New SSD options for IBM Power Systems provide enhanced performance at a lower cost

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At a glance

Multiple solid-state drive (SSD) enhancements deliver increased value for users of IBM(R) Power Systems™:

- New, fourth-generation Enterprise Multi-Level Cell (eMLC4) 2.5-inch SSDs offer capacity and price/performance enhancements.
- 1.9TB Read Intensive 2.5-inch SSDs offer new price/performance options for workloads with modest write requirements for POWER8(R) servers.
- New eMLC4 1.8-inch SSDs offer capacity and price/performance enhancements for POWER8 system units.

Overview

POWER8 and POWER7(R) servers now feature the fourth generation of 2.5-inch small form factor (SFF) eMLC4 (SAS) SSD technology. These eMLC4 SSDs provide high-performance, enterprise-class storage at much higher performance levels than available on disk drives. The new SAS SSDs offer three key advantages over the existing popular SFF SAS SSDs:

- Significantly improved price/performance in terms of lower price per drive and lower price per gigabyte, especially for the 4k drives.
- With a new 1.55 TB SSD, twice the maximum capacity per drive compared to the previous-generation SSD for POWER8 servers. The larger capacity can save space, require fewer SAS adapters, and provide better price/performance for larger SSD configurations. Up to 37.2 TB of flash memory technology storage fits in just 2U of rack space in an EXP24S drawer.
- Improved drive performance compared to previous eMLC SSD generations.

This is a refresh of the 387 GB and 775 GB capacity point SAS SSDs, and a new 1550 GB (1.55 TB) higher capacity point to the Power(R) SAS SSD portfolio. The new SAS SSDs are supported in all POWER8 system units with SAS bays and run by integrated SAS controllers. The SAS SSDs are also supported in the EXP24S storage drawer when attached to a POWER8 or POWER7 system and run by PCIe3 or PCIe2 SAS RAID controllers. The new SSDs can be intermixed with existing SSD configurations, providing flexible growth to existing servers. Both 4224 (4k) and 528 (5xx) byte sector features are offered to provide configuration flexibility for POWER8 servers. 5xx SSDs are provided to POWER7 servers.

1.9TB Read Intensive 2.5-inch SAS SSDs are introduced for POWER8 servers using SAS bays. These drives are supported in POWER8 system units (SFF-3) and in EXP24S I/O drawers attached to POWER8 servers (SFF-2). With their large capacity

and lower cost per GB, they can provide a very cost-effective and footprint-effective solution for many read intensive configurations. Note these drives are designed for workloads with modest write requirements.

1.8-inch eMLC4 SAS SSDs refresh and expand the configuration options associated with this space-efficient drive. The Power S822L, S824, S824L, and E850 system units have 1.8-inch bays that can take advantage of this eMLC4 drive. The 1.8-inch 387 GB drive refreshes the existing 387 GB offering with the newer eMLC4 technology, which provides performance and price/performance advantages. The new 1.8-inch 775 GB drive doubles the capacity per drive, allowing greater footprint density, and matches the previously available 775 GB capacity point already available in 2.5-inch SAS bays.

Key prerequisites

- POWER8 server with available SAS bays in the system unit or EXP24S I/O drawer
- Supported SAS controllers and adapters running these SAS bays
- Appropriate software levels

Planned availability date

- April 22, 2016 for features EL78, EL7E, EL7K, EL7P, EL85, EL8C, EL8F, EL8N, EL8Q, EL8V, ELQ5, ELQ8, ELQC, ELQE, ELQF, ELT6, ELT9, ELTD, ELTF, ELTG, ELTL, ELTP, ELTQ, ELTR, ELTW, EQ78, EQ79, EQ73, EQ7F, EQ85, EQ86, EQ8C, EQ8D, EQ8F, EQ8G, ES78, ES79, ES7E, ES7F, ES7K, ES7L, ES7P, ES7Q, ES85, ES86, ES8C, ES8D, ES8F, ES8G, ES8N, ES8P, ES8Q, ES8R, ES8V, and ES8W
- May 27, 2016 for features EL1C, EL2W, EL2X, EL4K, EL78, EL7E, EL7V, EL80, EL8J, ELQ8, ELQE, ELR0, ELSD, ELSL, ELSW, ELSY, ELT1, ELT9, ELTF, ELTK, EQ78, EQ79, EQ7E, EQ7F, EQ80, EQ81, ES1C, ES1D, ES2V, ES2W, ES2X, ES2Y, ES4K, ES4L, ES78, ES79, ES7E, ES7F, ES80, ES81, ES8J, and ES8K

Description

eMLC4 2.5-inch SSDs

The fourth-generation eMLC (eMLC4) SSDs are available for Power Systems servers with POWER8 and POWER7 technology. These SAS SSDs are 2.5-inch SFF drives that can be installed either in the POWER8 system unit SAS bays (SFF-3) or in EXP24S SAS bays (SFF-2) attached to a POWER8 or POWER7 server. The new eMLC4 SAS SSDs provide significantly improved price/performance compared to previous eMLC3 SSDs.

eMLC4 SSD performance is improved over previous generations of Power eMLC SSDs. Compared to the eMLC3 SSDs, the new eMLC4 drives offer improved input/output operations per second (IOPS), throughput, and latency. For example, measurements show:

- Up to 50% higher maximum IOPS value for random mixed read/write workloads
- Up to 750 MBps while reading from the drive or up to 470 MBps while writing to the drive
- Up to 20% better latency running a random mixed read/write workload (down to a 0.12 ms latency)

Note that performance measurements and comparisons vary based on workload. For example, random read-only eMLC4 IOPS is only slightly improved over eMLC3 drives, while random write-only eMLC4 IOPS is very significantly improved. Also note that most client application environments do not drive their SSDs to these IOPS or throughput levels.

Power eMLC flash memory provides enterprise-class performance and reliability characteristics. The new fourth-generation eMLC SSDs build upon a heritage of performance and endurance to provide a better value proposition to users of POWER8 and POWER7 servers. They provide SAS 6 Gbps capability, but are designed to be 12 Gbps compliant if future SAS adapters support 12 Gbps capability.

As with IBM's earlier eMLC SSDs, the new drives are designed to deliver great endurance and reliability. For example, the new eMLC SSD modules are designed to provide 24x7x365 usage running write-intensive levels for about five years. Typical client usage is expected to be much lower, especially regarding the average percentage of writes, and thus drive lifespan can be much longer. Similar to the eMLC3 SSDs, the new SSDs provide a Drive Write Per Day (DWPD) rating of approximately "10." This rating estimates the number of times the SSD's capacity could be written per day over the projected life of the drive.

The POWER8 servers that support the new SAS SSDs in their system unit are the S812L (8247-21L), S814 (8286-41A), S822 (8284-22A), S822L (8247-22L), S824 (8286-42A), S824L (8247-42L), and E850 (8408-E8E). The SFF-3 SAS bay in these servers uses an SFF-3 carrier/tray, on which the SAS drive is mounted. Other model POWER8 servers do not have SAS bays in their system units and therefore can not support eMLC4 SFF-3 SSDs. Earlier Power servers do not use the SFF-3 SAS bay.

When attached to a POWER8 or POWER7 server, the EXP24S I/O drawers (#5887 or #EL1S) can hold up to 24 of the new SAS SSDs. The EXP24S SAS bays use an SFF-2 carrier/tray, on which the SAS drive is mounted. For POWER8 servers, the Power S814 (6-core and 8-core), S822, S824, E850, E870, and E880 support the #5887 EXP24S. The S812L, S822L, and S824L support the #EL1S EXP24S. For POWER7 and POWER7+™ servers, the new SSDs are supported on:

- Power 710 Express® (8231-E1C, 8231-E1D, and 8268-E1D)
- Power 720 Express (8202-E4D)
- Power 730 Express (8231-E2C and 8231-E2D)
- Power 740 Express (8205-E6C and 8205-E6D)
- Power 750 Express (8408-E8D)
- Power 760 (9109-RMD)
- Power 770 (9117-MMC and 9117-MMD)
- Power 780 (9179-MHC and 9179-MHD)
- Power 795 (9119-FHB)

The eMLC4 SSDs refresh the previously available 387 GB and 775 GB capacity points for POWER7 and POWER8 servers. The eMLC4 SSDs add a new 1550 GB (1.55 TB) capacity point for POWER8 servers. These are 400 GB, 800 GB, and 1600 GB SSDs that are always formatted either to 4224 (4k) byte sectors or to 528 (5xx) byte sectors for additional protection, resulting in 387 GB, 775 GB, and 1550 GB capacities. The 4096 or 512 byte sectors or JBOD are not supported. 4k drives are supported only on POWER8 servers.

Multiple features are available for ordering SSDs to meet your business requirements.

Four key characteristics are differentiated in these features:

- Capacity: 387 GB, 775 GB, or 1.55 TB
- Carrier/tray or SAS bay: SFF-3 or SFF-2
- Sector size: 5xx (528) or 4k (4224) byte
- Type server/OS: Linux-only or multi-OS. If multi-OS and planning for IBM i or AIX/Linux, footnote 1 applies.

Multi-OS server feature numbers

SSD	For SFF-3 and 4k	For SFF-3 and 5xx	For SFF-2 and 4k	For SFF-2 and 5xx
387 GB	ES8N and ES8P[1]	ES7K and ES7L[1]	ES85 and ES86[1]	ES78 and ES79[1]
775 GB	ES8Q and ES8R[1]	ES7P and ES7Q[1]	ES8C and ES8D[1]	ES7E and ES7F[1]
1.55 TB	ES8V and ES8W[1]	N/A[2]	ES8F and ES8G[1]	N/A[2]

Linux-only server feature numbers

SSD	For SFF-3 and 4k	For SFF-3 and 5xx	For SFF-2 and 4k	For SFF-2 and 5xx
387 GB	EL8N	EL7K	EL85	EL78
775 GB	EL8Q	EL7P	EL8C	EL7E
1.5 TB	EL8V	N/A[2]	EL8F	N/A[2]

[1] The multi-OS SSDs for AIX/Linux and IBM i are identical. There are two feature numbers versus one feature number because IBM i configurations require protection (such as mirroring or RAID 5), whereas AIX(R) and Linux™ only strongly recommend protection. Different feature numbers enable IBM configuration tools such as e-config to apply the appropriate rules even when both OS environments or VIOS are on the same server.

[2] The new 1.55 TB capacity SSD is available only on POWER8 servers. It is available as a 4k drive and is not available as a 5xx drive.

In addition to the above features, "quantity 150" features for the SFF-2 drives address maximum order quantity limitations within the IBM ordering and manufacturing systems. No-charge load source specify features provide guidance to IBM configuration tools and manufacturing.

Controllers and adapters

The new eMLC4 SSDs are run either by the integrated SAS controllers in the POWER8 system unit or by PCIe3 or PCIe2 SAS adapters. The PCIe3/2 adapters are:

- PCIe3 12GB Cache RAID PLUS SAS Adapter Quad-port 6GB x8 (#EJ14)
- PCIe3 12 GB Cache RAID SAS Adapter Quad-port 6Gb x8 (#EJ0L)
- PCIe3 RAID SAS Adapter Quad-port 6Gb x8 (#EJ0J or #EL59)
- PCIe3 LP RAID SAS Adapter Quad-port 6Gb x8 (#EJ0M or #EL3B)
- PCIe2 1.8GB Cache RAID SAS Adapter Tri-port 6Gb (#5913)
- PCIe2 1.8GB Cache RAID SAS Adapter Tri-port 6Gb CR (#ESA3)

Support of the new eMLC4 SSDs by earlier SAS adapters prior to PCIe2 is not planned. Examples of earlier SAS adapters include the PCIe1 5805 feature and all PCI-X features.

The SSD configuration rules, maximums, limitations, and capabilities of these PCIe3 and PCIe2 SAS adapters and integrated POWER8 SAS controllers are unchanged, whether new eMLC4 SSDs are used or earlier SSDs are used. You can mix eMLC4 SSDs and earlier SSDs under the same controller or adapter, as well as mix them in the same array. This allows existing SSD investments to be leveraged and can provide more flexible growth.

Existing SSD rules are unchanged. For example:

- Do not mix different size capacities such as 387 GB and 775 GB in the same array or mix 775 GB and 1.55 TB in the same array.
- Do not mix 4k and 5xx drives in the same array.
- The largest SSD supported in the 4-core S814 is 387 GB.

- Do not mix SSDs and HDDs in the same array unless it is an Easy Tier(R) array.
- 4k drives are supported only on POWER8 servers.

Software requirements (assuming the server supports this software level):

- AIX for 4k drives: AIX 7.2 TL0, or later; AIX 7.1 TL3 SP3, or later; or AIX 7.1 TL4, or later; AIX 6.1 TL 9 SP 3, or later.
- AIX for 5xx drives: All AIX levels that are supported on that server.
- IBM i 7.3 or later, IBM i 7.2 TR4 or later, IBM i 7.1 TR11 or later. The 1.55 TB requires IBM i 7.2 TR4 or later.
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.0, or later; RHEL 7.1, or later; Ubuntu 15.10, or later; Ubuntu 14.04.3, or later.
- PowerVM(R) VIOS for 4k drives: PowerVM VIOS V2.2.3.3, or later; PowerVM VIOS V2.2.4.0, or later. 387 GB, 775 GB, or 1.55 TB capacity points are supported across all these software levels.
- PowerVM VIOS for 5xx drives: All VIOS levels that are supported on that server.
- PowerVM VIOS for 4k drives: VIOS 2.2.3.3 or later, VIOS 2.2.4.0 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

1.9TB Read Intensive 2.5-inch SAS SSDs

The 1.9 TB capacity drive is designed to provide a lower cost per TB of SSD storage in a space-efficient footprint. It is a 2.5-inch SAS SSD which is mounted on an SFF-3 carrier/tray for a POWER8 system unit or mounted on an SFF-2 carrier/tray for an EXP24S drawer when attached to a POWER8 server. The drive is formatted to use 4224-byte sectors (4k) and does not support the 4k JBOD 4096-byte sector. It also does not use the 512-byte or 528-byte (5xx) sector formatting.

When in the POWER8 system units with SAS SFF-3 bays, the drive is run by the integrated SAS controller such as found in the Power S812L, S822L, S824L, S814, S822, S824, and E850. When in the EXP24S (SFF-2) the drive is run by a PCIe3 SAS RAID adapter, such as the feature EJ0L, EJ14, EJ0J, EJ0M, EL3B, and EL59. These PCIe3 controllers support 4k drives on POWER8 servers. Earlier-generation SAS controllers don't support 4k drives. When placed in one of these PCIe3 controllers' SSD arrays, the array must be all read intensive (RI) SSD or all non-RI SSD. A SAS controller can currently run both 4k and 5xx drives, but they must be in separate arrays. Drives in an array should be the same or similar capacity. HDD and SSD can only be mixed in the same array when part of an Easy Tier array (RAID-5TS, -6T2 or -10T2) provided by SAS RAID controllers such as the feature EJ0L or EJ14 or POWER8 integrated backplane controllers.

Like all SSDs, the performance of the 1.9TB RI SSD is excellent compared to a disk drive (HDD). Performance compared to other SSDs such as non-read-intensive eMLC3 or eMLC4 SSDs is expected to be noticeably lower in many scenarios. A key reason for the lower 1.9TB RI SSD performance expectation is due to its more limited write performance compare to an SSD with more write capability, up to 75% slower for writes. The degree of lower performance varies by workload and environment. As with any drive, either HDD or SSD, the number of drives is still a factor in achieving satisfactory performance, especially for IBM i.

This is a read intensive (RI) drive and is not suitable for write intensive workloads. Assuming a typical heavily random workload, at about 3,394 TB of writes to the drive it will be at its maximum projected write capability. Writes past the drive's maximum write capacity will continue to work for some period of time, but much more slowly. A Predictive Failure Analysis message will indicate that it is time to replace the drive. If the predictive failure is ignored and writes continue to be sent to the drive, eventually the drive will be unable to accept write commands and will accept only read commands for a period of time. A failed write will result in a more serious error message indicating that the drive must be replaced.

The nature of the workload has a great impact on the maximum write capacity. For example, if a high percentage of more sequentially oriented writes is used instead of random writes, the maximum write capacity can be significantly larger. The user should occasionally check to see what percentage of the drive's write life remains and adjust the workload or drive assignment as it makes sense to do so. Checking is done by inspecting the "SSD Read Intensive Fuel Gauge." This capability is available through AIX, IBM i, and Linux. The query or command to view the information varies by operating system. Check all the RI drives' remaining life individually, even if all are in the same array.

If the drive reaches its maximum write capability during the warranty period, IBM will replace it at no charge to the client. The warranty period of the drive is defined by the server machine type under which the drive feature code is ordered and will be either 3 years or 1 year for Power Systems. After the warranty period, the drive's replacement is not covered under IBM maintenance if the maximum number of writes has been achieved. You would need to order a new, chargeable SSD as its replacement. Other aspects of SSD maintenance are consistent with SSDs that are not read intensive.

There are multiple feature codes used to identify the proper 1.9TB SSD characteristics. Key characteristics are:

- Multi-OS server or Linux-only server
- If Multi-OS, then is planned for AIX/Linux or for IBM i
- SFF-3 or SFF-2 carrier/trays

	For SFF-3	**For SFF-2**
Multi-OS server feature codes	ES8J (AIX/Linux) and ES8K (IBM i)	ES80 (AIX/Linux) and ES81 (IBM i)
Linux-only server feature codes	EL8J	EL80

Note: The Multi-OS SSDs for AIX/Linux and IBM i are identical. There are two feature number versus one feature number because IBM i configurations require protection (such as mirroring or RAID 5), whereas AIX and Linux only strongly recommend protection. Different feature numbers enable IBM configuration tools such as e-config to apply the appropriate rules even when both OS environments or VIOS are on the same server.

There are also feature codes that order a quantity 150 of the SFF-2 drives (#EQ80, EQ81, #ELR0) and no-charge load source specify features (#ELT1 and #ELTK).

Software requirements (assuming the server supports this software level):

- AIX Version 7.2 with the 7200-00 Technology Level and Service Pack 2
- AIX Version 7.1 with the 7100-04 Technology Level and Service Pack 2
- AIX Version 7.1 with the 7100-03 Technology Level and Service Pack 7 (planned availability September 8, 2016)
- AIX Version 6.1 with the 6100-09 Technology Level and Service Pack 7
- IBM i 7.3 or later, IBM i 7.2 TR4 or later.
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.0, or later; RHEL 7.1, or later; Ubuntu 15.10, or later; Ubuntu 14.04.3, or later.
- AIX assignment to the VIOS requires VIOS 2.2.4.2 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

1.8-inch eMLC4 SSDs

Two different capacities of 1.8-inch eMLC4 SSDs are offered: 387 GB and 775 GB. The 387 GB drive is a 400 GB drive that is always formatted for additional protection yielding 387 GB. Similarly the 775 GB drive is an 800 GB drive also always formatted for protection. A 400 GB and 800 GB JBOD formatting is not supported. Both a 528-byte sector drive (5xx) and a 4224-byte sector drive (4k) are available.

Compared to the previously available 387 GB 1.8-inch SSD, the new eMLC4 drive offers:

- Additional performance
- Better price/performance
- A larger-capacity 775 GB drive with twice the footprint density
- A 4k-byte sector drive as well as a 5xx drive for configuration flexibility
- Same excellent reliability and endurance

These 1.8-inch eMLC4 SSDs are supported on the POWER8 system units of the S822 (8284-22A), S822L (8247-22L), S824 (8286-42A), S824L (8247-42L), and E850 (8408-E8E). The 1.8-inch SAS bays in these servers are located in the front of the server and run by the same integrated SAS controllers that run the 2.5-inch (SFF-3) bays in these system units. These 1.8-inch eMLC4 SSDs are not supported in the EXP30 Ultra Drawer used on POWER7/POWER7+ servers.

The 387 GB 1.8-inch eMLC4 SSD can be intermixed in the same array with other 387 GB SSDs, either earlier-generation 1.8-inch or 2.5-inch (SFF-3) 387 GB SSDs. Similarly the 775 GB 1.8-inch eMLC4 SSD can be intermixed in the same array with 2.5-inch (SFF-3) 775 GB SSDs. Configured in RAID-5T2, -6T2, or -10T2 arrays with disk drives they can be used by the SAS controllers supporting the Easy Tier Function.

Multiple features are available for ordering 1.8-inch eMLC4 SSDs to meet your business requirements. Three key characteristics are differentiated in these features:

- Capacity: 387 GB or 775 GB
- Sector size: 5xx (528) or 4k (4224) byte
- Type server/OS: Linux-only or multi-OS. If multi-OS and planning for IBM i or AIX/Linux, footnote 1 applies.

Feature codes for Multi-OS servers (see note below)

SSD	4224 (4k) byte sectors	528 (5xx) byte sectors
387 GB	ES2V (AIX/Linux) & EX2W (IBM i)	ES1C (AIX/Linux) & ES1D (IBM i)
775 GB	ES4K (AIX/Linux) & EX4L (IBM i)	ES2X (AIX/Linux) & ES2Y (IBM i)

Feature codes for Linux-only servers

SSD	4224 (4k) byte sectors	528 (5xx) byte sectors
387 GB	EL2W	EL1C
775 GB	EL4K	EL2X

Note: The Multi-OS SSDs for AIX/Linux and IBM i are identical. There are two feature numbers versus one feature number because IBM i configurations require protection (such as mirroring or RAID 5), whereas AIX and Linux only strongly recommend protection. Different feature numbers enable IBM configuration tools such as e-config to apply the appropriate rules even when both OS environments or VIOS are on the same server.

In addition to the above features four no-charge load source specify features provide guidance to IBM configuration tools and manufacturing: #ELSD, #ELSL, #ELSW, and #ELSY.

As with IBM's earlier eMLC SSDs, the new drives are designed to deliver great endurance and reliability. For example, the new eMLC SSD modules are designed to provide 24x7x365 usage running write-intensive levels for about five years. Typical client write is expected to be much lower, especially regarding the average percentage of writes, and thus drive life span can be much longer. Similar to the eMLC3 SSDs, the new SSDs provide a Drive Write Per Day (DWPD) rating of approximately "10." This rating estimates the number of times the SSD's capacity could be written per day over the projected life of the drive.

Software requirements (assuming the server supports this software level)

- AIX for 4k drives: AIX 7.2 TL0, or later; AIX 7.1 TL3 SP3, or later; or AIX 7.1 TL4, or later; AIX 6.1 TL 9 SP 3, or later.
- AIX for 5xx drives: All AIX levels that are supported on that server.
- IBM i 7.1 TR11, or later; IBM i 7.2 TR4, or later; IBM i 7.3, or later
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.2, or later; Ubuntu 16.04, or later; Ubuntu 14.04.4, or later.
- PowerVM VIOS for 4k drives: PowerVM VIOS V2.2.3.3, or later; PowerVM VIOS V2.2.4.0, or later. 387 GB and 775 GB capacity points are supported across all these software levels.
- PowerVM VIOS for 5xx drives: All VIOS levels that are supported on that server.
- PowerVM VIOS for 4k drives: VIOS 2.2.3.3 or later, VIOS 2.2.4.0 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

Product number

The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8236, 8246, 8247, 8248, 8268, 8284, 8286, 8408, 8412, 9109, 9117, 9119, and 9179 machine types:

Planned Availability Date April 22, 2016

New Feature

Description	MT	Model	Feature
387GB SFF-2 SSD 5xx eMLC4 for Linux	8246	L1S	EL78
	8246	L1T	
	8246	L2S	
	8246	L2T	
	8247	21L	
	8247	22L	
	8247	42L	
775GB SFF-2 SSD 5xx eMLC4 for Linux	8246	L1S	EL7E
	8246	L1T	
	8246	L2S	
	8247	21L	
	8247	22L	
	8247	42L	
387GB SFF-3 SSD 5xx eMLC4 for Linux	8247	21L	EL7K
	8247	22L	
	8247	42L	
775GB SFF-3 SSD 5xx eMLC4 for Linux	8247	21L	EL7P
	8247	22L	
	8247	42L	
387GB SFF-2 SSD 4k eMLC4 for Linux	8247	21L	EL85

	8247	22L	
	8247	42L	
775GB SFF-2 SSD 4k eMLC4 for Linux	8247	21L	EL8C
	8247	22L	
	8247	42L	
1.55TB SFF-2 SSD 4k eMLC4 for Linux	8247	21L	EL8F
	8247	22L	
	8247	42L	
387GB SFF-3 SSD 4k eMLC4 for Linux	8247	21L	EL8N
	8247	22L	
	8247	42L	
775GB SFF-3 SSD 4k eMLC4 for Linux	8247	21L	EL8Q
	8247	22L	
	8247	42L	
1.55TB SFF-3 SSD 4k eMLC4 for Linux	8247	21L	EL8V
	8247	22L	
	8247	42L	
Quantity 150 of #EL85 387GB SFF-2 SSD 4k	8247	21L	ELQ5
	8247	22L	
	8247	42L	
Quantity 150 of #EL78 387GB SFF-2 SSD 5xx	8246	L2S	ELQ8
	8246	L2T	
	8247	21L	
	8247	22L	
	8247	42L	
Quantity 150 of #EL8C 775GB SFF-2 SSD 4k	8247	21L	ELQC
	8247	22L	
	8247	42L	
Quantity 150 of #EL7E 775GB SFF-2 SSD 5xx	8246	L2S	ELQE
	8247	21L	
	8247	22L	
	8247	42L	
Quantity 150 of #EL8F 1.55TB SFF-2 SSD 4k	8247	21L	ELQF
	8247	22L	
	8247	42L	
#ES86 Load Source Specify (387GB SFF-2 SSD 4k for IBM i)	8286	41A	ELT6
	8286	42A	
	9119	MHE	
	9119	MME	
#ES79 Load Source Specify (387GB SFF-2 SSD 5xx for IBM i)	8202	E4B	ELT9
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
#ES8D Load Source Specify (775GB SFF-2 SSD 4k for IBM i)	8286	41A	ELTD
	8286	42A	
	9119	MHE	
	9119	MME	
#ES7F Load Source Specify (775GB SFF-2 SSD 5xx for IBM i)	8202	E4B	ELTF
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2C	
	8231	E2D	

	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
#ES8G Load Source Specify (1.55TB SFF-2 SSD 4k for IBM i)	8286	41A	ELTG
	8286	42A	
	9119	MHE	
	9119	MME	
#ES7L Load Source Specify (387GB SFF-3 SSD 5xx for IBM i)	8286	41A	ELTL
	8286	42A	
#ES8P Load Source Specify (387GB SFF-3 SSD 4k for IBM i)	8286	41A	ELTP
	8286	42A	
#ES7Q Load Source Specify (775GB SFF-3 SSD 5xx for IBM i)	8286	41A	ELTQ
	8286	42A	
#ES8R Load Source Specify (775GB SFF-3 SSD 4k for IBM i)	8286	41A	ELTR
	8286	42A	
#ES8W Load Source Specify (1.55TB SFF-3 SSD 4k for IBM i)	8286	41A	ELTW
	8286	42A	
Quantity 150 of #ES78 387GB SFF-2 SSD 5xx	8202	E4B	EQ78
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
Quantity 150 of #ES79 387GB SFF-2 SSD 5xx	8202	E4B	EQ79
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
Quantity 150 of #ES7E 775GB SFF-2 SSD 5xx	8202	E4B	EQ7E
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9117	MMB	
	9119	MHE	

	9119	MME	
	9179	MHB	
Quantity 150 of #ES7F 775GB SFF-2 SSD 5xx	8202	E4B	EQ7F
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
Quantity 150 of #ES85 387GB SFF-2 SSD 4k	8284	22A	EQ85
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Quantity 150 of #ES86 387GB SFF-2 SSD 4k	8286	41A	EQ86
	8286	42A	
	9119	MHE	
	9119	MME	
Quantity 150 of #ES8C 775GB SFF-2 SSD 4k	8284	22A	EQ8C
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Quantity 150 of #ES8D 775GB SFF-2 SSD 4k	8286	41A	EQ8D
	8286	42A	
	9119	MHE	
	9119	MME	
Quantity 150 of #ES8F 1.55TB SFF-2 SSD 4k	8284	22A	EQ8F
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Quantity 150 of #ES8G 1.55TB SFF-2 SSD 4k	8286	41A	EQ8G
	8286	42A	
	9119	MHE	
	9119	MME	
387GB SFF-2 SSD 5xx eMLC4 for AIX/Linux	8202	E4B	ES78
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8236	E8C	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
387GB SFF-2 SSD 5xx eMLC4 for IBM i	8202	E4B	ES79
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	

	8231	E1D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
775GB SFF-2 SSD 5xx eMLC4 for AIX/Linux	8202	E4B	ES7E
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8236	E8C	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
775GB SFF-2 SSD 5xx eMLC4 for IBM i	8202	E4B	ES7F
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8286	41A	
	8286	42A	
	9117	MMB	
	9119	MHE	
	9119	MME	
	9179	MHB	
387GB SFF-3 SSD 5xx eMLC4 for AIX/Linux	8284	22A	ES7K
	8286	41A	
	8286	42A	
	8408	E8E	
387GB SFF-3 SSD 5xx eMLC4 for IBM i	8286	41A	ES7L
	8286	42A	
775GB SFF-3 SSD 5xx eMLC4 for AIX/Linux	8284	22A	ES7P
	8286	41A	
	8286	42A	
	8408	E8E	
775GB SFF-3 SSD 5xx eMLC4 for IBM i	8286	41A	ES7Q
	8286	42A	
387GB SFF-2 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES85
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
387GB SFF-2 SSD 4k eMLC4 for IBM i	8286	41A	ES86
	8286	42A	
	9119	MHE	
	9119	MME	
775GB SFF-2 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES8C
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	

	9119	MME	
775GB SFF-2 SSD 4k eMLC4 for IBM i	8286	41A	ES8D
	8286	42A	
	9119	MHE	
	9119	MME	
1.55TB SFF-2 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES8F
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
1.55TB SFF-2 SSD 4k eMLC4 for IBM i	8286	41A	ES8G
	8286	42A	
	9119	MHE	
	9119	MME	
387GB SFF-3 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES8N
	8286	41A	
	8286	42A	
	8408	E8E	
387GB SFF-3 SSD 4k eMLC4 for IBM i	8286	41A	ES8P
	8286	42A	
775GB SFF-3 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES8Q
	8286	41A	
	8286	42A	
	8408	E8E	
775GB SFF-3 SSD 4k eMLC4 for IBM i	8286	41A	ES8R
	8286	42A	
1.55TB SFF-3 SSD 4k eMLC4 for AIX/Linux	8284	22A	ES8V
	8286	41A	
	8286	42A	
	8408	E8E	
1.55TB SFF-3 SSD 4k eMLC4 for IBM i	8286	41A	ES8W
	8286	42A	

The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8236, 8246, 8247, 8248, 8268, 8284, 8286, 8408, 8412, 9109, 9117, 9119, and 9179 machine types:

Planned Availability Date May 27, 2016

New Feature

Description	MT	Model	Feature
387GB 1.8" SAS 5xx SSD eMLC4 for Linux	8247	22L	EL1C
	8247	42L	
387GB 1.8" SAS 4k SSD eMLC4 for Linux	8247	22L	EL2W
	8247	42L	
775GB 1.8" SAS 5xx SSD eMLC4 for Linux	8247	22L	EL2X
	8247	42L	
775GB 1.8" SAS 4k SSD eMLC4 for Linux	8247	22L	EL4K
	8247	42L	
387GB SFF-2 SSD 5xx eMLC4 for Linux	8248	L4T	EL78
775GB SFF-2 SSD 5xx eMLC4 for Linux	8246	L2T	EL7E
	8248	L4T	
EL7V FEATURE IS RESTRICTED FOR USE ONLY ON ESS.			
1.6TB SFF-2 SSD 4k eMLC4 for Linux	8247	22L	EL7V
1.9TB Read Intensive SAS 4k SFF-2 SSD for Linux	8247	21L	EL80
	8247	22L	
	8247	42L	
1.9TB Read Intensive SAS 4k SFF-3 SSD for Linux	8247	21L	EL8J
	8247	22L	
	8247	42L	
Quantity 150 of #EL78 387GB SFF-2 SSD 5xx	8248	L4T	ELQ8
Quantity 150 of #EL7E 775GB SFF-2 SSD 5xx	8246	L2T	ELQE
	8248	L4T	
Quantity 150 of EL80 1.9TB SSD	8247	21L	ELR0
	8247	22L	
	8247	42L	
#ES1D Load Source Specify (387GB 1.8" SAS 5XX SSD)	8286	42A	ELSD

#ES4L Load Source Specify (775GB 1.8" SAS 4K SSDi)	8286	42A	ELSL
#ES2W Load Source Specify (387GB 1.8" SAS 4K SSD)	8286	42A	ELSW
#ES2Y Load Source Specify (775GB 1.8" SAS 5XX SSD)	8286	42A	ELSY
#ES81 Load Source Specify (1.9TB SFF-2 SSD)	8286	41A	ELT1
	8286	42A	
	9119	MHE	
	9119	MME	
#ES79 Load Source Specify (387GB SFF-2 SSD 5xx for IBM i)	8408	E8D	ELT9
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
#ES7F Load Source Specify (775GB SFF-2 SSD 5xx for IBM i)	8408	E8D	ELTF
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
#ES8K Load Source Specify (1.9TB SFF-3 SSD)	8286	41A	ELTK
	8286	42A	
Quantity 150 of #ES78 387GB SFF-2 SSD 5xx	8408	E8D	EQ78
	8412	EAD	
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
Quantity 150 of #ES79 387GB SFF-2 SSD 5xx	8408	E8D	EQ79
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
Quantity 150 of #ES7E 775GB SFF-2 SSD 5xx	8408	E8D	EQ7E
	8412	EAD	
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
Quantity 150 of #ES7F 775GB SFF-2 SSD 5xx	8408	E8D	EQ7F
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
Quantity 150 of #ES80 1.9TB SFF-2 SSD 4k	8284	22A	EQ80
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Quantity 150 of ES81 1.9TB SFF-2 SSD 4k	8286	41A	EQ81
	8286	42A	
	9119	MHE	
	9119	MME	
387GB 1.8" SAS 5xx SSD eMLC4 for AIX/Linux	8284	22A	ES1C
	8286	42A	
	8408	E8E	
387GB 1.8" SAS 5xx SSD eMLC4 for IBM i	8286	42A	ES1D
387GB 1.8" SAS 4k SSD eMLC4 for AIX/Linux	8284	22A	ES2V

	8286	42A	
	8408	E8E	
387GB 1.8" SAS 4k SSD eMLC4 for IBM i	8286	42A	ES2W
775GB 1.8" SAS 5xx SSD eMLC4 for AIX/Linux	8284	22A	ES2X
	8286	42A	
	8408	E8E	
775GB 1.8" SAS 5xx SSD eMLC4 for IBM i	8286	42A	ES2Y
775GB 1.8" SAS 4k SSD eMLC4 for AIX/Linux	8284	22A	ES4K
	8286	42A	
	8408	E8E	
775GB 1.8" SAS 4k SSD eMLC4 for IBM i	8286	42A	ES4L
387GB SFF-2 SSD 5xx eMLC4 for AIX/Linux	8408	E8D	ES78
	8412	EAD	
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
387GB SFF-2 SSD 5xx eMLC4 for IBM i	8408	E8D	ES79
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
775GB SFF-2 SSD 5xx eMLC4 for AIX/Linux	8408	E8D	ES7E
	8412	EAD	
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
775GB SFF-2 SSD 5xx eMLC4 for IBM i	8408	E8D	ES7F
	9109	RMD	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9179	MHC	
	9179	MHD	
1.9TB Read Intensive SAS 4k SFF-2 SSD for AIX/ Linux	8284	22A	ES80
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
1.9TB Read Intensive SAS 4k SFF-2 SSD for IBM i	8286	41A	ES81
	8286	42A	
	9119	MHE	
	9119	MME	
1.9TB Read Intensive SAS 4k SFF-3 SSD for AIX/ Linux	8284	22A	ES8J
	8286	41A	
	8286	42A	
	8408	E8E	
1.9TB Read Intensive SAS 4k SFF-3 SSD for IBM i	8286	41A	ES8K
	8286	42A	

Publications

No publications are shipped with the announced products.

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Technical information

Specified operating environment

Software requirements

eMLC4 2.5-inch SSDs

Software requirements (assuming the server supports this software level):

- AIX for 4k drives: AIX 7.2 TL0, or later; AIX 7.1 TL3 SP3, or later; or AIX 7.1 TL4, or later; AIX 6.1 TL 9 SP 3, or later.
- AIX for 5xx drives: All AIX levels that are supported on that server.
- IBM i 7.3 or later, IBM i 7.2 TR4 or later, IBM i 7.1 TR11 or later. The 1.55 TB requires IBM i 7.2 TR4 or later.
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.0, or later; RHEL 7.1, or later; Ubuntu 15.10, or later; Ubuntu 14.04.3, or later.
- PowerVM VIOS for 4k drives: PowerVM VIOS V2.2.3.3, or later; PowerVM VIOS V2.2.4.0, or later. 387 GB, 775 GB, or 1.55 TB capacity points are supported across all these software levels.
- PowerVM VIOS for 5xx drives: All VIOS levels that are supported on that server.
- PowerVM VIOS for 4k drives: VIOS 2.2.3.3 or later, VIOS 2.2.4.0 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

1.9TB Read Intensive 2.5-inch SAS SSDs

Software requirements (assuming the server supports this software level):

- AIX Version 7.2 with the 7200-00 Technology Level and Service Pack 2.
- AIX Version 7.1 with the 7100-04 Technology Level and Service Pack 2.
- AIX version 7.1 with the 7100-03 Technology Level and Service Pack 7 (planned availability September 8, 2016).
- AIX Version 6.1 with the 6100-09 Technology Level and Service Pack 7.
- IBM i 7.3 or later, IBM i 7.2 TR4, or later.
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.0, or later; RHEL 7.1, or later; Ubuntu 15.10, or later; Ubuntu 14.04.3, or later.
- PowerVM VIOS for 4k drives: PowerVM VIOS V2.2.3.3, or later; PowerVM VIOS V2.2.4.0, or later.
- AIX assignment to the VIOS requires VIOS 2.2.4.2 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

1.8-inch eMLC4 SSDs

Software requirements (assuming the server supports this software level):

- AIX for 4k drives: AIX 7.2 TL0, or later; AIX 7.1 TL3 SP3, or later; or AIX 7.1 TL4, or later, AIX 6.1 TL 9 SP 3, or later.
- AIX for 5xx drives: All AIX levels that are supported on that server.
- IBM i 7.1 TR11, or later; IBM i 7.2 TR4, or later; IBM i 7.3, or later.
- SLES 11 SP4, or later; SLES 12, or later.
- RHEL 6.7, or later; RHEL 7.2, or later; Ubuntu 16.04, or later; Ubuntu 14.04.4, or later.
- PowerVM VIOS for 4k drives: PowerVM VIOS V2.2.3.3, or later; PowerVM VIOS V2.2.4.0, or later. 387 GB and 775 GB capacity points are supported across all these software levels.
- PowerVM VIOS for 5xx drives: All VIOS levels that are supported on that server.
- PowerVM VIOS for 4k drives: VIOS 2.2.3.3 or later, VIOS 2.2.4.0 or later.

Refer to the feature description section of the *Sales Manual* for specific software requirements.

Planning information

Cable orders

No additional cables are required.

Security, auditability, and control

This product uses the security and auditability features of host software and application software.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

IBM Electronic Services

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single Internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, go to the IBM Electronic Support website.

Terms and conditions

MES discount applicable

Equal to the volume commitment discount.

Field installable feature

Yes.

Warranty period

These features assume the same warranty or maintenance terms as the machine in which they are installed for the full warranty or maintenance period announced for such machine.

1.9TB Read Intensive (RI) 2.5-inch SSDs have a maximum number of write cycles. 1.9TB RI 2.5-inch SSD failures will be replaced during the standard warranty period for the attached server at IBM's expense regardless of usage levels. IBM Maintenance Agreements after the warranty period are limited to 1.9TB RI 2.5-inch SSDs that have not reached the maximum number of write cycles. 1.9TB RI 2.5-inch SSDs that reach this limit may fail to operate according to specifications and must be replaced at customers' expense. Individual service life may vary and can be monitored using an OS command.

Customer setup

Yes.

Machine code

Same license terms and conditions as base machine.

Prices

For all local charges, contact your IBM representative.

AP distribution

Country/Region	Announced
AP IOT	
ASEAN *	Yes
India/South Asia **	Yes
Australia	Yes
Hong Kong	Yes
Macao SAR of the PRC	Yes
Mongolia	Yes
New Zealand	Yes
People's Republic of China	Yes
South Korea	Yes
Taiwan	Yes
Japan IOT	
Japan	Yes

* Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Timor-Leste Vietnam

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Corrections

(Corrected on July 18, 2016)

The "Description" section was revised.