - (dual port or quad Port) • Ten Gigabit Ethernet (dual Port) • Dual Port Ethernet / Dual Port Fibre Channel combo • 4Gb/s Fibre Channel (dual port) • SAS ExpressModule with Two x4 external miniSAS connectors • 4x 10Gb/s (SDR) InfiniBand (dual port) • 4x 20Gb/s (DDR) InfiniBand (dual port)
PCIe Network Express Modules (NEM)	Hot-pluggable Up to 8 NEMs per chassis (2 per shelf, for a single height) Network Express Modules: • Sun Blade 6048 QDR IB Switched NEM - includes 24 GbE passthru ports (supported with Sun Blade X6440 & Sun Blade X6275(IB) Server Modules) • Gigabit Ethernet 12 Port (copper) passthru (NEM12)
Removable media	N/A
Service Processor	ILOM for X6240, X6440, X6250, X6450, X6270, X6275, T6320 & T6340 ALOM for T6300 Chassis Monitoring Modules have integrated Service Processors
In-band management	CLI via serial port on CMM
Out-of-band management	SSH via network port on CMM
Remote management features	Remote power control remote access to BIOS, remote FRU status, monitoring. Logging, role-based access control

Features	*Sun Blade 6048 (Gen 2) Chassis*
System management paths	Dedicated management network 10/100/1000BaseT port plus a system serial port
Chassis Height	81.61 in. (2,073mm)
Chassis Depth	40.34 in. (1,025mm)
Power Supply Modules	Eight per chassis (two per shelf) High-efficiency, hot-swappable, 1+1 redundant, load-sharing, load-balancing 1+1 PSU rating; 8,400W each power supply module (three 2,800 W cores); can be configured to 5,600W (two 2,800 W cores) (check the 5,600 W support)

AC Power Requirements

	Sun Blade 6048 Chassis
Power Supply Modules	Two hot-plug / hot-swap 8400W power supply modules (per shelf), 8400W total with N+N redundancy
Voltage	200 to 240 VAC
Frequency	50 / 60 Hz
Current	16A per input
Number of AC inputs	24 AC inputs (three per power supply module) at 8400W; 16 AC inputs (two per power supply module) to achieve 5600W.
AC input connection	Dependent on location: • AMER – L6-20P to IEC 320 C19; 2.5m; Sun PN 180-2005-01 • EPAC – IEC 309 to IEC 320 C19; 2.5m; Sun PN 180-2004-01 • Pre-installed in rack with power distribution unit – IEC 320 C20 to IEC 320 C19
Power Calculator	(Sun Blade 6048 Chassis) www.sun.com/servers/blades/6048/calc/

Acoustic Noise Emissions

Declared noise emissions are in accordance with ISO 9295/9296 standards.

Data center personnel should take necessary precautions to reduce exposure to the high noise levels.

Thermal Design Specifications

Parameter	*Specification*
Volumetric airflow (per shelf)	844 CFM typical, 1460 CFM maximum possible
Maximum possible (per shelf) heat dissipation/HVAC load	32,000 BTU/hour
Maximum possible temperature rise through chassis	19.6^0 C (35^0 F)

Environmental Specifications

Sun Blade 6048 Chassis		
Parameter	***Operating Specification***	***Non-operating Specification***
Temperature	5^0 C to 32^0 C (41^0 F to 90^0 F) non-condensing	-40^0C to 65^0 C (-40^0 F to 149^0 F) non-condensing
Optimum ambient temperature	23^0 C (73.4^0 F)	
Relative Humidity	10% to 90% RH, non-condensing, 27^0 C max wet bulb	5% to 93% RH, non-condensing, 38^0 C max wet bulb
Optimum ambient relative humidity	45% to 50% RH, non-condensing	
Altitude	0 to 10,000 feet (0 - 3048 m) maximum ambient temperature is derated by 1^0C per 300 m (984 ft) above 900 m (2953 ft)	0 to 39,370 feet (0 - 12,000 m)
Sine Vibration	Z (vertical) axis: 0.15G X/Y axis: 0.10G 5 - 500 Hz sine	Z (vertical) axis: 0.50G X/Y axis: 0.25G 5 - 500 Hz sine
Shock	3Gs, 11msec, half sine	

Physical Dimensions and Weight

Sun Blade 6048 Chassis & Component Weights	
Chassis shipping crate specifications	
Shipping Crate Height	87.5 inches (222.3 cm)
Shipping Crate Width	48 inches (121.9 cm)
Shipping Crate Depth	62 inches (157.5 cm)
Shipping weight	Chassis, packaging, and pallet weight: Approximately 2500 lb (1134 kg)
Chassis Specifications	
Chassis Height	81.7 inches (2075 mm)
Chassis Width	23.78 inches (604 mm)
Chassis Depth	40.35 inches (1025 mm)
Standard Chassis with Doors (no filler panels)	1075.26 lbs. (487.73 kg)
Subassembly & Miscellaneous Component Weights	
Midplane	6.6 lbs. (2.99 kg)
Front Indicator Module	0.75 lb. (0.34 kg)
Power Supply Module	28.40 lbs. (12.88 kg)
T6300 Server Module (Fully Configured)	14.95 lbs. (6.78 kg)
T6320 Server Module (Fully Configured)	17.30 lbs. (7.84 kg)
T6340 Server Module (Fully Configured)	20 lbs (9.1 kg)

Sun Blade 6048 Chassis & Component Weights	
Sun Blade X6220 Server Module (Fully Configured)	15.95 lbs. (7.23 kg)
Sun Blade X6240 Server Module	17.41 lbs. (7.90 kg)
Sun Blade X6250 Server Module (Fully Configured)	16.56 lbs. (7.51 kg)
Sun Blade X6270 Server Module (Fully Configured)	17.4 lbs. (7.9 kg)
Sun Blade X6275 Server Module (Fully Configured)	20.61 lbs. (9.37 kg)
Sun Blade X6450 Server Module (Fully Configured)	17.58 lbs. (7.97 kg)
Rear Fan Module	2.25 lbs. (1.02 kg)
Chassis Monitoring Module	0.70 lb. (0.32 kg)
GbE Network Express Module (NEM12)	4.68 lbs. (2.12 kg)
ExpressModule (EM)	0.80 lb. (0.36 kg)
ExpressModule Filler Panel	0.45 lb. (.20 kg)
Server Module Filler Panel	5.65 lb. (2.56 kg)
Sun Cooling Door 5200	Weight (empty without coolant): 90 kg (198 lbs) Weight (with coolant): 97 kg (214 lbs)
Sun Cooling Door 5600	Weight (empty without coolant): 59 kg (130 lbs) Weight (with coolant): N/A at this time

Regulatory Compliance

The Sun Blade 6048 Chassis complies with the following Sun Microsystems and agency regulatory standards.

Category	*Standard*
Product Safety	UL approved to UL 60950 and C22.2 No. 60950
	UL Demko approval to EN60950-1 and CB Report IEC 60950-1; including all amendments and full worldwide deviations
	GOST Certification for Russia
	Korean MIC Certification
	China CCC Mark for power supply (system is exempt since it is rated greater than 1300W)
	CE Declaration of Conformity (SMI self declaration) to The Electromagnetic Compatibility Directive and Low Voltage Directive 2006/95/EC
	IRAM S-Mark for power supply (system is exempt due to class of equipment)
	CNS 14336 (Taiwan)
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

Category	*Standard*
Electromagnetic Interference	CFR 47 Part 15 (Code of Federal Regulations, Part 15, Subpart B) Class A
	EN55022:2006 Class A per EMC Directive 2004/108/EEC (CE Mark)
	VCCI Class A
	Industry Canada ICES-003
	AS/NZ 3548 (Australia/New Zealand)
	CNS 13438 (Taiwan)
Immunity	EN55024:1998 +A1:2001 +A2:2003 per EMC Directive 2004/108/EC, including: • IEC 61000-4-2 Electrostatic discharge immunity test • 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
Line Distortion	EN 61000-3-2 per EMC Directive 2004/108/EC
Voltage Fluctuations and Flicker	EN 61000-3-3 per EMC Directive 2004/108/EC

Sun Blade 6048 Chassis Power and Electrical Requirements

The Sun Blade 6048 modular system uses two 200-240V, 8400W power supply modules per shelf. The amount of power that the system consumes is dependent on its configuration, that is, the number of active modular components installed. To determine the power redundancy requirements, you need to know:

- Source power available
- Power consumption (depends on component configuration)
- Redundancy level required

The system requires a minimum of two AC inputs per shelf. To provide 2N power redundancy at a 8400 W consumption level, and to ensure that the system can tolerate a loss of three power supplies, the system should never exceed 9375 W per shelf of power consumption at any given time.

The power requirements for different components in the Sun Blade 6048 System are provided via the power calculator:

http://www.sun.com/servers/blades/6048chassis/calc/

The AC power requirements for the Sun Blade 6048 modular system are summarized in the table shown below.

Function	*Specification*
Voltage	200 to 240 VAC
Frequency	50/60 Hz
Current	16A per input
Number of AC inputs	When configured to support 8400W power envelope: 6 per shelf / 24 per chassis When configured to support 5600W power envelope: 4 per shelf / 16 per chassis
AC input connection	Americas Domestic - NEMA L6-20P to IEC320-C19M (4m, Sun PN X5044A-Z) International - IEC309 to IEC320-C19 (4m, Sun PN X5045A-Z) If using Modular power system - IEC320-C319 to IEC320-C20 (1.5m, Sun PN X5046A-Z; 2.0m, X5047A-Z)

The installation site must meet the following electrical requirements for installation of a Sun Blade 6048 System:

- Six 200-240 VAC, 16A/20A branch circuits, one for each of the AC inlets on the system, are required.
- The connection to the Sun Blade 6048 Chassis AC inlet requires the following types of power cords, dependent on site location. Each AC inlet requires a separate power cord; therefore, six power cords are required for the 8400W configuration and four power cords are required for the 5600W configuration. The power cord must be rated at 16A or 20A, depending on the site location.

If you are connecting the system directly to an external power source (for example, power is not obtained through a modular power system), use these types of power cords:

- Americas Domestic - NEMA L6-20P to IEC320-C19 (4m, Sun part number X5044A-Z)
- International - IEC309 to IEC320-C19 (4m, Sun part number X5045A-Z)

You can configure the Sun Blade 6048 modular system for grid redundancy by using two AC line feeds and the appropriate modular power system. *Grid redundancy* refers to the performance of the chassis power subsystem in the intended AC configuration. For grid redundancy, the AC configuration is supplied AC power from two independent feeds, which can be called Line A and Line B. By connecting one power supply to the Line A feed and one power supply to the Line B feed, the system can tolerate the failure of one power supply or the complete loss of either AC feed.

Sun Blade 6048 Chassis - Cooling & Airflow Requirements

(Note: Does not include Sun Cooling Door)

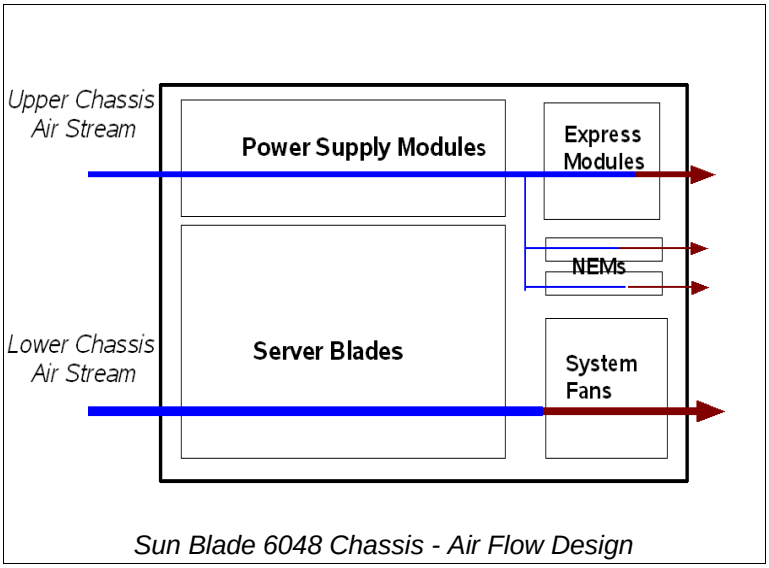
Every watt of power used by the system is dissipated into the air as heat. The thermal power dissipation of the shelf in a 9375W 2N configuration is 32,000 BTU/h. This requires that the data center heating, ventilation, and air conditioning (HVAC) system must accommodate the maximum heat release of a fully configured system, as well as any other systems in the data center.

The amount of heat output per Sun Blade 6048 System varies, depending on the system configuration. The systems are equipped with fans that route cool air throughout the chassis from front to rear. The fans are speed-controlled based on system temperature sensors. Typical airflow (for room temperatures below 23° C) is about 844 CFM per shelf. Maximum possible airflow is about 1460 CFM per shelf.

As long as the necessary air conditioning is provided in the data center to dissipate the heat load, and sufficient space and properly vented door openings are provided at the front and back of rackmounted systems, the system fans will enable the system to work within the temperature specifications for systems in operation.

Service and Aisle Clearance Requirements

Location	*Service Access Requirements*
Front cold aisle	4 feet (1.22 m); required for inserting server modules
Rear hot aisle	3 feet (0.9 m); required for cable access



Sun Blade 6048 Chassis - Air Flow Design

Airflow Requirements

The system uses forced air to draw in ambient air for cooling from the front of the chassis, while heated air exits the rear of the chassis. The design of the system provides two primary regions of airflow: The lower airstream cools the Server Modules, and the upper airstream cools the power supplies, Chassis Monitoring Modules, Sun Blade 6048 Network Express Modules, and PCI Express Modules.

The rear fan cage includes eight rear fan modules(per shelf), each module having two fans, for a total of 16 fans. The fans draw cool air through the front of the Server Modules and exhaust heated air through the back of the chassis. This results in typical measurements of approximately 844 CFM (cubic feet per minute) of total airflow through a shelf.

The upper airstream provides forced air by using a combination of internal fans within each power supply.

Follow these airflow guidelines:

- Do not block the ventilation areas of the system.
- Ensure that all cabling at the rear of the system does not block any exhaust air.

System Requirements and Operational Details

System Requirements

The Sun Blade 6048 Chassis with Sun Blade Server Modules runs the Solaris 10 Operating System on SPARC and x64 as well as standard Red Hat & SUSE Linux distributions, Microsoft Windows Server 2003 and Windows Server 2008, VMware ESX. For a current list of supported OS versions regarding a specific Server Module model please refer to the following URL:

http://www.sun.com/servers/blades/os.jsp

Standard System Configurations

The Sun Blade 6048 PTO chassis (standard configuration, B22-D) consists of the following standard components:

- 1 Constellation C48 chassis
  - Eight (8,400W) power supply modules (per chassis), 1+1 redundancy
- 32 Rear Fan Modules (64 total fans, N + 1 redundancy)
- Eight Front Fan Modules
- Four Chassis Monitoring Modules (CMM)
- Four PCIe 2.0 passive midplanes for electrical and high-speed interconnect of modules and chassis infrastructure
- Filler panels: 47 Server Module, 96 ExpressModule, 8 Network Express Modules
- 2 Dongles w/ adapters

The Sun Blade 6048 chassis is also offered as an XATO item (B22-C). The XATO offering does not include the 47 Server Module, 96 ExpressModule, 8 Network Express Modules filler panels. Filler Panels are offered as XATO options.

The XATO Sun Blade 6048 Chassis includes:

- 1 Constellation C48 chassis
- Eight (8,400W) power supply modules (per chassis), 1+1 redundancy
- 32 Rear Fan Modules (64 total fans, N + 1 redundancy)
- Eight Front Fan Modules
- Four Chassis Monitoring Modules (CMM)
- Four PCIe 2.0 passive midplanes for electrical and high-speed interconnect of modules and chassis infrastructure
- 2 Dongles w/ adapters

System Options

The following components are optional for the Sun Blade 6048 Modular System and must be ordered separately:

- Up to 48 Sun Blade Server Modules
- Up to 8 Network Express Modules (NEMs)
- Up to 96 PCIe ExpressModules (EMs)
- Filler panel options (for use with B22-C):
  - Server Module filler panel: 4460A
  - NEM filler panel: 4461A
  - EM filler panel: 4462A

Note: Please check the supported EMs and NEMs for each individual blade. For example, Sun Blade X6275 initially only supports the following EMs:

- Sun Dual 10GbE SFP+ PCIe ExpressModule incorporating (Intel 82598 10 Gigabit Ethernet

controller) and supporting pluggable SFP+ Transceivers.

- 4Gb FC Dual Port PCIe ExpressModule (QLogic)
- Sun StorageTek SAS ExpressModule HBA

Power Calculator

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

The intent of the power calculator is to provide guidance for estimating the electrical and heat loads for typical operating conditions. **It should not be used to calculate power or HVAC requirements.**

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

Sun Blade 6048 Chassis Power Calculators:

http://www.sun.com/servers/blades/6048chassis/calc/index.jsp

Sun Blade Modular System CMM Power Configurator

The Sun Blade System Power Configuration tool provides the worst case power consumption for a Sun Blade 6048 modular systems, and the results can be used for site planning purpose. In addition, the Sun Blade System Power Configuration Tool will calculate whether there are enough power to power the Sun Blade 6048 modular systems after they have been installed with Sun Blade modular systems, EMs and NEMs of all different kinds. The results, the leftover power and whether it will work or not, are calculated for three different power redundancy configurations - 1) N+N redundancy, 2) N+1 redundancy and 3) no redundancy.

For specific configuration measurements, please refer to the on-line Power Configuration Tool available at SunWin:

- Sun Blade 6048 System Power Configuration Tool, SunWIN# 539275

MTBF & RAS Information

The MTBF & RAS (Mean Time Between Failure & Reliability, Availability, Serviceability) for the Sun Blade 6048 Chassis components vary from component to component depending on configuration specifics. Under normal operating conditions the MTBF calculations for several of the components is shown in the table below.

The MTBF information shown below 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 shown here.

For more specific and granular information, please refer to the MTBFtool (part of the (RASsuite tools) found at the RAS Engineering website: http://ras4sun.sfbay/

Component	*Part Number*	*Partial "parts list" Description*	*MTBF Calculation*
Sun Blade 6048 Chassis Standard Configuration	B22-B	1x 42U "unibody"Chassis 4x Assembly Midplanes 4x Front Indicator Modules 8x Power Supply Modules 32x Rear Fan Modules 4x Chassis Monitoring Modules	31,777 hours

Reliability, Availability, Serviceability (RAS) Features

*Note (The Items shown below include Chassis & Server Module RAS features)

Reliability:

- Multi-core processors support automatic reboot in the event of a failed core
- ECC memory with ChipKill support
- Enterprise SAS drives with 1.6 M hours MTBF rating
- No Fans on Server Modules
- No Power Supplies on Server Modules
- Passive midplane increases reliability - minimizes chassis cabling

Availability

- Hot-plug / hot-swap HDDs, integrated RAID protection
- 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 module failure
- Redundant hot-plug / hot-swap Rear Fan Modules with dual fans

Serviceability

- Modularity increases serviceability and reduces time to resolution
- Front-accessible, hot-plug / hot-swap disk drives.
- Single-step power supply removal: Power-supplies can be serviced without sliding the blade 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.
- 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 CPU 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

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/

Sun Blade 6048 Ordering Information

Detailed ordering information is provided in the SunWIN document titled “Sun Blade 6048 Modular System Ordering Menu”. This document can be located by logging in to SunWIN and searching for the document title mentioned above or by using document token number 517110.

Warranty Support

The Sun Blade 6048 Chassis has a three year, next business day warranty.

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

Just like the Sun Blade 6000, the Sun Blade 6048 warranty covers the entire chassis; regardless of the number of components in the system. 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 forty-eight, 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.

Additional blade server hardware warranty information can be found at:
http://www.sun.com/service/warranty/bladeservers.xml

Additional Global Warranty support information can be found at:

http://www.sun.com/service/warranty/index.xml

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

- **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

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

SunSpectrum Service Plans

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

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

Warranty Upgrade to SunSpectrum Service Plan for Sun Blade Server Module Servers

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

Part Number	*Warranty Upgrade to SunSpectrum Service*
for Sun Blade 6048 Gen 2 (B22-C, B22-D)	
IWU-SB6048G2-1S	Upgrade to 1 year SunSpectrum Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2-2S	Upgrade to 2 year SunSpectrum Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2-3S	Upgrade to 3 year SunSpectrum Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2-1G	Upgrade to 1 year SunSpectrum Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2-2G	Upgrade to 2 year SunSpectrum Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2-3G	Upgrade to 3 year SunSpectrum Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2-24-1G	Upgrade to 1 year SunSpectrum Gold 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-24-2G	Upgrade to 2 year SunSpectrum Gold 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-24-3G	Upgrade to 3 year SunSpectrum Gold 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-1P	Upgrade to 1 year SunSpectrum Platinum for Sun Blade 6048 Gen 2
IWU-SB6048G2-2P	Upgrade to 2 year SunSpectrum Platinum for Sun Blade 6048 Gen 2
IWU-SB6048G2-3P	Upgrade to 3 year SunSpectrum Platinum for Sun Blade 6048 Gen 2

Sun[sm] 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

Sun System Service Plans for Windows OS: Features Matrix

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 Server Module Servers

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 6048 modular systems:

Part Number	*Warranty Upgrade to Windows Service*
for Sun Blade 6048 Gen 2 (B22-C, B22-D)	
IWU-SB6048G2W-1S	Upgrade to 1 year Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2W-2S	Upgrade to 2 year Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2W-3S	Upgrade to 3 year Silver for Sun Blade 6048 Gen 2
IWU-SB6048G2W-1G	Upgrade to 1 year Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2W-2G	Upgrade to 2 year Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2W-3G	Upgrade to 3 year Gold for Sun Blade 6048 Gen 2
IWU-SB6048G2W-1P	Upgrade to 1 year Platinum for Sun Blade 6048 Gen 2
IWU-SB6048G2W-2P	Upgrade to 2 year Platinum for Sun Blade 6048 Gen 2
IWU-SB6048G2W-3P	Upgrade to 3 year Platinum for Sun Blade 6048 Gen 2

Warranty Upgrade to Sun HW Only Service for Sun Blade Server Module Servers

Part Number	*Warranty Upgrade to Sun Hardware Only Same Business Day Service*
for Sun Blade 6048 Gen 2 (B22-C, B22-D)	
IWU-SB6048G2-SD-1H	Upgrade to 1 year Sun HW Only SBD for Sun Blade 6048 Gen 2
IWU-SB6048G2-SD-2H	Upgrade to 2 year Sun HW Only SBD for Sun Blade 6048 Gen 2

Part Number	*Warranty Upgrade to Sun Hardware Only Same Business Day Service*
IWU-SB6048G2-SD-3H	Upgrade to 3 year Sun HW Only SBD for Sun Blade 6048 Gen 2

Part Number	*Warranty Upgrade to Sun Hardware Only 7x24 Service*
for Sun Blade 6048 Gen 2 (B22-C, B22-D)	
IWU-SB6048G2-24-1H	Upgrade to 1 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-24-2H	Upgrade to 2 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-24-3H	Upgrade to 3 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2

Part Number	*Warranty Upgrade to Sun Hardware Only 7x24 Service – 2 hour response*
for Sun Blade 6048 Gen 2 (B22-C, B22-D)	
IWU-SB6048G2-22-1H	Upgrade to 1 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-22-2H	Upgrade to 2 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2
IWU-SB6048G2-22-3H	Upgrade to 3 year Sun HW Only 7x24 for Sun Blade 6048 Gen 2

Installation Service for Sun Blade Server Module Servers

Sun's exceptional support for server installation is also available for the Sun Blade Server Modules 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-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

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.
Ethernet 10/100/1000Base-T	The most widely used LAN access method defined by the IEEE 802.3 standard; uses standard RJ-45 connectors and telephone wire. 100Base-T is also referred to as Fast Ethernet. And 1000Base-T is also referred to as Gigabit Ethernet.
FRU	Field Replaceable Unit.
Hot-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 CPU 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 CPU chip. The AMD Opteron processor integrates 1 MB of L2 cache per CPU.
LAN	Local Area Network

1U or RU	One rack unit as defined by the Electronic Industries Alliances (EIA). A vertical measurement equal to 1.75 inches.
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.
PCI	Peripheral Component Interconnect . A high-speed parallel bus originally designed by Intel to connect I/O peripherals to a CPU.
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
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 (Mobs) 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.

Internal Information

Sun Proprietary—Confidential: Internal Use Only

Competitive Information

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 6048 Modular System versus competitors' products, and positioning information.

*Note: Since product feature sets change very frequently you should validate any non Sun Blade 6048 Modular System product comparisons with data found at each competitor's respective website.

Positioning Sun Blade 6048

Elevator Pitch:

The Sun Blade 6048 Modular System provides industry leading CPU horsepower, I/O bandwidth and much more. Built on open standards, the Sun Blade Express Modules are fully hot-pluggable and provide superior I/O throughput ideal for HPC, back-office and web requirements.

Key Differentiators:

- Support for Sun Blade 6048 InfiniBand QDR Switched Network Express Module due to implementation of PCIe 2.0 technology
- More efficient and higher cooling capacity due to Sun Cooling Door
- Hot pluggable I/O, blades, CMM and fans provide maximum RAS.
- Mix and match SPARC, Intel, AMD, Windows, Linux and Solaris to meet multiple data center requirements. Manage this varied environment through the CMM and your own management software.
- 51 percent more compute performance per rack than HP c-Class platform
- 71 percent more compute performance per rack than IBM BladeCenter H platform

1. SPARC blades require less energy. Systems can be up to 40% less power hungry.

Product Availability

RR: 3/24/09

PRESTO Announcement: 3/30/2009

GA: 4/7/2009

Change Log	
Version	***Change Summary***

1.7	• Minor cosmetic & grammatical updates made
	• Network Express Module Updates:
	  • Removed references to DDR IB Switched NEM P/N X5196A-Z (impending EOL)
	  • Indicated the QDR InfiniBand Switched NEM (X)5500A is currently only supported with the Sun Blade X6440 & Sun Blade X6275(IB) Server Modules