Scalable AMD Opteron blade server with unmatched investment protection optimized for business applications and virtualized workloads.

Product Guide
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IBM

IBM BladeCenter LS42

Product Overview

Powerful, scalable AMD Opteron blade server optimized for business applications and virtualized workloads.

Suggested Uses: *Applications requiring large memory and fabric bandwidth, enterprise-class availability and extreme flexibility.*

Today's data center environment is tougher than ever. You're looking to reduce IT cost, complexity, space requirements, power consumption and heat output, while increasing flexibility, utilization and manageability. The **IBM® BladeCenter® LS42** blade server, combined with the various BladeCenter chassis, can help you accomplish all of these goals. Manage growth, complexity and risk with scalability and unmatched investment protection with a platform that can scale from an affordable 2-socket blade to a screaming 4-socket blade.

The LS42 is sold as either a 2- or 4-socket server. The LS42 base unit is a **two-socket 30mm** blade. It supports up to **two** of the latest **quad-core** AMD **Opteron** processors. The processors are designed with **2MB** of **L2** cache and **6MB** of **L3** cache and **HyperTransport** technology to provide you with the computing power you require to match your business needs and growth..It supports up to **64GB** of **PC2-5300** or **PC2-6400** memory (in **8** DIMM slots) and **two SAS** high-density or solid state drives.

The 30mm LS42 offers unparalleled investment protection by offering "pay as you grow" flexibility. It is **upgradeable**—via click and scale with an optional **Multiprocessor Expansion (MPE) unit**—to the 4-socket model. Click and scale does not require any tools and is accomplished by just tightening a hand-adjustable screw without any need for costly "rip and replace." The MPE unit adds two more **quad-core Opteron** processors to make the LS42 a 4-processor blade server with a 60mm form factor. The LS42 with MPE unit also supports up to **128GB** of **PC2-5300** (667MHz) or **PC2-6400** (800MHz) double data rate II (**DDR2**) ECC memory (in **16** DIMM slots), with optional **Chipkill**™[1] protection, for high performance and reliability.

Two dual-port Gigabit Ethernet[2] controllers are standard in both the base unit and the MPE unit for a maximum of **four** dual-port controllers, providing high-speed data transfers and offering **TOE** (TCP/IP Offload Engine) support, **load-balancing** and **failover** capabilities. Via optional expansion cards, each blade can connect to additional Ethernet, **SAS**, **Fibre Channel**, **iSCSI, InfiniBand**™ and other high-speed communication switches housed in the chassis. Optional **2-port Expansion Cards** add additional fabrics to the LS42 as needed. This blade is designed with **power management capability** to provide the maximum uptime possible for your systems. In extended thermal conditions, rather than shut down completely, or fail, the LS42 automatically reduces the processor frequency to maintain acceptable thermal levels.

A single **BladeCenter E** or **BladeCenter H** chassis supports up to **14 hot-swappable 30mm** LS42 blades (or **7 60mm** LS42 blades) in only **7U** (BladeCenter E) or **9U** (BladeCenter H) of rack space. (A rugged **8U BladeCenter T** chassis supports up to **7 30mm** LS42 blades or **4 60mm** LS42 blades in a telecommunications environment.) 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 **42** LS42 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**

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[1] All models require optional Chipkill-enabled DIMMs for Chipkill protection. The 512MB DIMMs shipped with some systems are not Chipkill-enabled. Reliability improvements depend on many factors and may be less than the maximum stated.
[2] 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.

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2.0 support, including **highly secure remote power control**; **text-console redirect over LAN**, a **Management Module** (upgradeable with a redundant MM), **IBM Systems 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 with large memory bandwidth and up to four processors, in a space- or power-constrained environment, the LS42 is the ideal system.

Selling Features

Price/Performance

- The LS42 offers a choice of high-performance **quad-core Opteron** processors in standard and high-efficiency versions. This means there is an LS42 model to fit all budgets.

- The new enhanced quad-core AMD Opteron processors have a **high memory capacity** and throughput to handle large workloads across **multiple virtual machines**.

- The standard **PC2-5300** ECC memory operates at **667MHz** with **dual-interleaving**, for high performance. Optional **PC2-6400** memory operates at **800MHz**, for a **20%** boost in memory performance.

- Optional **15.8GB solid-state drives** (SSDs) use only **1W** of power per drive. This is as much as **90%** less power than a 2.5-inch HDD would use (**9-10W**) with a corresponding reduction in heat output). The optional **31.4GB** SSD requires only **2W**.

- **Two dual-port Gigabit Ethernet** controllers with TCP Offload Engine (**TOE**) support provide speedy communications, standard. Two more are provided with the MPE unit.

- **Internal USB port** for **embedded hypervisor** support.

- 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 BladeCenter 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 your 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** bridge modules.

- The 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 you even more money for, as more of the power input you are paying for is used for processing, rather than released into the data center as waste heat.

- **55W** or **75W average CPU power (ACP)** processors, **13.75W** or **18.75W** per core, and **DDR2** memory used in the LS42 help reduce energy use vs. less efficient processors and Fully Buffered memory.

- Further energy efficiency is gained with AMD's **Dual Dynamic Power Management**.

- 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 **LS42** has the ability to grow with your application requirements, thanks to:

- A choice of processors with **2.7GHz** or **2.5GHz** at **75W** ACP or **2.2GHz** or **2.3GHz** at **55W** ACP.

- Up to **four quad-core** Opteron processors (**sixteen cores** in all).

- Up to **128GB** of fast **533MHz** PC2-5300, or **64GB** of faster still **800MHz** PC2-6400 **DDR2** ECC system memory with optional **Chipkill** protection.

- Up to **two** internal **2.5**-inch SAS HDDs (up to **293.6GB**) or SSDs (up to 62.8GB) and access to terabytes of external **IBM System Storage™** SAN and NAS storage devices.

- Up to eight Gigabit Ethernet ports; plus more, using a **2-port Gigabit Ethernet Expansion Card**.

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

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- A 30mm LS42 blade server can be upgraded, via a **Multiprocessor Expansion unit** to a double-wide LS42 (with double the capabilities).

- Opteron processor-based **LS42** blades can be used in the same chassis as Intel processor-based **HC10/HS12/HS20/HS21/HS21 XM/HS40** blades, Opteron processor-based **LS20/LS21/LS22/LS41** blades, IBM PowerPC® processor-based **JS12/JS20/JS21/JS22** blades, Cell Broadband Engine™ processor-based **QS21** blades, and IBM PowerXCell™ processor-based **QS22** blades. Depending on the blade servers used, the various BladeCenter chassis support Microsoft **Windows**, **Linux**, **VMware**, **Netware**, IBM **AIX**® and Sun **Solaris 10** operating systems in the same chassis.

- *Every LS/HS/JS blade server ever released by IBM is supported in BladeCenter H, and most are supported in every BladeCenter chassis ever release*d, 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. And the switches can be Ethernet, iSCSI, InfiniBand, Fibre Channel, SAS, 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 LS42 blade server includes a **Baseboard Management Controller (BMC)** to monitor server availability, perform Predictive Failure Analysis, etc., and trigger IBM Systems 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 Systems Director to anomalous environmental factors, such as voltage and thermal conditions. It also supports **highly secure remote power control**.

- The LS42 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 Systems Director** is included for proactive systems management and works with both the blade's internal BMC and the chassis' management module. IBM Systems Director comes with a portfolio of tools, including *Management Processor Assistant, Rack Manager, RAID Manager, Update Assistant* and *Software Distribution*. In addition, IBM Systems Director offers extended systems management tools for additional server management and increased availability. When a problem is encountered, IBM Systems 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.

- LS42 blade servers support the use of **Chipkill-enabled memory DIMMs** (1GB or larger). 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 control 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

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[3] 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.

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less ambient noise in the data center than if they were constantly running at full speed.

- **Text console redirection** support allows the administrator to remotely view LS42 text messages over serial or LAN connections.

- A **standard three-year (parts and labor) limited onsite warranty**[3] affords you peace of mind and greater potential investment protection.

Build a dynamic infrastructure

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. You need to reduce your costs, improve your service, and manage risk. 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 that allows you to adapt easily, mindfully, and rapidly to meet new opportunities or fend off threats. 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.

- 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
- 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
- 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 Systems 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 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
- 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

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- Our eco-friendly servers and services can help you be environmentally responsible.
  - Become more energy efficient with IBM expertise

Key Features

AMD Opteron Processors

The LS42 supports up to **four** identical Opteron processors (that is, the same clock rate and cache size and the same number of cores). The choice of processors includes:

- **75W ACP quad-core** Series 8384 **2.7GHz** or Series 8380 **2.5GHz** Opteron processor, both with **6MB** of **L3** processor cache and **2MB** of L2 processor cache, integrated memory controller, **HyperTransport** technology and **Direct Connect Architecture**
- **55W ACP quad-core** Series 8376 **2.3GHz** or Series 8374 **2.2GHz** Opteron processor, both with **6MB** of **L3** processor cache and **2MB** of L2 processor cache, integrated memory controller, **HyperTransport** technology and **Direct Connect Architecture**

30mm LS42 blade servers support configurations of either **one** or **two** processors; **60mm** LS42 blade servers with the MPE unit support configurations of **three** or **four** processors.

64-bit extensions allow Opteron processors to use large memory addressing when running with a 64-bit operating system. This can result in higher performance. Additional registers and instructions can further boost performance for applications written to use them. Contact your software provider to determine their software support for 64-bit addressing.

All LS42 models feature **quad-core Opteron** processors, which contain **four complete processor cores**, each with its own **1MB L2** cache. The four cores appear to software as four physical processors. The quad-core processors offer considerably higher performance than a same-speed Opteron processor with a dual core.

HyperTransport Technology is a high-speed, low latency, point-to-point link designed to increase the communication speed between integrated circuits in computers, servers, embedded systems, and networking and telecommunications equipment up to **48 times** faster than some existing technologies. It helps reduce the number of buses in a system, which can reduce system bottlenecks and enable today's faster microprocessors to use system memory more efficiently in high-end multiprocessor systems.

By eliminating the front-side bus (FSB) used in other processor architectures, **Direct Connect Architecture** avoids some classic bottlenecks between CPU and memory while setting new performance-per-watt standards.

DDR2 ECC Memory

The LS42 ships with **PC2-5300** double data rate II (DDR2) **dual-interleaved** memory DIMMs operating at **533MHz** for fast access. It supports up to **128GB** of PC2-5300 memory in **16** DIMM slots, using industry-standard ECC registered DIMMs. DDR2 memory uses up to **37% less** energy than Fully Buffered memory. For higher speed, the LS42 supports **PC2-6400** (800MHz) DDR2 memory, up to **64GB** (in 16 DIMM slots). The LS42 supports **Chipkill** ECC technology (using 1GB or larger DIMMs), for **up to 16X** better error correction than standard ECC memory. (*Note:* Four DIMM slots are available to each processor. A one-processor configuration can access memory from 4 DIMMs; a two-processor configuration can access 8 DIMMs, etc.)

In the LS42, memory has its own high-speed path to the processor, rather than having to share a front-side bus (FSB) with other devices. This gives the Opteron a high-speed link to memory—memory is accessed at the full clock rate. Moreover, because each Opteron contains its own integrated memory controller, installing a second Opteron means having *two* high-speed data paths to memory, providing up to double the memory throughput. (Having an integrated memory controller also reduces memory latency for faster memory access.)

PC2-5300 memory is available in **2GB**, **4GB**, **8GB**, and **16GB** memory kits (**two** 1GB, 2GB, 4GB, or 8GB DIMMs per kit, respectively). PC2-6400 memory is available in an **8GB** memory kit (**two** 4GB DIMMs per kit). DIMMs are installed in pairs for increased performance, provided by dual-interleaving.

Adapter Slots

The LS42 blade server includes **one x8 PCIe** and **two 133MHz PCI-X** adapter slot on each blade. *Either* **two** legacy **PCI-X** expansion card *or* **two** SFF (small form factor) **PCI-X** slots or **one SFF** (small form factor) **PCI-X** and **one SFF PCIe** adapter can be installed in this blade (two cards total).

An expansion unit may be added to increase the number of expansion card slots available:

- 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 slots on the LS42 blade (**four** slots usable). (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 utilizes the PCIe slot in the LS42. When attached to a 30mm LS42, this expansion unit uses a second 30mm BladeCenter slot. When attached to a 60mm LS42, it uses a third 30mm BladeCenter slot.

The LS42 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.

Flexible Internal Storage Capacity

The LS42 offers a choice of disk storage, supporting up to **two** fixed drives, as well as an expansion unit that offers additional direct-attached storage.

- **10K** RPM **2.5-inch SAS**—73 or **146GB** capacities (**292GB maximum**)
- **15K** RPM **2.5-inch SAS**—**73GB** capacity (**146GB maximum**)
- **2.5-inch** Solid state drive—16 or **32GB** capacities (**64GB 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 for enterprise-class HDDs). 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.

If this is not enough internal 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** HDDs. It is installed in the slot adjacent to an LS42 blade server.

Fully populating both the LS42 blade and the expansion unit provides up to **367GB** of local storage to the LS42 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 storage 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 LS42 supports various external rack-mounted SAN-attached tape drives. Supported tape technologies include:

- **IBM System Storage DS3200**

Take an overburdened internal storage infrastructure to the next level by using the flexible and affordable SAS-based DS3200 storage system. The DS3200 combines next-generation SAS technology with time-proven designs for external storage and intuitive management interface to create a fully-featured, shared storage system. This 2U rack mount enclosure with 12 easily accessible disks supports both SAS and SATA drives and is expandable up to 48 drives by attaching up to three EXP3000s. Supported by all BladeCenter chassis, the DS3200 can increase the capacity, management efficiency and availability of your SAS-based storage.

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

Gigabit Ethernet Controllers

The **30mm** LS42 includes **one dual-port** integrated **Broadcom 5709S**; the **60mm** LS42 (or the **Multiprocessor Expansion Unit**) adds **another dual-port Broadcom 5709S** Gigabit Ethernet controller. These provide up to 10X higher maximum throughput than a 10/100 Ethernet controller. The controllers offer TCP Offload Engine (**TOE**) support, as well as **failover** and **load balancing** for better throughput and system availability. They also provide DMA buffer management, highly secure remote power management using IPMI 2.0, plus Wake on LAN® and PXE (Preboot Execution Environment) Flash interface. Additionally, both the base blade and expansion blade provide a PCI-X expansion card connector.

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.)

BladeCenter Chassis

IBM's blade architecture offers ***five choices*** of 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 use. It takes standard 110-220V power, and offers low acoustic levels. 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 telecoms), **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.

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 Systems Director and Remote Deployment Manager.

The **AMM**, in combination with the LS42 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 control
- 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 Systems Director to anomalous

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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, Active Energy Manager (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 Systems 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 LS42 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 Systems Director. This provides the ability to replace the failing component *before* it fails, resulting in increased uptime.

IBM Systems Director software for advanced workgroup management is included with the server. IBM Systems Director comes with a portfolio of tools, including *Management Processor Assistant, Rack Manager, RAID Manager, Update Assistant* and *Software Distribution*. *IBM Systems Director Active Energy Manager for x86, System Availability* (a no-charge download) and *Capacity Manager* (sold separately) are available as add-ons for additional server management and increased availability. IBM Systems Director provides a single uniform graphical interface for all of these systems management functions.

IBM Systems 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 includeBM 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

ServerProven

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 service[4] 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.

LS42 Multiprocessor Expansion Unit — The LS42 MPE unit uses the LS42's unique Click–and-scale feature to attach to the 2-socket model. Click-and-scale does not require any tools and is accomplished by just tightening a hand-adjustable thumbscrew without any need for costly "rip and replace." The MPE unit adds two more **quad-core Opteron** processors to make the LS42 a 4-processor blade server with a 60mm form factor. The LS42 with MPE unit has double the memory and Ethernet ports, and more I/O ports than the base LS42 blade.

Processors — The AMD Opteron processor provides four cores, 64-bit extensions, a large cache, HyperTransport technology and advanced features for availability and manageability. Large cache size, combined with Direct Connect Architecture, reduces memory latency and facilitates 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 quad-core processor, there should be twice as much memory available as for a dual-core processor.

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[4] For onsite labor, IBM will attempt to diagnose and resolve the problem remotely before sending a technician.

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Hard Disk Drives — IBM hard disk drives help improve the transaction and cost performance of your LS42 servers. The choice of hard disk drives can be a critical aspect of maximizing the I/O throughput of the system. **Serial-Attach SCSI** (SAS) hard disk drives (**2.5-inch**) are available for the LS42 with capacities up to **146GB** at **10,000** RPMs and **73GB** at **15,000** RPMs.

External Storage — The IBM **System Storage DS3000, DS4000, DS6000,** and **DS8000 SAN** series, as well as the **N3000, N5000, and N7000** NAS 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 System Storage **DS400** direct-attach 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 LS42 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.

LS42 Images

Front View: Base LS42 Blade Server With Multiprocessor Expansion Unit
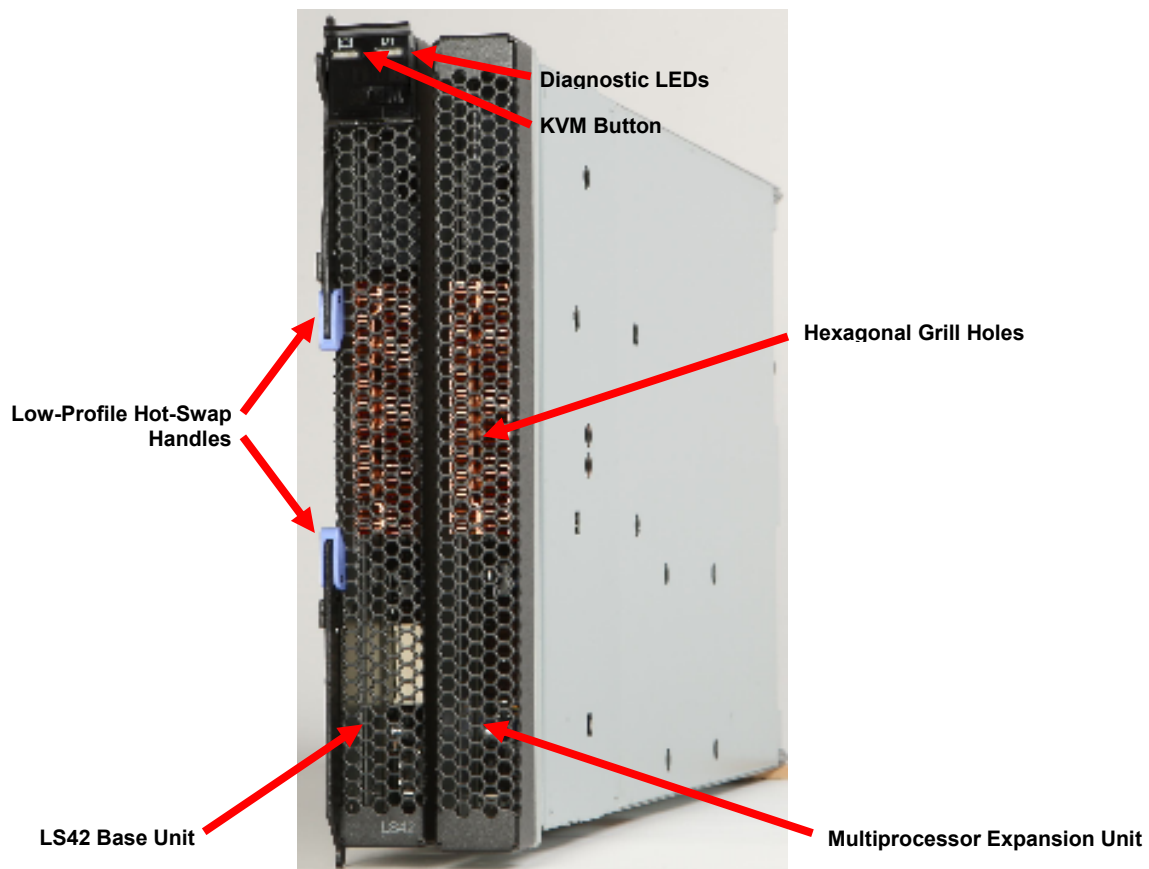
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Interior View: Base LS42 Blade Server
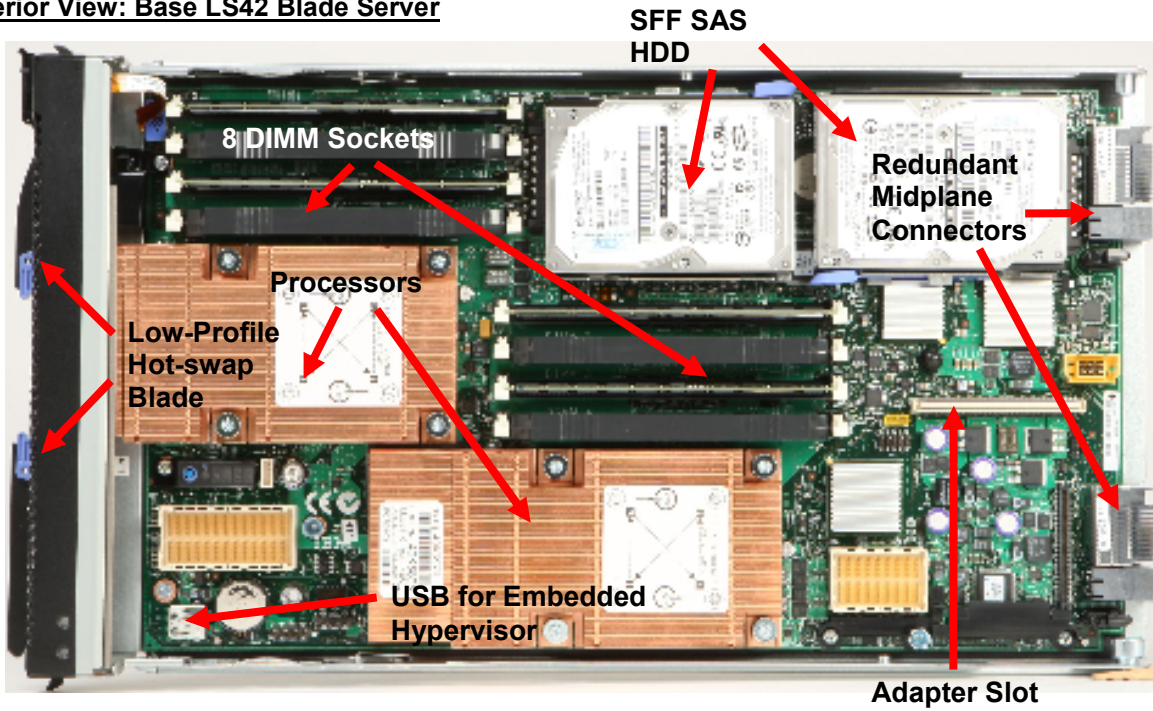
Interior View: Multiprocessor Expansion Unit
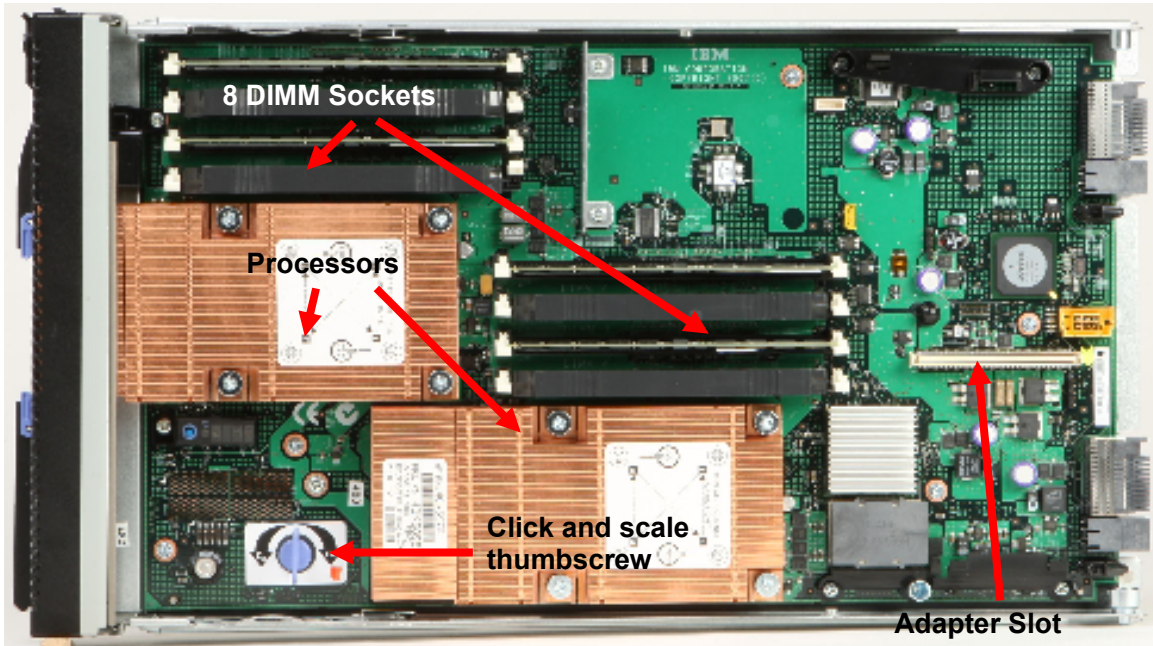
BladeCenter LS42 Specifications	
Machine type	**7902-3xX/3xY** (2-sockets/expandable to 4 via MPE unit)
Form factor	**30mm** blade (3SX/1SX)—expandable to 60mm (using Multiprocessor Expansion	**30mm** MPE unit (44X1685/46M6817)

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BladeCenter LS42 Specifications	
	unit)
Processor type	**Quad-core** AMD Opteron processor (**8000** series) **2.7GHz 8384** (3SX for base unit; 44X1685 for MPE unit), **2.5GHz 8380** (1SX for base unit; 44X6817 for MPE unit), **2.3GHz 8376** (3LX for base unit; 46M6890 for MPE unit)**,** **2.2GHz 8374** (CTO-only for base unit; 46M6885 for MPE unit)
Processor power draw	**75W** ACP, **55W** ACP
HyperTransport Tunnel speed	1.0GHz
# of processors standard / maximum	**1 / 2** as is; **4** with MPE unit installed
Internal cache	**2MB** L2 cache and **6MB** L3 cache
Chipset	ServerWorks HT 2000/1000
Standard / maximum memory[5]	**64GB** as-is; **128GB** (with Multiprocessor Expansion unit installed)
Standard memory type	**PC2-5300** (533MHz) **DDR II** ECC (optional PC2-6400/800MHz)
Memory interleaving	Two-way (using pairs of DIMMs)
DIMM capacities supported	1GB, 2GB, 4GB, 8GB
Chipkill protection supported	Yes
# of DIMM sockets available	**8** as-is; **16** with MPE unit installed
# of 2.5-inch drive bays available	**2 fixed** (standard)
Maximum internal 2.5" HDD capacity	**293.6GB** (**2** x 146.8GB) SAS
Maximum HDD capacity using a storage expansion unit	**597.2GB** (**4** x 146.8GB)—*without* Multiprocessor Expansion unit installed, using optional **Storage and I/O Expansion Unit**; **734GB** (**5** x 146.8GB)—*with* Multiprocessor Expansion unit installed, using optional **Storage and I/O Expansion Unit**
2.5-inch HDD capacities supported	36.4, 73.4, **146.8GB** — **10K** RPMs; **73.4GB** — **15K** RPMs, **146.8GB** — **15K** RPMs
# of HDDs standard	None
# of optical drives standard	None (one standard in chassis)
# of diskette drives standard	None (one standard in BladeCenter E / BladeCenter H chassis)
Internal tape drives supported	None (SAN-attached)
Disk drive technology	Serial-Attach SCSI (SAS)
Integrated disk controller	LSI Logic 53C1064
# of disk drives supported *per channel*	1 (one-drive limit internally, due to available bays)
External disk drive support	NAS/SAN-attach
# of adapter slots total / available	**2**
# of PCIe x8 (4Mbps) slots	**1** legacy PCIe slot (additional slots available with optional expansion units)
# of PCI-X 133MHz (1Mbps) slots	**1** standard, or **2** (replacing the PCIe slot)
# of legacy PCI slots	None
# of video ports	None (chassis-attached)

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[5] Maximum memory and disk capacity may require the replacement of standard components with the largest supported component available.

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BladeCenter LS42 Specifications		
Video controller	ATI Radeon ES1000	
Video memory	16MB SGRAM	
Maximum video resolution at 32-bit color	1024 x 768 x 32-bit color at 75Hz	
Gigabit Ethernet controllers standard	**2** x Broadcom **BCM5706S**—*without* MPE unit installed	**2** x Broadcom **BCM5706S** *and* **2** x Broadcom **BCM5708S**—*with* MPE unit installed
# of RS485 ports	None	
# of serial ports	None (1 via BladeCenter H chassis)	
# of parallel ports	None	
# of mouse ports	None (1 via chassis)	
# of keyboard ports	None (1 via chassis)	
# of USB 1.1 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	
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** (31X/31Y, 3AX/3AY, 51X/51Y, 6AX/6AY) 2.28" (58mm) **W** (32X/32Y, 3BX/3BY, 52X/52Y, 6BX/6BY) 17.6" (446mm) **D**	10.77 **lb** (maximum)—30mm 4.88 **kg** (maximum)—30mm; 24.76 **lb** (maximum)—60mm 11.23 **kg** (maximum)—60mm
Operating systems supported	Microsoft Windows Server, Microsoft Cluster Server, Red Hat Enterprise Linux, SUSE Linux, Novell NetWare, VMware ESX, Solaris	
Length of limited warranty	3 years (parts and labor) onsite	

The Bottom Line

The LS42 offers maximum bang for the buck by incorporating outstanding features in a tiny package:

Performance

- **High-performance quad-core processors** — Up to **two 2.7GHz quad-core AMD** Opteron processors
- **Large cache** — **2MB** of L2 cache and **6MB** of **L3** cache
- **Fast memory** — **667MHz or 800 MHz PC2-5300 DDR II** ECC memory
- **Fast disk technology** — Internal **SAS** storage (**2 HDDs**), with the option for **three** additional (hot-swap) SAS HDDs in an adjacent storage blade (**4 HDDs**) total
- **Fast I/O** — **4X InfiniBand**, **SAS**, **iSCSI** or **Fibre Channel** connectivity via an optional expansion card; support for **10Gb Ethernet** when available
- **Fast communications** — Integrated **quad Gigabit** Ethernet, with the option for two additional Gigabit Ethernet ports via expansion cards (total **8** ports per blade) and expansion unit

Flexibility

- **Large memory capacity** —**128GB** using **sixteen 8GB DIMMs**

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- **High-capacity disk storage** — Up to **293.6GB** of internal **SAS** storage
- **Integrated RAID** — **RAID-1** mirrored arrays standard
- **Two** *available* **adapter slots** standard:
  - ❑ Two slots for **legacy** or **Small Form Factor PCI-X** adapters, or
  - ❑ One slot for **x8 PCIe** adapters, or
  - ❑ One slot for **legacy** or **Small Form Factor PCI-X** adapters and one slot for **x8 PCIe** adapters

Manageability and Availability

- IBM **Systems 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** (BMC):
  - ❑ **IPMI 2.0** compliance, including highly secure remote power control
- Interface to one or two **Advanced Management Modules** in the BladeCenter chassis for advanced systems management capability
  - ❑ Supports **LDAP** and **SSL** industry standards
  - ❑ **Text console redirection** systems management
  - ❑ **Serial over LAN**
- 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**

Server Comparison Chart

Theme	Key Workloads	Scalability	Floating Point Performance	Memory Throughput	Integer Performance	I/O and Storage	Density	High Availability	Systems Management	Security	Distributed Deployment	HC10	HS12	HS21	HS21 XM	LS22	LS42	JS12	JS22	QS22
HPC	Cluster / HPC												○	○	●	●	●	○	●	●
	Modeling & Simulation												○	○	▼	▼	●	○	●	●
	High Performance DB												○	○	▼	▼	●	○	●	
	Business Intelligence												○	○	●	●	●	○	○	▼
Web 2.0 / Web 3D	Search												○	▼	●	●	●	○	○	▼
	Content												○	○	▼	●	●	○	○	
	Communities												○	○	▼	●	●	○	○	
	Commerce												○	○	▼	●	●	○	▼	●
	Collaboration											▼	▼	●	●	●	●	▼	●	
Business Applications	ERP/SCM												○	●	●	●	●	○	●	
	CRM												▼	●	●	●	○	○	▼	
	Hosted Client											●	▼	▼	●	○	○	○	▼	
	Point of Sale																			
	Branch Office												▼	▼	●	●		○	●	●
Infrastructure Applications	Virtualization												○	○	●	●	●	○	●	
	Business Continuity												○	○	●	●	●	○	▼	
	Database												▼	●	▼	▼	●	○	○	
	Email/Collaboration												●	▼	○	▼	○	●	▼	○
	Security												●	▼	○	●	○	●	●	○
	Web Serving												●	●	○	●	○	○	●	
	File & Print												●	▼	○	▼	○	●	●	

Legend:

- ■ Important
- ▨ Nice to Have
- ☐ Can do without
- ● Best
- ▼ Better
- ○ Good

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For More Information

IBM System x and xSeries Servers	http://**ibm.com**/systems/x
Electronic Service Agent	http://**ibm.com**/support/electronic
IBM System x and BladeCenter Power Configurator	http://**ibm.com**/systems/bladecenter/powerconfig
Standalone Solutions Configuration Tool	http://**ibm.com**/servers/eserver/xseries/library/configtools.html
Configuration and Options Guide	http://**ibm.com**/servers/eserver/xseries/cog
ServerProven Program	http://**ibm.com**/servers/eserver/serverproven/compat/us
Technical Support	http://**ibm.com**/server/support

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