Lenovo Flex System x240 M5 (E5-2600 v4)
Product Guide

The Lenovo Flex System x240 M5 Compute Node is a high-performance server that offers enhanced security, efficiency, and reliability features to handle business-critical workloads. The blade server incorporates up to two Intel Xeon E5-2600 v4 processors. The processors feature up to 22 cores each and use new lightning-fast Lenovo TruDDR4 memory, which runs at speeds up to 2400 MHz.

Suggested uses: database, virtualization, enterprise applications, collaboration and email, streaming media, Web, HPC, and cloud applications.

Figure 1 shows the Flex System x240 M5 Compute Node.

Figure 1. Flex System x240 M5 Compute Node

Did you know?

The x240 M5 Compute Node uses TruDDR4 DIMM technology, which offers higher clock speeds, faster data transfer rates, and runs at a lower voltage (1.2V) than DDR3. With DDR4 technology and the new Intel Xeon E5-2600 v4 processors, memory DIMMs can now operate at speeds up to 2400 MHz, which provides lower latency times and enhanced computing power. The TruDDR4 memory portfolio includes RDIMMs with advanced error correction for reliability, performance, and maximum memory capacity. In addition, Lenovo's industry-unique TruDDR4 DIMMs support memory performance that exceeds industry standards. (See the Key Features section for details.)

The x240 M5 Compute Node integrates leadership security and reliability capabilities. System x Trusted Platform Assurance, an exclusive set of System x features and practices, establishes a highly secure foundation for your workloads. Enterprise-class data protection is provided with optional self-encrypting drives and simple, centralized key management through Security Key Lifecycle Management. Diagnostic tools facilitate reduced downtime and costs.

Key features

The Flex System x240 M5 Compute Node is a high-availability, scalable compute node that is optimized to support the next-generation microprocessor technology. It is ideally suited for medium and large businesses. This section describes the key features of the server.

Scalability and performance

The x240 M5 offers the following features to boost performance, improve scalability, and reduce costs:

- Improves productivity by offering superior system performance with up to 22-core processors, up to 55 MB of L3 cache, and up to 9.6 GT/s QPI interconnect links.
- Supports up to two processors, 44 cores, and 88 threads, which maximizes the concurrent execution of multi-threaded applications.
- Intelligent and adaptive system performance with energy-efficient Intel Turbo Boost Technology allows CPU 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 2.0 (AVX 2.0) enable acceleration of enterprise-class workloads, such as databases and enterprise resource planning.
- Up to 2400 MHz memory speeds with two DIMMs per channel (2DPC) that are running at 2400 MHz to help maximize system performance. (Competitive servers—using standard DDR4 DIMMs—are limited to only 2133MHz when running 2DPC.)
- Up to 1.5 TB of memory capacity using 64 GB LRDIMMs (planned for 2Q/2016).
- Optional support for high-performance PCIe-attached NVMe Flash Storage solid-state drives (SSDs) can significantly improve I/O performance. (support planned for late 2Q/2016)
- Supports the Storage Expansion Node, which provides another 12 hot-swap, 2.5-inch drive bays for local storage.
- Up to 32 virtual I/O ports per compute node with available 10 Gb Virtual Fabric Adapters, which offers the choice of Ethernet, iSCSI, or Fibre Channel over Ethernet (FCoE) connectivity.
- The x240 M5 offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by 60% (8 GT/s 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 integration helps to dramatically reduce I/O latency and increase overall system performance.
- Support for high-bandwidth I/O adapters; up to two in each x240 M5 Compute Node.
- Support for 10 Gb Ethernet, 16 Gb Fibre Channel, and FDR InfiniBand.
- Supports the PCIe Expansion Node for support for up to six more I/O adapters.
- High-speed USB 3.0 port for connectivity to external devices.

Availability and serviceability

The x240 M5 provides the following features to simplify serviceability and increase system up-time:

- Chipkill, memory mirroring, and memory rank sparing for redundancy if there is a non-correctable memory failure.
- Toolless cover removal provides easy access to upgrades and serviceable parts, such as CPU, memory, and adapter cards.

- Hot-swap drives 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 feature 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 hard disk drives) operate outside of standard thresholds and generates proactive alerts in advance of possible failure, which increases uptime.
- Solid-state drives (SSDs), which offer significantly better reliability than mechanical HDDs for greater uptime.
- Built-in Integrated Management Module II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovering actions if there is a failure, to minimize downtime.
- Built-in diagnostics uses Dynamic Systems Analysis (DSA) Preboot to speed up troubleshooting tasks and 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 the local and remote management of the x240 M5:

- Support for Lenovo XClarity Administrator, providing auto-discovery, inventory tracking, monitoring, policy-based firmware updates, address pool management, configuration patterns and operating system installation.
- The x240 M5 includes an Integrated Mangement Module (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.
- System x Trusted Platform Assurance, an exclusive set of System x security features and practices, establishes a highly secure foundation for workloads by delivering firmware that is securely built, tested, digitally signed, and verified before execution.
- The server offers enterprise-class data protection with optional self-encrypting drives and simple, centralized key management through Security Key Lifecycle Management.
- Industry-standard AES NI support for faster, stronger encryption.
- Intel Execute Disable Bit functionality can help 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 x240 M5 offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to the green environment:

- The component-sharing design of the Flex System chassis provides ultimate power and cooling savings.
- The Intel Xeon E5-2600 v4 processor family offers significantly better performance than previous generations of processors, while fitting into the same thermal design power (TDP) limits.

- Intel Intelligent Power Capability powers individual processor elements on and off as needed, which reduces 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 1.2 V DDR4 memory DIMMs use up to 20% less energy than 1.35 V DDR3 DIMMs (even less compared to 1.5 V DIMMs).
- Solid state drives (SSDs) use as much as 80% less power than traditional spinning 2.5-inch HDDs.
- The x240 M5 uses hexagonal ventilation holes, which are a part of Calibrated Vectored 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

Figure 2 shows the front of the server.

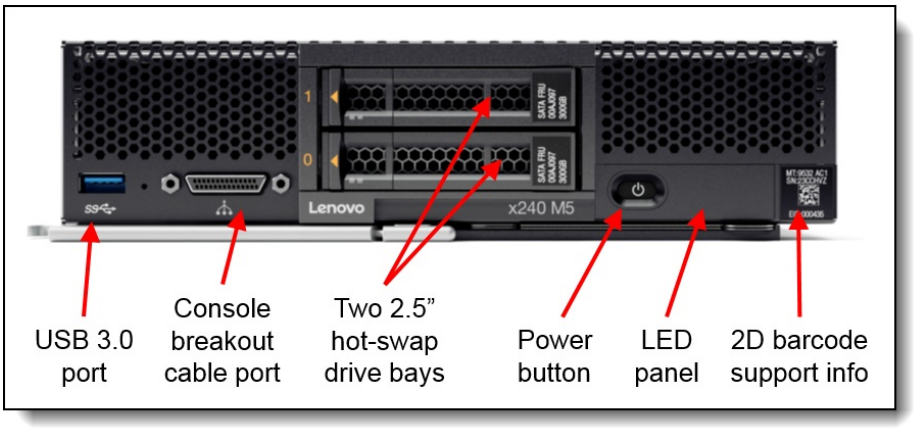

Figure 2. Front view of the Flex System x240 M5 Compute Node

Figure 3 shows the locations of key components inside the server.

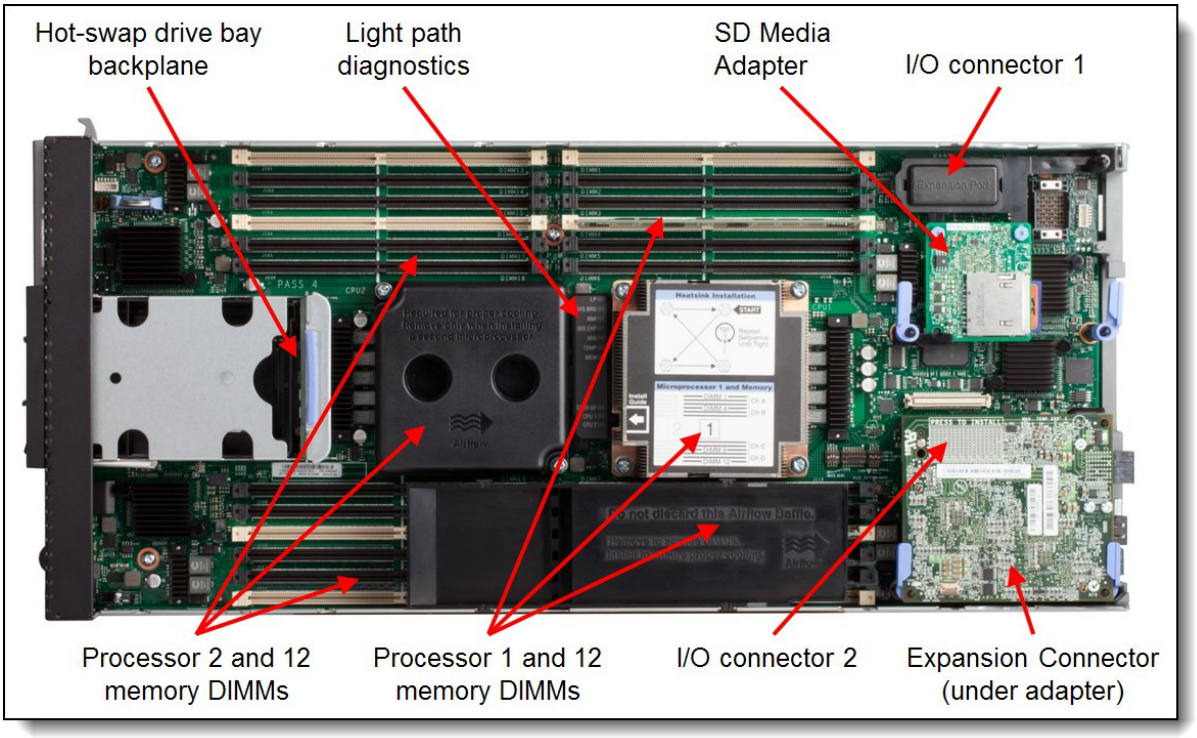

Figure 3. Inside view of the Flex System x240 M5 Compute Node

Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications

Components	Specification
Models	9532
Firmware	Lenovo-signed firmware
Form factor	Standard-width compute node.
Chassis support	Flex System Enterprise Chassis with CMM2. Flex System Carrier-Grade Chassis (non-NEBS mode)
Processor	Up to two Intel Xeon processor E5-2600 v4 product family CPUs: from 4 cores to 22 cores piece; core speeds from 1.7 GHz to 3.5 GHz; up to 55 MB L3 cache. Two QPI links up to 9.6 GT/s each. Up to 2400 MHz memory speed.
Chipset	Intel C612
Memory	Up to 24 DIMM sockets (12 DIMMs per processor). RDIMMs and LRDIMMs are supported. Memory types cannot be intermixed. Memory speed up to 2400 MHz. Four memory channels per processor (3 DIMMs per channel).
Memory maximums	With LRDIMMs: Up to 1.5 TB with 24x 64 GB LRDIMMs and two CPUs (planned 2Q/16) With RDIMMs: Up to 768 GB with 24x 32 GB RDIMMs and two CPUs
Memory protection	ECC, optional memory mirroring and memory rank sparing.
Disk drive bays	Two 2.5-inch hot-swap SAS/SATA drive bays that support SAS, SATA, and SSDs. Optional support for 2.5-inch NVMe PCIe SSDs (planned for late 2Q/2016). Optional support for up to four 1.8-inch SSDs in place of the two 2.5-inch bays. Up to 12 more 2.5-inch drive bays with the optional Storage Expansion Node.
Maximum internal storage	• With two 2.5-inch hot-swap drives: Up to 7.68 TB by using 3.84 TB 2.5-inch SATA SSDs, or up to 4 TB by using 2 TB NL SATA HDDs. An intermix of SAS HDDs, SATA HDDs, and SSDs is supported. • With two 2.5-inch NVMe PCIe SSDs: Up to 4 TB by using 2 TB NVMe PCIe SSDs (planned for late 2Q/2016). • With four 1.8-inch SSDs: Up to 3.2 TB by using 800 GB 1.8-inch SSDs. More storage is available with an attached Flex System Storage Expansion Node.
RAID support	RAID-0 and RAID-1 with integrated LSI SAS3004 controller or optional ServeRAID M5215. Optional RAID-5 support with ServeRAID M1200 RAID-5 Enablement Kit and 1.8-inch SSDs
Network interfaces	None standard; optional 1 Gb, 10 GbE, or 40 GbE adapters.
PCI Expansion slots	Two I/O connectors for adapters. PCI Express 3.0 x16 interface. Includes an Expansion Connector (PCIe 3.0 x16) to connect an expansion node, such as the PCIe Expansion Node. PCIe Expansion Node supports two full-height PCIe adapters, two low-profile PCIe adapters, and two Flex System I/O adapters.
Ports	Front: One USB 3.0 port and one console breakout cable port that provides local KVM and serial ports (cable standard with chassis; more cables optional). Internal: Optional SD Media Adapter provides two SD Media slots for VMware vSphere hypervisor support (RAID-1 pair).
Systems management	UEFI, Integrated Management Module 2 (IMM2) with Renesas SH7758 controller, Predictive Failure Analysis, light path diagnostics panel, automatic server restart, remote presence. Support for Lenovo XClarity Administrator, Lenovo Energy Manager, and Lenovo ToolsCenter.
Security features	Power-on password, administrator's password, Trusted Platform Module 1.2.

Components	Specification
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.
Operating systems supported	Microsoft Windows Server 2012 and 2012 R2, Red Hat Enterprise Linux 6 and 7, SUSE Linux Enterprise Server 11 and 12, VMware vSphere 5.5 and 6.0. For more information, see Supported operating systems.
Service and support	Optional service upgrades are available through Lenovo warranty services: 4-hour or 2-hour response time, 8-hour fix time, 1-year or 2-year warranty extension, remote technical support for Lenovo hardware and selected Lenovo and original equipment manufacturer (OEM) software.
Dimensions	Width: 215 mm (8.5 inches), height 51 mm (2.0 inches), depth 493 mm (19.4 inches).
Weight	Maximum configuration: 7.1 kg (15.6 lb).

The x240 M5 servers are shipped with the following items:

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

Standard models

The following table lists the standard models.

USA and Canada customers: These standard models are not available in USA and Canada.

Memory speeds: All models ship with TruDDR4 memory that is rated at 2400 MHz (as described in the Memory options section), however some models include processors that operate at a lower memory bus speed. As a result, memory installed in those models will operate at a speed that matches the processor, as indicated with parentheses in the Memory column.

Table 2. Standard models

Model*	Intel Xeon Processor (2 maximum)**	Memory	Disk controller	Drive bays† (used/max)	Disks	10 GbE	I/O slots (used / max)
9532-12x	1x E5-2620 v4 8C 2.1GHz 20MB 2133MHz 85W	1x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-13x	1x E5-2609 v4 8C 1.7GHz 20MB 1866MHz 85W	1x 16GB (1866 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-22x	1x E5-2630 v4 10C 2.2GHz 25MB 2133MHz 85W	1x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-23x	1x E5-2637 v4 4C 3.5GHz 15MB 2400MHz 135W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-32x	1x E5-2640 v4 10C 2.4GHz 25MB 2133MHz 90W	1x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-33x	1x E5-2643 v4 6C 3.4GHz 20MB 2400MHz 135W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-42x	1x E5-2650 v4 12C 2.2GHz 30MB 2400MHz 105W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-52x	1x E5-2660 v4 14C 2.0GHz 35MB 2400MHz 105W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-62x	1x E5-2680 v4 14C 2.4GHz 35MB 2400MHz 120W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-72x	1x E5-2690 v4 14C 2.6GHz 35MB 2400MHz 135W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-82x	1x E5-2697 v4 18C 2.3GHz 45MB 2400MHz 145W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-92x	1x E5-2699 v4 22C 2.2GHz 55MB 2400MHz 145W	1x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2

* The model numbers listed here include the letter x. The x represents a letter that varies by country and geography. For example, in the United States, the x is replaced with the letter U, so that model 12x is actually 12U in the US. In Europe, the letter x is replaced with G.
** Processor detail: Processor quantity, model, cores, core speed, L3 cache, memory speed, power TDP rating.
† The two 2.5-inch drive bays can be replaced with four 1.8-inch SSD bays.

NEBS-compliant models

There are currently no NEBS-compliant models of the x240 M5 with E5-2600 v4 processors. For NEBS models with v3 processors, see the x240 M5 (E5-2600 v3) Product Guide: https://lenovopress.com/tips1199#nebs-compliant-models.

TopSeller models

The following table lists the available TopSeller models.

Memory speeds: All models ship with TruDDR4 memory that is rated at 2400 MHz (as described in the Memory options section), however some models include processors that operate at a lower memory bus speed. As a result, memory installed in those models will operate at a speed that matches the processor, as indicated with parentheses in the Memory column.

Table 3. TopSeller models

Model	Intel Xeon Processor (2 maximum)*	Memory	Disk adapter	Drive bays†	Disks	10 GbE	I/O slots
TopSeller models - North America							
9532-EEx	2x E5-2660 v4 14C 2.0GHz 35MB 2400MHz 105W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EFx	2x E5-2650 v4 12C 2.2GHz 30MB 2400MHz 105W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EGx	2x E5-2640 v4 10C 2.4GHz 25MB 2133MHz 90W	4x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EHx	2x E5-2630 v4 10C 2.2GHz 25MB 2133MHz 85W	4x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EJx	2x E5-2620 v4 8C 2.1GHz 20MB 2133MHz 85W	2x 16GB (2133 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EJx	2x E5-2609 v4 8C 1.7GHz 20MB 1866MHz 85W	2x 16GB (1866 MHz)	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EKx	2x E5-2637 v4 4C 3.5GHz 15MB 2400MHz 135W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-ELx	2x E5-2667 v4 8C 3.2GHz 25MB 2400MHz 135W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EMx	2x E5-2690 v4 14C 2.6GHz 35MB 2400MHz 135W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-ENx	2x E5-2680 v4 14C 2.4GHz 35MB 2400MHz 120W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EOx	2x E5-2699 v4 22C 2.2GHz 55MB 2400MHz 145W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2
9532-EPx	2x E5-2697 v4 18C 2.3GHz 45MB 2400MHz 145W	4x 16GB 2400 MHz	LSI SAS3004	2.5” hot-swap (0 / 2)	Open	Open	0 / 2

* Processor detail: Processor quantity, model, cores, core speed, L3 cache, memory speed, power TDP rating.
† The two 2.5-inch drive bays can be replaced with four 1.8-inch SSD bays.

Chassis support

The x240 M5 Compute Node is supported in the Flex System chassis as listed in the following table.

Table 4. Chassis support

Chassis models	Description	Supports x240 M5 (9532) with E5-2600 v4 processors
8721-HC1 based: 8721-A1x, LRx, DCx 8721-K1G, E1Y, E2Y	Lenovo Flex System Enterprise Chassis with CMM (68Y7030) standard	No
8721-HC2 based: 8721-ALx, DLx 8721-E3Y, E4Y	Lenovo Flex System Enterprise Chassis with CMM2 (00FJ669) standard	Yes
7385-DCx	Lenovo Flex System Carrier-Grade Chassis	Yes (non-NEBS)

Up to 14 x240 M5 Compute Nodes can be installed in the chassis; however, the actual number that can be installed in a chassis depends on the following factors:

- TDP power rating for the processors that are installed in the x240 M5
- Number of power supplies that are installed in the chassis
- Capacity of the installed power supplies (2100 W or 2500 W)
- Chassis power redundancy policy that is used (N+1 or N+N)

The following table provides guidelines about what number of x240 M5 Compute Nodes can be installed. For more information, use the Power Configurator, which is found at the following website: http://ibm.com/systems/bladecenter/resources/powerconfig.html

The following color coding was used In the table:

- Green = No restriction on the number of x240 M5 Compute Nodes that can be installed
- Yellow = Some bays must be left empty in the chassis

Table 5. Maximum number of x240 M5 Compute Nodes that can be installed based on installed power supplies and power redundancy policy used

x240 M5 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 5 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
50 W	14	14	11	11	14	14	14	14
55 W	14	14	11	11	14	14	14	14
65 W	14	14	11	11	14	14	14	14
75 W	14	14	11	11	14	14	14	14
85 W	14	14	11	11	14	14	14	14
90 W	14	14	11	11	14	14	14	14
105 W	14	14	11	11	14	14	13	14
120 W	14	14	11	11	14	14	13	14
135 W	14	13	11	11	14	14	12	13
145 W	14	13	11	11	14	14	12	13

Processor options

The x240 M5 supports the processor options that are listed in the following table. The server supports one or two processors. The table also shows which server models have each processor standard, if any.

Note: This product guide covers the x240 Compute Node with E5 v4 processors. For information about the server with v3 processor support, see the x240 (E5-2600 v3) Product Guide at https://lenovopress.com/tips1199.

Table 6. Processor options

Part number	Feature code*	Intel Xeon processor description	Models where used
00MW744	ATCZ / ATDQ	Intel Xeon Processor E5-2603 v4 6C 1.7GHz 15MB 1866MHz 85W	-
00YE941	ATD0 / ATDR	Intel Xeon Processor E5-2608L v4 8C 1.6GHz 20MB 1866MHz 50W	-
00MW743	ATCY / ATDP	Intel Xeon Processor E5-2609 v4 8C 1.7GHz 20MB 1866MHz 85W	13x, EJx
00YE942	ATD1 / ATDS	Intel Xeon Processor E5-2618L v4 10C 2.2GHz 25MB 2133MHz 75W	-
00YD966	ATCN / ATDD	Intel Xeon Processor E5-2620 v4 8C 2.1GHz 20MB 2133MHz 85W	12x, EIx
00MW742	ATCX / ATDN	Intel Xeon Processor E5-2623 v4 4C 2.6GHz 10MB 2133MHz 85W	-
00YE943	ATD2 / ATDT	Intel Xeon Processor E5-2628L v4 12C 1.9GHz 30MB 2133MHz 75W	-
00YD965	ATCM / ATDC	Intel Xeon Processor E5-2630 v4 10C 2.2GHz 25MB 2133MHz 85W	22x, EHx
00MW741	ATCW / ATDM	Intel Xeon Processor E5-2630L v4 10C 1.8GHz 25MB 2133MHz 55W	-
00MW740	ATCV / ATDL	Intel Xeon Processor E5-2637 v4 4C 3.5GHz 15MB 2400MHz 135W	23x, EKx
00YD964	ATCL / ATDB	Intel Xeon Processor E5-2640 v4 10C 2.4GHz 25MB 2133MHz 90W	32x, EGx
00MW739	ATCU / ATDK	Intel Xeon Processor E5-2643 v4 6C 3.4GHz 20MB 2400MHz 135W	33x
00YE944	ATD3 / ATDU	Intel Xeon Processor E5-2648L v4 14C 1.8GHz 35MB 2400MHz 75W	-
00YD963	ATCK / ATDA	Intel Xeon Processor E5-2650 v4 12C 2.2GHz 30MB 2400MHz 105W	42x, EFx
00MW738	ATCT / ATDJ	Intel Xeon Processor E5-2650L v4 14C 1.7GHz 35MB 2400MHz 65W	-
00YE945	ATD4 / ATDV	Intel Xeon Processor E5-2658 v4 14C 2.3GHz 35MB 2400MHz 105W	-
00YD962	ATCJ / ATD9	Intel Xeon Processor E5-2660 v4 14C 2.0GHz 35MB 2400MHz 105W	52x, EEx
00MW737	ATCS / ATDH	Intel Xeon Processor E5-2667 v4 8C 3.2GHz 25MB 2400MHz 135W	ELx
00YD961	ATCH / ATD8	Intel Xeon Processor E5-2680 v4 14C 2.4GHz 35MB 2400MHz 120W	62x, ENx
00MW735	ATCR / ATDG	Intel Xeon Processor E5-2683 v4 16C 2.1GHz 40MB 2400MHz 120W	-
00YD960	ATCG / ATD7	Intel Xeon Processor E5-2690 v4 14C 2.6GHz 35MB 2400MHz 135W	72x, EMx
00MW733	ATCQ / ATDF	Intel Xeon Processor E5-2695 v4 18C 2.1GHz 45MB 2400MHz 120W	-
00YD959	ATCF / ATD6	Intel Xeon Processor E5-2697 v4 18C 2.3GHz 45MB 2400MHz 145W	82x, EPx
00MW732	ATCP / ATDE	Intel Xeon Processor E5-2698 v4 20C 2.2GHz 50MB 2400MHz 135W	-
00YD958	ATCE / ATD5	Intel Xeon Processor E5-2699 v4 22C 2.2GHz 55MB 2400MHz 145W	92x, EOx

* The first feature code is for processor 1 and second feature code is for processor 2.

Memory options

The x240 M5 with E5-2600 v4 processors uses Lenovo TruDDR4 memory operating at speeds up to 2400 MHz.

TruDDR4 Memory uses the highest quality components that are sourced from Tier 1 DRAM suppliers and only memory that meets the strict requirements of Lenovo is selected. It is compatibility tested and tuned on every System x server to maximize performance and reliability. TruDDR4 Memory has a unique signature that is programmed into the DIMM that enables System x servers to verify whether the memory that is installed is qualified or supported by Lenovo.

Because TruDDR4 Memory is authenticated, certain extended memory performance features can be enabled to extend performance over industry standards. From a service and support standpoint, Lenovo memory automatically assumes the Lenovo system warranty and Lenovo provides service and support worldwide.

The following table lists the supported memory options.

Note: A 64GB LRDIMM option is planned for 2Q/2016.

Table 7. Memory options for the x240 M5

Part number	Feature code	Description	Models where used
Registered DIMMs (RDIMMs)			
46W0821	ATC8	8GB TruDDR4 Memory (1Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	-
46W0825	ATC9	8GB TruDDR4 Memory (2Rx8, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	-
46W0829	ATCA	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	All models
46W0833	ATCB	32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	-

The server supports up to 12 TruDDR DIMMs when one processor is installed and up to 24 DIMMs when two processors are installed. Each processor has four memory channels, and there are three DIMMs per memory channel (3 DPC). RDIMMs and LRDIMMs are supported, but the mixing of these different types is not supported. UDIMMs are not supported. DIMMs can be installed individually; however, for best performance install them in sets of four (one for each of the four memory channels).

The following rules apply when the memory configuration is selected:

- Mixing of different types of DIMMs (RDIMM and LRDIMM) in the same server is not supported.
- The maximum number of supported ranks per channel is eight.
- The maximum quantity of DIMMs that can be installed in the server depends on the number of CPUs, DIMM ranks and operating voltage, as shown in the "Maximum quantity" row in the following table.
- All DIMMs in all CPU memory channels operate at the same speed, which is determined as the lowest value of the following factors:
    - Memory speed that is supported by the specific CPU.
    - Lowest maximum operating speed for the selected memory configuration that depends on rated speed, as shown in the "Maximum operating speed" section in the following 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 table also shows the maximum memory capacity at any speed that is supported by the DIMM and maximum memory capacity at rated DIMM speed.

In the table, cells that are highlighted in gray 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 8. Maximum memory speeds

Specification	**RDIMMs**	
Rank	Single rank	Dual rank
Part numbers	46W0821 (8 GB)	46W0825 (8 GB) 46W0829 (16 GB) 46W0833 (32 GB)
Rated speed	2400 MHz	2400 MHz
Rated voltage	1.2 V	1.2 V
Operating voltage	1.2 V	1.2 V
Maximum quantity*	24	24
Largest DIMM	8 GB	32 GB
Max memory capacity	192 GB	768 GB
Max memory at rated speed	128 GB	512 GB
Maximum operating speed (MHz)		
One DIMM per channel	2400 MHz	2400 MHz
Two DIMMs per channel	2400 MHz†	2400 MHz†
Three DIMMs per channel	1866 MHz†	1866 MHz†

* The maximum quantity that is supported is shown for two processors that are installed. When one processor is installed, the maximum quantity that is supported is half of that shown.
† This speed is above the Intel standard and is achieved only when Lenovo TruDDR4 memory is used

The following memory protection technologies are supported:

- ECC
- Memory mirroring
- Memory sparing

If memory mirroring is used, 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.

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 (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 that are installed.

Internal storage

The x240 M5 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 connect to the integrated LSI SAS3004 12 Gbps SAS/SATA RAID-on-Chip (ROC) controller.

The integrated LSI SAS3004 ROC has the following features:

- Four-port LSI SAS3004 controller with 12 Gbps throughput per port
- PCIe x4 Gen 2 host interface
- Two SAS ports routed internally to the two hot-swap drive bays
- Supports RAID-0, RAID-1 and RAID-1E

The onboard controller optionally supports self-encrypting drives (SEDs) with the addition of Features on Demand license upgrade, ServeRAID M1200 Series Zero Cache/RAID 5 Upgrade, 00AE930. This license upgrade enables the LSI MegaRAID SafeStore service which offers instant secure erase and local key management for SEDs.

The two 2.5-inch front-accessible drive bays can be replaced with four 1.8-inch drive bays by using the ServeRAID M1200 RAID 5 Enablement Kit (P/N 00JX141). This kit contains a replacement backplane to connect the four 1.8-inch SSDs. The kit also includes ServeRAID M1200 Zero Cache/RAID 5 Upgrade (Feature on Demand license), which adds RAID-5 support.

The two standard 2.5-inch SAS/SATA drive bays can also be replaced with new NVMe (Non-Volatile Memory Express) drives that are directly connected to the PCIe bus of the second processor. Such connectivity, when combined with SSD drives, ensures the lowest possible latency while still using a standard drive form factor.

Note: Support for NVMe drives planned for late 2Q/2016.

2nd processor required: Support for NVMe PCIe SSDs requires a replacement drive backplane for the two 2.5-inch drives, plus the second processor must also be installed in the server. The kit containing the backplane, NVMe Enterprise PCIe SSD Enablement Kit for Flex System x240 M5, is listed in the following table. The second processor is ordered separately.

Table 9. Internal storage upgrades

Part number	Feature code	Name and description	Maximum supported
00AE930	A5H5	ServeRAID M1200 Series Zero Cache/RAID 5 Upgrade for Systems-FoD	1
00JX141	A5SF	ServeRAID M1200 RAID 5 Enablement Kit for Flex System x240 M5	1
00JX177*	A5SH*	NVMe Enterprise PCIe SSD Enablement Kit for Flex System x240 M5	1
00JX142	A5SE	ServeRAID M5215 with 2GB Flash Enablement - Flex System x240 M5	1

* Support planned for late 2Q/2016.

Supported drives are listed in the Internal drive options section. The ServeRAID M5215 is described in the next section.

ServeRAID M5215 SAS/SATA controller

The ServeRAID M5215 SAS/SATA controller is an advanced RAID controller based on the LSI SAS 3108 chipset. The M5215 replaces the onboard SAS controller in the compute node and supports high-performance RAID-0 and RAID-1 to the two internal 2.5-inch drive bays. The M5215 is installed at the front of the server over the top of the drive bays, as shown in the following figure.

Note: The use of the ServeRAID M5215 requires that the second processor be installed.

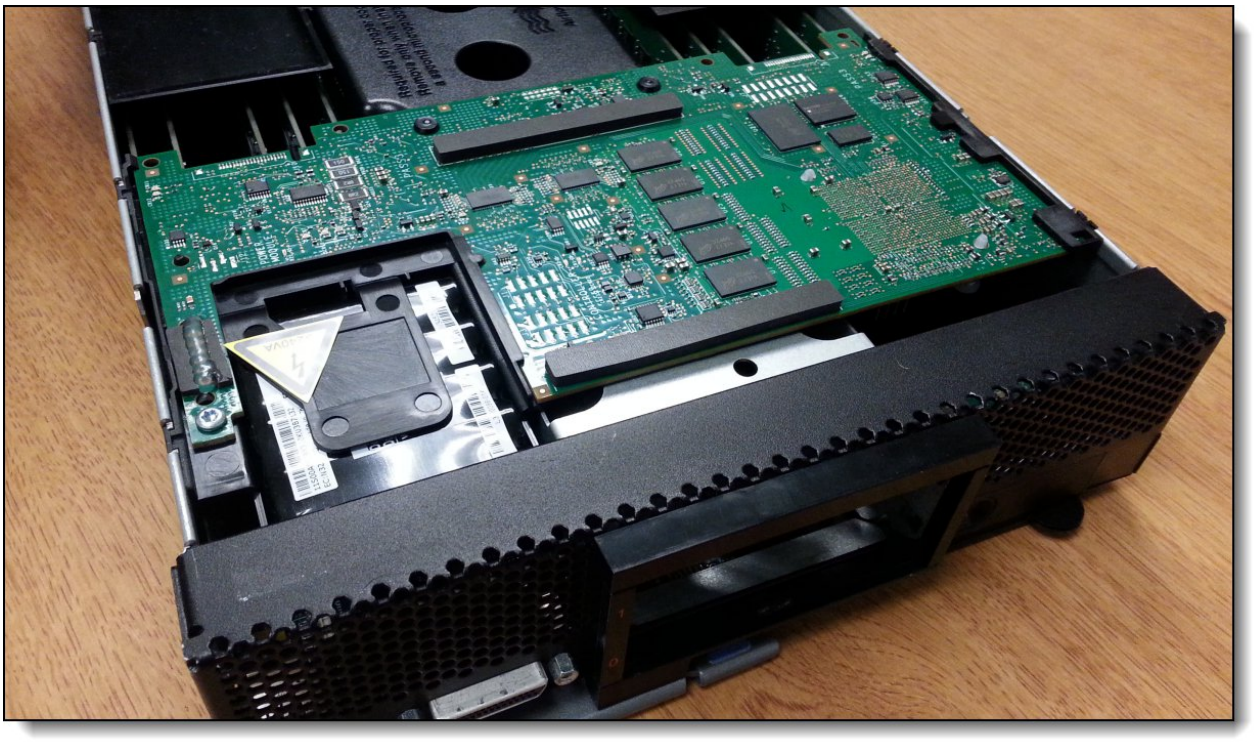

Figure 4. ServeRAID M5215 SAS/SATA controller installed in the Flex System x240 M5

The part numbers to order the ServeRAID M5215 controller and feature upgrade are listed in the following table.

Table 10. ServeRAID M5215 SAS/SATA controller

Part number	Feature code	Name and description	Maximum supported
Adapter			
00JX142	A5SE	ServeRAID M5215 with 2GB Flash Enablement	1
Feature on Demand upgrades			
47C8710	A3Z7	ServeRAID M5200 Series Performance Accelerator for FoD (MegaRAID FastPath)	1

The ServeRAID M5215 option includes the following components:

- RAID controller
- Flash power module
- Replacement 2-drive backplane

The following figure shows the adapter, flash power module and backplane that are included in the option. The included backplane replaces the standard backplane that came with the server. The backplane also serves as the conduit to route the PCIe signals from the second processor to the RAID controller.

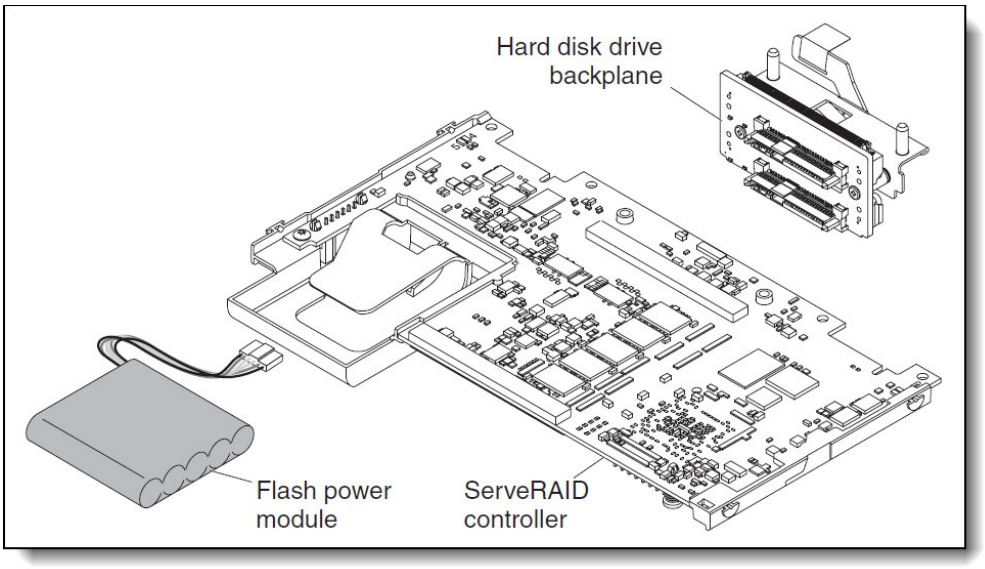

Figure 5. ServeRAID M5215 SAS/SATA controller

Note: The ServeRAID M5215 installed in the x240 M5 only supports two 2.5-inch drives using the supplied backplane. 1.8-inch drives are not supported.

The ServeRAID M5215 SAS/SATA controller has the following features:

- Eight internal 12 Gbps SAS/SATA ports (also supports 6 Gbps)
- PCI Express 3.0 x8 host interface
- 12 Gbps throughput per port
- LSI SAS3108 12 Gbps RAID on Chip (ROC) controller
- Onboard 2 GB data cache (DDR3 running at 1866 MHz)
- Support for RAID levels 0 and 1
- Standard flash power module (supercapacitor-based) provides the power capacity needed to off-load the cache to flash in the event of a power failure
- Support 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 (LSI MegaRAID SafeStore)
- Optional support for SSD performance acceleration with MegaRAID FastPath
- Support for up to 64 virtual disks, up to 128 arrays, and up to 16 virtual disks per array
- 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

The Performance Accelerator upgrade (47C8710), implemented using the LSI MegaRAID FastPath software, provides high-performance I/O acceleration for SSD-based virtual drives by using an extremely 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 47C8710 is a Feature on Demand license.

Internal drive options

The x240 M5 supports the following 2.5-inch and 1.8-inch drives internally to the server:

- Table 11: 2.5-inch hot-swap 12 Gb SAS/SATA HDDs
- Table 12: 2.5-inch hot-swap 6 Gb SAS/SATA HDDs
- Table 13: 2.5-inch hot-swap 12 Gb SAS/SATA SSDs
- Table 14: 2.5-inch hot-swap 6 Gb SAS/SATA SSDs
- Table 15: 2.5-inch hot-swap NVMe PCIe SSDs
- Table 16: 1.8-inch SSDs

The 2.5-inch drive bays support SAS or SATA HDDs or SATA SSDs. The following tables list the supported 2.5-inch drive options.

Table 11. 2.5-inch hot-swap 12 Gb SAS/SATA HDDs

Part number	Feature	Description	Maximum supported
2.5-inch hot-swap HDDs - 12 Gb SAS 10K			
00WG685	AT89	300GB 10K 12Gbps SAS 2.5" G3HS HDD	2
00WG690	AT8A	600GB 10K 12Gbps SAS 2.5" G3HS HDD	2
00WG695	AT8B	900GB 10K 12Gbps SAS 2.5" G3HS HDD	2
00WG700	AT8C	1.2TB 10K 12Gbps SAS 2.5" G3HS HDD	2
00NA251	ASBH	900GB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA241	ASBF	600GB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA261	ASBK	1.2TB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA271	ASBM	1.8TB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
2.5-inch hot-swap HDDs - 12 Gb SAS 15K			
00WG660	AT84	300GB 15K 12Gbps SAS 2.5" G3HS HDD	2
00WG665	AT85	600GB 15K 12Gbps SAS 2.5" G3HS HDD	2
00NA221	ASBB	300GB 15K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA231	ASBD	600GB 15K 12Gbps SAS 2.5" G3HS 512e HDD	2
2.5-inch hot-swap HDDs - 12 Gb NL SAS			
00NA491	AT7Z	1TB 7.2K 12Gbps NL SAS 2.5" G3HS HDD	2
00NA496	AT80	2TB 7.2K 12Gbps NL SAS 2.5" G3HS 512e HDD	2
2.5-inch hot-swap SED HDDs - 12 Gb SAS 10K			
00WG705	AT8D	300GB 10K 12Gbps SAS 2.5" G3HS SED	2
00WG710	AT8E	600GB 10K 12Gbps SAS 2.5" G3HS SED	2
00NA291	ASBR	600GB 10K 12Gbps SAS 2.5" G3HS 512e SED	2
00WG715	AT8F	900GB 10K 12Gbps SAS 2.5" G3HS SED	2
00WG720	AT8G	1.2TB 10K 12Gbps SAS 2.5" G3HS SED	2
00NA301	ASBT	1.2TB 10K 12Gbps SAS 2.5" G3HS 512e SED	2

Table 12. 2.5-inch hot-swap 6 Gb SAS/SATA HDDs

Part number	Feature	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
2.5-inch hot-swap HDDs - 6 Gb SAS 15K			
00AJ111	A4TQ	146GB 15K 6Gbps SAS 2.5" G3HS HDD	2
00AJ300	A4VB	600GB 15K 6Gbps SAS 2.5" G2HS HDD	2
2.5-inch hot-swap HDDs - 6 Gb NL SAS			
00AJ121	A4TT	500GB 7.2K 6Gbps NL SAS 2.5" G3HS HDD	2
2.5-inch hot-swap HDDs - 6 Gb NL SATA			
00AJ136	A4TW	500GB 7.2K 6Gbps NL SATA 2.5" G3HS HDD	2
00AJ141	A4TX	1TB 7.2K 6Gbps NL SATA 2.5" G3HS HDD	2
00NA526	AT81	2TB 7.2K 6Gbps NL SATA 2.5" G3HS 512e HDD	2
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

Table 13. 2.5-inch hot-swap 12 Gb SAS/SATA SSDs

Part number	Feature	Description	Maximum supported
2.5-inch hot-swap SSDs - 12 Gb SAS - Enterprise Performance (10+ DWPD)			
00FN379	AS7C	200GB 12G SAS 2.5" MLC G3HS Enterprise SSD	2
00FN389	AS7E	400GB 12G SAS 2.5" MLC G3HS Enterprise SSD	2
00FN399	AS7G	800GB 12G SAS 2.5" MLC G3HS Enterprise SSD	2
00FN409	AS7J	1.6TB 12G SAS 2.5" MLC G3HS Enterprise SSD	2

Table 14. 2.5-inch hot-swap 6 Gb SAS/SATA SSDs

Part number	Feature	Description	Maximum supported
2.5-inch hot-swap SSDs - 6 Gb SAS - Enterprise Capacity			
00NA671	ASW6	3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD	2
2.5-inch hot-swap SSDs - 6 Gb SAS - Enterprise Performance (10+ DWPD)			
00AJ212	A4UB	400GB SAS 2.5" MLC G3HS Enterprise SSD	2
00AJ217	A4UC	800GB SAS 2.5" MLC G3HS Enterprise SSD	2
2.5-inch hot-swap SSDs - 6 Gb SATA - Enterprise Performance (10+ DWPD)			
00YC320	AT9C	S3710 200GB Enterprise Performance SATA G3HS 2.5" SSD	2
00YC325	AT9D	S3710 400GB Enterprise Performance SATA G3HS 2.5" SSD	2
00YC330	AT9E	S3710 800GB Enterprise Performance SATA G3HS 2.5" SSD	2
2.5-inch hot-swap SSDs - 6 Gb SATA - Enterprise Mainstream (3-5 DWPD)			
00AJ395	A577	120GB SATA 2.5" MLC G3HS Enterprise Value SSD	2
00AJ400	A578	240GB SATA 2.5" MLC G3HS Enterprise Value SSD	2
00AJ405	A579	480GB SATA 2.5" MLC G3HS Enterprise Value SSD	2
00AJ410	A57A	800GB SATA 2.5" MLC G3HS Enterprise Value SSD	2
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)			
00WG620	AT93	S3510 120GB Enterprise Entry SATA G3HS 2.5" SSD	2
00WG625	AT94	S3510 240GB Enterprise Entry SATA G3HS 2.5" SSD	2
00WG630	AT95	S3510 480GB Enterprise Entry SATA G3HS 2.5" SSD	2
00WG635	AT96	S3510 800GB Enterprise Entry SATA G3HS 2.5" SSD	2
00YC385	AT8R	120GB Enterprise Entry SATA G3HS 2.5" SSD	2
00YC390	AT8S	240GB Enterprise Entry SATA G3HS 2.5" SSD	2
00YC395	AT8T	480GB Enterprise Entry SATA G3HS 2.5" SSD	2
00YC400	AT8U	960GB Enterprise Entry SATA G3HS 2.5" SSD	2

Table 15. 2.5-inch hot-swap NVMe PCIe SSDs

Part number	Feature	Description	Maximum supported
2.5-inch hot-swap SSDs - NVMe - Enterprise Performance (10+ DWPD)			
00YA818*	AT7V	P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	2
00YA821*	AT7W	P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	2
00YA824*	AT7X	P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	2
00YA827*	AT7Y	P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	2
2.5-inch hot-swap SSDs - NVMe - Enterprise Mainstream (3-5 DWPD)			
90Y3227*	A5RW	P3600 400GB NVMe 2.5" G3HS Enterprise Value PCIe SSD	2
90Y3230*	A5RX	P3600 800GB NVMe 2.5" G3HS Enterprise Value PCIe SSD	2
90Y3233*	A5RY	P3600 1.6TB NVMe 2.5" G3HS Enterprise Value PCIe SSD	2
90Y3236*	A5RZ	P3600 2.0TB NVMe 2.5" G3HS Enterprise Value PCIe SSD	2

* Support planned for late 2Q/2016

The supported 1.8-inch SSDs are listed in the following table. The use of 1.8-inch drives requires the ServeRAID M1200 RAID 5 Enablement Kit, 00JX141. The ServeRAID M5215 is not supported.

Table 16. 1.8-inch SSDs

Part number	Feature	Description	Maximum supported
1.8-inch hot-swap SSDs - 6 Gb SATA - Enterprise Mainstream (3-5 DWPD)			
00AJ335	A56V	120GB SATA 1.8" MLC Enterprise Value SSD	4
00AJ340	A56W	240GB SATA 1.8" MLC Enterprise Value SSD	4
00AJ345	A56X	480GB SATA 1.8" MLC Enterprise Value SSD	4
00AJ350	A56Y	800GB SATA 1.8" MLC Enterprise Value SSD	4

Flex System Storage Expansion Node

The x240 M5 supports the attachment of the Flex System Storage Expansion Node. The Flex System Storage Expansion Node provides the ability to attach another 12 hot-swap 2.5-inch HDDs or SSDs locally to the attached compute node. The Storage Expansion Node provides storage capacity for Network Attach Storage (NAS) workloads, which provides flexible storage to match capacity, performance, and reliability needs.

The following figure shows the Flex System Storage Expansion Node attached to a compute node.

Figure 6. Flex System Storage Expansion Node (right) attached to the x240 M5 (left)

The ordering information for the Storage Expansion Node is shown in the following table.

Table 17. Ordering part number and feature code

Part number	Feature code	Description	Maximum supported
68Y8588	A3JF	Flex System Storage Expansion Node	1

The Storage Expansion Node has the following features:

- Connects directly to supported compute nodes via a PCIe 3.0 interface to the compute node's expansion connector (see the internal view in the Locations of key components and connectors section).
- Supports 12 hot-swap 2.5-inch drives, accessible via a sliding tray.
- Supports 6 Gbps SAS and SATA drives, both HDDs and SSDs.
- Based on an LSI SAS2208 6 Gbps RAID on Chip (ROC) controller.
- Supports RAID-0, 1, and 10 as standard. JBOD also supported. Optional RAID-5 and 50 with cache upgrade.
- Optional 512 MB or 1 GB cache with cache-to-flash super capacitor offload and RAID 5/50 support.

Notes:

- The use of the Storage Expansion Node requires that the x240 M5 Compute Node have both processors installed.
- The Storage Expansion Node uses a different hot-swap drive tray (G2HS) to the x240 M5 (G3HS). As a result, the SEN drives and x240 M5 drives not interchangable.

For more information, see the Lenovo Press Product Guide: http://lenovopress.com/tips0914

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. See http://support.lenovo.com/en/documents/pd011281 for information about available external optical drives from Lenovo. Alternatively, use the remote media feature of the IMMv2 and the Chassis Management Module.

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

I/O expansion options

The x240 M5 has two I/O expansion connectors for attaching I/O adapter cards. There is a third expansion connector that is designed to connect an expansion node, such as the PCIe Expansion Node. The I/O expansion connectors use a high-density, 216-pin PCIe connection. Installing I/O adapter cards allows the server to connect with switch modules in the chassis. Each slot has a PCI Express 3.0 x16 host interface and both slots support the same form-factor adapters.

The following figure shows the location of the I/O expansion connectors.

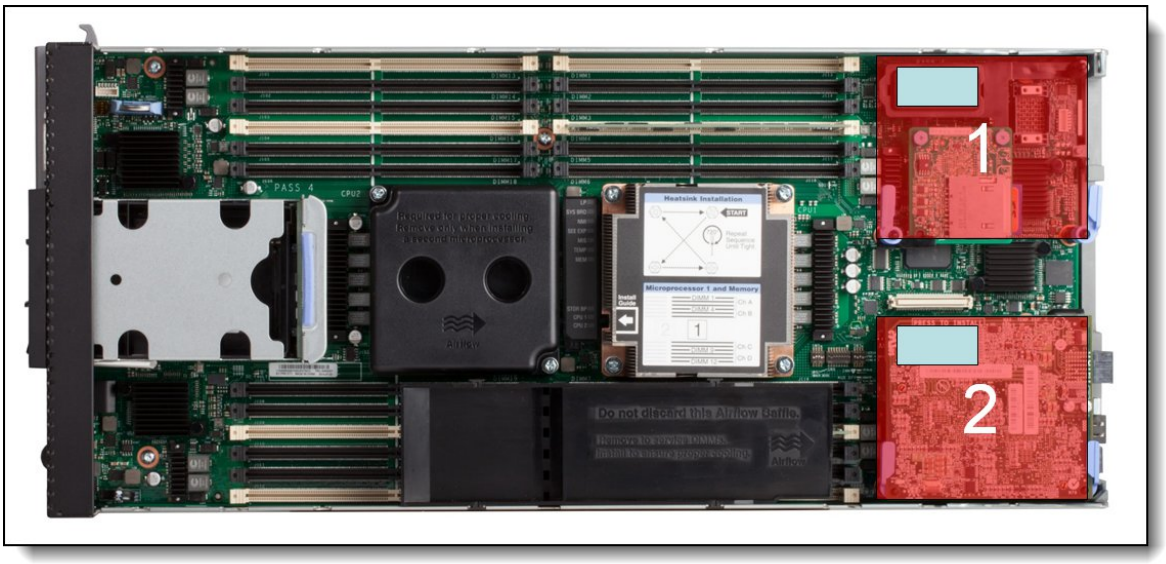

Figure 7. Location of the I/O adapter slots in the Flex System x240 M5 Compute Node

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 18. 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

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

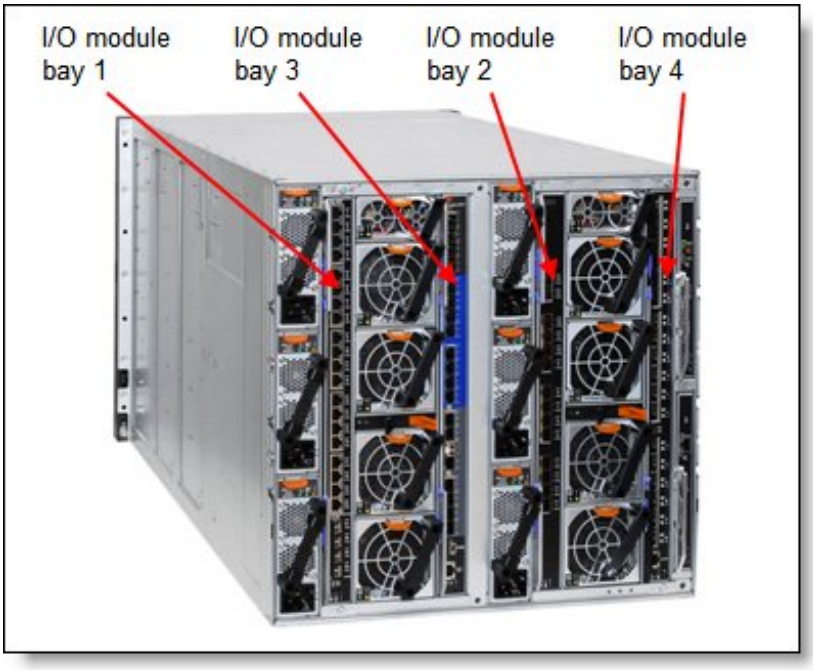

Figure 8. Location of the switch bays in the Flex System Enterprise Chassis

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

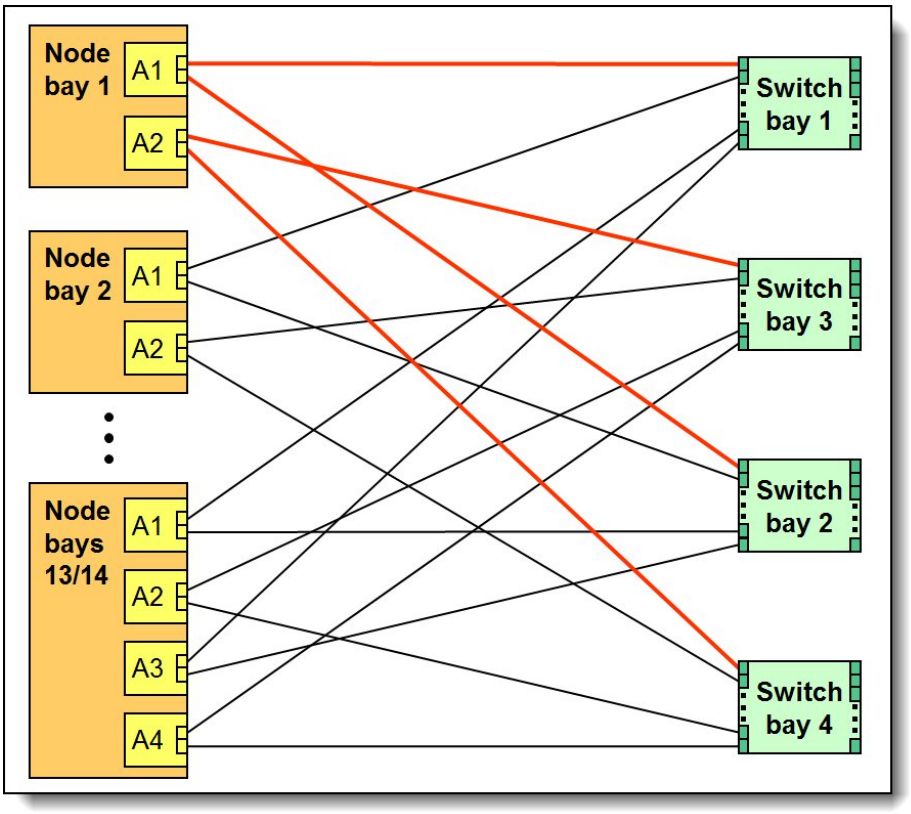

Figure 9. Logical layout of the interconnects between I/O adapters and I/O modules

Flex System PCIe Expansion Node

The x240 M5 supports the attachment of the Flex System PCIe Expansion Node. By using the Flex System PCIe Expansion Node, more PCI Express cards can be attached, such as High IOPS SSD adapters, fabric mezzanine cards, and next-generation graphics processing units (GPU) to supported Flex System compute nodes. This capability is ideal for many applications that require high performance I/O, special telecommunications network interfaces, or hardware acceleration that uses a PCI Express card. The PCIe Expansion Node supports up to four PCIe 2.0 adapters and two more Flex System expansion adapters.

The PCIe Expansion Node is attached to a Flex System compute node, as shown in the following figure.

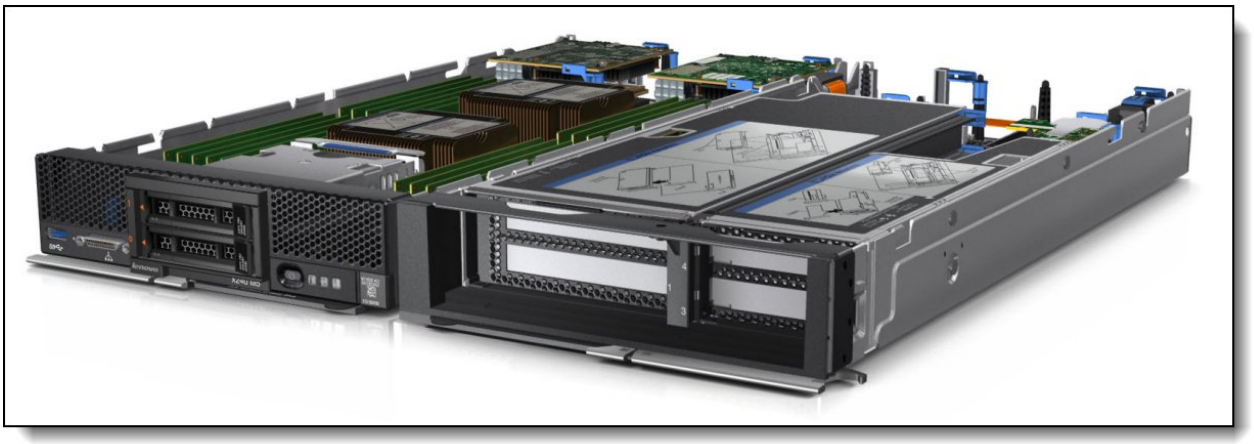

Figure 10. PCIe Expansion Node attached to the x240 M5

The ordering information for the PCIe Expansion Node is shown in the following table.

Table 19. Ordering part number and feature code

Part number	Feature code	Description	Maximum supported
81Y8983	A1BV	Flex System PCIe Expansion Node	1

The PCIe Expansion Node has the following features:

- Support for up to four standard PCIe 2.0 adapters:
  - Two PCIe 2.0 x16 slots that support full-length, full-height adapters
  - Two PCIe 2.0 x8 slots that support half-length, low-profile adapters
- Support for PCIe 3.0 adapters by operating them in PCIe 2.0 mode
- Support for one full-length, full-height double-wide adapter (that uses the space of the two full-length, full-height adapter slots)
- Support for PCIe cards with higher power requirements; a single adapter card (up to 225W) or to two adapters (up to 150W each)
- Two Flex System I/O expansion connectors to further expand the I/O capability of the attached compute node

Note: The use of the PCIe Expansion Node requires that the x240 M5 Compute Node has both processors installed.

For more information, see the Lenovo Press Product Guide: http://lenovopress.com/tips0906

Network adapters

The following table lists the supported network adapters and upgrades. Adapters can be installed in either slot. However, compatible switches must be installed in the corresponding bays of the chassis. All adapters can also be installed in the PCIe Expansion Node. The "Maximum supported" column in the table indicates the number of adapters that can be installed in the server and in the PCIe Expansion Node (PEN).

Table 20. Network adapters

Part number	Feature code	Description	Number of ports	Maximum supported (x240 M5 / PEN)
40 Gb Ethernet				
90Y3482	A3HK	Flex System EN6132 2-port 40Gb Ethernet Adapter	2	2 / None
10 Gb Ethernet				
88Y5920	A4K3	Flex System CN4022 2-port 10Gb Converged Adapter	2	2 / 2
00AG540	ATBT	Flex System CN4052S 2-port 10Gb Virtual Fabric Adapter	2	2 / 2
00JY800	A5RP	Flex System CN4052 2-port 10Gb Virtual Fabric Adapter	2	2 / 2
00JY804	A5RV	Flex System CN4052 Virtual Fabric Adapter SW Upgrade (FoD) (License to enable FCoE and iSCSI on 00AG540 or 00JY800)	License	2 / 2
00AG590	ATBS	Flex System CN4054S 4-port 10Gb Virtual Fabric Adapter	4	2 / 2
00AG594	ATBU	Flex System CN4054S 4-port 10Gb Virtual Fabric Adapter SW Upgrade (License to enable FCoE and iSCSI on 00AG590)	License	2 / 2
00Y3306	A4K2	Flex System CN4054R 10Gb Virtual Fabric Adapter	4	2 / 2
90Y3558	A1R0	Flex System CN4054 Virtual Fabric Adapter (SW Upgrade) (License to enable FCoE and iSCSI on 00Y3306)	License	2 / 2
94Y5160	A4R6	Flex System CN4058S 8-port 10Gb Virtual Fabric Adapter	8	2 / 2
94Y5164	A4R9	Flex System CN4058S Virtual Fabric Adapter SW Upgrade (FoD) (License to enable FCoE and iSCSI on 94Y5160)	License	2 / 2
90Y3466	A1QY	Flex System EN4132 2-port 10Gb Ethernet Adapter	2	2 / 2
00AG530	A5RN	Flex System EN4172 2-port 10Gb Ethernet Adapter	2	2 / 2
1 Gb Ethernet				
49Y7900	A10Y	Flex System EN2024 4-port 1 Gb Ethernet Adapter	4	2 / 2
InfiniBand				
90Y3454	A1QZ	Flex System IB6132 2-port FDR InfiniBand Adapter	2	2 / 2

For details about these adapters, see the Lenovo Press product guides in the Network adapters category: https://lenovopress.com/servers/blades/nic

For more information about adapter-to-switch compatibility, see the Flex System Interoperability Guide: http://lenovopress.com/fsig

Storage host bus adapters

The following table lists storage HBAs that are supported by the x240 M5 server, both internally in the compute node and in the PCIe Expansion Node.

Table 21. Storage adapters

Part number	Feature code	Description	Number of ports	Maximum supported (x240 M5 / PEN)
Fibre Channel				
95Y2386	A45R	Flex System FC5052 2-port 16Gb FC Adapter	2	1 / 1
95Y2391	A45S	Flex System FC5054 4-port 16Gb FC Adapter	4	1 / 1
69Y1942	A1BQ	Flex System FC5172 2-port 16Gb FC Adapter	2	1 / 1
69Y1938	A1BM	Flex System FC3172 2-port 8Gb FC Adapter	2	1 / 1
95Y2375	A2N5	Flex System FC3052 2-port 8Gb FC Adapter	2	1 / 1

For details about these adapters, see the Lenovo Press product guides in the Storage adapters category: https://lenovopress.com/servers/blades/hba

For more information about adapter-to-switch compatibility, see the Flex System Interoperability Guide: http://lenovopress.com/fsig

PCIe Flash Storage adapters

The compute node supports the PCIe Flash Storage Adapters listed in the following table.

Notes: These adapters are installed in an attached PCIe Expansion Node.

Table 22. SSD adapters

Part number	Feature code	Description	Maximum supported
00YA800	AT7N*	io3 1.25TB Enterprise Mainstream Flash Adapter	4
00YA803	AT7P*	io3 1.6TB Enterprise Mainstream Flash Adapter	4
00YA806	AT7Q*	io3 3.2TB Enterprise Mainstream Flash Adapter	4
00YA809	AT7R*	io3 6.4TB Enterprise Mainstream Flash Adapter	2
00YA812	AT7L	P3700 1.6TB NVMe Enterprise Performance Flash Adapter	4
00YA815	AT7M	P3700 2.0TB NVMe Enterprise Performance Flash Adapter	4
00AE983	ARYK	1250GB Enterprise Value io3 Flash Adapter for System x	4
00AE986	ARYL	1600GB Enterprise Value io3 Flash Adapter for System x	4
00AE989	ARYM	3200GB Enterprise Value io3 Flash Adapter for System x	4
00AE992	ARYN	6400GB Enterprise Value io3 Flash Adapter for System x	2
00AE995	ARYP	1000GB Enterprise io3 Flash Adapter for System x	4
00AE998	ARYQ	1300GB Enterprise io3 Flash Adapter for System x	4
00JY001	ARYR	2600GB Enterprise io3 Flash Adapter for System x	4

* These adapters cannot be ordered from the factory installed in the PCIe Expansion Node. Instead, order the adapters separately using the option part numbers.

For more information about these adapters, see the Lenovo Press Product Guides in the PCIe SSD Adapter category:
https://lenovopress.com/servers/options/ssdadapter

GPU adapters

The compute node supports the GPU adapters listed in the following table.

Note: These adapters are installed in an attached PCIe Expansion Node.

Table 23. GPU adapters

Part number	Feature code	Description	Maximum supported
94Y5960	A1R4	NVIDIA Tesla M2090 (full-height adapter)	1**‡
47C2120	A4F1	NVIDIA GRID K1 for Flex System PCIe Expansion Node	1†‡
47C2121	A4F2	NVIDIA GRID K2 for Flex System PCIe Expansion Node	1†‡
47C2137	A5HD	NVIDIA Tesla K40 for Flex System PCIe Expansion Node	1†‡
47C2122	A4F4	Intel Xeon Phi 5110P for Flex System PCIe Expansion Node	1†‡

** If the NVIDIA Tesla M2090 is installed in the Expansion Node, then an adapter cannot be installed in the other full-height slot. If installed, only this adapter is supported in the expansion node. No other PCIe adapters may be selected.
† The K1, K2, K20, K40 and 5110P adapters are double-wide cards and occupy the two full-height PCIe slots. If installed, the adjacent slot is unavailable, however adapters can be installed in the two low-profile slots.
‡ NVIDIA GRID Kx and Tesla Kxx GPUs supported only when the x240 M5 has 1 TB or less memory installed.

Power supplies

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

Integrated virtualization

The x240 M5 supports the VMware vSphere (ESXi) hypervisor on one or two SD cards with the optional SD Media Adapter for System x. This adapter is installed in a dedicated slot beneath I/O Adapter slot 1, as shown in the following figure.

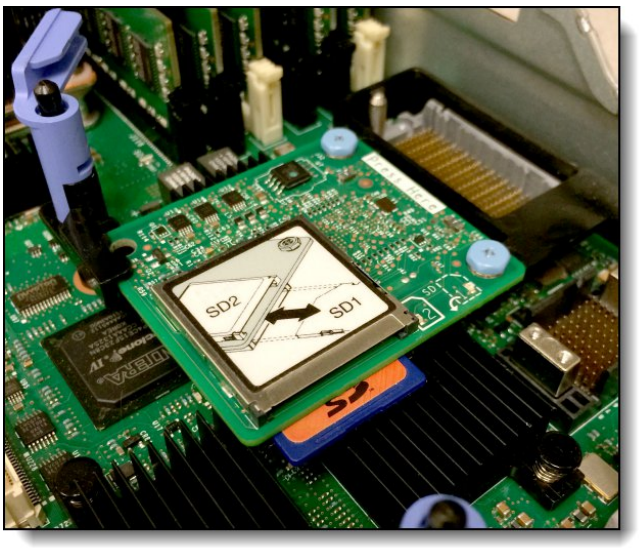

Figure 11. SD Media Adapter for System x

When only one SD card is installed in the adapter, you can create up to 16 volumes, each of which is presented to UEFI as a bootable device. When two SD Media cards are inserted, volumes can be mirrored (RAID-1) across both cards, up to a total of eight mirrored volumes. The use of mirrored volumes improves system availability because the server remains operational, even if one SD card fails. The RAID functionality is handled internally by the SD Media Adapter.

The following table shows the available options. The table also indicates whether the option includes the SD Media RAID Adapter and how many SD cards are included.

Table 24. Virtualization options

Part number	Feature code	Description	Includes Adapter	Includes Media
00ML706	A5TJ	SD Media Adapter for Systems x (Option 00ML706 includes 2 blank 32GB SD cards)	Yes	Yes (2)*
00ML700	AS2V	Blank 32GB SD Media for System x	No	Yes (1)
None**	ASCG	RAID Adapter for SD Media w/ VMware ESXi 5.1 U2 (1 SD Media)	Yes	Yes (1)
None**	AS4B	RAID Adapter for SD Media w/ VMware ESXi 5.1 U2 (2 SD Media, RAIDed)	Yes	Yes (2)
None**	ASCH	RAID Adapter for SD Media w/ VMware ESXi 5.5 U2 (1 SD Media)	Yes	Yes (1)
None**	AS4C	RAID Adapter for SD Media w/ VMware ESXi 5.5 U2 (2 SD Media, RAIDed)	Yes	Yes (2)
None**	ATS9	RAID Adapter for SD Media w/VMware ESXi 6.0 U1A (2 SD Media, RAIDed)	Yes	Yes (2)
None**	ATSA	RAID Adapter for SD Media w/ VMware ESXi 6.0 U1A (1 SD Media)	Yes	Yes (1)

* Option 00ML706 includes two 32GB SD cards; however, for CTO orders, feature code A5TJ does not include SD media and the 32GB cards and VMware vSphere preload must be selected separately.
** CTO only.

Light path diagnostics

For quick problem determination when you are physically at the server, the x240 M5 offers the following three-step guided path:

1. Illuminate the Fault LED on the front panel.
2. Identify the fault in the light path diagnostics panel, as shown in the following figure.
3. Illuminate LEDs on the system board next to the faulty components.

The x240 M5 light path diagnostics panel is inside the server between the two processors, as shown in the following figure.

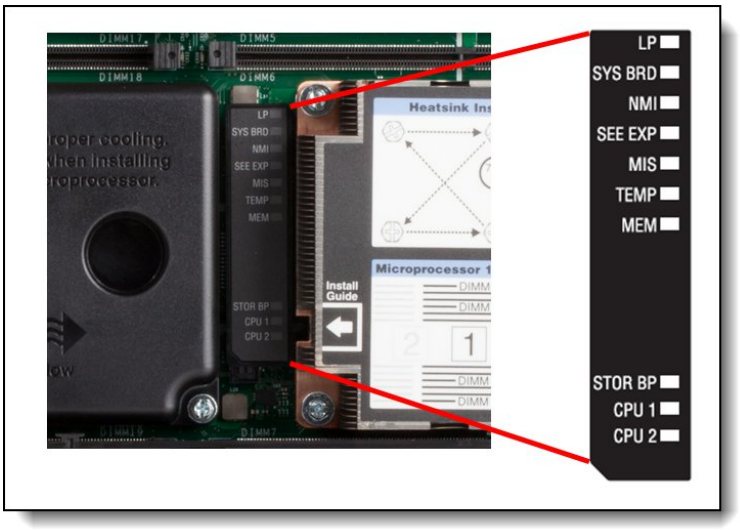

Figure 12. Location of x240 M5 light path diagnostics panel

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 doubles as the light path diagnostics reminder button when the server is removed from the chassis.

The meanings of the LEDs in the light path diagnostics panel are listed in the following table.

Table 25. Light path diagnostic panel LEDs

LED	Meaning
LP	The light path diagnostics panel is operational.
SYS BRD	A system board error is detected.
NMI	A non-maskable interrupt (NMI) occurred.
SEE EXP	A fault is detected in the adjacent expansion unit (if installed).
MIS	A mismatch occurred between the processors, DIMMs, or HDDs within the configuration as reported by POST.
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.

Remote management

Lenovo XClarity Administrator is a centralized resource management solution designed to reduce complexity, speed response, and enhance the availability of Lenovo systems and solutions.

Lenovo XClarity Administrator provides agent-free hardware management for ThinkServer, System x and Flex System servers. The administration dashboard, shown in the following figure, based on HTML 5, allows fast location of resources so tasks can be run quickly.

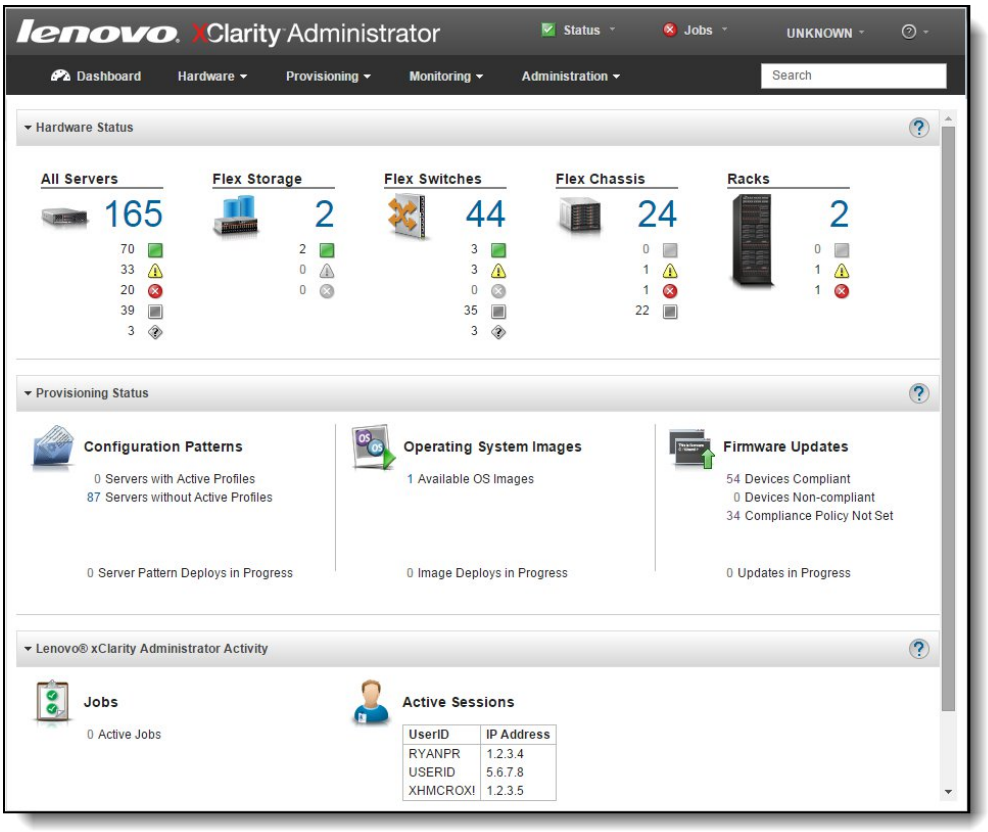

Figure 13. Lenovo XClarity Administrator dashboard

Because Lenovo XClarity Administrator does not include any agent software that must be installed on the managed endpoints, there are no CPU cycles spent on agent execution and no memory is used, which means that up to 1GB of RAM and 1 - 2% CPU usage is saved, compared to a typical managed system where an agent is required.

Lenovo XClarity Administrator supports the following functions with Flex System systems:

- Discovery
- Inventory
- Monitoring and alerting
- Call home
- Centralized user management
- Cryptography modes, server certificates, and encapsulation
- Configuration patterns
- Operating system deployment
- Firmware updates

For more information about Lenovo XClarity Administrator, including ordering part numbers, see the Lenovo XClarity Administrator Product Guide:
https://lenovopress.com/tips1200-lenovo-xclarity-administrator

The server contains an Integrated Management Module II (IMM2), which interfaces with the advanced management module in the chassis. The combination of these modules 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, and 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.

Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 7
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 12
- SUSE Linux Enterprise Server 12 with XEN
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 6.0 (ESXi)

Note: Support by some of these operating system versions is available after the date of initial availability. 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 server features the following dimensions and weight (approximate):

- Height: 51 mm (2.0 in)
- Depth: 493 mm (19.4 in)
- Width: 215 mm (8.5 in)
- Maximum weight: 7.1 kg (15.6 lb)

The server features the following shipping dimensions and weight (approximate):

- Height: 197 mm (7.8 in)
- Depth: 603 mm (23.7 in)
- Width: 430 mm (16.9 in)
- Weight: 8 kg (17.6 lb)

Supported environment

The Flex System x240 M5 compute node complies with ASHRAE Class A3 specifications.

The following Power on operating environment is supported:

- 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)

The following power-off operating environment is supported:

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

The following Storage (non-operating) operating environment is supported:

- 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)

The following Shipment (non-operating) environment is supported:

- 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 country-specific. Not all warranty service upgrades are available in every country. For more information about Lenovo warranty service upgrade offerings that are available in your country, visit the Lenovo Services website:

https://www-304.ibm.com/sales/gss/download/spst/servicepac/extProductSelectorWWW.do

The following table explains warranty service definitions in more detail.

Table 26. 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 country 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
- Japan VCCI, Class A
- IEC 60950-1 (CB Certificate and CB Test Report)
- Taiwan BSMI CNS13438, Class A; CNS14336
- Australia/New Zealand AS/NZS CISPR 22, Class A
- Korea KN22, Class A, KN24
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2,
- EN61000-3-3)
- TUV-GS (EN60950-1/IEC 60950-1, EK1-ITB2000)

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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:

- Flex System x240 M5 Compute Node product page
  http://shop.lenovo.com/us/en/systems/servers/blades/flex-system/compute-nodes/x240-m5/
- Flex System Information Center
  http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp
- Flex System x240 M5 Compute Node Installation and Service Guide
  http://pic.dhe.ibm.com/infocenter/flexsys/information/topic/com.lenovo.acc.9532.doc/printable_doc.html
- ServerProven for Flex System
  http://www.lenovo.com/us/en/serverproven/flexsystem.shtml
- ServerProven hardware compatibility page for the x240 M5
  http://www.lenovo.com/us/en/serverproven/flex/9532.shtml
- Flex System Interoperability Guide
  http://lenovopress.com/fsig
- Operating System Interop Guide (OSIG):
  http://lenovopress.com/osig
- xREF - System x Reference
  http://lenovopress.com/xref
- IBM System Storage
- Interoperation Center
  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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