



Product Guide

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IBM BladeCenter HS21

Product Overview

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Uncompromising 2-socket blade server for business-critical or telecommunications applications

Suggested uses: *Front- and mid-tier applications requiring high performance, enterprise-class availability and extreme flexibility and power efficiency.*

Today's data center environment is tougher than ever. You are looking to reduce IT cost, complexity, space requirements, power consumption and heat output, while increasing flexibility, utilization and manageability. Incorporating IBM® **X-Architecture™** features, the IBM **BladeCenter® HS21 blade server**, combined with the various BladeCenter chassis, can help you accomplish all of these goals.

Reducing an entire server into as little as **.5U** of rack space does *not* mean trading away features and capabilities for smaller size. Each HS21 blade server offers features comparable to many 1U rack-optimized full-featured servers: The HS21 supports up to **two** of the latest high-performance or low-voltage **quad-** and **dual-core** Intel® **Xeon®** processors. The Xeon processors are designed with **4MB** or **6MB** (dual-core), or **8MB** or **12MB** (quad-core) of **L2** cache, a leading-edge **1066MHz** or **1333MHz** front-side bus (FSB), and **64-bit extensions (EM64T)**, to help provide the computing power you require to match your business needs and growth. The HS21 supports up to **32GB** of **667MHz PC2-5300 Fully Buffered ECC** (Error Checking and Correcting) double data rate II (**DDR2**) memory in **8** DIMM slots, using the **Memory and I/O Expansion Unit**, with optional **Chipkill™** protection, for high performance and reliability. The base HS21 is packaged as a single-wide (30mm) blade and supports up to **16GB** of memory in **4** DIMM slots.

Integrated **dual Gigabit Ethernet¹** controllers are standard, providing high-speed data transfers and offering **TOE** (TCP Offload Engine) support, **load-balancing** and **failover** capabilities. The **Memory and I/O Expansion Unit** provides **two** additional **Gigabit Ethernet** controllers (without TOE support). Via optional expansion cards, each blade can also connect to additional Ethernet, **Myrinet**, **Fibre Channel**, **iSCSI**, **InfiniBand™** and other high-speed communication switches housed in the chassis. Optional **2-port Expansion Cards** add additional fabrics to the HS21 server as needed. This blade is designed with **power management capability** to provide the maximum uptime possible for your systems. In extended thermal conditions or power brownouts, rather than shut down completely, or fail, the HS21 automatically reduces the processor frequency to maintain acceptable thermal and power levels.

All HS21 models offer impressive features at an equally impressive price, including up to **two SAS** hard disk drives, with **RAID-0** data striping or **RAID-1** disk mirroring support standard, or support for **two** SATA-based **15.8GB Solid State Drives**, or **two** SATA-based **31.4GB Solid State Drives**. An optional 30mm **Storage and I/O Expansion Unit** connects to a blade (model-dependent) to provide an **additional three 2.5"** SAS HDDs with **hot-swap** support, optional **RAID-5** with **battery-backed cache**, and **four** additional **communication** ports. Moreover, the HS21 is **optimized** for diskless operation, offering each blade server access to essentially unlimited storage capacity via Fibre Channel or iSCSI.

A single **BladeCenter E** or **BladeCenter H** chassis supports up to **14 hot-swappable** 30mm-wide HS21 blades in only **7U** (BladeCenter E) or **9U** (BladeCenter H) of rack space or up to **8** hot-swappable blades in the rugged **8U BladeCenter T** chassis or up to **12** in the **12U BladeCenter HT** high-speed telecommunications chassis, including **NEBS-3/ETSI-compliant** blade servers. In addition to the blade servers, these chassis also hold up to **four** (BladeCenter E/BladeCenter T) **communication switches**, or up to **eight** or **ten switches/bridges** (BladeCenter HT and H, respectively) internally. Not only can this save significant data center space (and therefore the cost of floor space and rack hardware) compared to 1U servers, it also consolidates switches/bridges and cables for reduced complexity and lower cabling costs, and allows clients to manage everything in the solution as one. Using a BladeCenter E chassis, up to

¹ Actual data transfer speed will vary and is often less than the maximum possible. Gigabit Ethernet transfer speed requires support on both system and server, and appropriate network infrastructure.

84 HS21 servers (168 processors) can be installed in one **industry-standard 42U** rack but the value of BladeCenter extends far beyond high density data center environments.

The various BladeCenter chassis are designed to monitor environmental conditions in the chassis and each blade and send alerts to the administrator. Advanced standard features, such as **Active Memory™**, **Predictive Failure Analysis™**, **light path diagnostics**, **hot-swap redundant power supplies and blower modules** with **Calibrated Vectored Cooling™**; **IPMI 2.0** support, including **highly secure remote power control**; **text-console redirect over LAN**, a **Management Module** (upgradeable with a redundant MM), **IBM Director** management software including **IBM Systems Director Active Energy Manager for x86** (formerly known as PowerExecutive), **Remote Deployment Manager**, and **IBM ServerGuide™** help maintain system availability with increased uptime.

If you need highly manageable, high-performance computing power in a space- or power-constrained environment, the HS21 is the ideal system.

Selling Features

Price/Performance

- There is an HS21 model to fit all budgets. The HS21 offers a choice of high-performance **quad- and dual-core Xeon processors** with 64-bit extensions, **1.6GHz to 3.33GHz** clock rates, **1066MHz** or **1333MHz** front side bus, and **4MB to 12MB** (processor-specific) of integrated Level 2 cache.
- **Low-voltage processors** draw less energy and produce less waste heat than high-voltage processors, thus helping to reduce data center energy costs. On a per-core basis, the standard 80W **quad-core** processors are extremely economical, consuming only **20W** per core. Some low-voltage quad-core Xeon processors consume only **50W (12.5W per core)**. For even lower overall energy utilization, consider **dual-core** processors operating at **40W** and even **35W (20W and 17.5W per core, respectively)**.
- **Fully buffered PC2-5300 ECC** memory operates at **667MHz** with **dual-interleaving**, for high performance.
- **RAID-1 standard** offers high-performance disk access.
- Optional **15.8GB solid-state drives** use only **1W** of power per drive, vs. **10W** for 2.5-inch HDDs. This is as much as **90%** less power than a HDD would use (with a corresponding reduction in heat output). The **31.4GB** drive requires only **2W**.
- Selected HS21 blade servers are **NEBS3/ETSI-compliant** and feature long-life availability. These blades are ideal for telecom or Next Generation Network (NGN) applications such as IPTV, IP Multimedia Subsystem (IMS) and security. NEBS3/ETSI-compliance testing of the BladeCenter HT chassis by Underwriters Laboratories is in progress. When complete, the BladeCenter HT chassis will be covered under a UL-certified NEBS Level 3/ETSI test report, which will be available for customer review.
- The **extremely high degree of integration** in the various BladeCenter chassis reduces the need for server **components**, replacing numerous fans, KVM and Ethernet cables, power supplies, external switches and other components with fewer *shared* hot-swap/redundant components in the chassis itself. This integration also can greatly **reduce** the amount of **power consumed** and **heat produced**, relative to an equivalent number of 1U servers. This can significantly reduce a data center's power bill. The **reduced datacenter footprint** can also save on infrastructure cost.
- The chassis **midplane** provides **high-speed blade-to-blade, blade-to-switch-module and module-to-module communication** internally as well as externally. The midplane in the BladeCenter H provides **four 10Gb** data channels to each blade, and supports **4X InfiniBand** and **10Gb Ethernet** high-speed switch modules.
- The various BladeCenter chassis use **ultrahigh efficiency power supplies**. Most industry-standard servers use power supplies that are between **65-75% efficient** at converting power from AC wall current to the DC power used inside servers. BladeCenter power modules can be **more than 90% efficient**. This helps **save** even more money, as more of the power input you are paying for is used for processing, rather than released into the data center as waste heat.
- BladeCenter also **reduces the number of parts required** to run the system. Sharing fans, systems management, floppy devices and media means fewer parts to buy and maintain, and fewer items that can bring the solution down.

Flexibility

The **HS21** has the ability to grow with your application requirements, thanks to:

- Up to **two multi-core** Xeon processors (**four or eight cores** in all).
 - A choice of speeds from **1.6 to 3.33GHz** (*dual-core*), and **1.6 to 3.16GHz** (*quad-core*), a choice of **1066MHz** or **1333MHz** FSB, a choice of **4MB, 6MB, 8MB** or **12MB** of L2 cache, and a choice of power draw from **35W to 120W**.
 - Up to **16GB** (standard) or **32GB** (using the optional **Memory and I/O Expansion Unit**) of high-speed **fully buffered 667MHz PC2-5300 DDR2** error checking and correcting (ECC) system
-

memory with optional **Chipkill** protection.

- Up to **two** internal 2.5-inch SAS HDDs, up to **three** 2.5-inch SAS HDDs in an adjacent **Storage and I/O Expansion Unit**, and access to terabytes of external **IBM System Storage™** and **IBM TotalStorage™** SAN and NAS storage devices. **2.5-inch** drives consume approximately *half the power* of 3.5-inch drives.
- One optional internal SATA-based **15.8GB** or **31.4GB Solid State Drive** in place of the HDDs, as either higher-reliability/higher-availability storage or as a boot-to-SAN drive.
- **Two** Gigabit Ethernet ports standard; plus more, using either a **2-port Gigabit Ethernet Expansion Card**, a **Memory and I/O Expansion Unit**, or a **PCI I/O Expansion Unit II**.

In addition, the various **BladeCenter chassis** offer a high degree of flexibility:

- A 30mm HS21 blade server can be upgraded, via a **Memory and I/O Expansion Unit** to a double-wide HS21 (with expanded capabilities). With or without the Memory and I/O Expansion Unit, the blade can be expanded further with a **Storage and I/O Expansion Unit** and/or a **PCI I/O Expansion Unit**. This expandability allows configurations that are **30mm, 60mm, 90mm** or **120mm** wide, with a variety of memory, storage and I/O options, depending on need.
- Xeon processor-based **HS21** blades can be used in the same chassis as Intel processor-based **HC10, HS12, HS20, HS21 XM** and **HS40** blades; Opteron processor-based **LS20, LS21, and LS41** blades; IBM PowerPC® processor-based **JS12, JS20, JS21** and **JS22** blades; and Cell Broadband Engine™ processor-based **QS21** blades. Depending on the blade servers used, the various BladeCenter chassis support Microsoft **Windows, Linux, Netware, IBM AIX®** and Sun **Solaris 10** operating systems in the same chassis.
- *Every HS/LS/JS blade server ever released by IBM is supported in BladeCenter H, and most are supported in every BladeCenter chassis ever released, going back to 2002. Every switch module released by IBM is equally compatible. (Ask HP and Dell how far back their compatibility goes.)* Future blades and fabric switches are expected to continue to be compatible with previous chassis for the foreseeable future.
- A blade server has access to as many as **10 communication switches** and/or bridges in one **BladeCenter H** chassis. (Up to **6** switches in a BladeCenter E or BladeCenter T chassis.) And the switches can be Ethernet, iSCSI, InfiniBand, Fibre Channel, Myrinet, or anything else designed and ServerProven for BladeCenter use. Switches, bridges and interface cards are currently available from such vendors as Brocade, Cisco, Intel, McData, Nortel, QLogic, Cisco Topspin and others, in addition to IBM.

Manageability

- The HS21 blade server includes a **Baseboard Management Controller (BMC)** to monitor server availability, perform Predictive Failure Analysis, etc., and trigger IBM Director alerts.
- Each BladeCenter chassis includes an **Advanced Management Module** to provide additional systems management capabilities, including *Web-based out-of-band control; virtual floppy and CD-ROM support; Windows “blue screen” error capture; LDAP and SSL support; and remote redirection of video, text, keyboard and mouse.*
- Integrated industry-standard **IPMI 2.0** support works with the BMC to alert IBM Director to anomalous environmental factors, such as voltage and thermal conditions. It also supports **highly secure remote power control**.
- **IBM Systems Director Active Energy Manager for x86**, an IBM-exclusive, is designed to take advantage of new system power management features, by monitoring *actual* power usage and providing power consumption capping features. More accurate power usage data helps with data center construction planning and the sizing of power and cooling needs, as well as allowing you to use available power more efficiently.
- The HS21 supports an optional feature card that provides **concurrent KVM (cKVM)** and **concurrent media (cMedia)** access by multiple administrators at once. (This card uses a dedicated slot and does not affect the use of PCI-X/PCIe adapters.)
- **IBM Director** is included for proactive systems management and works with both the blade's internal BMC and the chassis' management module. It comes with a portfolio of tools, including *IBM Systems Director Active Energy Manager for x86, Management Processor Assistant, RAID Manager, Update Assistant, and Software Distribution*. In addition, IBM Director offers extended systems management tools for additional server management and increased availability. When a problem is encountered, IBM Director can issue administrator alerts via e-mail, pager, and other methods.

Availability and Serviceability

- BladeCenter chassis are designed for operation with **greatly reduced potential for single points of failure**. Most aspects of operation, from blade servers to communication modules, to management modules, to power and blower modules, are **hot-swappable**. The midplane connections are **redundant** and the other features can be made so, when used in pairs.

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- **Solid-state drives** offer up to *triple* the availability (MTBF rates) of conventional SAS HDDs. This can lessen the need for redundant drives.
 - HS21 blade servers support the use of **Chipkill-enabled** memory (using 1GB or larger DIMMs). Chipkill memory can be up to **16X** better than standard ECC memory at correcting some types of memory errors. This can help reduce downtime caused by memory errors.
 - **IPMI 2.0** supports highly secure remote system power on/off using data encryption. This allows an administrator to restart a server without having to visit it in person, saving travel time and getting the server back up and running quickly and securely.
 - **Environmentally tuned blower modules** in the chassis adjust to compensate for changing thermal characteristics. At the lower speeds they draw less power and suffer less wear. Equally important in a crowded data center, temperature-controlled blowers produce less ambient noise in the data center than if they were constantly running at full speed.
 - **Text and graphics console redirection** support allows the administrator to remotely view HS21 text and graphic messages over serial or LAN connections.
 - A **standard three-year (parts and labor) limited onsite warranty**² affords you peace of mind and greater potential investment protection.
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Right, Open, Easy, Green

You need to make IT decisions that will drive business success. You face management challenges and technological complexity such as space constraints, power and cooling limitations, heterogeneous environments and I/O connectivity issues. IBM brings together the widest choice of compatible chassis, blade servers, storage and networking offerings and solution providers in the industry to help you build an open and flexible IT environment. And regardless of the size of your business, you want to be up and running 24/7. With built-in redundancy, innovative power and cooling and the latest I/O and management tools, IBM BladeCenter is easy to own—so you can focus on your business demands and stay ahead of the competition.

The **RIGHT** choice, tailored to fit your diverse needs:

- It's flexible and modular. As needs evolve, a one-size-fits-all solution doesn't work.
 - Meet your needs with BladeCenter: everything from a high-performance data center to a small office with limited IT skills—IBM has you covered
 - Get flexibility with 5 compatible chassis and 5 blade types supporting multiple I/O fabrics, all managed from a common point
- It's robust and reliable, providing redundancy throughout and the information you need to keep your business up and running.
 - Provide redundancy for no single point of failure with IBM BladeCenter
 - Preserve application uptime with IBM Predictive Failure Analysis[®] and light path diagnostics
 - Make decisions based on accurate data for quick problem diagnosis with First Failure Data Capture

OPEN and innovative, for a flexible business foundation:

- It's comprehensive, providing broad, fast, and reliable networking and storage I/O with BladeCenter Open Fabric.
 - Match your data center needs and the appropriate interconnect using a common management point, and 5 I/O fabrics to choose from
 - Extract the most from your third-party management solutions by utilizing the BladeCenter Open Fabric Manager
- It's collaborative, enabling you to harness the power of the industry to deliver innovation that matters.
 - Get flexibility from a myriad of solutions created by Blade.org members and industry leaders that have downloaded our open specification

EASY to deploy, integrate and manage:

- It enables efficient integrated management, which allows you to minimize costs with the tools you need for effective management.
 - Automate OS installation and BIOS updates remotely with IBM Director tools
 - Administer your blades at the chassis or rack level with the Advanced Management Module
 - Plug into your enterprise management software
 - It enable deployment simplicity without tradeoffs by speeding the deployment of new hardware in
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² For terms and conditions or copies of the IBM Statement of Limited Warranty, call 800-772-2227 in the U.S. In Canada call 800-426-2255. Telephone support may be subject to additional charges. For warranties including onsite labor, a technician is sent after IBM attempts to resolve the problem remotely. International warranty service is available in any country in which this product is sold.

minutes rather than days, using BladeCenter Open Fabric Manager

- Get significantly faster deployment of servers and I/O than from rack solutions
- Reduce costly downtime with integrated failover capability
- Manage from a single point of control via the Advanced Management Module
- Use with virtually all IBM switches, blades and chassis

GREEN today for a better tomorrow:

- It offers control via powerful tools that help you optimize your data center infrastructure so you can be responsive.
 - Understand your power requirements with IBM Power Configurator
 - Monitor, control and virtualize your power with IBM Systems Director Active Energy Manager for x86
 - Reduce data center hot spots with the IBM Rear Door Heat eXchanger
 - Optimize and future-proof your data center with IBM Data Center Energy Efficiency services
 - Our eco-friendly servers and services can help you be environmentally responsible.
 - Become more energy efficient with IBM expertise
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Key Features

Multicore Intel Xeon Processors

The HS21 supports up to **two** identical Xeon processors (that is, the same clock rate and cache size and the same number of cores). The choice of processors includes:

- **120W quad-core** Xeon processor model **X5460** at 3.16GHz, with 64-bit extensions, *only 30W per core* power draw, a **1333MHz** FSB, and **12MB** of L2 processor cache (2 x 6MB); supported in BladeCenter H and BladeCenter HT chassis only.
- **50W quad-core** Xeon processor models **L5420** at 2.5GHz, with 64-bit extensions, *low power draw* and impressive *performance/watt (only 12.5W per core)*, a **1333MHz** FSB, and **12MB** of L2 processor cache (2 x 6MB); supported in all BladeCenter chassis.
- **80W quad-core** Xeon processor models **E5405**, **E5420**, **E5430**, **E5440**, and **E5450** at 2.0, 2.5, 2.6, 2.83, or 3.0GHz (respectively), with 64-bit extensions, *reduced power draw (only 20W per core)*, a **1333MHz** FSB, and **12MB** of L2 processor cache (2 x 6MB); supported in all BladeCenter chassis.
- **120W quad-core** Xeon processor model **X5355** at 2.66GHz, with 64-bit extensions, *only 30W per core* power draw, a **1333MHz** FSB, and **8MB** of L2 processor cache (2 x 4MB); supported in BladeCenter H and BladeCenter HT chassis only.
- **50W quad-core** Xeon processor models **L5310** and **L5320** at 1.6 or 1.86GHz (respectively), with 64-bit extensions, *low power draw (only 12.5W per core)*, a **1066MHz** FSB, and **8MB** of L2 processor cache (2 x 4MB); supported in all BladeCenter chassis.
- **80W quad-core** Xeon processor models **E5310**, **E5320**, **E5330**, and **E5345** at 1.6, 1.86, 2.0, or 2.33GHz (respectively), with 64-bit extensions, *reduced power draw (only 20W per core)*, a **1066MHz** (1.6 or 1.86GHz) or **1333MHz** (2.33GHz) FSB, and **8MB** of L2 processor cache (2 x 4MB); supported in all BladeCenter chassis.
- **80W dual-core** Xeon processor model **E5260** at 3.33GHz, with 64-bit extensions, *reduced power draw*, a **1333MHz** FSB, and **6MB** of **shared** L2 processor cache; supported in all BladeCenter chassis.
- **40W dual-core** Xeon processor model **L5240** at 3.0GHz, with 64-bit extensions, *ultralow power draw (only 20W per core)*, a **1333MHz** FSB, and **6MB** of **shared** L2 processor cache; supported in all BladeCenter chassis.
- **80W dual-core** Xeon processor model **E5160** at 3.0GHz, with 64-bit extensions, *reduced power draw*, a **1333MHz** FSB, and **4MB** of **shared** L2 processor cache; supported in BladeCenter E, BladeCenter H, and BladeCenter HT chassis only.
- **40W dual-core** Xeon processor model **E5148** at 2.33GHz, with 64-bit extensions, *ultralow power draw (only 20W per core)*, a **1333MHz** FSB, and **4MB** of **shared** L2 processor cache; supported in all BladeCenter chassis.
- **35W dual-core** Xeon processor model **E5138** at 2.13GHz, with 64-bit extensions, *ultralow power draw (only 17.5W per core)*, a **1066MHz** FSB, and **4MB** of **shared** L2 processor cache; supported in all BladeCenter chassis. This processor is a long-life, embedded offering, intended for a NEBS environment.
- **65W dual-core** Xeon processor models **E5110** or **E5120** at 1.6 or 1.86GHz (respectively), with a **1066MHz** FSB, or models **E5130**, **E5140**, or **E5150** at 2.0, 2.33, or 2.66GHz, with a **1333MHz** FSB. These processors feature 64-bit extensions, *low power draw* and **4MB** of **shared** L2 processor cache. Select models also feature an embedded processor with *long life support* as well as NEBS 3/ETSI compliance. Supported in all BladeCenter chassis.



The **dual-core Xeon** processors contain **two complete processor cores**; **quad-core**

processors, similarly, contain **four** cores. The processors also contain one (dual-core) or two (quad-core) shared caches. The shared cache is dynamically allocated between pairs of cores as needed. The two cores appear to software as two physical processors. The dual-core processors offer considerably higher performance than a same-speed Xeon processor with a single core. Likewise, quad-core processors offer considerably higher performance than a same-speed Xeon processor with dual cores.

Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.

Intel **Extended Memory 64 Technology (EM64T)** 64-bit extensions allow Xeon processors to use large memory addressing when running with a 64-bit operating system. This can result in higher performance. Additional registers and instructions (SSE3) can further boost performance for applications written to use them. Contact your software providers to determine their software support for EM64T.

DDR II ECC Fully Buffered Memory with Chipkill Protection

The HS21 ships with **PC2-5300 fully-buffered** double data rate II (DDR II) memory (operating at **667MHz**) for faster access, and provides Active Memory features, including advanced **Chipkill** memory protection (using 1GB or larger DIMMs), for **up to 16X** better error correction than standard ECC memory. The HS21 supports up to **16GB** of memory in **four** DIMM slots. Adding a 30mm **Memory and I/O Expansion Unit** doubles the memory support to **32GB** in **eight** DIMM slots.

The fully buffered memory in the HS21 provides up to **triple** the memory bandwidth of the older HS20 (up to **21.3GBps** in *four* channels of PC2-5300 fully-buffered DIMMs vs. a maximum of 6.4GBps in two channels of unbuffered PC2-3200 memory). By performing reads and writes simultaneously, it eliminates the previous memory read-to-write blocking latency. In addition, it also offers innovative data reliability and security features to help improve data integrity, including enhanced CRC protection, data retry on error detect and buffer registers for improved fault isolation.

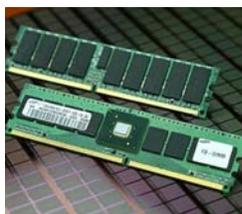
For increased availability, the HS21 offers two additional (but mutually exclusive) levels of IBM Active Memory protection: online **memory mirroring**, and **online hot-spare memory**.

Memory mirroring works much like disk mirroring. The total memory is divided into two channels. Data is *written concurrently to both channels*. If a DIMM fails in one of the DIMMs in the primary channel, it is instantly disabled and the mirrored (backup) memory in the other channel becomes active (primary) until the failing DIMM is replaced. One-half of total memory is available for use with mirroring enabled. (**Note:** Due to the double writes to memory, performance is affected.)

When *online hot-spare memory* is enabled, using single and/or dual-rank DIMMs **one rank** is set aside per channel as online spares in case one of the other ranks in that channel fails. *The spare rank must have capacity at least that of the largest active rank*. (In other words, if a combination of 2GB and 4GB DIMMs are used in a branch, one rank on each 4GB DIMM will be used for sparing.) In an HS21 with **16GB** installed, up to **12GB** (using 4 *dual-rank* 4GB DIMMs) of memory is available when the hot-spare feature is active.

Both mirroring and sparing are handled at the hardware level; no operating system support is required.

PC2-5300 fully buffered memory is available in **1GB, 2GB, 4GB** and **8GB** memory kits (two 512MB, 1GB, 2GB or 4GB DIMMs per kit, respectively). DIMMs are installed in pairs for increased performance, provided by dual-interleaving.



Gigabit Ethernet Controllers

The HS21 includes **two** integrated **Broadcom BCM5708S** Gigabit Ethernet controllers for up to 10X higher maximum throughput than a 10/100 Ethernet controller. The controllers offer **TOE** (TCP Offload Engine) support, as well as **failover** and **load balancing** for better throughput and system availability. They also support highly secure remote power management using **IPMI 2.0**, plus Wake on LAN[®] and PXE (Preboot Execution Environment) Flash interface.

For additional Gigabit Ethernet controllers, an optional **Memory and I/O Expansion Unit** may be added. This provides **two Broadcom BCM5714S** controllers (no TOE support). An optional **2-port Ethernet** expansion card adds two additional Gigabit Ethernet ports per HS21 server.

Flexible HDD Storage

The HS21 offers a choice of disk storage, supporting up to **two** internal **fixed 2.5-inch SAS** or **solid-state drives**, as well as an expansion unit that offers additional direct-attached storage.

- **SAS-based 10K RPM 2.5-inch HDD** — 73.4 or **146.8GB** capacities (**293.6GB** maximum)
- **SAS-based 15K RPM 2.5-inch HDD** — **73.4GB** capacities (**146.8GB**)
- **SATA-based solid state** — 15.8GB or **31.4GB** capacities (**62.8GB** maximum)





Due to the statistically higher failure rates for traditional spinning media, IBM recommends the use of the solid state drives (SSDs) as an alternative. They store data on flash memory chips, rather than on magnetic media. Like HDDs, SSDs can be used as boot media and for random access storage. However, SSDs offer higher thresholds of shock and vibration, and a higher operating temperature range (between 0 and 70 degrees C). This yields a failure rate only 1/3 that of HDDs (approximately 3,000,000 hours MTBF vs. 1,000,000 hours). In addition, the **IBM 15.8GB 2.5" Solid State Drive** uses as little as **1W** of power per drive vs. as much as **10W** for a **2.5-inch** HDD. Similarly, the **IBM 31.4GB 2.5" Solid State Drive** requires only **2W**. This reduces the storage power requirement and heat output by as much as **90%**, compared to 2.5-inch HDDs. If used as a boot device, no special device drivers are required.

For additional in-chassis storage, an optional "sidecar" storage blade is available. The **Storage and I/O Expansion Unit** is a 30mm blade that supports up to **three 2.5-inch hot-swap SAS** HDDs. It is installed in the slot adjacent to the blade server.

Fully populating both the HS21 blade and the expansion unit provides up to **734GB** of local **HDD** storage to the blade server. This storage can be configured as a single **RAID-1** or **RAID-5** array, or as two separate RAID arrays—one in the expansion unit and the other in the base blade—for even more flexibility. If you need more storage space, terabyte capacities are possible with optional external iSCSI and SAN storage solutions.



External Tape Storage

The HS21 supports various external rack-mounted SAN-attached tape drives. Supported tape technologies include:

- **IBM LTO3 4U Tape Library**
- **IBM System Storage TS3100/TS3200 Tape Library**
- **IBM System Storage TS3310 Modular Tape Library**



Disk Controllers

All HS21 models include an integrated **LSI 1064E SAS** controller. This controller supports up to **two** internal **SAS** HDDs or **two** internal **solid-state drives** and offers **hardware RAID-0/1** support.

If an optional **Storage and I/O Expansion Unit** is used, the integrated **ServeRAID-8k-I** controller offers **hardware RAID-0/1/1E** support and **32MB** of fast **PC2-4200 DDR2** cache for the internal drives. A **ServeRAID-8k** option adds **RAID-5** support for up to **five** direct-attached **SAS** drives, along with **256MB** of cache memory for higher performance, and battery backup, *without* consuming a valuable adapter slot.

The **SAS** controller provides data transfer speeds of up to **300MB** per second³ in *each* direction (**full-duplex**) across the SAS bus, for an aggregate speed of **600MBps**, nearly double that of Ultra320 SCSI's **320MBps** (half-duplex) bandwidth. The serial design of the SAS bus allows maximum performance to be maintained as additional drives are added.

High-Performance Adapter Slots

The HS21 blade server includes **one x8 PCIe** and **one 133MHz PCI-X** adapter slot on each blade. *Either one* standard BladeCenter form factor or **SFF** (small form factor) **PCI-X** expansion card *or one SFF PCIe* adapter, or **two CFF** (compact form factor) cards (one CFFv and one CFFh) can be installed in this blade. (The CFFh card or the SFF PCIe card uses the high-speed expansion connector as a second I/O slot.)

One of two possible expansion units may be added to increase the number of expansion card slots available. *Each will utilize the expansion connector* in the HS21:

- The 30mm **PCI I/O Expansion Unit II** provides **two PCI-X** slots in addition to the **one** on the HS21 blade (**3 PCI-X** slots usable).
- The 30mm **Storage and I/O Expansion Unit** provides **two** adapter slots: either **two PCI-X** cards or **one PCI-X** and **one PCIe** slot in addition to the **one PCI-X** slot on the HS21 blade. (The first PCI-X card installed in the expansion unit must be a Gigabit Ethernet card, because it is routed to module bays 1 and 2.) It connects to the blade server via the high-speed expansion connector. (If this expansion unit is used, a CFFh card can be plugged into the expansion unit's expansion connector, instead of in the HS21 blade's expansion connector.)

The HS21 also supports an optional feature card (in a dedicated slot) that provides **concurrent KVM (cKVM)** and **concurrent media (cMedia)** access by multiple administrators at once. Adapters can also be used to add interfaces to BladeCenter communication modules, including Fibre Channel, Myrinet, additional Gigabit Ethernet modules, InfiniBand, etc.



BladeCenter Chassis

IBM's blade architecture offers *five choices* of compatible and interoperable chassis in which to use various blade servers. Each chassis serves different customer needs. The new **BladeCenter S** is a small, entry-level chassis designed for office environments. The original **BladeCenter E** chassis offers maximum density, great flexibility and a wide variety of expansion options at an entry-level price. The next-generation **BladeCenter H** chassis offers all of BladeCenter's capabilities, and adds new high-performance features. If you need a **ruggedized** chassis (for example, government/military or telecom), **BladeCenter T** offers special features optimized for those environments. The next-generation **BladeCenter HT** is a high-performance **ruggedized** telecommunications platform. There is a high degree of interchangeability and compatibility of features among the chassis. Any or all of these chassis can be installed in a rack along with other rack-optimized equipment.

See the separate *BladeCenter Chassis Sales Guide* for details.

Light Path Diagnostics

Light path diagnostics enables a technician to quickly identify and locate a failed or failing system component, such as a specific blower module or memory DIMM. This enables quick replacement of the component, which helps increase server uptime and lower servicing costs.

The front of each blade server—and the chassis itself—has an LED indicator light to show possible component failures. This lets the servicer identify the failing component without the need to or remove the blade server from the chassis. The light path diagnostics panel tells the servicer which component of the affected server requires attention.

In addition, many components have their own identifying LEDs. For example, each of the memory modules has an LED next to the socket, as do both processors. This allows the servicer to easily identify exactly which component needs servicing. By following the "light path," the component can be replaced quickly, and without guesswork. (**Note:** In the event of a failed DIMM, the system will restart and mark the DIMM as bad while offline, thus allowing the system to continue running, with reduced memory capacity, until serviced.)

Advanced Systems Management Capabilities

Each BladeCenter chassis offers a high level of systems management capabilities that are well-suited to remote locations as well as to stand-alone environments. Features include the Advanced Management Module (AMM), Baseboard Management Controller (BMC), Automatic Server Restart, Systems Director Active Energy Manager for x86, Wake on LAN[®] support, PXE 2.0 support, text and graphics console redirect, Real Time Diagnostics, Predictive Failure Analysis, IBM Director and Remote Deployment Manager.

The **AMM**, in combination with the HS21 blade server **BMC**, provides industry-standard **Intelligent Platform Management Interface (IPMI) 2.0**-compliant systems management. It provides a number of important system functions, including:

- Monitoring of system and battery voltage, system temperature, fans, power supplies, processor and DIMM status
- Fan speed control
- Product ID and Family ID detection
- Highly secure remote power on/off
- System reset control
- NMI/SMI detection and generation
- System diagnostic LED control (power, HDD, activity, alerts, heartbeat)
- IPMI over LAN
- Serial Over LAN
- Proxy server support
- LAN messaging and alerting
- Text console redirection over LAN
- VLAN support
- Enhanced authentication and encryption algorithms (RMCP+, SHA-1, AES)
- Local update of BMC firmware
- Firmware firewall
- Support for IPMI v2.0 compliant management software (e.g., xCAT)
- Other mandatory and optional IPMI BMC functions

The BMC, via the management module, alerts IBM Director to anomalous environmental factors,

such as voltage and thermal conditions—even if the server has failed.

Other systems management features offered for the combination of blade server and chassis include:

- Predictive Failure Analysis for system processors, memory and HDDs, as well as chassis switch modules, blower modules and power modules
- Web-based out-of-band control
- Windows “blue screen” capture
- Remote virtual media
- High-speed remote redirection of PCI video, keyboard and mouse
- SSL (Secure Socket Layer) and LDAP (Lightweight Directory Access Protocol) support

In order to put control of processor power-saving features at the fingertips of administrators, IBM developed **IBM Systems Director Active Energy Manager for x86**. Active Energy Manager is designed to take advantage of new processor features, such as balancing the performance of the system according to available power input. It provides the ability to plan and predict power consumption based on your BladeCenter hardware configuration. It also allows you to reduce the infrastructure required for redundancy, by using fewer servers on smaller power feeds and potentially lowering your overall data center support costs. It does this by inventorying all components at the blade level, then adding up the power draw for each blade and tracking that usage. In failure mode, Systems Director Active Energy Manager for x86 (through the BladeCenter Management Module) might request that certain blades in each domain throttle down to reduce power consumption.

Automatic Server Restart (ASR) helps reduce downtime by restarting the server automatically in the event of a system lockup. ASR technology is a combination of hardware circuitry tied into the server’s system reset function and a device driver. As long as the server continues running, the ASR watchdog timer will keep being reset, but if the operating system crashes or the hardware freezes somehow the ASR software will be unable to reset the hardware timer. If the timer is not reset within five minutes, it automatically triggers the ASR hardware, which immediately restarts the server (and logs an ASR event with IBM Director). These features are designed so that *no more than five minutes can pass before the server is restarted*.

Text and Graphics Console Redirect support allows the administrator to remotely view HS21 text and graphics messages over serial or LAN.

Wake on LAN permits the server to be remotely powered on if it has been shut off. Once powered up, the server can be controlled across the network, using the **Preboot Execution Environment (PXE)**.

Like Wake on LAN, **PXE** is system firmware. It allows software such as the **IBM Remote Deployment Manager** to take control of a system before the BIOS, operating system or applications are loaded (using Wake on LAN/PXE) and lets an administrator perform many low-level tasks remotely that would otherwise require a visit to each system. These tasks may include such things as formatting a hard disk drive, updating system firmware, or deploying a Windows or Linux operating system.

Predictive Failure Analysis (PFA) enables the MM/AMM and the BMC to detect impending failure of supported components (processors; memory; expansion cards; switch, blower and power supplies; and hard disk drives) *before* actual failure, and alert the administrator through IBM Director. This gives you the ability to replace the failing component *before* it fails, resulting in increased uptime.

IBM Director software for advanced workgroup management is included with the server. IBM Director comes with a portfolio of tools, including *Management Processor Assistant*, *Rack Manager*, *RAID Manager*, *Update Assistant* and *Software Distribution*. *System Availability* (a no-charge download) and *Capacity Manager* (sold separately) are available as add-ons for additional server management and increased availability. IBM Director provides a single uniform graphical interface for all of these systems management functions.

IBM Director enables you to customize thresholds and monitor system components (for things like temperature, voltage regulation, etc.) to help maximize uptime.

Extensive System Support Features

The IBM services and technical support portfolio provides world-class, consistent, high-quality service and support. From the start, IBM programs make it easier for you to plan for, configure and purchase BladeCenter servers, get them running and keep them running long-term. These features include IBM ServerProven[®], the IBM Standalone Solutions Configuration Tool, IBM System x and BladeCenter Power Configurator IBM ServerGuide, IBM Electronic Service Agent[™], Product Customization Services and extensive technical support offerings.

The IBM **ServerProven** program provides the confidence that specific options and operating systems have been tested on the blade servers and are officially supported to work together. It



is updated frequently to keep the latest compatibility information at your fingertips.

The IBM **Standalone Solutions Configuration Tool** (SSCT) is a downloadable tool that simplifies the often complex chore of configuring a full rack of servers (including blade servers) and confirming that you have all the cables, power distribution units, KVM (keyboard, video and mouse) switch boxes and other components you need, as well as the proper airflow clearances, electrical circuits and other environmental conditions.

IBM **System x and BladeCenter Power Configurator** helps IT managers plan for data center power needs, by providing the following information for specific configurations of System x and BladeCenter systems: *power input* (watts), *PDU sizing* (amps), *heat output* (BTUs), *airflow requirements through chassis* (CFM), *VA rating*, *leakage current* (mA), and *peak inrush current* (amps).

IBM **ServerGuide** (installed from CD) simplifies the process of installing and configuring xSeries servers. ServerGuide goes beyond mere hardware configuration by assisting with the automated installation of the Microsoft® Windows® Server 2000 and 2003 operating systems, device drivers and other system components, with minimal user intervention. (Drivers are also included for support of Novell NetWare, Red Hat Linux and SUSE LINUX.) This focus on deployment helps you reduce both your total cost of ownership and the complexity that administrators and technical personnel face.

IBM **Electronic Service Agent™** is an innovative “call home” feature that allows System x and BladeCenter servers to automatically report hardware problems to IBM support, which can even dispatch onsite service⁴ if necessary to those customers entitled to onsite support under the terms of their warranty or an IBM Maintenance Agreement. Electronic Service Agent resides on a server and provides electronic support and problem management capabilities through a highly secure electronic dialogue between your systems and IBM. It monitors networked servers for hardware errors and it can perform hardware and software inventories and report inventory changes to IBM. All information sent to IBM is stored in a highly secure database and used for improved problem determination.

Additional services include hardware warranty upgrades and factory-installed **Product Customization Services** (PCS), such as asset tagging, hardware integration, software imaging and operating systems personalization.

IBM offers extensive **technical support** by phone and via the Web. Support options include links to forums/newsgroups, problem submission, online shopping support, service offerings, device drivers for all IBM product lines, software downloads and even upcoming technical seminar worldwide schedules and registration. Also available are remote installation, configuration and usage support for both xSeries hardware and software, as well as onsite custom services to provide the level of expertise you require.

Key Options

IBM options for xSeries servers let you take your servers to a higher level

You can rely on xSeries and blade options to supply a comprehensive solution for your business needs. Options help you create an optimized server system to meet your data protection, storage and availability needs. Every IBM option is designed and tested for peak performance and flexibility, helping to maximize your return on investment. The combination of xSeries servers and options lets you keep your fingers on the pulse of your e-business.

Processors — The Intel Xeon processor provides high clock rates, 64-bit extensions, a large cache, Hyper Threading Technology and advanced features for availability and manageability. Large cache size and multiple cores, combined with a **1066MHz** or **1333MHz** system bus speed, reduce memory latency and facilitate the movement of data through the processor and I/O devices. (**Note:** System performance depends not only on the number of processors in the server but also on the power and functionality of each processor.) Adding a second processor may be a cost-effective way to achieve significant performance improvements.

Memory — Memory is a significant factor in systems application performance. Adding more memory to a BladeCenter server is one of the most effective ways to increase application performance. For best performance in a server with a dual-core processor, there should be twice as much memory available as for a single-core processor.

Hard Disk Drives — IBM hard disk drives help you improve the transaction and cost performance of your HS21 servers. The choice of hard disk drives can be a critical aspect of maximizing the I/O throughput of the system. **SAS** hard disk drives (**2.5-inch**) are available for the HS21 with capacities up to **146.8GB** at **10,000** RPMs or up to **73.4GB** at **15,000** RPMs. Additionally, a **Storage and I/O Expansion Unit** can be attached to the HS21 to add up to **three** additional **2.5-inch** SAS drives.

Solid State Drives — IBM offers a choice of **15.8GB** or **31.4GB 2.5” Solid State Drive** as an alternative to internal HDDs. It can be used as a highly available boot drive or for storing disk images.

I/O slots — The HS21 supports the addition of a **PCI I/O Expansion Unit II**, which provides **two front-accessible PCI-X slots**. Also, the **Storage and I/O Expansion Unit** provides **two additional adapter slots**: either **two legacy PCI-X cards** or **one PCI-X and one PCIe slot**. (The first PCI-X card added must be a Gigabit Ethernet card.) Adding a 30mm **Memory and I/O Expansion Unit** to an HS21 provides a PCIe slot and a *second* PCI-X slot.

External Storage — The IBM **TotalStorage DS3000, DS4000, DS6000, and DS8000** series, as well as the **System Storage DS4000, N3000, N5000, and N7000** series, comprise a powerful and broad shared storage family with integrated management software designed to meet midrange and enterprise needs. For lower-end needs, IBM offers the TotalStorage **DS300** and **DS400** storage enclosures.

Additionally, external LAN-attached tape storage is available.

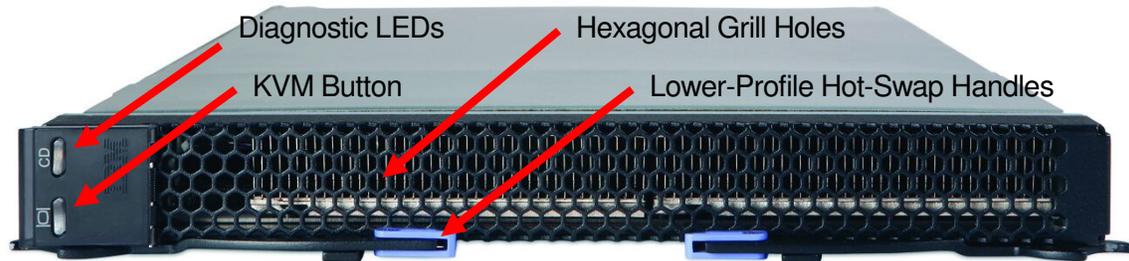
Communication Modules — The various BladeCenter chassis support integrated communication and I/O switches and/or bridges for Gigabit Ethernet, Myricom, Fibre Channel, InfiniBand, and others. Expansion adapters for individual HS21 blades are available to interface with these modules.

Rear Door Heat eXchanger — The unit attaches to the back of an IBM S2 42U Enterprise Rack. It is capable of removing up to 50,000 BTUs (14KVa) from the data center using water lines under the raised floor. The door swings open for servicing.

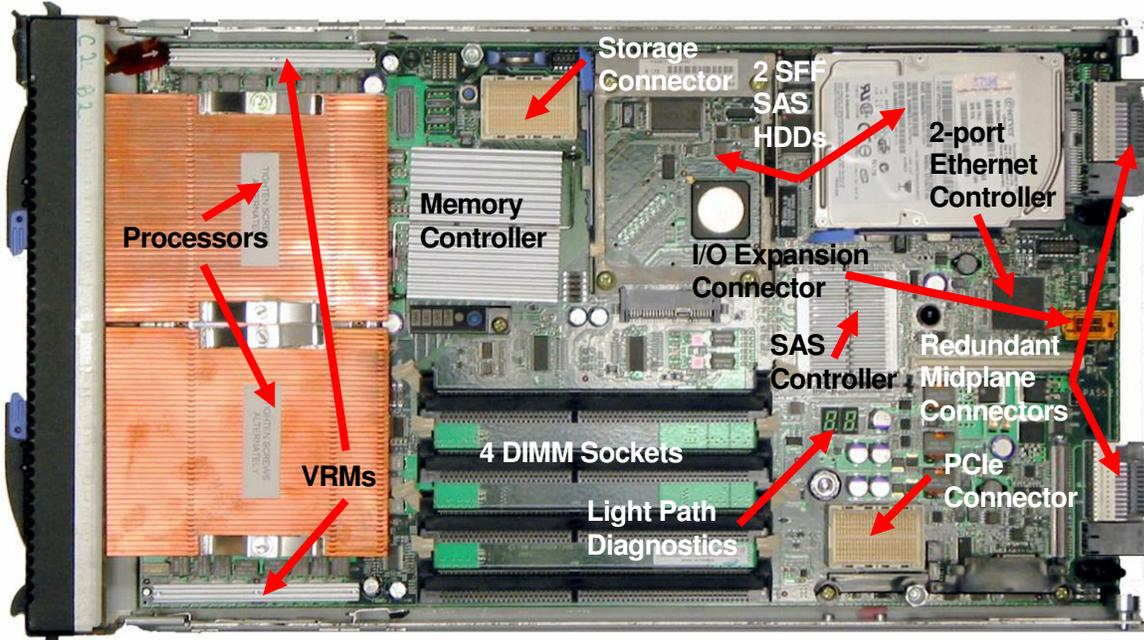
Redundant features — Optional power supply modules, blower modules, management modules, switches and bridges provide redundancy for the various BladeCenter chassis.

HS21 Images

Front View



Interior View



| BladeCenter HS21 Specifications | | | | | | |
|---|---|---|--|--|----------------------------------|-------------------------|
| Machine type | 8853-AxX/AxY, CxX/CxY, GxX/GxY, HxX/HxY, JxX/JxY, LxX/LxY, NxX/NxY, RxX/RxY | | | | | |
| Form factor | 30mm blade | | | | | |
| Processor type | Quad-core Xeon (E54xx/X54xx) 2.0GHz E5405 (G1X/G1Y), 2.5GHz E5420 (G3X/G3Y), 2.5GHz L5420 (GLX/GLY), 2.66GHz E5430 (G4X/G4Y), 2.83GHz E5440 (G5X/G5Y), 3.0GHz E5450 (G6X/G6Y), 3.16GHz X5460 (G7X/G7Y) | Quad-core Xeon (E53xx/ L53xx/ E53xx) 1.6GHz E5310 (A1X/A1Y), 1.6GHz L5310 (J1X/J1Y), 1.86GHz E5320 (C1X/C1Y), 1.86GHz L5320 (J2X/J2Y), 2.0GHz E5330 (A2X/A2Y), 2.33GHz E5345 (C2X/C2Y), 2.66GHz X5355 (C3X/C3Y) | Dual-core Xeon (E52xx/L52xx) 3.00GHz 5240 (RLX/RLY), 3.33GHz 5260 (R2X/R2Y) | Dual-core Xeon (51xx) 1.6GHz 5110 (L1X/L1Y), 1.86GHz 5120 (L2X/L2Y), 2.0GHz 5130 (L3X/L3Y), 2.13GHz 5138 (NTX/NTY), 2.33GHz 5140 (L4X/L4Y), 2.33GHz 5148 (H1X/H1Y), 2.66GHz 5150 (L5X/L5Y), 3.0GHz 5160 (L6X/L6Y) | | |
| Processor power draw | 120W (C3X/C3Y, G7X/G7Y) | 80W (AxX/AxY, C1X/C1Y, C2X/C2Y, G1X/G1Y, G3X/G3Y, G4X/G4Y, G5X/G5Y, G6X/G6Y, L6X/L6Y, R2X/R2Y) | 65W (L1X/L1Y, L2X/L2Y, L3X/L3Y, L4X/L4Y, L5X/L5Y) | 50W (GLX/GLY, J1X/J1Y, J2X/J2Y) | 40W (H1X/H1Y, RLX/RLY) | 35W (NTX/NTY) |
| Internal L2 cache | 12MB (2 x 6MB shared cache)— GxX/GxY | 8MB (2 x 4MB shared cache)— AxX/AxY, CxX/CxY, JxX/JxY | 6MB (1 x 6MB shared cache)— RxX/RxY | 4MB (1 x 4MB shared cache)— HxX/HxY, LxX/LxY, NxX/NxY | | |
| Front-side bus (FSB) speed | 1333MHz (C2X/C2Y, C3X/C3Y, GxX/GxY, H1X/H1Y, L3X/L3Y, L4X/L4Y, L5X/L5Y, L6X/L6Y, RxX/RxY) | | | 1066MHz (AxX/AxY, C1X/C1Y, L1X/L1Y, L2X/L2Y, NTX/NTY) | | |
| # of processors standard / maximum | 1 / 2 | | | | | |
| NEBS/ETSI Compliance | Select blades are NEBS3/ETSI-compliant. (Contact IBM sales for details.) | | | | | |
| Chipset | Intel 5000P | | | | | |
| Standard / maximum memory⁵ | 2GB (2 x 1GB) quad-core / 16GB (32GB using a Memory and I/O Expansion Unit) | | | 1GB (2 x 512MB) dual-core / 16GB | | |
| Standard memory type | PC2-5300 (667MHz) Fully Buffered DDR II ECC | | | | | |
| Memory interleaving | Yes | | | | | |
| DIMM capacities supported | 512MB, 1GB, 2GB, 4GB | | | | | |
| Chipkill protection supported | Yes (using 1GB or larger DIMMs) | | | | | |
| # of DIMM sockets total / available | 4 / 2 (standard) | | | 8/6 (using a Memory and I/O Expansion Unit) | | |
| # of 2.5-inch drive bays total / available | 2 / 2 SAS (standard) | | | 5 / 5 SAS (using a Storage and I/O Expansion Unit) | | |
| # of 3.5-inch drive bays total / available | None | | | | | |

| BladeCenter HS21 Specifications | | |
|--|--|---|
| Maximum internal 2.5" HDD capacity | Standard 293.6GB (2 x 146.8GB) fixed SAS (using SFF card or no expansion card); 146.8GB (1 x 146.8GB) fixed SAS (using legacy expansion card) | Using a Storage and I/O Expansion Unit 734GB (5 x 146.8GB)—two fixed SAS in the base blade, plus three hot-swap SAS in the expansion unit |
| 2.5-inch HDD capacities supported | 36.4, 73.4, 146.8GB — 10K RPMs; 73.4GB — 15K RPMs | |
| 2.5-inch solid-state drives supported | 2 x 15.8GB or 31.4GB | |
| # of HDDs standard | None | |
| # of optical drives standard | None (one standard in chassis) | |
| # of diskette drives standard | None (one standard in BladeCenter E or BladeCenter H chassis) | |
| Internal tape drives supported | None (SAN-attached) | |
| Disk drive technology | SAS | |
| Integrated disk controller | LSI Logic 53C1046E (standard in HS21) | ServeRAID-8k-I (using a Storage and I/O Expansion Unit) |
| Optional RAID controller | None | ServeRAID-8k (using a Storage and I/O Expansion Unit) |
| RAID levels supported | RAID-0/1 (standard) | RAID-0/1/1E (ServeRAID-8k-I); RAID-0/1/1E/5 (ServeRAID-8k) |
| # of disk drives supported <i>per channel</i> | 4 (four drive limit, due to available bays) | |
| External disk drive support | NAS/SAN-attach | |
| # of adapter slots standard | 1 legacy PCI-X slot, plus 1 PCIe <i>or</i> a second PCI-X slot on the blade | |
| # of PCIe slots | 1 (in place of second PCI-X slot); 1 PCIe slot available with the optional Storage and I/O Expansion Unit (1 total) | |
| # of PCI-X slots | 1 or 2 (in place of PCIe slot); 2 extra via optional PCI Expansion Unit II (3 total); 1 or 2 extra via optional Storage and I/O Expansion Unit (3 total) | |
| # of legacy PCI slots | None | |
| # of video ports | None (chassis-attached) | |
| Video controller | ATI Radeon ES1000 | |
| Video memory | 16MB SDRAM | |
| Maximum video resolution at 32-bit color | 1024 x 768 x 32-bit color at 85Hz | |
| Gigabit Ethernet controllers | Dual Broadcom BCM5708S (standard)— TOE-enabled | Dual Broadcom BCM5714S (in the Memory and I/O Expansion Unit)— <i>not</i> TOE enabled |
| # of Gigabit Ethernet ports | 2 (standard) | 4 when using the Memory and I/O Expansion Unit . Up to 8 when using the 2-Port Ethernet Expansion Card . |
| # of RS485 ports | None | |
| # of serial ports | None (1 direct via BladeCenter H chassis, or Serial over LAN in BladeCenter E and BladeCenter H) | |
| # of parallel ports | None | |
| # of mouse ports | None (1 via chassis) | |
| # of keyboard ports | None (1 via chassis) | |

| BladeCenter HS21 Specifications | | |
|---|---|---|
| # of USB ports | None (2 via chassis) | |
| Systems management controller | Integrated BMC | |
| Diagnostic LEDs (front panel) | Power good, blade location, over temperature, information, general fault | |
| Predictive Failure Analysis support | Processor, memory, HDDs, expansion cards | |
| Power supply size | Contained in chassis | |
| # of power supplies standard / maximum | Contained in chassis | |
| # of fans/blowers standard / maximum | Contained in chassis | |
| Dimensions (HWD) / weight | 9.7" (245mm) H 1.14" (29mm) W 17.6" (446mm) D | 12 lbs (maximum) 5.44 kg (maximum) |
| Operating systems supported | Microsoft Windows Server 2003 (Standard/Web/Enterprise Editions) 32-bit and 64-bit, RHEL 3/4 32-bit and 64-bit, SLES 9 32-bit and 64-bit, Novell NetWare 6.5, Sun Solaris 10, VMware ESX Server 3.0 | |
| Extended/long life support | Select blades are supported for long life. (Contact IBM sales for details.) | |
| Length of limited warranty | 3 years (parts and labor) onsite | |

The Bottom Line

The HS21 offers maximum bang for the buck by incorporating outstanding features in a tiny package:

Price/Performance:

- **Multi-core processors** — Up to **two 1.6 to 3.16GHz quad-core** or **1.6 to 3.33GHz dual-core 64-bit** (EM64T) Xeon processors
- **Low-voltage processors** to help reduce energy usage — Up to **two 50W quad-core** or **two 35W or 40W dual-core** 64-bit (EM64T) Xeon processors
- **Fast front-side bus** — **1066MHz** or **1333MHz** FSB
- **Large cache** — **12MB, 8MB, 6MB** or **4MB** of L2 processor cache
- **Fast memory** — **667MHz Fully Buffered PC2-5300 DDR II** ECC memory
- **Fast disk technology** — Internal **SAS** storage (**2 HDDs**), with the option for **three** additional SAS HDDs in an adjacent **Storage and I/O Expansion Unit (5 HDDs total)**; **RAID-0** data striping
- Optional **15.8GB** or **31.4GB Solid State Drives** as an energy-saving alternative to hard disk drives
- **Fast I/O** — **10Gb Ethernet, 4X InfiniBand, Myrinet, iSCSI, or Fibre Channel** connectivity via an optional expansion card
- **Fast communications** — Integrated **dual Gigabit** Ethernet, with the option for two additional Gigabit Ethernet ports via expansion cards (total **8** ports per blade) and expansion unit

Flexibility:

- **Single- (30mm), double- (60mm), triple- (90mm), or quadruple-wide (120mm)** configurations
- **Large memory capacity** — Up to **16GB** standard using **four 4GB** DIMMs (or up to **32GB** and **eight** DIMM slots, using the **Memory and I/O Expansion Unit**)
- **High-capacity disk storage** — Up to **293.6GB** of internal **SAS** storage, with the option for **three** additional 2.5-inch SAS HDDs in an adjacent **Storage and I/O Expansion Unit (5 HDDs, 734GB total)**
- A choice of **hard disk, flash memory, or solid-state** storage
- Integrated RAID — **RAID-1** mirrored arrays standard; enhanced **RAID-1E** arrays optional (using a **Storage and I/O Expansion Unit**); **RAID-5** arrays available using the optional **ServeRAID-8k** controller
- **One available adapter slot** standard —
 - One **legacy** slot for standard PCI-X adapters, *or*
 - One high-speed **PCIe** slot
- Additional **optional** adapter slots —
 - Two **legacy PCI-X** slots or one **PCI-X** and one high-speed **PCIe** slot provided by the **Storage**

and I/O Expansion Unit⁶

- Two standard **PCI-X** slots provided by the **PCI I/O Expansion Unit II⁷**
- One standard **PCI-X** slot and one high-speed **PCIe** slot provided by the **Memory and I/O Expansion Unit⁸**

Manageability and Availability:

- IBM **Director** systems management software, including:
 - IBM Systems Director Active Energy Manager for x86
 - IBM Management Processor Assistant
 - IBM Rack Manager
 - IBM RAID Manager
 - IBM Update Assistant
 - IBM Software Distribution
 - IBM System Availability
- Integrated **Baseboard Management Controller**:
 - IPMI 2.0** compliance, including highly secure remote power control
- Interface to one or two **Advanced Management Modules** in the chassis for advanced systems management capability
 - Supports **LDAP** and **SSL** industry standards
 - Text and graphics console redirection** systems management
 - Serial over LAN**
- Optional **IBM 15.8GB** or **31.4GB Solid State Drive** as a high-reliability alternative to internal storage (with up to three times the MTBF of spinning disk drives)
- Optional **concurrent KVM** and **concurrent media** support
- Numerous **hot-swap/redundant capabilities** provided via the chassis
- **Hot-swap SAS storage** via an optional **Storage and I/O Expansion Unit**

Blade Workload Comparisons

The following table suggest the best HSxx server blade to use with the following usage and workload levels:

| Workloads | Light Usage | Medium Usage | Heavy Usage |
|--------------------------|-------------|-----------------|-------------|
| HPC | HS21 XM | HS21 XM | HS21 XM |
| Virtualization | HS21 XM | HS21 XM | HS21 XM |
| Database | HS21 | HS21 XM | HS21 XM |
| General business | HS12 | HS21 to HS21 XM | HS21 XM |
| Collaboration | HS21 | HS21 XM | HS21 XM |
| VoIP | HS12 | HS12 | HS12 |
| Web server | HS12 | HS21 | HS21 XM |
| Video server | HS12 | HS21 | HS21 |
| Application server | HS12 | HS21 to HS21 XM | HS21 XM |
| Mail Server | HS12 | HS12 | HS21 |
| Print Server | HS12 | HS12 | HS12 |
| File Server | HS12 | HS12 | HS21 |
| Citrix/Terminal Services | HS12 | HS21 XM | HS21 XM |



For More Information

IBM BladeCenter Servers and Options
 Electronic Service Agent
 IBM System x and BladeCenter Power Configurator
 Standalone Solutions Configuration Tool (SSCT)
 Configuration and Options Guide
 ServerProven Program
 Technical Support
 Other Technical Support Resources

ibm.com/systems/bladecenter
ibm.com/support/electronic
ibm.com/systems/bladecenter/powerconfig
ibm.com/servers/eserver/xseries/library/configtools.html
ibm.com/servers/eserver/xseries/cog
ibm.com/servers/eserver/serverproven/compat/us
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Some machines are designed with a power management capability to provide customers with the maximum uptime possible for their systems. In extended thermal conditions, rather than shutdown completely, or fail, these machines automatically reduce the processor frequency to maintain acceptable thermal levels.

MB, GB and TB = 1,000,000, 1,000,000,000 and 1,000,000,000,000 bytes, respectively, when referring to storage capacity. Accessible capacity is less; up to 3GB is used in service partition. Actual storage capacity will vary based upon many factors and may be less than stated.

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will depend on considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

Maximum internal hard disk and memory capacities may require the replacement of any standard hard drives and/or memory and the population of all hard disk bays and memory slots with the largest currently supported drives available. When referring to variable speed CD-ROMs, CD-Rs, CD-RWs and DVDs, actual playback speed will vary and is often less than the maximum possible.

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