BladeCenter HS23 (E5-2600)
Product Guide (withdrawn product)

The BladeCenter® HS23 (E5-2600) is a two-socket blade server running the Intel® Xeon® processor E5-2600 product family. With its industry-leading RAS features, energy efficiency, outstanding performance, flexible and scalable I/O, and complete systems management, HS23 offers a robust platform optimized for your mission-critical applications. Standard 30 mm single-wide form-factor protects your investments by providing compatibility with the BladeCenter H, E, S, and HT chassis.

Suggested use: versatile platform to run a broad range of workloads, including infrastructure, virtualization, and enterprise applications.

The following figure shows the BladeCenter HS23.

Figure 1. BladeCenter HS23

Did you know?

BladeCenter HS23 is the first BladeCenter server that offers four integrated LAN ports: dual-port Gigabit Ethernet and dual-port 10Gb Ethernet with Virtual Fabric capability. With Emulex 10GbE Virtual Fabric Adapter II for HS23 CFFh expansion card, HS23 scales up to 14 virtual NICs (vNICs) per single-wide blade server for a total of 18 I/O ports with the choice of Ethernet, Fibre Channel, SAS, iSCSI, and FCoE connectivity.

Key features

The BladeCenter HS23 gives you the networking capacity that you need to manage your data center. The new Virtual Fabric capable integrated 10 GbE offers extreme speed, and the HS23 is designed with highly scalable I/O to give you a total of up to four 10 Gb physical ports that can be divided into up to 14 virtual ports, as well as the ability to run multiple I/O protocols (FCoE/iSCSI). Sixteen DIMM slots supporting up to 512 GB of DDR3 memory allow you to fit more and larger virtual machines per blade. In addition, the HS23 is backward-compatible with all BladeCenter chassis, including the original BladeCenter E. (Some configurations might have restrictions. See Table 5 for compatibility details.)

Availability and serviceability

The BladeCenter HS23 provides many features to simplify serviceability and increase system uptime:

- Dual independent power and signal connectors to the BladeCenter chassis midplane provide fault tolerance to increase uptime.

- The HS23 offers Chipkill, memory mirroring, and memory rank sparing for redundancy in the event of a non-correctable memory failure.

- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as memory and adapter cards.

- The server offers hot-swap drives supporting integrated RAID 1 redundancy for data protection and greater system uptime.

- The power source independent light path diagnostics panel and individual light path LEDs quickly lead the technician to failed (or failing) components. This simplifies servicing, speeds up problem resolution, and helps improve system availability.

- The Predictive Failure Analysis (PFA) detects when system components (processors, memory, and hard disk drives) operate outside of standard thresholds and generates pro-active alerts in advance of possible failure, therefore increasing uptime.

- Solid-state drives (SSDs) offer significantly better reliability than traditional mechanical HDDs for greater uptime.

- Built-in Integrated Management Module II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovering actions in case of failures to minimize downtime.

- Built-in diagnostics using Dynamic Systems Analysis (DSA) Preboot speeds up troubleshooting tasks to reduce service time.

Scalability and performance

The HS23 offers numerous features to boost performance, improve scalability, and reduce costs:

- The Intel Xeon processor E5-2600 product family improves productivity by offering superior system performance with up to 8-core processors and up to 3.0 GHz core speeds depending on the CPU's number of cores, up to 20 MB of L3 cache, and QPI interconnect links of up to 8 GT/s.

- Up to two processors, 16 cores, and 32 threads maximize the concurrent execution of multi-threaded applications.

- Intelligent and adaptive system performance with Intel Turbo Boost Technology 2.0 allows processor cores to run at maximum speeds during peak workloads by temporarily going beyond processor TDP.

- Intel Hyper-Threading Technology boosts performance for multi-threaded applications by enabling simultaneous multi-threading within each processor core, up to two threads per core.

- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better utilize the hardware for virtualization workloads.

- Up to 16 DDR3 ECC memory RDIMMs provide speeds up to 1600 MHz and a memory capacity of up to 512 GB. (See Table 7 for details.)

- The use of solid-state drives (SSDs) instead of or along with traditional spinning drives (HDDs) can significantly improve I/O performance. An SSD can support significantly more I/O operations per second (IOPS) than a typical HDD.
- The HS23 scales to 18 I/O ports on a single-wide blade with integrated Gigabit Ethernet and 10 Gb Ethernet ports and optional expansion cards, offering the choice of Ethernet, Fibre Channel, SAS, iSCSI, and FCoE connectivity.
- The HS23 offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by almost 100% (8 GTps per link using 128b/130b encoding) compared to the previous generation of PCI Express 2.0 (5 GTps per link using 8b/10b encoding).
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This helps to dramatically reduce I/O latency and increase overall system performance.

Manageability and security

Powerful systems management features simplify local and remote management of the HS23:

- The HS23 includes an Integrated Management Module II (IMM2) to monitor server availability and perform remote management.
- Integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.
- Integrated Trusted Platform Module (TPM) 1.2 support enables advanced cryptographic functionality, such as digital signatures and remote attestation.
- Industry-standard AES NI support for faster, stronger encryption.
- Systems Director provides proactive systems management with comprehensive management tools that help increase up-time, reduce costs, and improve productivity through advanced server management capabilities.
- FastSetup simplifies, automates, and speeds up the deployment process from server power-up to production, making BladeCenter easier to manage, deploy, and maintain.

Energy efficiency

The HS23 offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to the green environment:

- Component-sharing design of the BladeCenter chassis provides ultimate power and cooling savings.
- The Intel Xeon processor E5-2600 product family offers significantly better performance over the previous generation while fitting into the same thermal design power (TDP) limits.
- Intel Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.
- Low-voltage Intel Xeon processors draw less energy to satisfy demands of power and thermally constrained data centers and telecommunication environments.
- Low-voltage 1.35 V DDR3 memory RDIMMs consume up to 19% less energy than 1.5 V DDR3 RDIMMs.
- The HS23 uses hexagonal ventilation holes, a part of Calibrated Vectored Cooling™ technology. Hexagonal holes can be grouped more densely than round holes, providing more efficient airflow through the system.
- Systems Director Active Energy Manager™ provides advanced power management features with actual real-time energy monitoring, reporting, and capping features.

Components and connectors

The following figure shows the front view of the server, indicating key components.
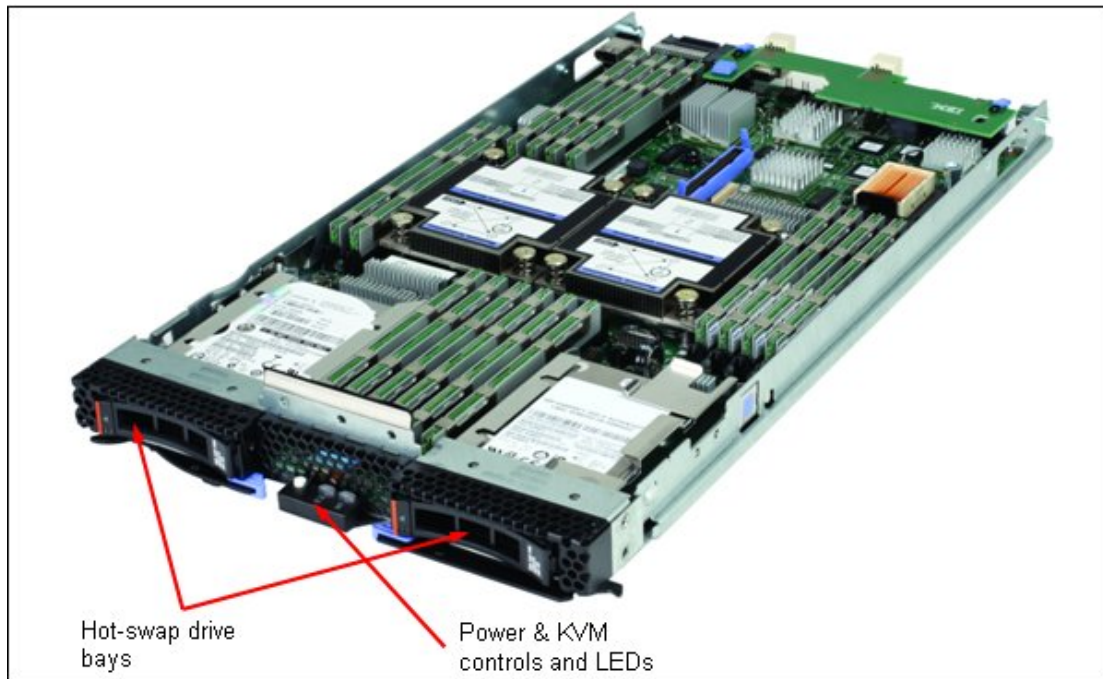

Figure 2. Front view of the BladeCenter HS23

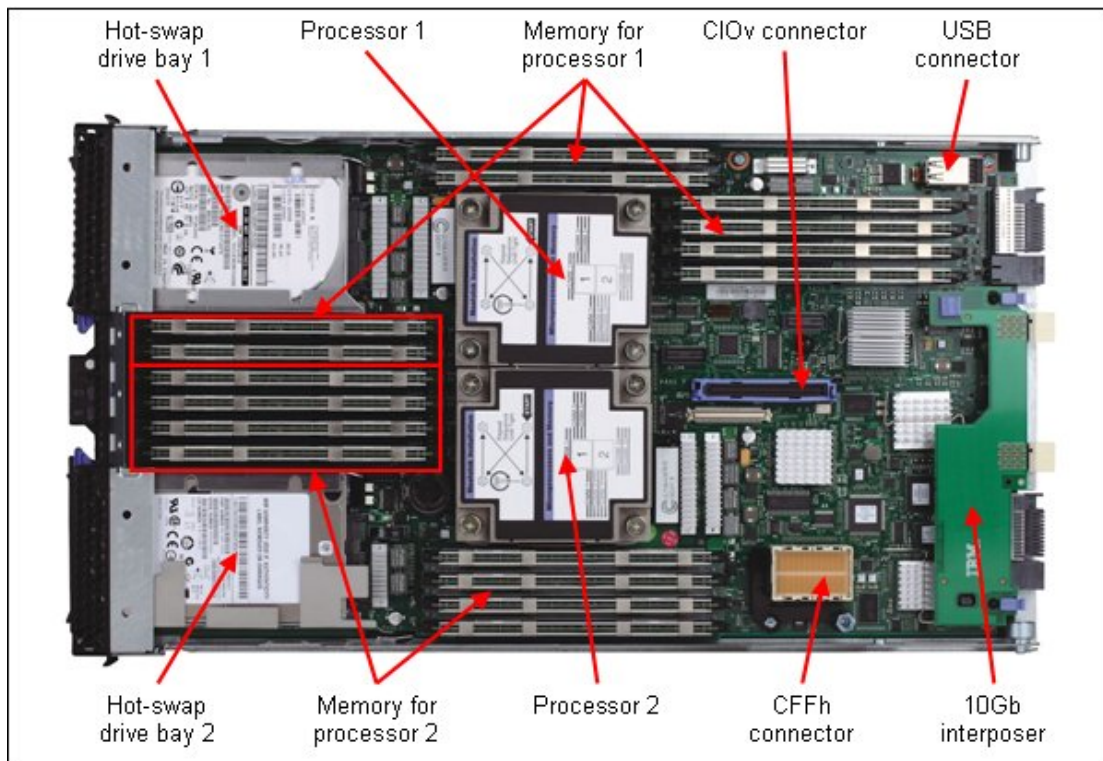The following figure shows the top view of the server, indicating key components.

Figure 3. Top view of the BladeCenter HS23

The following figure shows the bottom view of the BladeCenter HS23 (contains light path diagnostics panel).
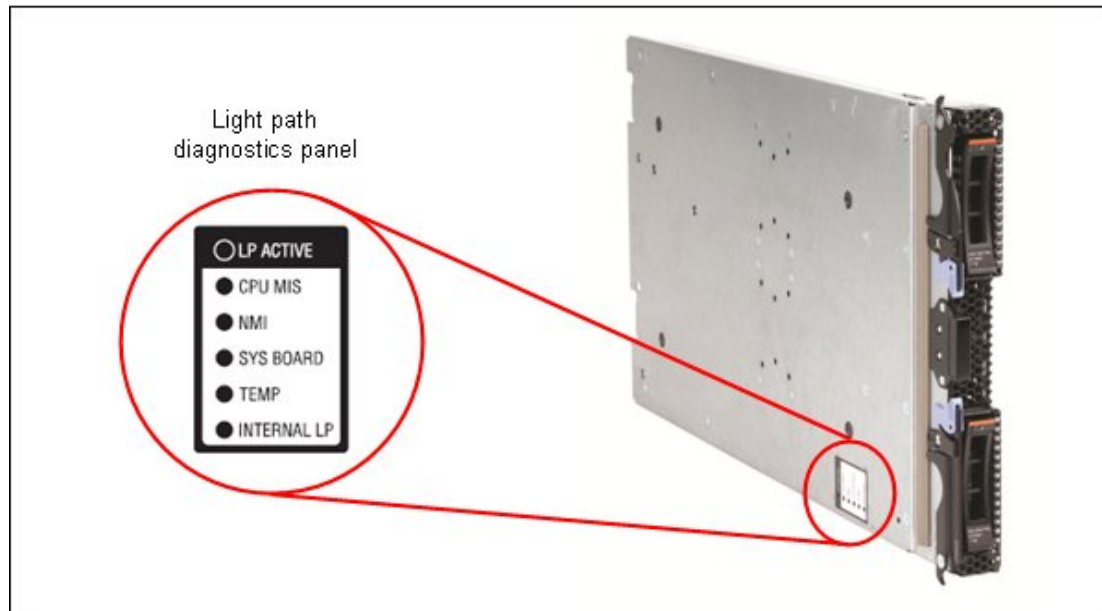

Figure 4. Bottom view of the BladeCenter HS23 (shows light path diagnostics panel)

System specifications

The following table lists the system specifications.

Table 1. System specifications

Components	Specifications
Form factor	Single-wide (30 mm) blade server.
Chassis support	BladeCenter H, BladeCenter HT, BladeCenter S, BladeCenter E. (Some configurations might have restrictions. See Table 5 for compatibility details.)
Processor	Up to two Intel Xeon processor E5-2600 product family CPUs with eight-core (up to 2.7 GHz) or six-core (up to 2.9 GHz) or quad-core (up to 3.3 GHz) or dual-core (up to 3.0 GHz). Two QPI links up to 8.0 GT/s each. Up to 1600 MHz memory speed. Up to 20 MB L3 cache.
Chipset	Intel C600.
Memory	Up to 16 DDR3 DIMM sockets (8 DIMMs per processor) using Very Low Profile (VLP) DIMMs. Support for up to 1600 MHz memory speed depending on the processor. Four memory channels per processor (2 DIMMs per channel).
Memory maximums	Up to 512 GB with 16x 32 GB RDIMMs and two processors.
Memory protection	ECC, Chipkill, memory mirroring, and memory rank sparing.
Disk drive bays	Two 2.5" hot-swap SAS/SATA drive bays supporting SAS, SATA, and SSD drives.
Maximum internal storage	Up to 3.6 TB with 1.2 TB 2.5" SAS HDDs, or up to 2 TB with 1 TB 2.5" NL SAS HDDs, or up to 2 TB with 1 TB 2.5" SATA HDDs, or up to 3.2 TB with 1.6 TB 2.5" SAS SSDs. Intermix of SAS and SATA HDDs and SSDs is supported.
RAID support	RAID 0, 1, 1E, and 10 with integrated LSI SAS2004 controller.

Components	Specifications
Network interfaces	Two Gigabit Ethernet ports and two 10 Gb Ethernet ports with integrated Emulex BladeEngine 3 (BE3) controller.
PCI Expansion slots	One CIOv slot (PCIe 3.0 x8) and one CFFh slot (PCIe 3.0 x16). Two additional PCIe 2.0 x8 standard form factor slots (slot 1 is full-height full-length, slot 2 is full-height half-length) with the optional PCI Express Gen 2 Expansion Blade II. One HS23 supports up to four PCIe expansion blades (8 slots).
Ports	One internal USB port (for embedded hypervisor).
Hot-swap components	Hard drives.
Systems management	UEFI, Integrated Management Module II (IMM2) with Renesas SH7757 controller, Predictive Failure Analysis, light path diagnostics, Automatic Server Restart, Systems Director and Systems Director Active Energy Manager, ServerGuide.
Security features	Power-on password, administrator's password, Trusted Platform Module (TPM 1.2).
Video	Matrox G200eR2 video core with 16 MB video memory integrated into the IMM2. Maximum resolution is 1600x1200 at 75 Hz with 16 M colors (32 bits per pixel).
Operating systems supported	Microsoft Windows Server 2012 R2, 2012, 2008 R2, and 2008 (x64); Red Hat Enterprise Linux 5 (x64), 6 (x86 and x64), and 7; SUSE Linux Enterprise Server 10 (for AMD64/EM64T), 11 (for x86 and AMD64/EM64T), and 12; Oracle Solaris 10 and 11; VMware ESX 4.1 and ESXi 4.1, and VMware vSphere 5.0, 5.1, 5.5, and 6.0.
Limited warranty	3-year customer-replaceable unit and onsite limited warranty with 9x5/next business day response time.
Service and support	Optional service upgrades are available through Lenovo Services: 4-hour or 2-hour response time, 8-hour fix time, 1-year or 2-year warranty extension, remote technical support for System x hardware and selected third-party (Microsoft, Linux, VMware) software.
Dimensions	Height: 245 mm (9.7 in), width: 29 mm (1.14 in), depth: 446 mm (17.6 in).
Weight	Maximum configuration (single-wide blade): 5.4 kg (12 lb).

The BladeCenter HS23 servers are shipped with the following items:

- Documentation CD
- Registration Flyer
- Statement of Limited Warranty
- Important Notices
- Technical Note Flyer

Standard models

The following table lists standard models.

Table 2. Standard models

Model*	Intel Xeon processor** (2 maximum)	Memory (std / max)	RAID controller	Drive bays (used / max)	Disk drives	Standard Ethernet	I/O slots (used / max)
7875-A1x	1x Xeon E5-2603 4C 1.8GHz 10MB 1066MHz 80 W	1x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb#	0 / 2
7875-A2x	1x Xeon E5-2609 4C 2.4GHz 10MB 1066MHz 80 W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb#	0 / 2
7875-B1x	1x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2

Model*	Intel Xeon processor** (2 maximum)	Memory (std / max)	RAID controller	Drive bays (used / max)	Disk drives	Standard Ethernet	I/O slots (used / max)
7875-B2x	1x Xeon E5-2640 6C 2.5GHz 15MB 1333MHz 95W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-B3x	1x Xeon E5-2630 6C 2.3GHz 15MB 1333MHz 95W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C1x	1x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C2x	1x Xeon E5-2660 8C 2.2GHz 20MB 1600MHz 95W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C3x	1x Xeon E5-2665 8C 2.4GHz 20MB 1600MHz 115W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C4x	1x Xeon E5-2670 8C 2.6GHz 20MB 1600MHz 115W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C5x	1x Xeon E5-2680 8C 2.7GHz 20MB 1600MHz 130W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C6x	1x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W	4x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C7x	1x Xeon E5-2660 8C 2.2GHz 20MB 1600MHz 95W	4x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-C8x	1x Xeon E5-2680 8C 2.7GHz 20MB 1600MHz 130W	4x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-D1x	1x Xeon E5-2650L 8C 1.8GHz 20MB 1600MHz 70W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-F1x	1x Xeon E5-2648L 8C 1.8GHz 20MB 1600MHz 70W	4x 4GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-G1x†§	1x Xeon E5-2630 6C 2.3GHz 15MB 1333MHz 95W	4x 4GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 4x 10Gb	1 / 2
7875-G2x†§	1x Xeon E5-2670 8C 2.6GHz 20MB 1600MHz 115W	4x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 4x 10Gb	1 / 2
7875-91x§‡	2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W	16x 8GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-92x§‡	2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W	16x 8GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-93x§‡	2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W	16x 8GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2

* x in the Machine Type Model (MTM) represents a region-specific letter (for example, the EMEA MTM is 7875A1G, and the US MTM is 7875A1U). Ask a Lenovo representative for specifics.
** Processor detail: Model, cores, core speed, L3 cache, memory speed, power.
# Supports 10Gb with the addition of the 10 Gb Interposer Card for BladeCenter HS23, 94Y8550.
† These models ship standard with Emulex 10GbE VFA Advanced II for BladeCenter HS23, 90Y9332.
§ These models ship standard with Virtual Fabric Advanced Software Upgrade (LOM), 90Y9310.
‡ Models 91x and 92x ship standard with USB Memory Key for VMWare ESXi 5.0, 41Y8300. Model 93x ships with USB Memory Key for VMware ESXi 5.0 Update1, 41Y8307.

Express models

The following table lists Express models.

Table 3. Express models

Model	Intel Xeon processor* (2 max)	Memory (std / max)	RAID controller	Drive bays**	Disk drives	Standard Ethernet	I/O slots**
United States, Latin America, Canada							
7875-E1U	2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W	8x 4 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-E2U	2x Xeon E5-2630 6C 2.3GHz 15MB 1333MHz 95W	8x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-E3U	2x Xeon E5-2670 8C 2.6GHz 20MB 1600MHz 115W	8x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-E4U	2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W	4x 8 GB† / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-E5U	2x Xeon E5-2640 6C 2.5GHz 15MB 1333MHz 95W	4x 8 GB† / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
7875-E6U	2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W	8x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2
Europe, Middle East, Africa							
7875-K1G	1x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W	1x 8 GB / 512 GB	Integrated SAS/SATA	0 / 2	Optional	2x 1Gb 2x 10Gb	0 / 2

* Processor detail: Model, cores, core speed, L3 cache, memory speed, power.
** Number used / Maximum number
† Models E4x and E5x have four DIMMs as standard which means that half of the eight memory channels are unused. To maximize memory performance, consider adding additional DIMMs to populate all channels.

Chassis support

The HS23 is supported in the various BladeCenter chassis listed in the following table. The number of HS23 servers supported in each chassis depends on the thermal design power of the processors used in the servers. The following table uses the following conventions:

- A green cell means that the chassis can be filled with HS23 blade servers up to the maximum number of blade bays in the chassis (for example, 14 blades in the BladeCenter H).

- A yellow cell means that the maximum number of HS23 blades that the chassis can hold is fewer than the total available blade bays (for example, 12 in a BladeCenter E). Other bays in the chassis *must* remain empty. Consult the BladeCenter Interoperability Guide for specific details: http://lenovopress.com/bcig

Notes:

- The HS23 is not supported in the BladeCenter E with power supplies smaller than 2000 W.
- The HS23 is not supported in the BladeCenter T.

Table 4. Chassis support

CPU TDP*	Maximum number of HS23 servers supported in each chassis									
	BC-E with AMM (8677) (14 bays)		BC-S (8886) (6 bays)	BC-H (models other than 4Tx) (14 bays)				BC-H (-4Tx) (14 bays)	BC-HT AC§ (8750) (12 bays)	BC-HT DC§ (8740) (12 bays)
	2000 W power supplies	2320 W power supplies		2900W supplies		2980W supplies**		2980W		
				Standard blowers	Enhanced blowers†	Standard blowers	Enhanced blowers†	Enhanced blowers†		
Intel Xeon processors										
130W	None‡	None‡	6	None‡	14	None‡	14	14	5+5	5+5
115W	None‡	None‡	6	None‡	14	None‡	14	14	5+5	5+5
95W	None‡	None‡	6	None‡	14	None‡	14	14	12	12
80W	6+7	14	6	14	14	14	14	14	12	12
70W	None‡	None‡	6	None‡	14	None‡	14	14	12	12
60W	None‡	None‡	6	None‡	14	None‡	14	14	12	12
Intel Xeon robust thermal profile processors#										
95W	5+7	14	6	14	14	14	14	14	12	12
70W	14	14	6	14	14	14	14	14	12	12

* Thermal Design Power.
§ Support shown is for non-NEBS environments.
** BladeCenter H 2980W AC Power Modules, 68Y6601 (standard in 4Tx, optional with all other BC-H models).
† BladeCenter H Enhanced Cooling Modules, 68Y6650 (standard in 4Tx, optional with all other BC-H models).
‡ Not supported.
# Intel Xeon E5-2648L (70 W) and E5-2658 (95 W) are robust thermal profile processors used in HS23.

Processors

The HS23 supports the processor options listed in the following table. The server supports one or two processors. The following table also shows which server models have each processor standard. If no corresponding *where used* model for a particular processor is listed, then this processor is available only through Configure to Order (CTO).

Table 5. Processor options

Part number	Intel Xeon processor description	Models where used
81Y9292	Intel Xeon Processor E5-2603 4C 1.8GHz 10MB 1066MHz 80 W	A1x
81Y9294	Intel Xeon Processor E5-2609 4C 2.4GHz 10MB 1066MHz 80 W	A2x
81Y9295	Intel Xeon Processor E5-2620 6C 2.0GHz 15MB 1333MHz 95W	B1x, 91x, E1U, E4U, K1G
94Y8572	Intel Xeon Processor E5-2630 6C 2.3GHz 15MB 1333MHz 95W	B3x, E2U, G1x
81Y9304	Intel Xeon Processor E5-2630L 6C 2.0GHz 15MB 1333MHz 60W	-
94Y8570	Intel Xeon Processor E5-2637 2C 3.0GHz 5MB 1600MHz 80W	-
94Y8571	Intel Xeon Processor E5-2640 6C 2.5GHz 15MB 1333MHz 95W	B2x, E5U
46C9206	Intel Xeon Processor E5-2643 4C 3.3GHz 10MB 1600MHz 130W	-
94Y8562*	Intel Xeon Processor E5-2648L 8C 1.8GHz 20MB 1600MHz 70W	F1x
81Y9298	Intel Xeon Processor E5-2650 8C 2.0GHz 20MB 1600MHz 95W	C1x, C6x, 92x, 93x, E6U
81Y9305	Intel Xeon Processor E5-2650L 8C 1.8GHz 20MB 1600MHz 70W	D1xy
94Y8565*	Intel Xeon Processor E5-2658 8C 2.1GHz 20MB 1600MHz 95W	-
81Y9299	Intel Xeon Processor E5-2660 8C 2.2GHz 20MB 1600MHz 95W	C2x, C7x
94Y8671	Intel Xeon Processor E5-2665 8C 2.4GHz 20MB 1600MHz 115W	C3x
81Y9302	Intel Xeon Processor E5-2667 6C 2.9GHz 15MB 1600MHz 130W	-
94Y8589	Intel Xeon Processor E5-2670 8C 2.6GHz 20MB 1600MHz 115W	C4x, E3U, G2x
81Y9300	Intel Xeon Processor E5-2680 8C 2.7GHz 20MB 1600MHz 130W	C5x, C8x

* Intel Xeon robust thermal profile processors.

Memory

Lenovo DDR3 memory is compatibility tested and tuned for optimal System x® and BladeCenter performance and throughput. Lenovo memory specifications are integrated into the light path diagnostics for immediate system performance feedback and optimum system uptime. From a service and support standpoint, Lenovo memory automatically assumes the Lenovo system warranty, and Lenovo provides service and support worldwide.

The BladeCenter HS23 (E5-2600) supports Very Low Profile (VLP) DDR3 memory RDIMMs. The server supports up to eight DIMMs when one processor is installed and up to 16 DIMMs when two processors are installed. Each processor has four memory channels, and there are two DIMMs per channel.

The following rules apply when selecting the memory configuration:

- Mixing 1.5 V and 1.35 V DIMMs in the same server is supported. In such a case all DIMMs operate at 1.5 V.
- The maximum number of ranks supported per channel is eight.
- The maximum quantity of DIMMs that can be installed in the server depends on the number of CPUs, DIMM rank, and operating voltage, as shown in the "Max. qty supported" row in Table 6.
- All DIMMs in all CPU memory channels operate at the same speed, which is determined as the lowest value of:
  - Memory speed supported by specific CPU
  - Lowest maximum operating speed for the selected memory configuration that depends on rated speed, as shown under the "Maximum operating speed" section in Table 6.

Table 6. Maximum memory speeds

Specification	RDIMM									
Rank	Single rank			Dual rank					Quad rank	
Rated speed	1333 MHz		1600 MHz	1333 MHz		1600 MHz	1600 MHz		1333 MHz	
Rated voltage	1.35 V		1.5 V	1.35 V		1.5 V	1.35 V		1.35 V	
Operating voltage	1.35 V	1.5 V	1.5 V	1.35 V	1.5 V	1.5 V	1.35 V	1.5 V	1.35 V	1.5 V
Max. qty supported*	16	16	16	16	16	16	16	16	16	16
Largest DIMM	8 GB	8 GB	8 GB	16 GB	16 GB	16 GB	16 GB	16 GB	32 GB	32 GB
Max. memory capacity*	128 GB	128 GB	128 GB	256 GB	256 GB	256 GB	256 GB	256 GB	512 GB	512 GB
Max. memory at rated speed*	128 GB	128 GB	128 GB	256 GB	256 GB	256 GB	256 GB	256 GB	N/A	N/A
Maximum operating speed										
1 DIMM per channel	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1600 MHz	800 MHz	1066 MHz
2 DIMMs per channel	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1333 MHz	1600 MHz	1333 MHz	1600 MHz	800 MHz	1066 MHz

* Maximum quantity supported is shown for two processors installed. When one processor is installed, the maximum quantity supported is half of what is shown.

The following memory protection technologies are supported:

- ECC
- Chipkill
- Memory mirroring
- Memory rank sparing

If memory mirroring is used, then DIMMs must be installed in pairs (minimum of one pair per CPU), and both DIMMs in a pair must be identical in type and size. The effective memory available to the system is only half of that installed.

If memory rank sparing is used, then two single-rank or dual-rank DIMMs must be installed per populated channel (the DIMMs do not need to be identical). In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The size of a rank varies depending on the DIMMs installed.

Chipkill, memory mirroring, and memory rank sparing modes are mutually exclusive. Only one operational memory mode can be enabled on a server, and it is a system-wide setting.

The following table lists memory options available for the HS23 server. DIMMs can be installed one at a time, but for performance reasons, install them in sets of four (one for each of the four memory channels).

Table 7. Memory options for the HS23

Part number	Feature code	Description	Maximum supported	Models where used
1333 MHz DIMMs				
46C0563	A0WY	4GB (1x4GB, 1Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	-
46C0564	A0WZ	4GB (1x4GB, 2Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	A1x, A2x, B1x, B2x, B3x, D1x, E1U, F1x, G1x
46C0568*	8644*	8GB (1x8GB, 2Rx4, 1.35V) PC3-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	91x, E2U, K1G
00D4985	A3BU	8GB (1x8GB, 2Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	E4U, E5U
46C0599	2422	16GB (1x16GB, 2Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	-
00D5008	A3KN	32GB (1x32GB, 4Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333MHz VLP RDIMM	16 (8 per processor)	-
1600 MHz DIMMs				
90Y3148	A1S1	4GB (1x4GB, 2Rx8, 1.5V) PC3-12800 CL11 ECC DDR3 1600 MHz VLP RDIMM	16 (8 per processor)	C1x, C2x, C3x, C4x, C5x, G2x
00D4989*	A3BV*	8GB (1x8GB, 1Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	16 (8 per processor)	93x, C7x
90Y3149*	A1S2*	8GB (1x8GB, 2Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600 MHz VLP RDIMM	16 (8 per processor)	92x, E3U
00D4993*	A3BW*	8GB (1x8GB, 2Rx8, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	16 (8 per processor)	C6x, C8x, E6U
90Y3157	A3BS	16GB (1x16GB, 2Rx4, 1.5V) PC3-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	16 (8 per processor)	-
46W0716	A4G9	16GB (1x16GB, 2Rx4, 1.35V) PC3L-12800 CL11 ECC DDR3 1600MHz VLP RDIMM	16 (8 per processor)	-

* Withdrawn, not available for ordering. Intended only as a reference for models where used.

Internal storage

The HS23 server has two hot-swap drive bays accessible from the front of the blade server. These bays are connected to the integrated 4-port LSI SAS2004 6 Gbps SAS/SATA RAID-on-Chip (ROC) controller.

The integrated LSI SAS2004 ROC has the following features:

- Four-port controller with 6 Gbps throughput per port
- PCIe x4 Gen 2 host interface
- Two SAS ports routed internally to the two hot-swap drive bays
- Two ports can be routed to the chassis I/O bays 3 and 4 with the SAS Connectivity Card (CIOv)
- Supports RAID levels:
    - RAID 0 (Integrated Striping)
    - RAID 1 (Integrated Mirroring)
    - RAID 10 (Integrated Mirroring and Striping)
    - RAID 1E (Integrated Mirroring Enhanced)
- Supports up to 14 drives (up to 12 integrated RAID drives and up to two hot-spare drives)
- Supports up to 10 integrated RAID drives per integrated volume
- Supports up to two integrated volumes
- Supports volumes greater than 2 TB for RAID 0, 10, and 1E
- Supports SAS and SATA HDDs and SSDs
- Supports connectivity to the disk storage modules in the BladeCenter S chassis
- Support connectivity to the tape drives and external storage systems

The following table lists the hard drive options that are available for internal storage.

Table 8. Drive options for internal storage

Part number	Feature code	Description	Maximum supported
SAS HDDs			
90Y8926	A2XB	146GB 15K 6Gbps SAS 2.5" SFF G2HS HDD	2
90Y8877	A2XC	300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
81Y9670	A283	300GB 15K 6Gbps SAS 2.5" SFF HS HDD	2
90Y8872	A2XD	600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
00AJ300	A4VB	600GB 15K 6Gbps SAS 2.5'' G2HS HDD	2
81Y9650	A282	900GB 10K 6Gbps SAS 2.5" Slim-HS HDD	2
00AD075	A48S	1.2TB 10K 6Gbps SAS 2.5'' G2HS HDD	2
00NA441	ASCD	1.8TB 10K 6Gbps SAS 2.5" G2HS 512e HDD	2
NL SAS HDDs			
90Y8953	A2XE	500GB 7.2K 6Gbps NL SAS 2.5" SFF G2HS HDD	2
81Y9690	A1P3	1TB 7.2K 6Gbps NL SAS 2.5" SFF Slim-HS HDD	2
NL SATA HDDs			
81Y9726	A1NZ	500GB 7.2K 6Gbps SATA 2.5" SFF Slim-HS HDD	2
81Y9730	A1AV	1TB 7.2K 6Gbps SATA 2.5" SFF Slim-HS HDD	2
SATA SSDs			
00AJ355	A56Z	120GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ360	A570	240GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ365	A571	480GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ370	A572	800GB SATA 2.5" MLC HS Enterprise Value SSD	2

Part number	Feature code	Description	Maximum supported
00AJ000	A4KM	S3500 120GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ005	A4KN	S3500 240GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ010	A4KP	S3500 480GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ015	A4KQ	S3500 800GB SATA 2.5" MLC HS Enterprise Value SSD	2
SAS SSDs			
49Y6129	A3EW	200GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6134	A3EY	400GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6139	A3F0	800GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6195	A4GH	1.6TB SAS 2.5" MLC HS Enterprise SSD	2

Optical drives

The server does interface to the optical drive installed in the BladeCenter chassis media tray if one is installed there.

I/O expansion

The HS23 server offers the following PCI Express 3.0 slots:

- CIOv expansion slot: PCIe 3.0 x8
- CFFh expansion slot: PCIe 3.0 x16

The CIOv I/O expansion connector provides I/O connections through the midplane of the chassis to modules located in bays 3 and 4 of a supported BladeCenter chassis. The CFFh I/O expansion connector provides I/O connections to high-speed switch modules that are located in bays 7, 8, 9, and 10 of a BladeCenter H or BladeCenter HT chassis.

The following table shows the connections between adapters installed in the HS23 blade server to the switch bays in the chassis.

Table 9. Adapter to I/O bay correspondence

I/O adapter slot in the HS23	Port on the adapter	Corresponding I/O module bay in the chassis		
		BladeCenter E	BladeCenter H, HT	BladeCenter S
Integrated 1 GbE	Port 1	I/O bay 1	I/O bay 1	I/O bay 1
	Port 2	I/O bay 2	I/O bay 2	I/O bay 1
Integrated 10 GbE	Port 1	Not supported	I/O bay 7†	I/O bay 2*
	Port 2	Not supported	I/O bay 9†	I/O bay 2*
CIOv slot	Port 1	I/O bay 3	I/O bay 3	I/O bay 3
	Port 2	I/O bay 4	I/O bay 4	I/O bay 4
CFFh slot	Port 1	Not supported	I/O bay 7	I/O bay 2
	Port 2	Not supported	I/O bay 9	I/O bay 2
	Port 3	Not supported	I/O bay 8	Not supported
	Port 4	Not supported	I/O bay 10	Not supported

† Requires the 10Gb LOM Interposer Card or Emulex 10GbE Virtual Fabric Adapter II for HS23 be installed in HS23.
* Requires the 10Gb LOM Interposer Card be installed in HS23. Both 10 GbE ports are routed to the I/O bay 2 of the BladeCenter S chassis and operate at 1 Gbps speed.

The HS23 optionally supports the PCI Express Gen 2 Expansion Blade II listed in the following table.

Table 10. PCIe expansion blades

Part number	Feature code	Description	Maximum supported
68Y7484	A247	BladeCenter PCI Express Gen 2 Expansion Blade II	4

The expansion blade provides the capability to attach selected PCI Express cards to the HS23. This capability is ideal for many applications that require special telecommunications network interfaces or hardware acceleration using a PCI Express card. The expansion blade provides one full-height and full-length PCI Express x16 (x8-wired) Gen 2 slot and one full-height and half-length PCI Express x16 (x8-wired) Gen 2 slot with a maximum power usage of 75 watts for each slot. It integrates PCI Express card support capability into the BladeCenter architecture. Up to four expansion blades can be attached to an HS23. Each expansion blade occupies a bay in the BladeCenter chassis.

For more information, see the Product Guide *BladeCenter PCI Express Gen 2 Expansion Blade and PCI Express Gen 2 Expansion Blade II*:
http://lenovopress.com/tips0783

Network adapters

The HS23 offers two integrated Gigabit Ethernet ports and two integrated 10 Gb Ethernet ports with the integrated Emulex BladeEngine 3 (BE3) controller. Two Gigabit Ethernet ports are routed to the chassis I/O bays 1 and 2 (BladeCenter E, H or HT), and two 10 Gb Ethernet ports are routed to the chassis I/O bays 7 and 9 using either 10Gb LOM Interposer Card or Emulex Virtual Fabric Adapter II for HS23 (BladeCenter H or HT). With BladeCenter S, both GbE ports are routed to the chassis I/O bay 1, and both 10 GbE ports are routed to the chassis I/O bay 2 using the 10Gb LOM Interposer Card (if installed).

The integrated BE3 4-port NIC has the following features:

- Two Gigabit Ethernet ports and two 10 Gb Ethernet ports (1 Gb and 10 Gb auto-negotiation).
- Full-duplex (FDX) capability.
- 10 Gb ports operate in either a virtual NIC (vNIC) or physical NIC (pNIC) mode:
  - vNIC mode: Up to six vNICs (up to three vNICs per one 10 Gb port)
    - Virtual Fabric mode or Switch Independent operational mode.
    - Virtual port bandwidth allocation in 100 Mbps increments.
    - Up to two vNICs can be configured as an iSCSI or FCoE vNICs (one per port) with optional Advanced Upgrade (90Y9310).
  - pNIC mode: dual-port 1/10 Gb Ethernet adapter
- IPv4/IPv6 offload:
  - TCP, UDP checksum offload
  - Large send offload (LSO)
  - Large receive offload (LRO)
  - Receive side scaling (RSS)
- IPv4 TCP Chimney Offload.
- IEEE 802.1Q VLAN tagging.
- VLAN insertion and extraction.
- Jumbo frames up to 9000 bytes.
- Load balancing and failover teaming support, including adapter fault tolerance (AFT), switch fault tolerance (SFT), adaptive load balancing (ALB), and IEEE 802.3ad.

- Enhanced Ethernet (draft) support:
    - Enhanced Transmission Selection (ETS) (P802.1Qaz)
    - Priority-based Flow Control (PFC) (P802.1Qbb)
    - Data Center Bridging eXchange Protocol (DCBX) (P802.1Qaz)
- Supports Serial over LAN (SoL) and concurrent KVM (cKVM).
- Preboot Execution Environment (PXE) support.
- Wake On LAN support.
- PCIe x8 Gen 2 host interface.
- SR-IOV support.
- Message Signal Interrupt (MSI-X) support.

The following table lists the 10Gb LOM Interposer Card.

Table 11. 10Gb LOM Interposer Card

Part number	Feature code	Description	Maximum supported	Standard models where used
94Y8550	A244	10Gb LOM Interposer Card	1	All except A1x, A2x

Note: While the 10Gb LOM Interposer card does not consume a CFFh slot, you have to remove it if you plan to install a CFFh expansion card.

The following table lists additional supported network adapters and upgrades.

Table 12. Network adapters

Part number	Feature code	Description	Slots supported	Maximum supported
Virtual Fabric Adapters and Upgrades				
90Y9310	A2TD	Virtual Fabric Advanced Software Upgrade (LOM)	(License only)	1
81Y3120	A287	Emulex 10GbE Virtual Fabric Adapter II for HS23	CFFh*	1
90Y9350	A2ZP	Virtual Fabric Advanced FOD Upgrade (for 81Y3120)	(License only)	1
90Y9332	A2ZN	Emulex 10GbE Virtual Fabric Adapter Advanced II for HS23	CFFh*	1
1 Gb Ethernet				
44W4479	5476	2/4 Port Ethernet Expansion Card (CFFh)	CFFh	1
44W4475	5477	Ethernet Expansion Card (CIOv)	CIOv	1

* With Emulex Virtual Fabric Adapters II for HS23 installed in a blade server, two 10 Gb Ethernet ports on the adapter itself are routed to the chassis I/O bays 8 and 10 (unlike other CFFh cards), and two 10 Gb Ethernet ports integrated on a blade itself are routed to the chassis I/O bays 7 and 9.

For more information, see the list of Product Guides in the Blade Network Adapters category:
http://lenovopress.com/servers/blades/nic

Storage host bus adapters

The following table lists storage HBAs supported by the HS23 server.

Table 13. Storage adapters

Part number	Feature code	Description	Slots supported	Maximum supported
Fibre Channel				
46M6140	3598	Emulex 8Gb Fibre Channel Expansion Card (CIOv)	CIOv	1
44X1945	1462	QLogic 8Gb Fibre Channel Expansion Card (CIOv)	CIOv	1
00Y3270*	A3JC	QLogic Enet and 8Gb FC Exp Card (CFFh)	CFFh	1
SAS				
43W4068	1593	SAS Connectivity Card (CIOv)	CIOv	1

For more information, see the list of Product Guides in the Blade Storage Adapters category:
http://lenovopress.com/servers/blades/hba

Flash storage adapters

The HS23 server supports the flash storage adapters listed in the following table. The adapters must be installed in a BladeCenter PCI Express Gen 2 Expansion Blade II. Up to eight flash storage adapters supported per one HS23 (two per PCI Express Gen 2 Expansion Blade II and up to four PCI Expansion Blades per HS23).

Table 14. Flash storage adapters

Part number	Feature code	Description	Maximum supported (per exp. blade / per HS23)
io3 Flash Adapters - Enterprise Value (Require the PCI Express Gen 2 Expansion Blade II [68Y7484])			
00AE983	ARYK	1250GB Enterprise Value io3 Flash Adapter	2 / 8
00AE986	ARYL	1600GB Enterprise Value io3 Flash Adapter	2 / 8
00AE989	ARYM	3200GB Enterprise Value io3 Flash Adapter	2 / 8
00AE992	ARYN	6400GB Enterprise Value io3 Flash Adapter	1 / 4
io3 Flash Adapters - Enterprise (Require the PCI Express Gen 2 Expansion Blade II [68Y7484])			
00AE995	ARYP	1000GB Enterprise io3 Flash Adapter	2 / 8
00AE998	ARYQ	1300GB Enterprise io3 Flash Adapter	2 / 8
00JY001	ARYR	2600GB Enterprise io3 Flash Adapter	2 / 8
00JY004	ARYS	5200GB Enterprise io3 Flash Adapter	1 / 4

For information about these adapters, see the following Product Guides:

- Enterprise io3 Flash Adapters
  http://lenovopress.com/tips1237-enterprise-value-io3-pcie-flash-adapters
- Enterprise Value io3 PCIe Flash Adapters
  http://lenovopress.com/tips1236-enterprise-io3-pcie-flash-adapters

Power supplies

Server power is derived from the power supplies installed in the BladeCenter chassis. There are no server options regarding power supplies.

Integrated virtualization

The server supports VMware ESXi installed on a USB memory key. The key is installed in a USB socket inside the server. The following table lists the virtualization options.

Table 15. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	Blank USB Memory Key for VMWare ESXi Downloads	1
41Y8382	A4WZ	USB Memory Key for VMWare ESXi 5.1 Update 1	1

Remote management

The server contains an Integrated Management Module II (IMM2), which is based on the Renesas SH7757 chip, and interfaces with the advanced management module in the BladeCenter chassis. The combination of these provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, LEDs on the system board are lit to help you diagnose the problem, the error is recorded in the event log, and you are alerted to the problem. A virtual presence capability comes standard for remote server management through the Advanced Management Module (AMM) in the BladeCenter chassis.

Remote server management is provided through industry-standard interfaces:

- Simple Network Management Protocol (SNMP) Version 3
- Systems Management Architecture for Server Hardware (SMASH)
- Web browser

The server also supports virtual media and remote control features, which provide the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel, regardless of the system state

- Remotely accessing the server using the keyboard and mouse from a remote client

- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO image files as virtual drives that are available for use by the server

- Capturing blue-screen errors

Operating systems

The HS23 blade server supports the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows HPC Server 2008
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition

- Oracle Solaris 10 Operating System
- Oracle Solaris 11 Operating System
- Red Hat Enterprise Linux 7
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- SUSE Linux Enterprise Server 12 with Xen
- SUSE Linux Enterprise Server 12
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for x86
- VMware vSphere 6.0
- VMware vSphere 5.5
- VMware vSphere 5.1
- VMware vSphere 5.0
- VMware ESX 4.1
- VMware ESXi 4.1

For more information about the specific versions and service levels that are supported and any other prerequisites, see the Operating System Interoperability Guide:
https://lenovopress.com/redposig-operating-system-interoperability-guide

Physical specifications

The HS23 blade server has the following physical specifications:

Dimensions and weight (approximate, for single-wide blade):

- Height: 245 mm (9.7 in)
- Depth: 446 mm (17.6 in)
- Width: 29 mm (1.14 in)
- Maximum weight: 5.4 kg (12 lb)

Shipping dimensions and weight (approximate, for single-wide blade):

- Height: 330 mm (13.0 in)
- Depth: 600 mm (23.5 in)
- Width: 165 mm (6.5 in)
- Weight: 4.2 kg (9.4 lb)

Operating environment

The HS23 blade server is supported in the following environment:

- Air temperature
  - Server on:
    - 10 to 35 °C (50 to 95 °F); altitude: 0 to 914 m (0 to 3,000 ft)
    - 10 to 32 °C (50 to 89.6 °F); altitude: 914 to 2133 m (3,000 to 7,000 ft)
  - Server off: 10 to 43 °C (50 to 109.4 °F)
  - Shipment: -40 to +60 °C (-40 to 140 °F)
- Humidity
  - Server on: 8 to 80%
  - Server off: 8 to 80%

Warranty

The BladeCenter HS23 has a three-year warranty with 24x7 standard call center support and 9x5 Next Business Day onsite coverage. Also available are Lenovo Services warranty maintenance upgrades and post-warranty maintenance agreements, with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

Lenovo warranty service upgrade offerings are region-specific. Not all warranty service upgrades are available in every region. For more information about Lenovo warranty service upgrade offerings that are available in your region, visit the Lenovo Services website:
https://www-304.ibm.com/sales/gss/download/spst/servicepac

The following table explains warranty service definitions in more detail.

Table 16. Warranty service definitions

Term	Description
On-site service	A service technician will arrive at the client's location for equipment service.
24x7x2 hour	A service technician is scheduled to arrive at the client's location within two hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
24x7x4 hour	A service technician is scheduled to arrive at the client's location within four hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
9x5x4 hour	A service technician is scheduled to arrive at the client's location within four business hours after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the client's local time zone, Monday-Friday, excluding Lenovo holidays. For example, if a customer reports an incident at 3:00 pm on Friday, the technician will arrive by 10:00 am the following Monday.
9x5 next business day	A service technician is scheduled to arrive at the client's location on the business day after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the client's local time zone, Monday - Friday, excluding Lenovo holidays. Calls received after 4:00 pm local time require an extra business day for service dispatch. Next business day service is not guaranteed.
Committed Repair	Problems receive priority handling so that repairs are completed within the committed time of 6, 8, or 24 hours. Lenovo provides service 24 hours/day, every day, including Lenovo holidays.

The following Lenovo warranty service upgrades are available:

- Warranty and maintenance service upgrades:
    - Three, four, or five years of 9x5 or 24x7 service coverage
    - Onsite response from next business day to 2 or 4 hours
    - Warranty extension of up to 5 years
    - Post warranty extensions
- Hard Drive Retention
  Lenovo's Hard Drive Retention service is a multi-drive hard drive retention offering that ensures your data is always under your control, regardless of the number of hard drives that are installed in your Lenovo server. In the unlikely event of a hard drive failure, you retain possession of your hard drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. The Hard Drive Retention service can be purchased in convenient bundles with our warranty upgrades and extensions.

- Remote Technical Support Services (RTS)
  RTS provides comprehensive technical call center support for covered servers, storage, operating systems, and applications. Providing a single source for support of hardware and software issues, RTS can reduce problem resolution time, decreasing the cost to address technical problems and increasing uptime. Offerings are available for Windows, Linux, IBM Systems Director, VMware, Microsoft business applications, and Lenovo System x storage devices, and IBM OEM storage devices.

Regulatory compliance

The HS23 blade server conforms to the following standards:

- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1-03
- Japan VCCI, Class A
- Australia/New Zealand AS/NZS CISPR 22:2006, Class A
- IEC 60950-1(CB Certificate and CB Test Report)
- Taiwan BSMI CNS13438, Class A
- Korea KN22, Class A; KN24
- Russia/GOST ME01, IEC-60950-1, GOST R 51318.22-99, GOST R 51318.24-99, GOST R 51317.3.2-2006, GOST R 51317.3.3-99
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, EN61000-3-3)
- CISPR 22, Class A

External drive enclosures

The HS23 does not support external drive enclosures. It can be used with the BladeCenter S integrated storage or external storage systems listed in the "External storage systems" section.

The BladeCenter S integrated storage is supported by the integrated LSI SAS2004 ROC controller together with the SAS connectivity card installed in the CIOv slot of the HS23. The following table lists the connectivity card.

Table 17. SAS connectivity card

Part number	Description	Maximum quantity supported
43W4068	SAS Connectivity Card (CIOv)	1

For more information about the BladeCenter S integrated storage, see the BladeCenter S product guide: http://lenovopress.com/tips0977

External storage systems

The following table lists the external storage systems that are offered by Lenovo that can be used with the BladeCenter HS23 in storage solutions.

Table 18. External storage systems

Part number	Description
Lenovo N Series (1 Gb or 10 Gb Ethernet NAS connectivity)	
70FX / 70FY*	Lenovo Storage N3310
70G0 / 70G1*	Lenovo Storage N4610
Lenovo Storage S2200 (1 Gb or 10 Gb iSCSI connectivity)	
64114B1	Lenovo Storage S2200 LFF Chassis FC/iSCSI Single Controller, Rack Kit, 9x5NBD
64114B2	Lenovo Storage S2200 LFF Chassis FC/iSCSI Dual Controller, Rack Kit, 9x5NBD
64114B3	Lenovo Storage S2200 SFF Chassis FC/iSCSI Single Controller, Rack Kit, 9x5NBD
64114B4	Lenovo Storage S2200 SFF Chassis FC/iSCSI Dual Controller, Rack Kit, 9x5NBD
Lenovo Storage S3200 (1 Gb or 10 Gb iSCSI connectivity)	
64116B1	Lenovo Storage S3200 LFF Chassis FC/iSCSI Single Controller, Rack Kit, 9x5NBD
64116B2	Lenovo Storage S3200 LFF Chassis FC/iSCSI Dual Controller, Rack Kit, 9x5NBD
64116B3	Lenovo Storage S3200 SFF Chassis FC/iSCSI Single Controller, Rack Kit, 9x5NBD
64116B4	Lenovo Storage S3200 SFF Chassis FC/iSCSI Dual Controller, Rack Kit, 9x5NBD
IBM Storwize (1 Gb or 10 Gb iSCSI connectivity, 8 Gb FC connectivity, 10 Gb FCoE connectivity)	
6096CU2	IBM Storwize V3500 3.5-inch Dual Control Storage Controller Unit
6096CU3	IBM Storwize V3500 2.5-inch Dual Control Storage Controller Unit
6099L2C	IBM Storwize V3700 3.5-inch Storage Controller Unit
6099S2C	IBM Storwize V3700 2.5-inch Storage Controller Unit
6099T2C	IBM Storwize V3700 2.5-inch DC Storage Controller Unit
6194L2C	IBM Storwize V5000 LFF Control Enclosure
6194S2C	IBM Storwize V5000 SFF Control Enclosure
6195SC5	IBM Storwize V7000 2.5-inch Storage Controller Unit

* Machine Type; see the respective Product Guide in the NAS Storage category (http://lenovopress.com/storage/nas) for available models.

For more information, see the list of Product Guides in the following categories:

- Lenovo N Series storage: http://lenovopress.com/storage/nas
- Lenovo S Series storage: http://lenovopress.com/storage/san/lenovo
- IBM storage: http://lenovopress.com/storage/san/ibm

External backup units

The following table lists the external backup options that are offered by Lenovo that can be used with the BladeCenter HS23 in backup solutions.

Table 19. External backup options

Part number	Description
External RDX USB drives	
362532Y	RDX External USB 3.0 Dock with 320GB Cartridge
362550Y	RDX External USB 3.0 Dock with 500GB Cartridge
36251TY	RDX External USB 3.0 Dock with 1TB Cartridge
External SAS tape backup drives	
6160S5E	IBM TS2250 Tape Drive Model H5S
External SAS tape backup autoloaders	
6171S5R	IBM TS2900 Tape Autoloader w/LTO5 HH SAS
External tape backup libraries	
61732UL	IBM TS3100 Tape Library Model L2U
61734UL	IBM TS3200 Tape Library Model L4U
Fibre Channel backup drives for TS3100 and TS3200 Tape Libraries	
00NA107	6173 LTO Ultrium 5 Fibre Channel Drive
00NA113	6173 LTO Ultrium 5 Half High Fibre Drive Sled
SAS backup drives for TS3100 and TS3200 Tape Libraries	
00NA109	6173 LTO Ultrium 5 SAS Drive Sled
00NA111	6173 LTO Ultrium 5 Half High SAS Drive Sled

For more information, see the list of Product Guides in the Backup units category:
https://lenovopress.com/servers/options/backup

Lenovo Financial Services

Lenovo Financial Services reinforces Lenovo's commitment to deliver pioneering products and services that are recognized for their quality, excellence, and trustworthiness. Lenovo Financial Services offers financing solutions and services that complement your technology solution anywhere in the world.

We are dedicated to delivering a positive finance experience for customers like you who want to maximize your purchase power by obtaining the technology you need today, protect against technology obsolescence, and preserve your capital for other uses.

We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

Our Premier Client services provide large accounts with special handling services to ensure these complex transactions are serviced properly. As a premier client, you have a dedicated finance specialist who manages your account through its life, from first invoice through asset return or purchase. This specialist develops an in-depth understanding of your invoice and payment requirements. For you, this dedication provides a high-quality, easy, and positive financing experience.

For your region specific offers please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website: http://www.lenovofs.com

Related publications and links

For more information, see the following resources:

- US Announcement Letter for HS23
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-044
- US Announcement Letter for memory, SSD and processor options for HS23
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-120
- BladeCenter Information Center
  http://publib.boulder.ibm.com/infocenter/bladectr/documentation
- ServerProven hardware compatibility page for the HS23
  http://www.lenovo.com/us/en/serverproven/blade/7875.shtml
- Lenovo Server Operating System Interoperability Guide
  http://lenovopress.com/redposig
- BladeCenter Interoperability Guide
  http://lenovopress.com/redpbcig
- *xREF: System x Reference*
  http://lenovopress.com/xref
- Support Portal - BladeCenter HS23
  https://www-947.ibm.com/support/entry/portal/product/bladecenter/bladecenter_hs23

Related product families

Product families related to this document are the following:

- Blade Servers

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
1009 Think Place - Building One
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

This document, TIPS0843, was created or updated on April 6, 2016.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
  http://lenovopress.com/TIPS0843

- Send your comments in an e-mail to:
  comments@lenovopress.com

This document is available online at http://lenovopress.com/TIPS0843.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at https://www.lenovo.com/us/en/legal/copytrade/.

The following terms are trademarks of Lenovo in the United States, other countries, or both:
BladeCenter Interoperability Guide
BladeCenter®
Lenovo Services
Lenovo®
ServerGuide
ServerProven®
System x®
vNIC

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux® is a trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft®, Windows Server®, and Windows® are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.