

## Flex System x440 Compute Node (7167) Product Guide (withdrawn product)

The Lenovo Flex System™ x440 Compute Node is a four-socket Intel Xeon processor-based server that is optimized for high-end virtualization, mainstream database deployments, and memory-intensive, high-performance environments.

**Withdrawn from marketing:** The models covered in this product guide are now withdrawn from marketing. The replacement system is the ThinkSystem SN850 which is described in <https://lenovopress.com/LP0638>.

Available with Intel Xeon E5-4600 v2 processors, it is price-performance optimized with a selection of processors, memory, and I/O options to help you match system capabilities and cost to workloads without compromise. The Flex System x440 Compute Node can help reduce floor space that is used and lower data center power and cooling costs.

Suggested usage: Database, virtualization, and enterprise applications.

The following figure shows the Flex System x440 Compute Node.



Figure 1. Lenovo Flex System x440 Compute Node

### Did you know?

Flex System is a new category of computing that integrates multiple server architectures, networking, storage, and system management capability into a single system that is easy to deploy and manage. Flex System has full, built-in virtualization support for servers, storage, and networking to speed provisioning and increase resiliency. In addition, it supports open industry standards, such as operating systems, networking and storage fabrics, virtualization, and system management protocols, to easily fit within existing and future data center environments. Flex System is scalable and extendable with multi-generation upgrades to protect and maximize IT investments.

## Key features

This section describes the key features of the compute node.

### Scalability and performance

The x440 offers the following features to boost performance, improve scalability, and reduce costs:

- The Intel Xeon processor E5-4600 v2 product family improves productivity by offering superior system performance with 12-core processors and up to 3.3 GHz core speeds, up to 30 MB of L3 cache, and up to two 8 GTps QPI interconnect links.
- Up to four processors, 48 cores, and 96 threads maximize the concurrent execution of multithreaded 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 thermal design power (TDP).
- Intel Hyper-Threading Technology boosts performance for multithreaded applications by enabling simultaneous multithreading 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 use the hardware for virtualization workloads.
- Intel Advanced Vector Extensions (AVX) improve floating-point performance for compute-intensive technical and scientific applications compared to Intel Xeon 5600 series processors.
- Up to 48 DDR3 ECC memory RDIMMs provide speeds up to 1600 MHz and a memory capacity of up to 768 GB. Load-reduced DIMMs (LRDIMMs) are supported with a maximum capacity of 1.5 TB of memory.
- The use of solid-state drives (SSDs) instead of or along with traditional hard disk drives (HDDs) can significantly improve I/O performance. An SSD can support up to 100 times more I/O operations per second (IOPS) than a typical HDD.
- Up to 64 virtual I/O ports per compute node with optional 10 Gb Ethernet ports, which offer the choice of Ethernet, iSCSI, or FCoE connectivity.
- The x440 offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by 60% (8 GTps per link), compared with the previous generation of PCI Express 2.0.
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This configuration reduces I/O latency and increases overall system performance.
- Support for up to four I/O adapters in each x440 Compute Node.

### Availability and serviceability

The x440 provides the following features to simplify serviceability and increase system uptime:

- Chipkill, memory mirroring, and memory rank sparing for redundancy if there is a non-correctable memory failure.
- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as processor, memory, and adapter cards.
- Hot-swap drives that support integrated RAID 1 redundancy for data protection and greater system uptime.
- A light path diagnostics panel and individual light path LEDs to quickly lead the technician to failed (or failing) components. This panel simplifies servicing, speeds up problem resolution, and helps improve system availability.
- Predictive Failure Analysis (PFA), which detects when system components (such as processors, memory, and HDDs) operate outside of standard thresholds and generates proactive alerts in advance of possible failure, which increases uptime.
- SSDs that offer 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.

- Three-year customer replaceable unit and on-site limited warranty; next business day 9x5. Optional service upgrades are available.

### **Manageability and security**

The following powerful systems management features simplify local and remote management of the x440:

- An IMM2 to monitor server availability and perform remote management.
- An integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.
- Integrated Trusted Platform Module (TPM) V1.2 support enables advanced cryptographic functionality, such as digital signatures and remote attestation.
- Industry-standard AES NI support for faster and stronger encryption.
- Integrates with the IBM Flex System Manager for proactive systems management. It offers comprehensive systems management for the entire Flex System platform, which increases uptime, reduces costs, and improves productivity through advanced server management capabilities.
- Fabric Manager simplifies the deployment of infrastructure connections by managing network and storage address assignments.
- Intel Execute Disable Bit functionality can prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, which allows an application to run in its own isolated space that is protected from all other software that is running on a system.

### **Energy efficiency**

The x440 offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to a green environment:

- Component-sharing design of the Flex System chassis provides ultimate power and cooling savings.
- The Intel Xeon processor E5-4600 v2 product family offers better performance over the previous generation while fitting into the same 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 use 15% less energy than 1.5 V DDR3 RDIMMs.
- SSDs use approximately 80% less power than traditional spinning 2.5-inch HDDs.
- The x440 uses hexagonal ventilation holes, which is a part of Calibrated Vecteded Cooling technology. Hexagonal holes can be grouped more densely than round holes, which provides more efficient airflow through the system.

## Locations of key components and connectors

The following figure shows the front of the server.

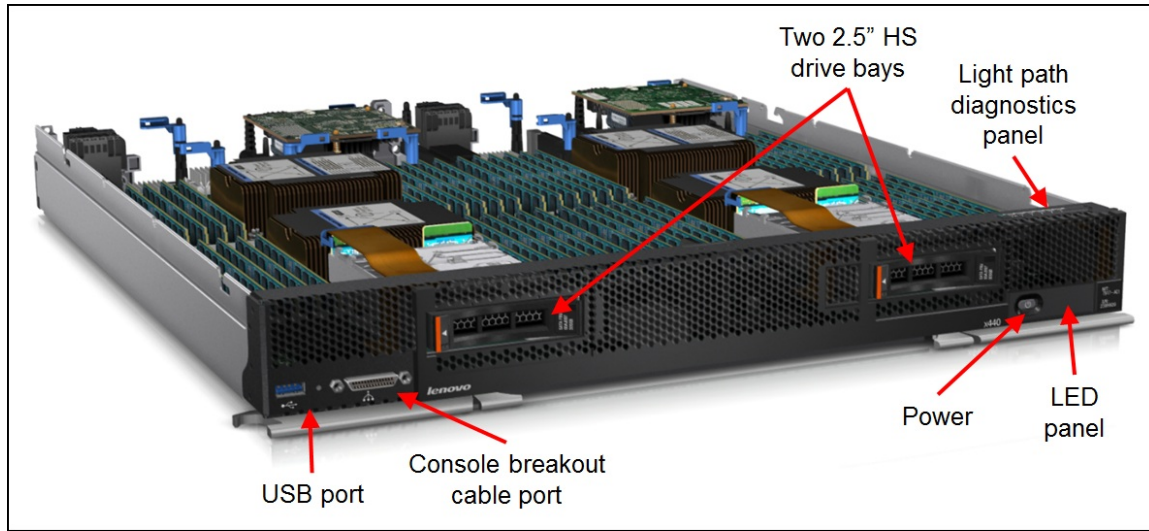


Figure 2. Front view of the Flex System x440 Compute Node

The following figure shows the locations of key components inside the server.

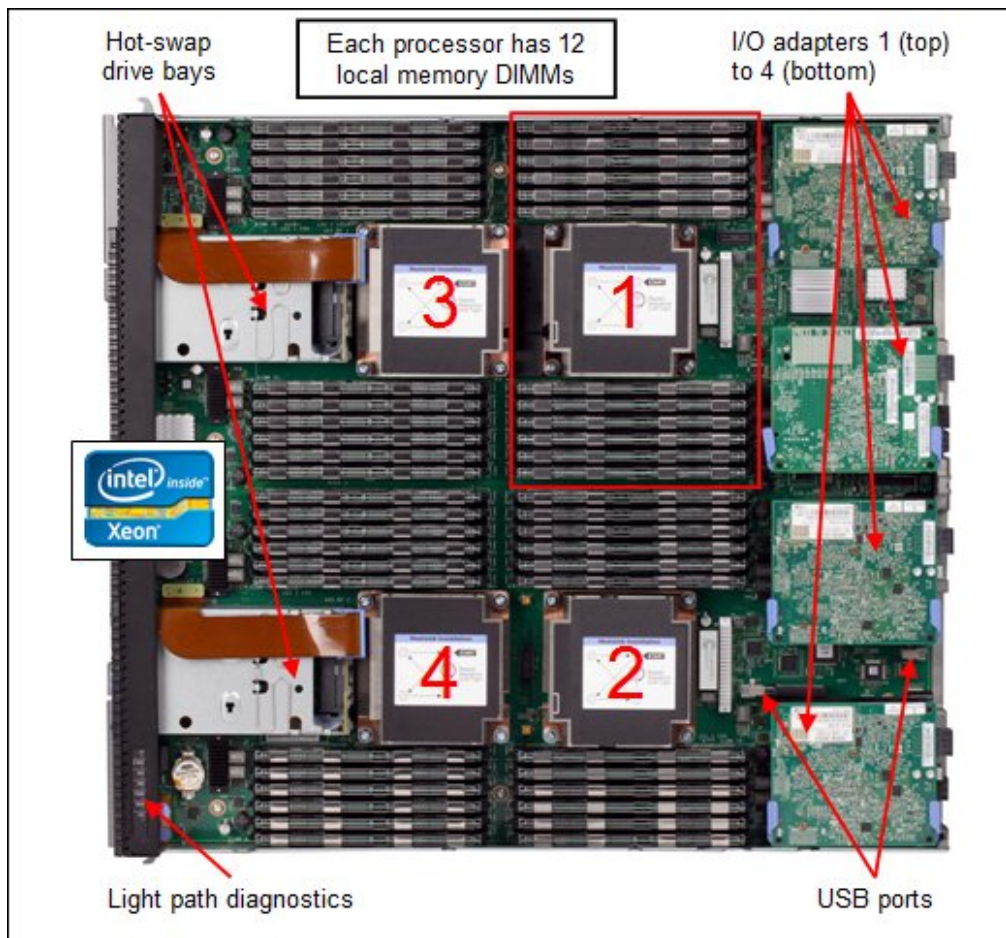


Figure 3. Inside view of the Flex System x440 Compute Node

## Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications

Components	Specification
Machine type	7167
Form factor	Double-wide compute node.
Chassis support	Flex System Enterprise Chassis.
Processor	Up to four Intel Xeon E5-4600 v2 family processors, each with 12 cores (2.4 GHz), 10 cores (2.4 GHz), 8 cores (up to 3.3 GHz), or 6 cores (2.6 GHz). Two QPI links, up to 8.0 GTps each. Up to 1600 MHz memory speed. Up to 30 MB L3 cache per processor.
Chipset	Intel C600 series.
Memory	Up to 48 DIMM sockets (12 DIMMs per processor) that use Low Profile (LP) DDR3 DIMMs. RDIMMs and LRDIMMs supported. Also, 1.5 V and low-voltage 1.35 V DIMMs are supported. Support for up to 1600 MHz memory speed, depending on the processor. Four memory channels per processor (three DIMMs per channel).
Memory maximums	<ul style="list-style-type: none"> <li>With LRDIMMs: Up to 1.5 TB with 48x 32 GB LRDIMMs and four processors.</li> <li>With RDIMMs: Up to 768 GB with 48x 16 GB RDIMMs and four processors.</li> </ul>
Memory protection	ECC, Chipkill (for x4-based memory DIMMs), memory mirroring, and memory rank sparing.
Disk drive bays	Two 2.5-inch hot-swap SAS/SATA drive bays that support SAS, SATA, and SSD drives. Optional support for four additional 1.8-inch SSDs internal to the compute node.
RAID support	RAID 0 and 1 with integrated LSI SAS2004 controller. Optional ServeRAID M5115 RAID controller with RAID 0, 1, 10, 5, and 50 support and 1 GB cache. Supports up to four 1.8-inch SSDs with an expansion kit. Optional flash-backup for cache and SSD performance enabler.
Maximum internal storage	<p>With two 2.5-inch hot-swap drives (Intermix of SAS and SATA HDDs and SSDs is supported):</p> <ul style="list-style-type: none"> <li>Up to 3.2 TB with 1.6 TB 2.5-inch SSDs</li> <li>Up to 2 TB with 1 TB 2.5-inch NL SAS HDDs</li> <li>Up to 2.4 TB with 1.2 TB 2.5-inch SAS HDDs</li> <li>Up to 2 TB with 1 TB 2.5-inch SATA HDDs</li> </ul> <p>With 1.8-inch SSDs and ServeRAID M5115 RAID adapter: Up to an additional 3.2 TB with four 800 GB 1.8-inch SSDs (in addition to the storage provided by the 2.5-inch drives).</p>
Network interfaces	<ul style="list-style-type: none"> <li>x4x models: Two 10 Gb Ethernet ports with Flex System EN4172 2-port 10Gb Ethernet Adapter, based on QLogic BCM57840 ASIC.</li> <li>x2x models: None standard; optional 1 Gb or 10 Gb Ethernet adapters.</li> </ul>
PCI Expansion slots	Four I/O connectors for adapters. PCI Express 3.0 x16 interface. I/O slots 3 and 4 require the second processor installed.
Ports	USB ports: One external. Two internal for embedded hypervisor. Console breakout cable port provides local KVM and serial ports (cable standard with chassis; more cables optional).
Systems management	UEFI, IMM2 with Renesas SH7757 controller, Predictive Failure Analysis, light path diagnostics panel, automatic server restart, and remote presence. Support for Lenovo XClarity Administrator, Flex System Manager, IBM Systems Director, and ServerGuide.
Security features	Power-on password and administrator's password, Trusted Platform Module 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.
Limited warranty	Three-year customer-replaceable unit and on-site limited warranty with 9x5/NBD.

Components	Specification
Operating systems supported	Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi. See the <a href="#">Operating system support</a> section for specifics.
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 hardware and some Lenovo and OEM software.
Dimensions	Width: 437 mm (17.2 in.), height 51 mm (2.0 in.), depth 493 mm (19.4 in.)
Weight	Maximum weight: 12.25 kg (27 lb)

The x440 servers are shipped with the following items:

- Statement of Limited Warranty
- Important Notices
- Documentation CD that contains the *Installation and Service Guide*

## Standard models

The following table lists the standard models.

Table 2. Standard models

Model	Intel Xeon processor (4 maximum)**	Memory	RAID controller	Disk bays (used/max)†	Disks	10 GbE Ethernet	I/O slots (used/max)
7167-G2x	1x E5-4607 v2 6C 2.6GHz 15MB 1333MHz 95W	1x 16 GB (1333 MHz)*	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	Optional	0/4
7167-H2x	1x E5-4610 v2 8C 2.3GHz 16MB 1600MHz 95W	1x 16 GB 1600 MHz	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	Optional	0/4
7167-J2x	1x E5-4620 v2 8C 2.6GHz 20MB 1600MHz 95W	1x 16 GB 1600 MHz	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	Optional	0/4
7167-J4x	1x E5-4620 v2 8C 2.6GHz 20MB 1600MHz 95W	1x 16 GB 1600 MHz	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	2x 10Gb‡	2/4‡
7167-L2x	1x E5-4650 v2 10C 2.4GHz 25MB 1866MHz 95W	1x 16 GB 1600 MHz*	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	Optional	0/4
7167-M2x	1x E5-4657L v2 12C 2.4GHz 30MB 1866MHz 115W	1x 16 GB 1600 MHz*	LSI SAS2004	2.5-inch hot-swap (0 / 2)	Open	Optional	0/4

\*\* Processor detail: Processor quantity and model, cores, core speed, L3 cache, memory speed, and power consumption.

\* For model G2x, the standard DIMM is rated at 1600 MHz, but operates at up to 1333 MHz to match the processor memory speed. For models L2x and M2x, the processor's memory channel operates at 1600 MHz to match the speed of the standard memory DIMM.

† The 2.5-inch drive bays can be augmented with extra internal bays to support up to four 1.8-inch SSDs. For more information, see the [Internal storage](#) section.

‡ The x4x models include the Flex System EN4172 2-port 10Gb Ethernet Adapter.

## Chassis support

The x440 is supported in the Flex System chassis in the following table.

Table 3. Chassis support

Compute node	Enterprise Chassis with CMM 68Y7030	Enterprise Chassis with CMM2 00FJ669	Carrier-Grade Chassis
x440 (7167)	Yes	Yes	No

Up to seven x440 compute nodes can be installed in the chassis in 10U of rack space. The actual number of x440 Compute Nodes that can be installed in a chassis depends on the following factors:

- TDP power rating for the processors that are installed in the x440
- Number of power supplies that are installed
- Capacity of the power supplies that are installed (2100 W or 2500 W)
- Power redundancy policy used (N+1 or N+N)

The following table provides guidelines about the number of x440 Compute Nodes that can be installed. For more information, see the Power Configurator, which is available at this web page:

<http://ibm.com/support/entry/portal/docdisplay?Indocid=LNVO-PWRCONF>

Consider the following points about the following table:

- Green = No restriction to the number of x440 Compute Nodes that can be installed
- Yellow = Some bays must be left empty in the chassis

Table 4. Maximum number of x440 Compute Nodes installable based on installed power supplies and power redundancy policy used

TDP rating	2100 W power supplies installed				2500 W power supplies installed			
	N+1, N=5 6 power supplies	N+1, N=4 5 power supplies	N+1, N=3 4 power supplies	N+N, N=3 6 power supplies	N+1, N=5 6 power supplies	N+1, N=4 5 power supplies	N+1, N=3 4 power supplies	N+N, N=3 6 power supplies
95 W	7	7	6	6	7	7	7	7
115 W	7	7	5	6	7	7	7	7
130 W	7	7	5	5	7	7	6	7

## Processor options

The x440 supports the processor options that are listed in the following table. The server supports one, two, or four processors (three processors is not supported). For a specific processor model (for example, the Xeon E5-4607), there are two part numbers: the first number is for the rear two processors (CPUs 1 and 2) and includes taller heat sinks; the second part number is for the front two processors (CPUs 3 and 4) and includes shorter heat sinks.

The table also shows which server models have each processor standard. If no corresponding model (where used) for a particular processor is listed, this processor is available through Configure to Order (CTO) only.

Table 5. Processor options

Part number	Feature code*	Intel Xeon processor description	CPUs 1 & 2	CPUs 3 & 4	Models where used
00FM322	AS4X / AS54	Intel Xeon Processor E5-4607 v2 6C 2.6GHz 15MB Cache 1333MHz 95W	Yes	No	G2x
47C2303	AS53		No	Yes	
00FM324	AS4Y / AS56	Intel Xeon Processor E5-4610 v2 8C 2.3GHz 16MB Cache 1600MHz 95W	Yes	No	H2x
47C2307	AS55		No	Yes	
00FM326	AS4Z / AS58	Intel Xeon Processor E5-4620 v2 8C 2.6GHz 20MB Cache 1600MHz 95W	Yes	No	J2x, J4x
47C2311	AS57		No	Yes	
00FM343	AS51 / AS5C	Intel Xeon Processor E5-4627 v2 8C 3.3GHz 16MB Cache 1866MHz 130W	Yes	No	-
47C2323	AS5B		No	Yes	
00FM328	AS50 / AS5A	Intel Xeon Processor E5-4650 v2 10C 2.4GHz 25MB Cache 1866MHz 95W	Yes	No	L2x
47C2319	AS59		No	Yes	
00FM330	AS52 / AS5E	Intel Xeon Processor E5-4657L v2 12C 2.4GHz 30MB Cache 1866MHz 115W	Yes	No	M2x
47C2331	AS5D		No	Yes	

\* For rows with two feature codes specified, the first feature code is for Processor 1 and the second feature code is for Processor 2. For rows with one feature code, the feature is for Processors 3 and 4.



## Memory options

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

The x440 supports DDR3 memory. The compute node supports up to 48 DIMMs when four processors are installed, with 12 DIMMs for each processor. Each processor has four memory channels, and there are three DIMMs per channel.

The following table lists the memory options that are available for the x440 Compute Node.

Table 6. Memory options

Part number	Feature code	Description	Maximum supported	Where used
RDIMMs				
00D5036	A3QH	8 GB (1x8 GB, 1Rx4, 1.35 V) PC3L-12800 CL11 ECC DDR3 1600 MHz LP RDIMM	48 (12 per processor)	-
46W0672	A3QM	16 GB (1x16 GB, 2Rx4, 1.35 V) PC3L-12800 CL11 ECC DDR3 1600 MHz LP RDIMM	48 (12 per processor)	All models
LRDIMMs				
46W0761	A47K	32 GB (1x3 2GB, 4Rx4, 1.5 V) PC3-14900 CL13 ECC DDR3 1866MHz LP LRDIMM	48 (12 per processor)	-

The following rules apply when the memory configuration is selected:

- The server supports RDIMMs and LRDIMMs; UDIMMs are not supported
- Mixing different types of memory (for example, RDIMMs and LRDIMMs) is not supported.
- 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 per one channel is eight (with the exception of Load Reduced DIMMs, where more than eight ranks are supported, because one quad-rank LRDIMM provides the same electrical load on a memory bus as a single-rank RDIMM).
- The maximum quantity of DIMMs that can be installed in the server depends on the number of processors that are installed. The following table shows the maximum when all four processors are installed. When two processors are installed, the maximum quantity that is supported is a half of the quantity that is shown.
- All DIMMs in the server operate at the same speed, which is determined as the lowest value of the following factors:
  - The memory speed that is supported by the specific processor.
  - The lowest of maximum operating speeds for the selected memory configuration that depends on rated speed, operating voltage, and quantity of DIMMs per channel, as shown under "Maximum operating speed" section in the table.

The following table shows the maximum memory speeds that are achievable based on the installed DIMMs and the number of DIMMs per channel. The following table also shows the maximum memory capacity at any speed that is supported by the DIMM and the maximum memory capacity at the rated DIMM speed.

Cells that are highlighted with a grey background in the following table indicate when the specific combination of DIMM voltage and number of DIMMs per channel still allows the DIMMs to operate at the rated speed.

Table 7. Maximum memory speeds

DIMM specification	RDIMMs		LRDIMMs
Ranks	Single-rank DIMMs	Dual-rank DIMMs	Quad-rank LRDIMMs
Part numbers	00D5036 (8 GB)	46W0672 (16 GB)	46W0761 (32 GB)
Rated speed	1600 MHz	1600 MHz	1866 MHz
Rated voltage	1.35 V	1.35 V	1.35 V
Max. qty supported*	48	48	48
Max. DIMM capacity	8 GB	16 GB	32 GB
Max. mem. capacity	384 GB	768 GB	1.5 TB
Max memory at rated speed	128 GB	512 GB	None
<b>Max operating speed (MHz) and operating voltage (operates at rated voltage unless specified)</b>			
1 DIMM per channel	1600 MHz	1600 MHz	1600 MHz
2 DIMMs per channel	1600 MHz	1600 MHz	1600 MHz
3 DIMMs per channel	1066 MHz	1066 MHz	1333 MHz

\* The maximum supported quantity is shown for four processors installed. When two processors are installed, the maximum supported quantity is a half of the quantity that is shown. When one processor is installed, the quantity is one quarter of that shown.

The following memory protection technologies are supported:

- ECC
- Chipkill (for x4-based memory DIMMs only; look for "x4" in the DIMM description)
- Memory mirroring
- Memory rank sparing

If memory mirroring is used, DIMMs must be installed in pairs (minimum of one pair per processor), and both DIMMs in a pair must be identical in type and size.

If memory rank sparing is used, a minimum of one quad-rank DIMM or two single-rank or dual-rank DIMMs must be installed per populated channel. 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 installed DIMMs.

## Internal storage

The x440 server has two 2.5-inch hot-swap drive bays that are accessible from the front of the blade server (see Figure 2). 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 that are routed internally to the two hot-swap drive bays
- Supports RAID levels 0 (Integrated Striping), 1 (Integrated Mirroring), 10 (Integrated Mirroring and Striping), and 1E (Integrated Mirroring Enhanced)

The x440 also supports an additional four 1.8-inch drives internally to the server with the addition of the ServeRAID M5115 controller and more SSD tray hardware, as described in the next section.

Supported drives are listed in the [Internal drive options](#) section.

## ServeRAID M5115 SAS/SATA controller

The x440 supports up to four internally-mounted 1.8-inch SSDs in addition to the front-mounted 2.5-inch drives, when combined with a ServeRAID M5115 SAS/SATA controller (90Y4390). The M5115 attaches to the I/O adapter 1 connector. The M5115 cannot be installed if an adapter is already installed in I/O adapter slot 1.

The ServeRAID M5115 supports the following combinations of 2.5-inch drives and 1.8-inch SSDs:

- Up to two 2.5-inch drives only
- Up to two 2.5-inch drives and up to four 1.8-inch SSDs

The ServeRAID M5115 SAS/SATA Controller (90Y4390) provides an advanced RAID controller that supports RAID 0, 1, 10, 5, 50. It includes 1 GB of cache, which can be backed up to flash memory when it is attached to the supercapacitor that is included with the optional ServeRAID M5100 Series Enablement Kit (46C9030).

At least one hardware kit is required with the ServeRAID M5115 controller. The hardware kits which enable specific drive support are listed in the following table.

Table 8. Supported upgrade features

Part number	Feature code	Description	Maximum supported
90Y4390	A2XW	ServeRAID M5115 SAS/SATA Controller	1**
46C9030	A3DS	ServeRAID M5100 Series Enablement Kit for Flex System x440	1
46C9032	A3DU	ServeRAID M5100 Series SSD Expansion Kit for Flex System x440	1

\*\* Ensure the IMM2 firmware of the x440 is at least level 40A for full compatibility

The following ServeRAID M5115 hardware kits are available:

- ServeRAID M5100 Series Enablement Kit for Flex System x440 (46C9030) enables support for up to two 2.5-inch HDDs or SSDs in the hot-swap bays in the front of the server. It includes a CacheVault unit, which enables MegaRAID CacheVault flash cache protection. This enablement kit replaces the two standard 1-bay backplanes (which are attached through the planar to an onboard controller) with new 1-bay backplanes that attach to an included flex cable to the M5115 controller. It also includes an air baffle, which also serves as an attachment for the CacheVault unit.

MegaRAID CacheVault flash cache protection uses NAND flash memory that is powered by a supercapacitor to protect data stored in the controller cache. This module eliminates the need for a lithium-ion battery that is commonly used to protect DRAM cache memory on PCI RAID controllers. To avoid the possibility of data loss or corruption during a power or server failure, CacheVault technology transfers the contents of the DRAM cache to NAND flash memory by using power from the supercapacitor. After the power is restored to the RAID controller, the saved data is transferred from the NAND flash memory back to the DRAM cache, which can then be flushed to disk.

Tip: The Enablement Kit is only required if 2.5-inch drives are to be used. If you plan to install 1.8-inch SSDs only, this kit is not required.

- ServeRAID M5100 Series SSD Expansion Kit for Flex System x440 (46C9032) enables support for up to four internal 1.8-inch SSDs. The four SSDs are installed on trays above the memory banks. This kit includes two air baffles that can attach two 1.8-inch SSD attachment locations and flex cables for attachment to up to four 1.8-inch SSDs.

**Note:** These kits are specific for the x440 and cannot be used with other compute nodes.

The following table shows the required kits for each combination of drives.

Table 9. ServeRAID M5115 hardware kits

Desired drive support			Required components		
Maximum number of 2.5-inch drives	Maximum number of 1.8-inch SSDs		ServeRAID M5115 90Y4390	Enablement Kit 46C9030	SSD Expansion Kit 46C9032
2	0	=>	Required	Required	Not required
2	4 (internal)	=>	Required	Required	Required

The following figure shows how the ServeRAID M5115 and the Enablement Kit are installed in the server to support two 2.5-inch drives with MegaRAID CacheVault flash cache protection.

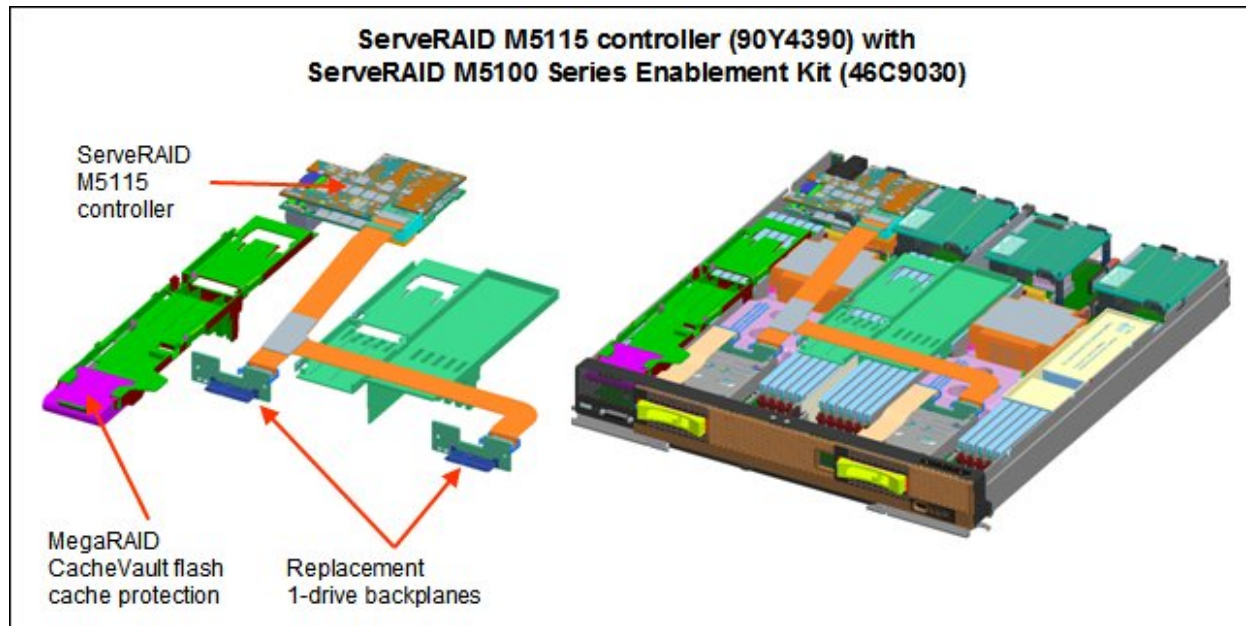


Figure 4. ServeRAID M5115 and Enablement Kit installed

The ServeRAID M5115 controller has the following specifications:

- Eight internal 6 Gbps SAS/SATA ports
- PCI Express 3.0 x8 host interface
- 6 Gbps throughput per port
- 800 MHz dual-core IBM PowerPC® processor with LSI SAS2208 6 Gbps RAID on Chip (ROC) controller
- Support for RAID levels 0, 1, 10, 5, 50 standard
- Onboard 1 GB data cache (DDR3 running at 1333 MHz) with optional flash backup (MegaRAID CacheVault technology) as part of the Enablement Kit 46C9030.
- Support for SAS and SATA HDDs and SSDs
- Support for intermixing SAS and SATA HDDs and SSDs; mixing different types of drives in the same array (drive group) is not recommended
- Support for self-encrypting drives (SEDs) with MegaRAID SafeStore
- Optional support for SSD performance acceleration with MegaRAID FastPath
- Support for up to 64 virtual drives, up to 128 drive groups, up to 16 virtual drives per one drive group, and up to 32 physical drives per one drive group
- Support for logical unit number (LUN) sizes up to 64 TB
- Configurable stripe size up to 1 MB

- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- MegaRAID Storage Manager management software

Optional add-ons to the ServeRAID M5115 controller are listed in the following table.

Table 10. Supported upgrade features

Part number	Feature code	Description	Maximum supported
90Y4412	A2Y2	ServeRAID M5100 Series Performance Upgrade for Flex System (MegaRAID FastPath)	1

The Performance Upgrade for Flex System, 90Y4412, (implemented by using the LSI MegaRAID FastPath software) provides high-performance I/O acceleration for SSD-based virtual drives by using a low-latency I/O path to increase the maximum I/O per second (IOPS) capability of the controller. This feature boosts the performance of applications with a highly random data storage access pattern, such as transactional databases. Part number 90Y4412 is an FoD license.

## Internal drive options

The following tables list the drive options for internal storage.

Note: The use of 1.8-inch drives requires the ServeRAID M5115 SAS/SATA controller.

- Table 11: [1.8-inch SSDs](#)
- Table 12: [2.5-inch 6Gb HDDs](#)
- Table 13: [2.5-inch 6Gb SAS/SATA SSDs](#)

Table 11. 1.8-inch SSDs for internal storage

Part number	Feature code	Description	Maximum supported
1.8-inch hot-swap SSDs - 6 Gb SATA - Enterprise Mainstream (3-5 DWPD)			
00AJ340	A56W	240GB SATA 1.8" MLC Enterprise Value SSD	4

Table 12. 2.5-inch 6Gb HDDs for internal storage

Part number	Feature code	Description	Maximum supported
2.5-inch hot-swap HDDs - 6 Gb SAS 10K			
90Y8877	A2XC	300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
90Y8872	A2XD	600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
81Y9650	A282	900GB 10K 6Gbps SAS 2.5" SFF HS HDD	2
00AD075	A48S	1.2TB 10K 6Gbps SAS 2.5" G2HS HDD	2
2.5-inch hot-swap HDDs - 6 Gb SAS 15K			
81Y9670	A283	300GB 15K 6Gbps SAS 2.5" G2HS HDD	2
00AJ300	A4VB	600GB 15K 6Gbps SAS 2.5" G2HS HDD	2
2.5-inch hot-swap HDDs - 6 Gb NL SATA			
81Y9726	A1NZ	500GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	2
81Y9730	A1AV	1TB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	2
2.5-inch hot-swap SED HDDs - 6 Gb SAS 10K			
90Y8913	A2XF	300GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
90Y8908	A3EF	600GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2

Table 13. 2.5-inch 6Gb SAS/SATA SSDs for internal storage

Part number	Feature code	Description	Maximum supported
2.5-inch hot-swap SSDs - 6 Gb SAS - Enterprise Performance (10+ DWPD)			
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
2.5-inch hot-swap SSDs - 6 Gb SATA - Enterprise Mainstream (3-5 DWPD)			
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
2.5-inch hot-swap SSDs - 6 Gb SATA - Enterprise Entry (<3 DWPD)			
00AJ005	A4KN	S3500 240GB SATA 2.5" MLC HS Enterprise Value SSD	2
00AJ015	A4KQ	S3500 800GB SATA 2.5" MLC HS Enterprise Value SSD	2

The server also supports the 32 GB Enterprise Value USB Memory Key for general portable storage needs. The 32 GB Enterprise Value USB Memory Key offers a convenient delivery option from clients, with key capabilities enabling efficient distribution of large code loads. This key is targeted at workloads that require I/O performance in random read operations. Enterprise Value USB keys have good read IOPS performance, low cost per IOP, but lower endurance and write performance. The following table lists the ordering information for the 32 GB key.

Table 14. Ordering information for 32 GB Enterprise Value USB Memory Key

Part number	Feature code	Description
00ML200	A5R7	32 GB Enterprise Value USB Memory Key

**Note:** The 32 GB Enterprise Value USB Memory Key is not to be used for hypervisors; it is a general-use memory storage device.

## Internal tape drives

The server does not support an internal tape drive. However, it can be attached to external tape drives by using Fibre Channel connectivity.

## Optical drives

The server does not support an internal optical drive option; however, you can connect an external USB optical drive. For information about available external optical drives from Lenovo, see this web page: <http://support.lenovo.com/en/documents/pd011281>

Alternatively, use the remote media feature of the IMMv2 and the Chassis Management Module.

**Note:** The USB port on the compute node supplies up to 0.5 A at 5 V. For devices that require more power, an extra power source is required.

## EN4172 2-port 10Gb Ethernet Adapter

The Flex System EN4172 2-port 10Gb Ethernet Adapter is a dual-port 10 Gigabit Ethernet network adapter and is standard on some models. The adapter supports virtual network interface controller (vNIC) capability that helps clients reduce cost and complexity. The EN4172 2-port 10Gb Ethernet Adapter is based on the QLogic BCM57840 controller.

The adapter includes the following features:

- One Broadcom BCM57840 ASIC
- Connection to either 1 Gb or 10 Gb data center infrastructure (1 Gb and 10 Gb auto-negotiation).
- PCI Express 2.0 x8 host interface
- Full line-rate performance
- Supported by Flex System Manager (Tier 2 support only; no alerting)
- Supported by Fabric Manager
- Ethernet frame: 1500 byte or 9600 byte (jumbo frame)
- Virtual LAN (VLAN) support with VLAN tagging
- vNIC Switch Independent (vNIC2) Mode support - four vNIC/NPAR Ethernet devices per 10Gb physical port
- TCP Offload Engine (TOE) support

## I/O expansion options

The x440 has four I/O expansion connectors for attaching I/O adapter cards, as shown in the following figure. There is a fifth expansion connector (under I/O adapter 4) that is designed for future expansion options. The I/O expansion connector is a high-density 216-pin PCIe connector. Installing I/O adapters allows the server to connect with switch modules in the Flex System Enterprise Chassis. Each slot has a PCI Express 3.0 x16 host interface and all slots support the same form-factor adapters.

**Note:** A second processor must be installed to use I/O adapter slots 3 and 4 in the x440 compute node because the PCIe lanes that are used to drive I/O slots 3 and 4 are routed to processors 2 and 4.

Figure 6 shows the location of the I/O expansion connectors.



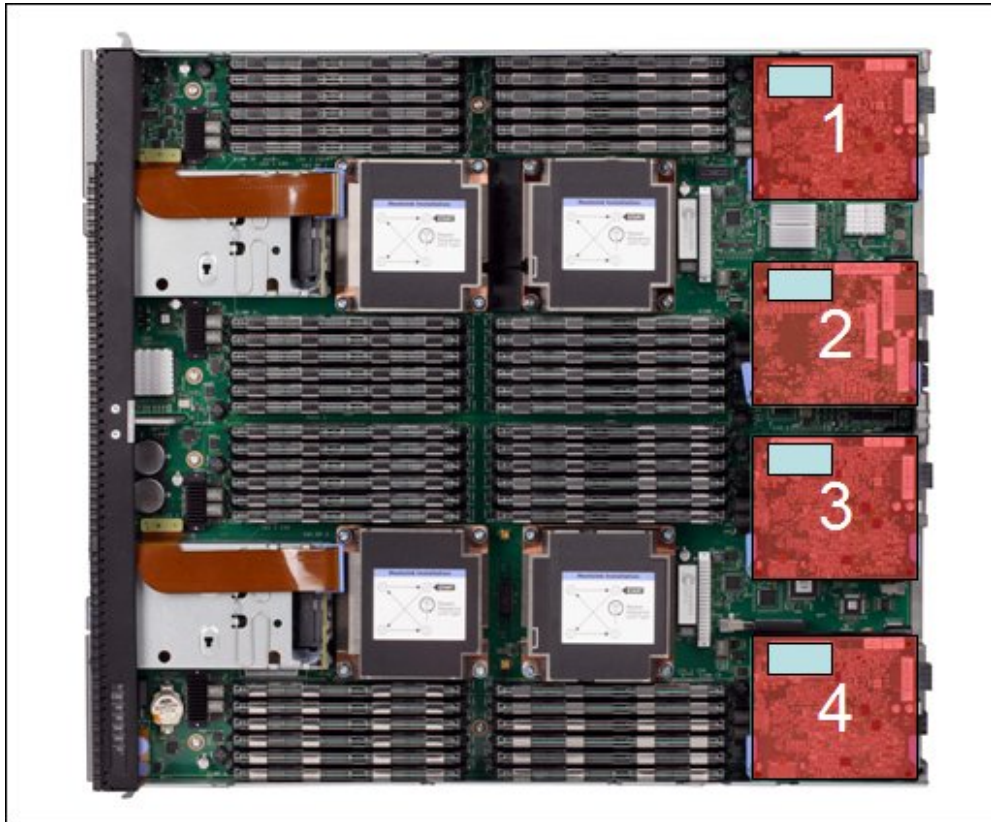


Figure 5. Location of the I/O adapter slots in the Flex System x440 Compute Node

All I/O adapters are the same shape and can be used in any available slot. A compatible switch or pass-through module must be installed in the corresponding I/O bays in the chassis, as indicated in the following table. Installing two switches means that all ports of the adapter are enabled, which improves performance and network availability.

Table 15. Adapter to I/O bay correspondence

I/O adapter slot in the server	Port on the adapter	Corresponding I/O module bay in the chassis
Slot 1	Port 1	Module bay 1
	Port 2	Module bay 2
	Port 3 (for 4-port cards)	Module bay 1
	Port 4 (for 4-port cards)	Module bay 2
Slot 2	Port 1	Module bay 3
	Port 2	Module bay 4
	Port 3 (for 4-port cards)	Module bay 3
	Port 4 (for 4-port cards)	Module bay 4
Slot 3	Port 1	Module bay 1
	Port 2	Module bay 2
	Port 3 (for 4-port cards)	Module bay 1
	Port 4 (for 4-port cards)	Module bay 2
Slot 4	Port 1	Module bay 3
	Port 2	Module bay 4
	Port 3 (for 4-port cards)	Module bay 3
	Port 4 (for 4-port cards)	Module bay 4

For more information about supported switches, see the Flex System Interoperability Guide, which is available at this web page:  
<http://lenovopress.com/fsig>

The following figure shows the location of the switch bays in the Flex System Enterprise Chassis.

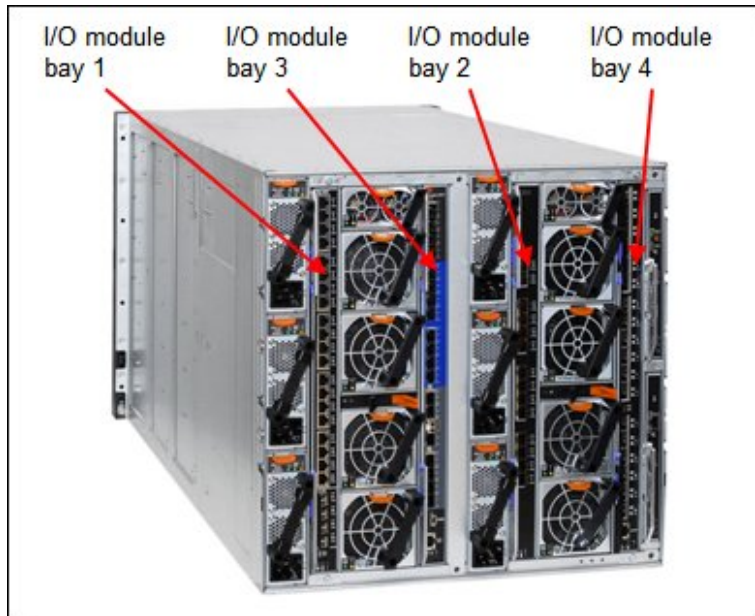


Figure 6. Location of the switch bays in the Flex System Enterprise Chassis

The following figure shows how 2-port adapters are connected to switches installed in the chassis.

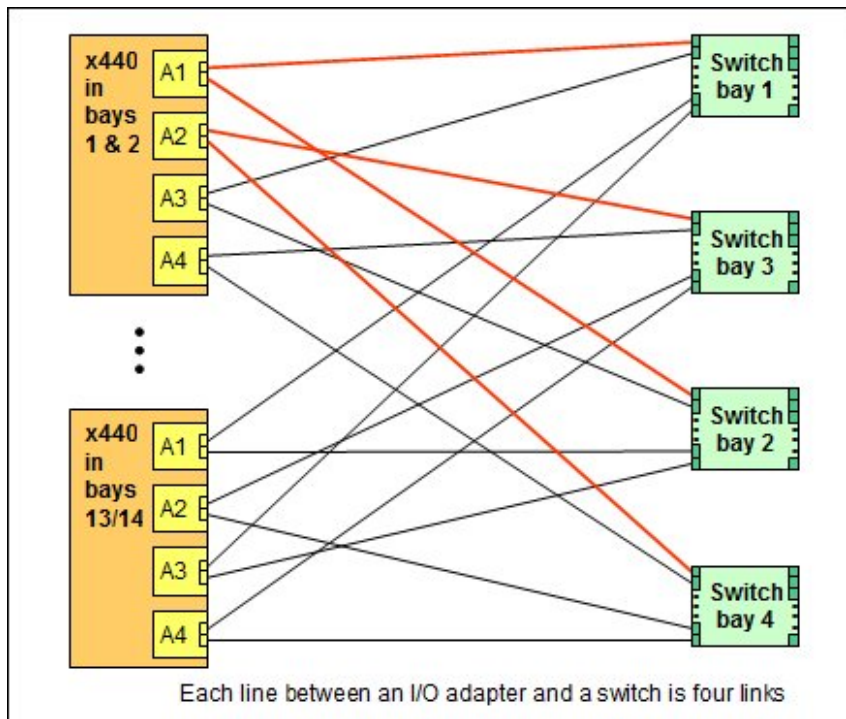


Figure 7. Logical layout of the interconnects between I/O adapters and I/O modules

## Network adapters

Most models of the x440 do not have an Ethernet adapter standard; therefore, you can select the adapters that best suite your network. The following table lists the supported network adapters and upgrades. Adapters can be installed in any slot. However, compatible switches must be installed in the corresponding bays of the chassis.

Table 16. Network adapters

Part number	Feature code	Description	Number of ports	Maximum supported
<b>10 Gb Ethernet</b>				
01CV780	AU7X	Flex System CN4052S 2-port 10Gb Virtual Fabric Adapter Advanced (with FCoE and iSCSI)	2	4
00AG540	ATBT	Flex System CN4052S 2-port 10Gb Virtual Fabric Adapter	2	4
00JY800	A5RP	Flex System CN4052 2-port 10Gb Virtual Fabric Adapter	2	4
00JY804	A5RV	Flex System CN4052 Virtual Fabric Adapter SW Upgrade (FoD) (License to enable FCoE and iSCSI on 00AG540 or 00JY800)	License	4
00JY804	A5RV	Flex System CN4052 Virtual Fabric Adapter SW Upgrade (FoD)	License	4
01CV790	AU7Y	Flex System CN4054S 4-port 10Gb Virtual Fabric Adapter Advanced (with FCoE and iSCSI)	4	4
90Y3558	A1R0	Flex System CN4054 Virtual Fabric Adapter (SW Upgrade) (License to enable FCoE and iSCSI on CN4054R, 00Y3306)	License	4
00AG590	ATBS	Flex System CN4054S 4-port 10Gb Virtual Fabric Adapter	4	4
00AG594	ATBU	Flex System CN4054S 4-port 10Gb Virtual Fabric Adapter SW Upgrade (License to enable FCoE and iSCSI on 00AG590)	License	4
00AG530	A5RN	Flex System EN4172 2-port 10Gb Ethernet Adapter	2	4**
<b>1 Gb Ethernet</b>				
49Y7900	A10Y	Flex System EN2024 4-port 1Gb Ethernet Adapter	4	4

\* Withdrawn from marketing

\*\* Model J4x has one EN4172 2-port 10Gb Ethernet Adapter installed as standard

For more information about adapter-to-switch compatibility, see the Flex System Interoperability Guide, which is available at this web page:

<http://lenovopress.com/fsig>

For more information, see the list of Product Guides in the Network Adapters category at this web page:

<https://lenovopress.com/servers/blades/nc>

## Storage host bus adapters

The following table lists the storage HBAs that are supported by the x440 server.

Table 17. Storage adapters

Part number	Feature code	Description	Number of ports
<b>Fibre Channel</b>			
95Y2375	A2N5	Flex System FC3052 2-port 8Gb FC Adapter	2
69Y1938	A1BM	Flex System FC3172 2-port 8Gb FC Adapter	2
95Y2391	A45S	Flex System FC5054 4-port 16Gb FC Adapter	4
69Y1942	A1BQ	Flex System FC5172 2-port 16Gb FC Adapter	2

For more information, see the list of Product Guides in the Host Bus Adapters category at this web page:

<https://lenovopress.com/servers/blades/hba>

## Power supplies

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

## Integrated virtualization

The x440 supports the ESXi hypervisor on a USB memory key via two internal USB ports (see [Figure 3](#)). The supported USB memory keys are listed in the following table.

There are two types of USB keys: preloaded keys or blank keys. Blank keys allow you to download a Lenovo customized version of ESXi and load it onto the key. The x440 supports one or two keys installed, but only in the following combinations:

- One preload key
- One blank key
- One preload key and one blank key
- Two blank keys

Two preload keys is not supported. Installing two preloaded keys prevents ESXi from booting (as described at this [web page](#):

<http://kb.vmware.com/kb/1035107>

Having two keys installed provides a backup boot device. Both devices are listed in the boot menu, which allows you to boot from either device or to set one as a backup if the first device becomes corrupted.

The supported USB memory keys are listed in the following table.

Table 18. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	Blank USB Memory Key for VMware ESXi Downloads	2
41Y8300	A2VC	USB Memory Key for VMware ESXi 5.0	1
41Y8307	A383	USB Memory Key for VMware ESXi 5.0 Update1	1
41Y8311	A2R3	USB Memory Key for VMware ESXi 5.1	1
41Y8385	A584	USB Memory Key for VMware ESXi 5.5	1

**Note:** The 32 GB Enterprise Value USB Memory Key (part number 00ML200) is not to be used for Hypervisors.

## Light path diagnostics panel

For quick problem determination when located physically at the server, the x440 offers the following 3-step guided path:

1. The Fault LED on the front panel.
2. The light path diagnostics panel.
3. LEDs that are next to key components on the system board.

The x440 light path diagnostics panel is visible when you remove the server from the chassis. The panel is located at the upper right side of the compute node, as shown in the following figure.

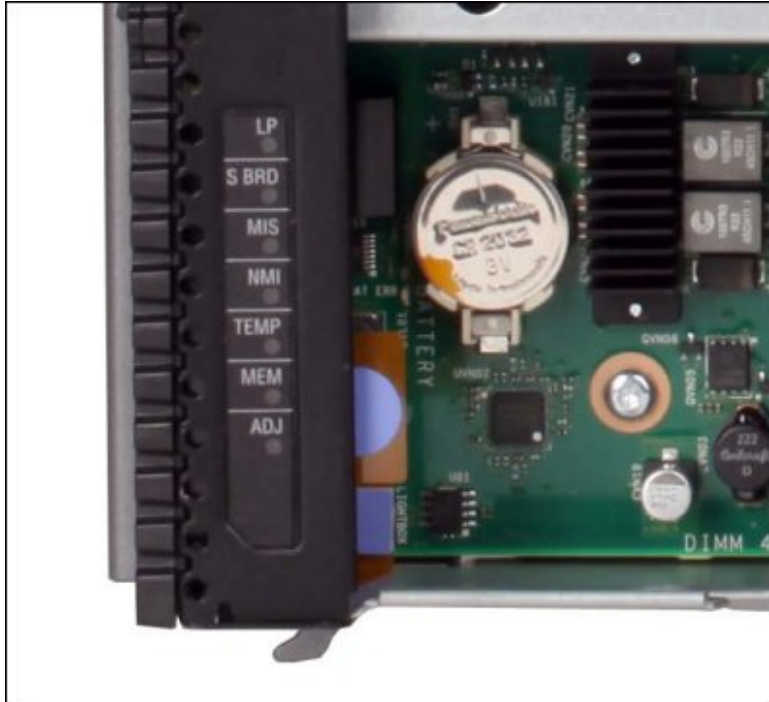


Figure 8. Location of x440 light path diagnostics panel

To illuminate the light path diagnostics LEDs, power off the compute node, slide it out of the chassis, and press the power button. The power button also serves as the light path diagnostics remind button when the server is removed from the chassis. The meanings of the LEDs are listed in the following table.

Table 19. Light path diagnostic panel LEDs

LED	Meaning
LP	The light path diagnostics panel is operational.
S BRD	A system board error is detected.
MIS	A mismatch occurred between the processors, DIMMs, or HDDs.
NMI	A non-maskable interrupt (NMI) occurred.
TEMP	An over-temperature condition occurred that was critical enough to shut down the server.
MEM	A memory fault occurred. The corresponding DIMM error LEDs on the system board are also lit.
ADJ	A fault is detected in the adjacent expansion unit (if installed).

## Remote management

The server contains an IMM2, which interfaces with the advanced management module in the chassis. The combination of these two components 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.

Remote server management is provided through the following industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3
- Common Information Model (CIM)
- 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 by 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
- Mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM2 memory and mapping it to the server as a virtual drive
- Capturing blue-screen errors

## Operating system support

The server supports the following operating systems:

- Microsoft Windows HPC Server 2008 SP1
- Microsoft Windows SBS 2008 Premium
- Microsoft Windows SBS 2008 Standard
- Microsoft Windows Server 2008 Datacenter x64 SP2
- Microsoft Windows Server 2008 Enterprise x64 SP2
- Microsoft Windows Server 2008 R2 SP1
- Microsoft Windows Server 2008 Standard x64 SP2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016
- Microsoft Windows Server, version 1709
- Red Hat Enterprise Linux 6.10 x64
- Red Hat Enterprise Linux 6.5 x64
- Red Hat Enterprise Linux 6.6 x64
- Red Hat Enterprise Linux 6.7 x64
- Red Hat Enterprise Linux 6.8 x64
- Red Hat Enterprise Linux 7.0
- Red Hat Enterprise Linux 7.1
- Red Hat Enterprise Linux 7.2
- Red Hat Enterprise Linux 7.3
- Red Hat Enterprise Linux 7.4
- Red Hat Enterprise Linux 7.5
- Red Hat Enterprise Linux 7.6
- Red Hat Enterprise Linux 7.7
- Red Hat Enterprise Linux 7.8
- Red Hat Enterprise Linux 7.9
- SUSE Linux Enterprise Server 11 Xen x64 SP3
- SUSE Linux Enterprise Server 11 Xen x64 SP4
- SUSE Linux Enterprise Server 11 x64 SP3

- SUSE Linux Enterprise Server 11 x64 SP4
- SUSE Linux Enterprise Server 12
- SUSE Linux Enterprise Server 12 SP1
- SUSE Linux Enterprise Server 12 SP2
- SUSE Linux Enterprise Server 12 SP3
- SUSE Linux Enterprise Server 12 SP4
- SUSE Linux Enterprise Server 12 Xen
- SUSE Linux Enterprise Server 12 Xen SP1
- SUSE Linux Enterprise Server 12 Xen SP2
- SUSE Linux Enterprise Server 12 Xen SP3
- SUSE Linux Enterprise Server 12 Xen SP4
- VMware ESXi 5.1 U2
- VMware ESXi 5.1 U3
- VMware ESXi 5.5 U2
- VMware ESXi 5.5 U3
- VMware ESXi 6.0
- VMware ESXi 6.0 U1
- VMware ESXi 6.0 U2
- VMware ESXi 6.0 U3
- VMware ESXi 6.5
- VMware ESXi 6.5 U1
- VMware ESXi 6.5 U2
- VMware ESXi 6.5 U3

For a complete list of supported, certified and tested operating systems, plus additional details and links to relevant web sites, see the Operating System Interoperability Guide: <https://lenovopress.com/osig#servers=x440-7167>

## Physical specifications

The server includes the following physical specifications (approximate):

- Width: 437 mm (17.2 in.)
- Height 51 mm (2.0 in.)
- Depth 493 mm (19.4 in.)
- Maximum weight: 12.25 kg (27 lbs)

## Supported environment

The Flex System x440 compute node complies with ASHRAE Class A3 specifications and features the following supported operating environment:

Power on:

- Temperature: 5 - 40 °C (41 - 104 °F)
- Humidity, non-condensing: -12 °C dew point (10.4 °F) and 8 - 85% relative humidity
- Maximum dew point: 24 °C (75 °F)
- Maximum altitude: 3048 m (10,000 ft.)
- Maximum rate of temperature change: 5 °C/hr (41 °F/hr)

Power off:

- Temperature: 5 - 45 °C (41 - 113 °F)
- Relative humidity: 8 - 85%
- Maximum dew point: 27 °C (80.6 °F)

Storage (non-operating):

- Temperature: 1 - 60 °C (33.8 - 140 °F)
- Altitude: 3050 m (10,006 ft.)
- Relative humidity: 5 - 80%
- Maximum dew point: 29 °C (84.2°F)

Shipment (non-operating):

- Temperature: -40 - 60 °C (-40 - 140 °F)
- Altitude: 10,700 m (35,105 ft)
- Relative humidity: 5 - 100%
- Maximum dew point: 29 °C (84.2 °F)



## Warranty options

The system 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, go to the Data Center Advisor and Configurator website <http://dcsc.lenovo.com>, then do the following:

1. In the Customize a Model box in the middle of the page, select the **Services** option in the Customization Option dropdown menu
2. Enter in the machine type & model of the system
3. From the search results, you can click either **Deployment Services** or **Support Services** to view the offerings

The following table explains warranty service definitions in more detail.

Table 20. 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
  - Committed repair service
  - Warranty extension of up to 5 years
  - Post warranty extensions

- **Committed Repair Service**  
Committed Repair Services enhances the level of Warranty Service Upgrade or Post Warranty/Maintenance Service offering associated with the selected systems. Offerings vary and are available in select countries.
  - Priority handling to meet defined time frames to restore the failing machine to good working condition
  - Committed repair service levels are measured within the following coverage hours:
    - 24x7x6: Service performed 24 hours per day, 7 days per week, within 6 hours
    - 24x7x8: Service performed 24 hours per day, 7 days per week, within 8 hours
    - 24x7x24: Service performed 24 hours per day, 7 days per week, within 24 hours
- **Hard Disk Drive Retention**  
Lenovo's Hard Disk Drive Retention (HDDR) 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.
- **Microcode Support**  
Keeping microcode current helps prevent hardware failures and security exposure. There are two levels of service: analysis of the installed base and analysis and update where required. Offerings vary by region and can be bundled with other 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 server conforms to the following standards:

- ASHRAE Class A3
- FCC - Verified to comply with Part 15 of the FCC Rules Class A
- Canada ICES-004, issue 3 Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1
- NOM-019
- Argentina IEC 60950-1
- Japan VCCI, Class A
- IEC 60950-1 (CB Certificate and CB Test Report)
- China CCC (GB4943); (GB9254, Class A); (GB17625.1)
- Taiwan BSMI CNS13438, Class A; CNS14336
- Australia/New Zealand AS/NZS CISPR 22, Class A
- Korea KN22, Class A, KN24
- Russia/GOST ME01, IEC 60950-1, GOST R 51318.22, GOST R 51318.249, GOST R 51317.3.2, GOST R 51317.3.3
- 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
- TUV-GS (EN60950-1/IEC 60950-1, EK1-ITB2000)

## 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:

<https://www.lenovo.com/us/en/landingpage/lenovo-financial-services/>

## Related publications and links

For more information, see the following resources:

- US Product Announcement:  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-143>
- Flex System Compute Node product page:  
<http://shop.lenovo.com/us/en/systems/servers/blades/flex-system/compute-nodes/>
- Customer Implementations of the x440 - Case Studies and Videos  
[https://lenovosuccess.com/search#term=&systems=Flex%2520System&system\\_models=x440](https://lenovosuccess.com/search#term=&systems=Flex%2520System&system_models=x440)
- Flex System Information Center:  
<http://flexsystem.lenovofiles.com/help/index.jsp>
- *Flex System x440 Compute Node Installation and Service Guide* :  
[http://flexsystem.lenovofiles.com/help/index.jsp?topic=%2Fcom.lenovo.acc.7917.doc%2Fprintable\\_doc.html](http://flexsystem.lenovofiles.com/help/index.jsp?topic=%2Fcom.lenovo.acc.7917.doc%2Fprintable_doc.html)
- ServerProven for Flex System:  
<http://www.lenovo.com/us/en/serverproven/flexsystem.shtml>
- Operating System Interoperability Guide (OSIG):  
<https://lenovopress.com/osig#servers=x440-7167>
- *Flex System Interoperability Guide* :  
<http://lenovopress.com/fsig>
- *Configuration and Option Guide* :  
<http://www.ibm.com/systems/xbc/cog/>
- xREF - System x Reference  
<http://lenovopress.com/xref>
- System x Support Portal:  
<http://ibm.com/support/entry/portal/>
- IBM System Storage® Interoperation Center (SSIC):  
<http://www.ibm.com/systems/support/storage/ssic>

## Related product families

Product families related to this document are the following:

- [Blade Servers](#)

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