

io3 Enterprise Mainstream Flash Adapters

Product Guide (withdrawn product)

Engineered for application acceleration, the Lenovo io3 Enterprise Mainstream PCIe Flash Storage Adapters can help deliver higher performance than typical solid-state devices at a fraction of the cost and space, which makes them a perfect fit for a broad range of applications, including database and cloud applications, big data analytics, and hyperscale data center workloads.

Delivering high speed, low latency, and high efficiency, this new third-generation line of flash adapters brings scalable and optimized performance to distributed scale-out architectures at low cost. These adapters are designed primarily for servers and computing appliances to maximize compute efficiency while providing the added benefits of lower power and cooling costs, low management impact, and smaller storage footprints.

The io3 6.4TB Enterprise Mainstream Flash Adapter is shown in the following figure.

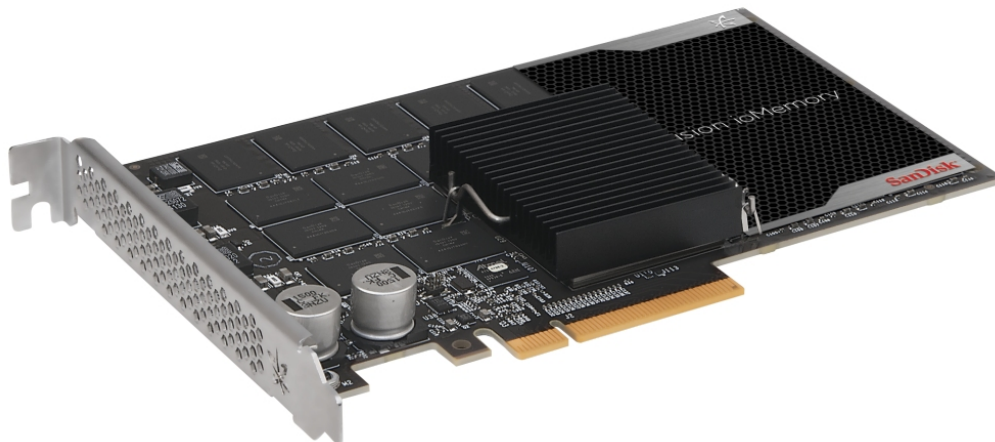


Figure 1. io3 6.4TB Enterprise Mainstream Flash Adapter

Did you know?

The io3 Enterprise Mainstream Flash Adapters use flash memory as their storage medium, which contain no moving parts and do not have the issues that are associated with vibration, noise, and mechanical failure. The adapters are built as block devices on a PCIe bus with advanced wear-leveling, ECC protection and chip-level fault tolerance, which provides exceptional reliability and efficiency.

With a capacity of up to 6.4 TB per PCIe adapter and a write latency of 15 μ s, the io3 Enterprise Mainstream Flash Adapters are an excellent choice for application acceleration with analytics, database, VDI, cloud, hyperscale, and big data applications.

Part number information

The following table lists the ordering information for the adapters.

Withdrawn: All adapters are now withdrawn from marketing.

Table 1. Ordering information

Part number	Feature	Description
00YA800	AT7N	io3 1.25TB Enterprise Mainstream Flash Adapter
00YA803	AT7P	io3 1.6TB Enterprise Mainstream Flash Adapter
00YA806	AT7Q	io3 3.2TB Enterprise Mainstream Flash Adapter
00YA809	AT7R	io3 6.4TB Enterprise Mainstream Flash Adapter

The part numbers for the adapters include the following items:

- A PCIe Flash Adapter with 3U full-height bracket attached
- Separate 2U low-profile PCIe bracket (1250GB, 1600GB, and 3200GB adapters only)
- USB Key with documentation
- Quick Install Guide
- Important Notices document
- Warranty Flyer

Features

The io3 Enterprise Mainstream Flash Adapters are based on the SanDisk Fusion ioMemory SX350 adapters. They use cost-effective Multi-Level Cell (MLC) NAND flash memory as the basic building block of solid-state storage and contain no moving parts, so they are less sensitive to issues that are associated with vibration, noise, and mechanical failure. These adapters are standard PCIe devices, and appear to the operating system as local block storage. io3 Mainstream adapters have advanced wear-leveling, ECC, and chip level fault tolerance, which provides for exceptional reliability and efficiency.

The io3 Enterprise Mainstream Flash Adapters can deliver the fast, scalable performance for general-purpose workloads at low latency that is required for webscale and cloud environments. The following typical applications require ultrahigh I/O performance:

- Large scale transaction processing
- Cloud computing
- Content distribution
- On-demand streaming
- Data warehousing
- Business intelligence and analytics
- Decision support
- Online Transaction Processing

The io3 Enterprise Mainstream Flash Adapters have the following features:

- Technology:
 - Up to 6.4 TB of solid-state storage in an industry-standard PCIe form factor.
 - High-density design with cost-effective MLC NAND technology that reduces storage footprint.
 - Functions as a PCIe storage and controller device. The operating system sees a block device.

- Performance:
 - Improved performance over the previous generation io3 Enterprise Value adapters
 - High-speed, low latency, consistent, and scalable I/O performance
 - Access latency can be as low as 15 μ s
 - Up to 2.8 GBps/2.2 GBps of sustained sequential read/write throughput
 - Up to 345,000/385,000 random read/write IOPS that uses 4 KB data blocks
- Reliability:
 - Advanced wear leveling
 - ECC protection
 - Adaptive Flashback redundancy for RAID-like chip protection with self-healing capabilities
- Monitoring and management:
 - Power consumption
 - Thermal information
 - Flash wear-out

Note: These adapters cannot be used as bootable devices.

Technical specifications

The following table lists the technical specifications for the io3 Enterprise Mainstream Flash Adapters.

Table 2. Technical specifications

Specification	1.25 TB	1.6 TB	3.2 TB	6.4 TB
Part number	00YA800	00YA803	00YA806	00YA809
Interface	PCIe 2.0 x8	PCIe 2.0 x8	PCIe 2.0 x8	PCIe 2.0 x8
Form factor	Half height, half length	Half height, half length	Half height, half length	Full height, half length
Capacity	1250 GB	1600 GB	3200 GB	6400 GB
Endurance (total bytes written, TBW)	4 PB	5.5 PB	11 PB	22 PB
Random read IOPS (4 KB blocks)	225,000	270,000	345,000	340,000
Random write IOPS (4 KB blocks)	345,000	375,000	385,000	385,000
Sequential read throughput	2.8 GBps	2.8 GBps	2.8 GBps	2.8 GBps
Sequential write throughput	1.3 GBps	1.7 GBps	2.2 GBps	2.2 GBps
Read access latency	79 μ s	79 μ s	79 μ s	79 μ s
Write access latency	15 μ s	15 μ s	15 μ s	15 μ s
Power consumption (Max)	19.5 W	22 W	24 W	24.5 W

The key difference between io3 Enterprise Mainstream and Enterprise Flash Storage devices is their endurance (or lifetime); that is, how long they can perform write operations because solid-state devices have a finite number of program/erase (P/E) cycles. Enterprise Mainstream PCIe Flash Adapters have better cost/IOPS ratio but lower endurance compared to Enterprise PCIe Flash adapters.

Because of difference in write endurance, the Enterprise Mainstream Flash Adapters are targeted for general-purpose workloads, and the Enterprise Flash Adapters are targeted for mixed read- and write-intensive workloads. Solid-state device write endurance often is measured by the number of P/E cycles that the drive incurs over its lifetime, which is listed as the total bytes of written (TBW) data in the device specification.

The TBW value that is assigned to a flash storage adapter is the TBW data (based on the number of P/E cycles) that an adapter can be guaranteed to complete (the percentage of remaining P/E cycles is equal to the percentage of remaining TBW). The Lenovo warranty for the flash storage adapter is limited to devices that have not reached the maximum guaranteed number of P/E cycles. Flash storage adapters that reaches this limit might fail to operate according to its specifications. Because of such behavior, careful planning must be done to use the adapters in the application environments to ensure that the TBW of the adapter is not exceeded before the end of the required life expectancy.

Writes are tracked and reported by the adapter's management utility and might be affected by application writes, data patterns, and maintenance designed to maximize data integrity.

Server support

The following tables list the server compatibility information for the io3 Enterprise Mainstream Flash Adapters.

Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Table 3. Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	x3850 X6/x3950 X6 (6241, E7 v4)	nx360 M5 (5465, E5-2600 v4)	sd350 (5493)
00YA800	io3 1.25TB Enterprise Mainstream Flash Adapter	N	N	Y*	Y*	Y	N	N
00YA803	io3 1.6TB Enterprise Mainstream Flash Adapter	N	N	Y*	Y*	Y	N	N
00YA806	io3 3.2TB Enterprise Mainstream Flash Adapter	N	N	Y*	Y*	Y	N	N
00YA809	io3 6.4TB Enterprise Mainstream Flash Adapter	N	N	Y*	Y*	Y*	N	N

* This adapter cannot be factory installed; it is supported as a field-installable option only. The server cannot be shipped with this adapter installed.

Support for servers with Intel Xeon v3 processors

Table 4. Support for servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3250 M5 (5458)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465)
00YA800	io3 1.25TB Enterprise Mainstream Flash Adapter	N	N	N	Y*	Y*	Y	N
00YA803	io3 1.6TB Enterprise Mainstream Flash Adapter	N	N	N	Y*	Y*	Y	N
00YA806	io3 3.2TB Enterprise Mainstream Flash Adapter	N	N	N	Y*	Y*	Y	N
00YA809	io3 6.4TB Enterprise Mainstream Flash Adapter	N	N	N	Y*	Y*	Y*	N

* This adapter cannot be factory installed; it is supported as a field-installable option only. The server cannot be shipped with this adapter installed.

Support for servers with Intel Xeon v2 processors

Table 5. Support for servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)	nx360 M4 (5455)
00YA800	io3 1.25TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA803	io3 1.6TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA806	io3 3.2TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA809	io3 6.4TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y*	N	N

* This adapter cannot be factory installed; it is supported as a field-installable option only. The server cannot be shipped with this adapter installed.

Support for Flex System compute nodes

The adapters are supported in the following Flex System compute nodes when installed in an attached PCIe Expansion Node.

Table 6. Support for Flex System servers

Part number	Description	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532)	x440 (7917)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)
00YA800	io3 1.25TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	Y	N	N	N	N
00YA803	io3 1.6TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	Y	N	N	N	N
00YA806	io3 3.2TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	Y	N	N	N	N
00YA809	io3 6.4TB Enterprise Mainstream Flash Adapter	N	N	N	N	N	Y	N	N	N	N

See the following ServerProven website for the latest compatibility information for System x servers:
<http://www.lenovo.com/us/en/serverproven/>

For further information about server compatibility, see this support page:
<https://support.lenovo.com/us/en/documents/serv-io3>

Operating system support

The io3 Enterprise Mainstream Flash Adapters support the following operating systems:

- Microsoft Windows Server 2008 R2
- 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: These adapters *cannot* be used as bootable devices.

For more information about the specific supported versions and service packs, see the following ServerProven web page:

<http://www.lenovo.com/us/en/serverproven/xseries/storage/mcmatrix.shtml>

On the ServerProven page, click the check mark that is associated with the server in question to see more information about the operating system support.

Warranty

The adapters carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported Lenovo server, these adapters assume the system's base warranty and any warranty upgrade.

Physical specifications

The 1.25 TB, 1.6 TB, and 3.2 TB io3 Enterprise Mainstream Flash Adapters have the following physical specifications:

- Dimensions and weight (approximate):
 - Height: 17 mm (0.7 in.)
 - Width: 69 mm (2.7 in.)
 - Depth: 167 mm (6.6 in.)
 - Weight: 152 g (0.3 lb)
- Shipping dimensions and weight (approximate):
 - Height: 65 mm (2.6 in.)
 - Width: 245 mm (9.6 in.)
 - Depth: 225 mm (8.9 in.)
 - Weight: 421 g (0.9 lb)

The 6.4 TB Enterprise Mainstream Flash Adapter has the following physical specifications:

- Dimensions and weight (approximate):
 - Height: 17 mm (0.7 in.)
 - Width: 112 mm (4.4 in.)
 - Depth: 167 mm (6.6 in.)
 - Weight: 212 g (0.5 lb)
- Shipping dimensions and weight (approximate):
 - Height: 65 mm (2.6 in.)
 - Width: 245 mm (9.6 in.)
 - Depth: 225 mm (8.9 in.)
 - Weight: 481 g (1.1 lb)

Operating environment

The adapters are supported in the following environment:

- Temperature (operational): 0 - 55 °C (32 - 131 °F) at 0 - 3,048 m (0 - 10,000 ft)
- Relative humidity: 5 - 95% (non-condensing)
- Maximum altitude (operational): 3,048 m (10,000 ft)

Agency approvals

The io3 Enterprise Mainstream Flash Adapters conform to the following regulations:

- FCC Title 47, Part 15 Subpart B, Class A
- CAN ICES-3 (A) NMB-3 (A)
- EN 55022: 2010
- EN 61000-3-2: 2006 plus A1:2009 and A2:2009
- EN 61000-3-3: 2008
- EN 55024: 2010
- VCCI V-3/2013.04 Class A & EN 55022: 2010 Class A
- ANSI C63.4: 2009
- BSMI CNS 13438: 2006 Class A
- EN 55022 (2006) A1 (2007) Class A
- AS/NZS CISPR 22: 2009 plus A1:2010
- MSIP-REM-FIO-ioScale3
- EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 and IEC 60950-1:2005 A1:2009
- RoHS Directive 2011/65/EU
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC
- REACH Directive 1999/45/EC and Regulation (EC) 1907/2006
- WEEE Directive 2002/96/EC

Related publications and links

For more information, see the following web pages and documents:

- Flash Adapters product page
<http://shop.lenovo.com/us/en/systems/servers/options/systemx/storage/solid-state/flash-adapters/>
- io3 Flash Adapter configuration information and requirements
<https://support.lenovo.com/us/en/documents/serv-io3>
- ioMemory VSL 4.1.2 io3 Flash Adapter Hardware Installation Guide (PDF)
<https://support.lenovo.com/us/en/docs/UM104182>
- ioMemory VSL 4.1.2 Release Notes (PDF)
<https://support.lenovo.com/us/en/docs/UM104183>
- ioMemory VSL 4.1.2 User Guide for Linux (PDF)
<https://support.lenovo.com/us/en/docs/UM104184>
- ioMemory VSL 4.1.2 User Guide for Microsoft Windows (PDF)
<https://support.lenovo.com/us/en/docs/UM104185>
- ioMemory VSL 4.1.2 User Guide for VMware ESXi (PDF)
<https://support.lenovo.com/us/en/docs/UM104186>
- Flash Management Console 3.15.0 Installation Guide (PDF)
<https://support.lenovo.com/us/en/docs/UM104178>
- Flash Management Console 3.15.0 Release Notes (PDF)
<https://support.lenovo.com/us/en/docs/UM104179>
- Flash Management Console 3.15.0 Tools Guide (PDF)
<https://support.lenovo.com/us/en/docs/UM104180>
- Flash Management Console 3.15.0 User Guide (PDF)
<https://support.lenovo.com/us/en/docs/UM104181>
- System x Configuration and Options Guide
<https://support.lenovo.com/us/en/documents/SCOD-3ZVQ5W>
- ServerProven
<http://www.lenovo.com/us/en/serverproven/>

Related product families

Product families related to this document are the following:

- [PCIe Flash Adapters](#)

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