Dell PowerEdge M640

Technical Guide

DELL EMC

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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System overview

Introduction

The PowerEdge M640 is an ultra-efficient blade server combining up to 28 cores of Intel processing power and up to 16 DDR4 DIMMs in a dense, easy to manage platform ideal for data center workloads.

The M640 is designed for use with the PowerEdge M1000e enclosure.

New technologies

Table 1. New technologies

Technology	Detailed description
CPU	• Single or dual CPU option • Supports Up to 28 cores Second Generation Intel Xeon Scalable processor family. • Up to 46-bit physical addressing and 48-bit virtual addressing • Intel AVX 256 b floating point • 32 KB instruction and 32 KB data L1 cache per core • 1.0 MB Mid Level Cache (MLC) per core • 1.375 MB non-inclusive Last Level Cache (LLC) • UPI up to 10.4 GT/s and up to two links • Integrated PCIe Gen3, 40 lanes/socket
Intel Ultra Path Interconnect (UPI)	• Up to 10.4 GT/s with up to two links between sockets
Memory	• Up to 6 channels with 2 or 1 DIMM per channel • 16 DIMMs in total • Supports DDR4, RDIMM, and LRDIMM • Support registered ECC DDR4 DIMMs only • DDR4 speed up to 2933 MHz • 64 GB (LRDIMM) or 32 GB (RDIMM) with a maximum RAM size of 1 TB
Chipset	• Intel Lewisburg chipset • Provides PCIe Gen2 ports • Up to 20 Gen3 lanes for root ports, and up to 24 Gen3 lanes used as downstream ports • 14 SATA ports
Internal cards	• bNDC daughter cards • Mezzanine cards • miniPERC • IDSDM and BOSS hardware RAID
iDRAC9 with Lifecycle controller	The new embedded systems management solution for the Dell EMC systems features hardware and firmware inventory and alerting, data center level power monitoring, and faster performance. For details, see the Dell EMC OpenManage systems management section

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System features

Product comparison

Table 2. General comparison

Feature	M630	M640
Form factor	Half height blade	Half height blade
CPU	• 2 socket Intel Haswell EP	• 2 socket Second Generation Intel Xeon Scalable processor family(Cascade Lake).
Memory	• 24x DDR4 RDIMM and LRDIMM	• 16x DDR4 RDIMM and LRDIMM
Hard drives	• 2.5-inch-12 GB SAS/SATA • 1.8-inch-6 GB SATA	• 2.5-inch-12 GB SAS and 6 GB SATA

Backplane	• 2.5-inch hard drive:
	  • SATA only from chipset
	  • SAS/SATA from PERC
	  • PCIe SSD from PCIe Exterder Module
	• 1.8-inch hard drive:
	  • uSATA from chipset
	  • uSATA from PERC
		• 2.5-inch hard drive:
		  • SAS only from PERC
		  • SAS/NVMe-SAS from PERC/PCIe from CPU2
		  • SATA/NVMe-SATA from chipset/PCIe from CPU2

Storage controller	• Hardware RAID: H330, H730, H730P • Software RAID: PERC S130	• Hardware RAID: H330, H730P, BOSS-M.2 SATA • Software RAID: PERC S140
PCIe SSD	Yes	Yes-NVMe
Communications	• bNDC: 4x1 GbE, 2x10 GbE, 4x10GbE	• bNDC: 4x1 GbE, 2x10 GbE, 4x10 GbE
Remote management	• iDRAC8	• iDRAC9
Heat sink type	• 68 mm-24 DIMMs • 86 mm-20 DIMMs	• CPU1 heat sink: 100x108x30.5 mm • CPU2 heat sink: 86x108x30.5 mm
TPM	TPM Modular-FIPS TPM 1.2	TPM Modular-TPM 1.2 FIPS, TPM 2.0 FIPS, TPM 2.0 China

Specifications

Table 3. Technical specifications

Feature	Specification
CPU	• One or Two – up to 28 cores Second Generation Intel Xeon family for servers(Cascade lake). • Up to 46-bit physical addressing and 48-bit virtual addressing • Intel AVX 256b floating point • 32 KB instruction and 32 KB data L1 cache per core • 1.0 MB Mid Level Cache (MLC) per core • 1.375 MB non-inclusive Last Level Cache (LLC)

Feature	Specification
	• UPI up to 10.4GT/s and up to two links • Integrated PCIe Gen3 40 lanes/socket
Chipset	• Platform Controller Hub: INTEL Lewisburg • Up to 20 Gen3 lanes (16 devices max) for root ports, and up to 24 Gen3 lanes used as downstream ports(Note1) • Up to 10 superspeed, 14 highspeed (Note2) • One integrated MAC • GPIO bus(Group A~L and GPD) • 1 SMBus ports, 6 SMlink ports(SMLink0B, SMLink0-4) • 14 SATA ports, up to 6Gb/s(Note3)
Memory	• Supports RDIMM and LRDIMM memory • Operate at DDR4-2933,2667, 2400 MT/s speeds • X16 288-pin memory module sockets • 8GB, 16GB, 32GB, and 64GB memory module capacities • Minimum 8GB capacitance per module • 64 GB (LRDIMM) or 32 GB (RDIMM) with maximum RAM size of 1 TB

PCIe slot	• Internal slot:
	  • One x8 PCIe Gen3 for bNDC cards – connected to CPU1
	  • Two x8 PCIe Gen3 for Mezz cards – connected to CPU1
	  • One x8 PCIe Gen3 for miniPERC – connected to CPU1
	  • One x 2 PCIe Gen3 for BOSS HW RAID – connected to CPU2

SATA	• 14 SATA ports available on the chipset • 2x2.5-in hard drive/SSD
Video	• Integrated VGA in iDRAC • 4 Gb DDR4 shared with iDRAC application memory
LAN	bNDC card: 1 G Quad ports, 10 G Dual/Quad ports
Dimension	• Depth: 544.32 mm-handle closed • Height: 50.35 mm • Width: 197.9 mm
Hard drives	• 2x 2.5-inch hard drives • 10,000 and 15,000 rpm 2.5-inch SAS hard drives • 7,200 rpm 2.5-inch Enterprise SATA hard drives • 2.5-inch Solid State Drives (SSD), including PCIe NVMe drives
RAID controller	• S140-SATA and NVMe software RAID • H330 • H730P
Tape drives	RD1000

Operating systems	• Supported operating systems:
	  • RedHat Enterprise Linux 6.9 Server x86_64
	  • RedHat Enterprise Linux 7.4 Server x86_64
	  • Novell SuSE Linux Enterprise Server 12 SP2 x86_64
	  • MS, Windows Server 2016
	  • MS, Windows Server 2012 R2
	  • Ubuntu 16.04 LTS

Feature	Specification
	• VMWare vSphere 2016 U1 (ESXi 6.5 U1) • VMWare vSphere 2015 U3 (ESXi 6.0 U3) • Citrix Xen Server 7.1 • Supported virtualization: • VMWare vSphere 2016 U1 (ESXi 6.5 U1) • VMWare vSphere 2015 U3 (ESXi 6.0 U3) • Citrix Xen Server 7.1

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Chassis views and features

Front view of the system

You can access the following components from the front of the system:

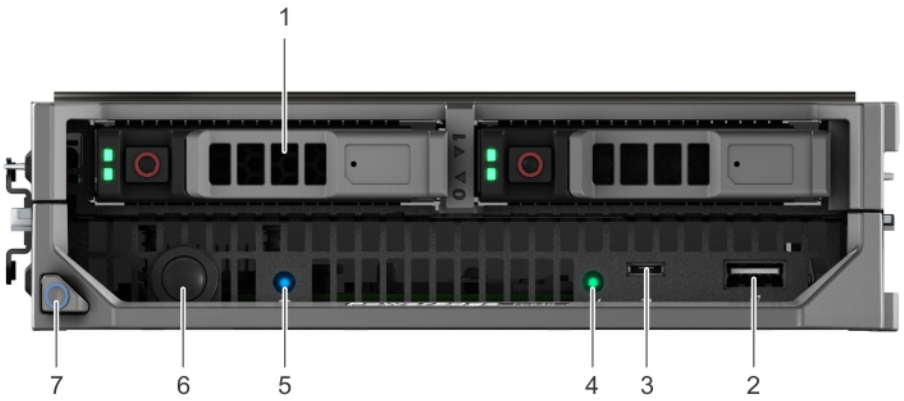

Figure 1. Front view of the system

Table 4. Features available on the front of the system

Item	Ports, panels, and components	Icon	Description
1	Hard drives/SSDs	N/A	2.5 inch hard drive/SSDs are supported. For more information, see the Technical specifications section.
2	USB 3.0 port	SS	Enables you to connect USB devices to the system.
3	iDRAC Direct port		The iDRAC Direct port is micro USB 2.0-compliant. This port enables you to access the iDRAC Direct features. For more information, see the *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/poweredgemanuals.
4	iDRAC Direct LED indicator	N/A	The iDRAC Direct LED indicator lights up to indicate that the iDRAC Direct port is actively connected to a device. For more information, see the iDRAC Direct LED indicator codes section
5	Status indicator		Provides information about the status of the system. For more information, see the Health status indicator section.
6	Power button		Indicates if the system is turned on or off. Press the power button to manually turn on or off the system. **NOTE: Press the power button to gracefully shut down an ACPI-compliant operating system.**
7	System handle release button	N/A	Enables you to unlock the system from the enclosure.

Inside the system

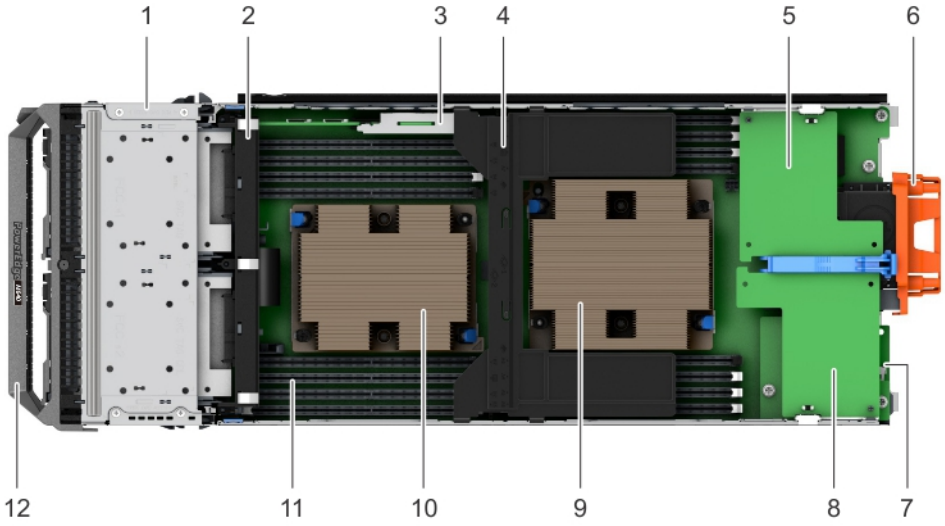

Figure 2. Inside the system

1. drive cage
2. drive backplane
3. IDSDM card
4. air shroud
5. mezzanine card (fabric C)
6. I/O connector cover
7. Network Daughter Card (NDC)
8. mezzanine card (fabric B)
9. heat sink (CPU1)
10. heat sink (CPU2)
11. memory module (16)
12. system handle

Security features

Table 5. Security features

System feature	Description
TPM	The Trusted Platform Module (TPM) is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM 1.2 is supported.
Power-off security	BIOS has the ability to disable the power button function.

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Processor

Processor features

The PowerEdge M640 provides 2 socket server based on Intel's technology to support the Intel Xeon Scalable family processors(including the Second Generation). The M640 will support the core speeds ratios for the processor to support its clock frequency. The M640's Intel Skylake processor features are as follows:

- Up to 2 socket processors
- Up to 28 cores Second Generation Intel Xeon Scalable family processors
- Intel AVX 256b floating point
- 32 KB instruction and 32 KB data L1 cache per core
- 1.0 MB Mid Level Cache (MLC) per core
- 1.375 MB non-inclusive Last Level Cache (LLC)
- UPI up to 10.4GT/s and up to two links
- Integrated PCIe Gen3 40 lanes/socket

Supported Processors

Table 6. Supported Processors for M640

Intel SKU	SKU type	Stepping	Speed(GHz)	Cache(MB)	QPI (GT/s)	Max Memory Speed(MT/s)	Cores	Turbo	TDP (W)
8276M	Platinum	XCC	2.2	38.5	10.4	2933	28	Yes	165
8276	Platinum	XCC	2.2	38.5	10.4	2933	28	Yes	165
8260M	Platinum	XCC	2.4	35.75	10.4	2933	24	Yes	165
8260	Platinum	XCC	2.4	35.75	10.4	2933	24	Yes	165
8176	Platinum	XCC	2.1	38	10.4	2667	28	Yes	165
8160M	Platinum	XCC	2.1	33	10.4	2667	24	Yes	150
8160	Platinum	XCC	2.1	33	10.4	2667	24	Yes	150
6252	Gold	XCC	2.1	35.75	10.4	2933	24	Yes	150
6248R*	Gold	XCC	3.0	35.75	10.4	2933	24	Yes	205
6248	Gold	XCC	2.5	27.5	10.4	2933	20	Yes	150
6246R*	Gold	XCC	3.4	35.75	10.4	2933	16	Yes	205
6246	Gold	XCC	3.3	24.75	10.4	2933	12	Yes	165
6244	Gold	XCC	3.6	24.75	10.4	2933	8	Yes	150
6246R*	Gold	XCC	3.1	35.75	10.4	2933	20	Yes	205
6242	Gold	XCC	2.8	22	10.4	2933	16	Yes	150
6240	Gold	XCC	2.6	24.75	10.4	2933	18	Yes	150
6240R	Gold	XCC	2.4	35.75	10.4	2933	24	Yes	165
6240M	Gold	XCC	2.6	24.75	10.4	2933	18	Yes	150
6238	Gold	XCC	2.1	30.25	10.4	2933	22	Yes	140
6238R	Gold	XCC	2.2	38.5	10.4	2933	28	Yes	165

Intel SKU	SKU type	Stepping	Speed(GHz)	Cache(MB)	QPI (GT/s)	Max Memory Speed(MT/s)	Cores	Turbo	TDP (W)
6238M	Gold	XCC	2.1	30.25	10.4	2933	22	Yes	140
6234	Gold	XCC	3.3	24.75	10.4	2933	8	Yes	130
6230	Gold	XCC	2.1	27.5	10.4	2933	20	Yes	125
6230R	Gold	XCC	2.1	35.75	10.4	2933	26	Yes	150
6230N	Gold	XCC	2.3	27.5	10.4	2933	20	Yes	125
6226	Gold	XCC	2.7	19.25	10.4	2933	12	Yes	125
6226R	Gold	XCC	2.9	22	10.4	2933	16	Yes	150
6222V	Gold	XCC	1.8	27.5	10.4	2400	20	Yes	115
6152	Gold	XCC	2.1	30	10.4	2667	22	Yes	140
6150	Gold	XCC	2.7	25	10.4	2667	18	Yes	165
6148	Gold	XCC	2.4	27	10.4	2667	20	Yes	150
6142	Gold	XCC	2.6	22	10.4	2667	16	Yes	150
6140M	Gold	XCC	2.3	25	10.4	2667	18	Yes	140
6140	Gold	XCC	2.3	24.75	10.4	2667	18	Yes	140
6138	Gold	XCC	2.0	27	10.4	2667	20	Yes	125
6136	Gold	XCC	3.0	24.75	10.4	2667	12	Yes	150
6134M	Gold	XCC	3.2	24.75	10.4	2667	8	Yes	130
6134	Gold	XCC	3.2	24.75	10.4	2667	8	Yes	130
6132	Gold	XCC	2.6	19	10.4	2667	14	Yes	140
6130	Gold	XCC	2.1	22	10.4	2667	16	Yes	125
6128	Gold	XCC	3.4	19.25	10.4	2667	6	Yes	115
6126	Gold	XCC	2.6	19.25	10.4	2667	12	Yes	125
5222	Gold	XCC	3.8	16.5	10.4	2933	4	Yes	105
5220	Gold	HCC	2.2	24.75	10.4	2667	18	Yes	125
5220R	Gold	XCC	2.2	35.75	10.4	2666	24	Yes	150
5220S	Gold	XCC	2.7	24.75	10.4	2667	18	Yes	125
5218	Gold	XCC	2.3	22	10.4	2667	16	Yes	125
5218R	Gold	XCC	2.1	27.5	10.4	2666	20	Yes	125
5218N	Gold	XCC	2.3	22	10.4	2667	16	Yes	110
5217	Gold	HCC	3.0	11	10.4	2667	8	Yes	115
5215	Gold	HCC	2.5	16.5	10.4	2667	10	Yes	85
5215M	Gold	HCC	2.5	13.75	10.4	2667	10	Yes	85
5122	Gold	XCC	3.6	16.5	10.4	2667	4	Yes	105
5120	Gold	HCC	2.2	19.25	10.4	2667	14	Yes	105
5118	Gold	HCC	2.3	16.5	10.4	2667	12	Yes	105
5117	Gold	HCC	2.0	19.25	10.4	2667	14	Yes	105
4216	Gold	HCC	2.1	22	9.6	2400	16	Yes	100
4215	Gold	HCC	2.5	11	9.6	2400	8	Yes	85
4215R	Silver	HCC	3.2	11	9.6	2400	8	Yes	130

Intel SKU	SKU type	Stepping	Speed(GHz)	Cache(MB)	QPI (GT/s)	Max Memory Speed(MT/s)	Cores	Turbo	TDP (W)
4214	Silver	HCC	2.2	16.5	9.6	2400	12	Yes	85
4214R	Silver	HCC	2.4	16.5	9.6	2400	12	Yes	100
4210	Silver	LCC	2.2	13.75	9.6	2400	10	Yes	85
4210R	Silver	LCC	2.4	13.75	9.6	2400	10	Yes	100
4208	Silver	LCC	2.1	11	9.6	2400	8	Yes	85
4116	Silver	HCC	2.1	16	9.6	2400	12	Yes	85
4114	Silver	LCC	2.2	14	9.6	2400	10	Yes	85
4112	Silver	LCC	2.6	8.25	9.6	2400	4	Yes	85
4110	Silver	LCC	2.1	11	9.6	2400	8	Yes	85
4108	Silver	LCC	1.8	11	9.6	2400	8	Yes	85
3206R	Bronze	LCC	1.9	11	9.6	2133	8	No	85
3204	Bronze	LCC	1.9	8.25	9.6	2133	6	No	85
3106	Bronze	LCC	1.7	11	9.6	2133	8	No	85
3104	Bronze	LCC	1.7	8	9.6	2133	6	No	85

NOTE: * **Available 1H 2020**

Chipset

The Intel Lewisburg provides extensive I/O support. Functions and capabilities include:

- ACPI Power Management Logic Support, Revision 4.0a
- PCI Express Base Specification Revision 3.0
- Integrated Serial ATA host controller, supports data transfer rates of up to 6 Gb/s on all ports.
- xHCI USB controller with SuperSpeed USB 3.0 ports
- Direct Media Interface
- Serial Peripheral Interface
- Enhanced Serial Peripheral Interface
- Flexible I/O—Allows some high speed I/O signals to be configured as PCIe root ports, PCIe uplink for use with certain PCH
- SKUs, SATA (and sSATA), or USB 3.0.
- General Purpose Input Output (GPIO)
- Low Pin Count interface, interrupt controller, and timer functions
- System Management Bus Specification, Version 2.0
- Integrated Clock Controller / Real Time Clock Controller
- Intel High Definition Audio and Intel Smart Sound Technology (Not Used)
- Integrated 10/1 Gb Ethernet (Not Used)
- Integrated 10/100/1000 Mbps Ethernet MAC (Not Used)
- Supports Intel Rapid Storage Technology Enterprise
- Supports Intel Active Management Technology and Server Platform Services
- Supports Intel Virtualization Technology for Directed I/O
- Supports Intel Trusted Execution Technology
- JTAG Boundary Scan support
- Intel QuickAssist Technology
- Intel Trace Hub for debug

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Memory

The M640 supports up to 16 DIMMs, with up to 2 TB of memory and speeds of up to 2933MT/s. The M640 supports registered (RDIMMs) and load reduced DIMMs (LRDIMMs) which use a buffer to reduce memory loading and provide greater density, allowing for the maximum platform memory capacity. Unbuffered DIMMs (UDIMMs) are not supported.

Supported memory technologies

Table 7. Supported memory technologies

Feature	Description
DIMM type	• LRDIMM • RDIMM
Transfer speeds	• 2933 MT/s • 2666 MT/s • 2400 MT/s
Voltage	• 1.2 V-DDR4

Table 8. Supported memory

DIMM speed	DIMM type	DIMM capacity-GB	Ranks per DIMM	Data width	SDDC support	DIMM volts
2933 MT/s	RDIMM	8	1	x8	Advanced ECC	1.2
2933 MT/s	RDIMM	16	2	x8	Advanced ECC	1.2
2933 MT/s	RDIMM	32	2	x4	All modes	1.2
2933 MT/s	LRDIMM	64	4	x4	All modes	1.2

Memory speed

The M640 support memory speeds of 2933 MT/s and 2666 MT/s depending on the DIMM types installed and the configuration. All memory on all processors and channels run at the same speed and voltage. By default, this speed will be the highest common supported speed between the CPUs and DIMMs. The operating speed of the memory is also determined by the maximum speed supported by the processor, the speed settings and the operating voltage of the system are in the BIOS.

Table 9. DIMM performance details

DIMM type	DIMM ranking	Capacity	DIMM rated voltage, speed	Intel Xeon-EP	
				1 DPC	2 DPC
RDIMM	1R/2R	8 GB, 16 GB, 32 GB	DDR4-1.2 V, 2933 or 2666 MT/s	2933 or 2666 MT/s	2933 or 2666 MT/s
LRDIMM	4R/8R	64 GB,128 GB	DDR4-1.2 V, 2666MT/s	2666 MT/s	2666 MT/s

Topics:

Memory configurations

The M640 server support flexible memory configurations ranging from capacities of 8 GB (minimum) to 1 TB (maximum). The M640 support up to 8 DIMMs per processor and up to 16 DIMMs in a dual- processor configuration. Each server has 6 memory channels per processor, with each channel supporting up to 2 DIMMs.

Memory population guidelines

M640 support a flexible memory configuration, according to the following population rules:

- Speed: If DIMMs of different speeds are mixed, all channels across all processors operate at the slowest DIMM's common frequency.
- DIMM type: Only one type of DIMM is allowed per system: RDIMM, or LRDIMM. These types cannot be mixed.
- DIMMs with different data widths can be mixed. DIMMs with x4 and x8 data widths are supported and mixing is allowed.
- Support mixing of DIMMs with different capacities.
  - Population rules require the largest capacity DIMM be placed first-slot A1 populated first, then A2, and so on. The second CPU mirrors the first CPU population.
  - Maximum of two different capacity DIMMs is allowed in a system
- Support mixing of DIMMs with different ranks.
  - Maximum of two different rank DIMMs is allowed in a system

Memory RAS features

Reliability, Availability, and Serviceability (RAS) features help keep the system online and operational without significant impact to performance, and can decrease data loss and crashing due to errors. RAS aids in rapid, accurate diagnosis of faults which require service.

Table 10. Supported RAS features

Feature	Description
Dense configuration optimized profile	Increased memory reliability can be a result from this selectable platform profile that adjusts parameters to reduce faults regarding refresh rates, speed, temperature and voltage.
Memory demand and patrol scrubbing	Demand scrubbing is the ability to write corrected data back to the memory once a correctable error is detected on a read transaction. Patrol scrubbing proactively searches the system memory, repairing correctable errors.
Recovery from single DRAM device failure-SDDC	Recovery from Single DRAM Device Failure-SDDC provides error checking and correction that protects against any single memory chip failure as well as multi- bit errors from any portion of a single memory chip.
Failed DIMM isolation	This feature provides the ability to identify a specific failing DIMM channel pair, thereby enabling the user to replace only the failed DIMM pair.
Memory mirroring	Memory mirroring is a method of keeping a duplicate (secondary or mirrored) copy of the contents of memory as a redundant backup for use if the primary intra-socket memory fails. The mirrored copy of the memory is stored in memory of the same processor socket.
Memory address parity protection	This feature provides the ability to detect transient errors on the address lines of the DDR channel.
Memory sparing-rank	Memory sparing allocates one rank per channel as a spare. If excessive correctable errors occur in a rank or channel, they are moved to the spare area while the operating system is running to prevent the errors from causing an uncorrectable failure.
Memory thermal throttling	This feature helps to optimize power/performance and can also be used to prevent DIMMs from overheating.

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Storage

The M640 for M1000e supports scalable storage that allows you to adapt your workload and operational requirements. With comprehensive storage options, the M640 for M1000e offers various internal and external storage controllers.

Storage controllers

Table 11. PERC series offering

Performance level	Controller and description
Entry	Software RAID: S140-SATA and NVMe
Value	• H330 (Internal hardware RAID) • Memory: None • supports x8 12 Gb SAS and x8 PCIe 3.0
Value performance	• H730P (Internal hardware RAID) • Memory: 2 GB, NV72-bit, 866 MHz • supports x8 12 Gb SAS and x8 PCIe 3.0

Supported hard drives

With comprehensive storage options, the system offers the following hard drives:

- 10,000 and 15,000 rpm 2.5-inch SAS drives
- 7,200 rpm 2.5-inch Enterprise SATA drives
- 2.5-inch Solid State Drives (SSD) including PCIe NVMe drives

Topics:

Internal persistent storage

The system offers two internal persistent storage:

- IDSDM module
- Boot Optimized Storage Subsystem (BOSS)

IDSDM module

The IDSDM module has a dedicated slot at the back of the system chassis. This is a Dell-proprietary PCIe x1 slot that uses a USB 3.0 interface to host. In the system, the IDSDM card size changes from SD to microSD and the supported capacity for IDSDM microSD cards are 16 GB, 32 GB, or 64 GB. The write-protect switch is built onboard the IDSDM module.

Boot Optimized Storage Subsystem (BOSS)

BOSS is offered as a means of booting 14G servers to a full OS in the following scenarios:

- A solution such as IDSDM may be desired, but the target OS is a full OS (not just hypervisor).
- The user does not to trade off the standard hot-plug hard drive slot for OS install.

BOSS located at the front of the system to support up to two 80mm M.2 SATA devices.

External storage

The PowerEdge M640 supports the RD1000 externally.

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Networking and PCIe

The PowerEdge M640 provides PCIe slot capabilities with support of generation 3 expansion cards.

Topics:

PCIe expansion

For information on card installation, requirements, and slot priorities, see the PowerEdge M640 Installation and Service Manual at Dell.com/Support/Manuals.

PCIe slot

The list below shows the available PCIe slots:

- One x8 PCIe Gen3 for bNDC card-connected to CPU1
- Two x8 PCIe Gen3 for Mezz card-connected to CPU1
- One x8 PCIe Gen3 for MiniPERC card-connected to CPU1
- One x2 PCIe Gen3 for BOSS hardware RAID-connected to CPU2

8

Power, Thermal, and Acoustics

The lower overall system-level power draw is a result of the breakthrough system design developed by Dell EMC. The system aims to maximize performance per watt through a combination of energy efficient technologies, optimized thermal designs and intelligent fan control algorithms. The system fan control algorithms use an extensive array of sensors that automatically monitor power and thermal activity to minimize fan speeds based on system cooling requirements, reducing the power required for cooling.

Topics:

Power consumption and energy efficiency

With the rise in the cost of energy coupled with increasing data center density, Dell EMC provides tools and technologies to help you realize greater performance with lower energy cost and wastage. More efficient data center usage can reduce costs by slowing the need for additional data center space. The following table lists the tools and technologies that Dell EMC offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

Table 12. Power tools and technologies

Feature	Description
Power supply units (PSU) portfolio	PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. For more information, see the *Power supply units* section.
Tools for right-sizing	Enterprise Infrastructure Planning Tool (EIPT) is a tool that helps you plan and tune your computer and infrastructure equipment for maximum efficiency by calculating hardware power consumption, power infrastructure and storage. Learn more at Dell.com/calc.
Power monitoring accuracy	PSU power monitoring improvements include: • Power monitoring accuracy of 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell EMC systems management tools such as OpenManage Power Center and iDRAC9 with an Enterprise license can be used to set a power limit for your server. This limits the output of a PSU and reduce system power consumption and help in constrained power situations.
Systems management	The integrated Dell Remote Access Controller 9 (iDRAC9) with Lifecycle Controller is embedded within every Dell EMC PowerEdge™ server and provides functionality that helps IT administrators deploy, update, monitor, and maintain servers with no need for any additional software to be installed. iDRAC functions regardless of operating system or hypervisor presence because from a pre-OS or bare-metal state, iDRAC is ready to work because it is embedded within each server from the factory.
Active power management	Dell EMC offers a complete power management solution accessed through the iDRAC9 with Enterprise licensing and OpenManage Power Center to implement policy-based management of power and thermal levels at the individual system, rack, or data center level. Hot spares reduce power consumption of redundant power supplies. Thermal control of fan speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption.

Power supply units

Energy Smart power supplies have intelligent features, such as the ability to dynamically optimize efficiency while maintaining availability and redundancy. Also featured are enhanced power-consumption reduction technologies, such as high-efficiency power conversion and advanced thermal-management techniques, and embedded power-management features including high-accuracy power monitoring.

The system supports two hot-swappable AC power supplies with 1 + 1 redundancy, auto-sensing and auto-switching capability.

Thermal and Acoustics

The system's thermal management delivers high performance through optimized cooling of components at the lowest fan speeds across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges. These optimizations result in lower fan power consumption which translate to lower system power and data center power consumption.

Power consumption and energy efficiency

With the rise in the cost of energy coupled with increasing data center density, Dell EMC provides tools and technologies to help you realize greater performance with lower energy cost and wastage. More efficient data center usage can reduce costs by slowing the need for additional data center space. The following table lists the tools and technologies that Dell EMC offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

Table 13. Power tools and technologies

Feature	Description
Power supply units (PSU) portfolio	PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. For more information, see the *Power supply units* section.
Tools for right-sizing	Enterprise Infrastructure Planning Tool (EIPT) is a tool that helps you plan and tune your computer and infrastructure equipment for maximum efficiency by calculating hardware power consumption, power infrastructure and storage. Learn more at Dell.com/calc.
Power monitoring accuracy	PSU power monitoring improvements include: • Power monitoring accuracy of 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell EMC systems management tools such as OpenManage Power Center and iDRAC9 with an Enterprise license can be used to set a power limit for your server. This limits the output of a PSU and reduce system power consumption and help in constrained power situations.
Systems management	The integrated Dell Remote Access Controller 9 (iDRAC9) with Lifecycle Controller is embedded within every Dell EMC PowerEdge™ server and provides functionality that helps IT administrators deploy, update, monitor, and maintain servers with no need for any additional software to be installed. iDRAC functions regardless of operating system or hypervisor presence because from a pre-OS or bare-metal state, iDRAC is ready to work because it is embedded within each server from the factory.
Active power management	Dell EMC offers a complete power management solution accessed through the iDRAC9 with Enterprise licensing and OpenManage Power Center to implement policy-based management of power and thermal levels at the individual system, rack, or data center level. Hot spares reduce power consumption of redundant power supplies. Thermal control of fan speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption.

Thermal design

The thermal design of the system reflects the following:

- **Optimized thermal design:** The system layout is architected for optimum thermal design. System component placement and layout are designed to provide maximum airflow coverage to critical components with minimal expense of fan power.

- **Comprehensive thermal management:** The thermal control system regulates the system fan speeds based on feedback from system component temperature sensors, as well as for system inventory and subsystem power draw. Temperature monitoring includes components such as processors, DIMMs, chipset, system inlet air temperature and hard disk drives.
- **Open and closed loop fan speed control:** Open loop fan control uses system configuration to determine fan speed based on system inlet air temperature. Closed loop thermal control uses temperature feedback to dynamically adjust fan speeds based on system activity and cooling requirements.
- **User-configurable settings:** With the understanding and realization that every customer has a unique set of circumstances or expectations from the system, in this generation of servers, we have introduced limited user-configurable settings in the iDRAC9 BIOS setup screen. For more information, see the Dell EMC PowerEdge system Installation and Service Manual on Dell.com/Support/Manuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- **Cooling redundancy:** The system allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.

Power supply units

Energy Smart power supplies have intelligent features, such as the ability to dynamically optimize efficiency while maintaining availability and redundancy. Also featured are enhanced power-consumption reduction technologies, such as high-efficiency power conversion and advanced thermal-management techniques, and embedded power-management features including high-accuracy power monitoring.

The system supports two hot-swappable AC power supplies with 1 + 1 redundancy, auto-sensing and auto-switching capability.

Acoustical design

Dell EMC focuses on sound quality in addition to sound power level and sound pressure level. Sound quality describes how disturbing or pleasing a sound is interpreted, and Dell EMC references a number of psychacoustical metrics and thresholds in delivering to it. Tone prominence is one such metric. Sound power and sound pressure levels increase with greater populations or higher utilization, while sound quality remains good even as the frequency content changes. A reference for comparison to sound pressure levels for familiar noise sources is given in the following table. An extensive description of Dell EMC Enterprise acoustical design and metrics is available in the Dell Enterprise Acoustics white paper.

Table 14. Acoustical reference points and output comparisons

LpA, dBA, re 20 µPa	Loudness, sones	Equivalent familiar noise experience
90	80	Loud concert
75	39	Data center, vacuum cleaner, voice must be elevated to be heard
60	10	Conversation levels
45	4	Whispering, open office layout, normal living room
35	2	Quiet office
30	1	Quiet library
20	0	Recording studio

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Dell EMC OpenManage systems management

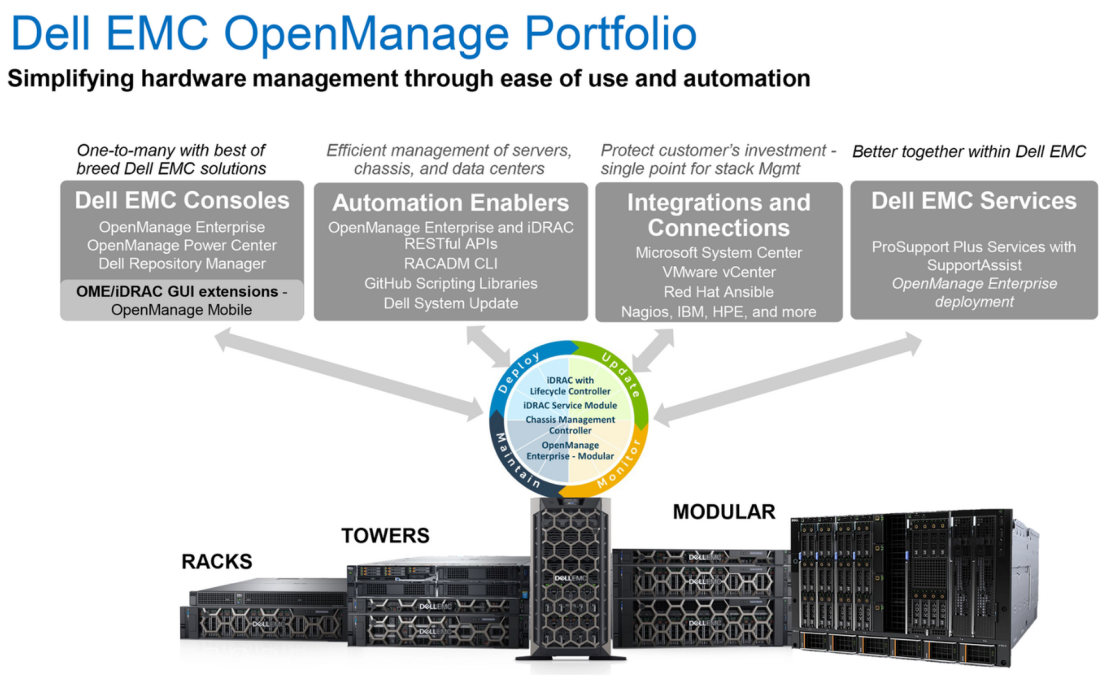

Figure 3. Dell EMC OpenManage Portfolio

Dell EMC delivers management solutions that help IT Administrators effectively deploy, update, monitor, and manage IT assets. OpenManage solutions and tools enable you to quickly respond to problems by helping them to manage Dell EMC servers effectively and efficiently; in physical, virtual, local, and remote environments, operating in-band, and out-of-band (agent-free). The OpenManage portfolio includes innovative embedded management tools such as the integrated Dell Remote Access Controller (iDRAC), Chassis Management Controller and Consoles like OpenManage Enterprise, OpenManage Power Manager plug in, and tools like Repository Manager.

Dell EMC has developed comprehensive systems management solutions based on open standards and has integrated with management consoles that can perform advanced management of Dell hardware. Dell EMC has connected or integrated the advanced management capabilities of Dell hardware into offerings from the industry's top systems management vendors and frameworks such as Ansible, thus making Dell EMC platforms easy to deploy, update, monitor, and manage.

The key tools for managing Dell EMC PowerEdge servers are iDRAC and the one-to-many OpenManage Enterprise console. OpenManage Enterprise helps the system administrators in complete lifecycle management of multiple generations of PowerEdge servers. Other tools such as Repository Manager, which enables simple yet comprehensive change management.

OpenManage tools integrate with systems management framework from other vendors such as VMware, Microsoft, Ansible, and ServiceNow. This enables you to use the skills of the IT staff to efficiently manage Dell EMC PowerEdge servers.

Topics:

Server and Chassis Managers

- Integrated Dell Remote Access Controller (iDRAC)
- Chassis Management Controller (CMC)
- iDRAC Service Module (iSM)

Dell EMC consoles

- Dell EMC OpenManage Enterprise
- Dell EMC Repository Manager (DRM)
- Dell EMC OpenManage Enterprise Power Manager plugin to OpenManage Enterprise
- Dell EMC OpenManage Mobile (OMM)

Automation Enablers

- OpenManage Ansible Modules
- iDRAC RESTful APIs (Redfish)
- Standards-based APIs (Python, PowerShell)
- RACADM Command Line Interface (CLI)
- GitHub Scripting Libraries

Integration with third-party consoles

- Dell EMC OpenManage Integrations with Microsoft System Center
- Dell EMC OpenManage Integration for VMware vCenter (OMIVV)
- Dell EMC OpenManage Ansible Modules
- Dell EMC OpenManage Integration with ServiceNow

Connections for third-party consoles

- Micro Focus and other HPE tools
- OpenManage Connection for IBM Tivoli
- OpenManage Plug-in for Nagios Core and XI

Dell EMC Update Utilities

- Dell System Update (DSU)
- Dell EMC Repository Manager (DRM)
- Dell EMC Update Packages (DUP)
- Dell EMC Server Update Utility (SUU)
- Dell EMC Platform Specific Bootable ISO (PSBI)

Dell resources

For additional information about white papers, videos, blogs, forums, technical material, tools, usage examples, and other information, go to the OpenManage page at www.dell.com/openmanagemanuals or the following product pages:

Table 15. Dell resources

Resource	Location
Integrated Dell Remote Access Controller (iDRAC)	www.dell.com/idracmanuals
iDRAC Service Module (iSM)	www.dell.com/support/article/sln310557
OpenManage Ansible Modules	www.dell.com/support/article/sln310720

Resource	Location
OpenManage Essentials (OME)	www.dell.com/support/article/sln310714
OpenManage Mobile (OMM)	www.dell.com/support/article/sln310980
OpenManage Integration for VMware vCenter (OMIVV)	www.dell.com/support/article/sln311238
OpenManage Integration for Microsoft System Center (OMIMSSC)	www.dell.com/support/article/sln312177
Dell EMC Repository Manager (DRM)	www.dell.com/support/article/sln312652
Dell EMC System Update (DSU)	www.dell.com/support/article/sln310654
Dell EMC Platform Specific Bootable ISO (PSBI)	Dell.com/support/article/sln296511
Dell EMC Chassis Management Controller (CMC)	www.dell.com/support/article/sln311283
OpenManage Connections for Partner Consoles	www.dell.com/support/article/sln312320
OpenManage Enterprise Power Manager	
OpenManage Integration with ServiceNow (OMISNOW)	Dell.com/support/article/sln317784

NOTE: Features may vary by server. Please refer to the product page on www.dell.com/manuals for details.

Appendix A. Additional specifications

Power supply

The list below shows the supported power supply units for the M640 for M1000e:

- 2700 W
- 3000 W

Chassis dimension

The following are the enclosure dimensions for the M640:

- Depth: 544.32 mm x Width: 50.35 mm x Height: 197.9 mm - handle push in.
- Depth: 564.87 mm x Width: 50.35 mm x Height: 197.9 mm - handle pull out.

Environmental specifications

NOTE: For additional information about environmental measurements for specific system configurations, see Dell.com/environmental_datasheets.

Table 16. Temperature specifications

Temperature	Specifications
Storage	–40°C to 65°C (–40°F to 149°F)
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Maximum temperature gradient (operating and storage)	20°C/h (68°F/h)

Table 17. Relative humidity specifications

Relative humidity	Specifications
Storage	5% to 95% RH with 33°C (91°F) maximum dew point. Atmosphere must be non-condensing at all times.
Operating	10% to 80% relative humidity with 26°C (78.8°F) maximum dew point.

Table 18. Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.26 G_{rms} at 5 Hz to 350 Hz (all operation orientations).
Storage	1.87 G_{rms} at 10 Hz to 500 Hz for 15 min (all six sides tested).

Table 19. Maximum shock specifications

Maximum shock	Specifications
Operating	Six consecutively executed shock pulses in the positive and negative x, y, and z axes of 6 G for up to 11 ms.
Storage	Six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71 G for up to 2 ms.

Table 20. Maximum altitude specifications

Maximum altitude	Specifications
Operating	3048 m (10,000 ft)
Storage	12,000 m (39,370 ft)

Table 21. Operating temperature de-rating specifications

Operating temperature de-rating	Specifications
Up to 35°C (95°F)	Maximum temperature is reduced by 1°C/300 m (1°F/547 ft) above 950 m (3,117 ft).
35°C to 40°C (95°F to 104°F)	Maximum temperature is reduced by 1°C/175 m (1°F/319 ft) above 950 m (3,117 ft).
40°C to 45°C (104°F to 113°F)	Maximum temperature is reduced by 1°C/125 m (1°F/228 ft) above 950 m (3,117 ft).

Particulate and gaseous contamination specifications

The following table defines the limitations that help avoid any equipment damage or failure from particulates and gaseous contamination. If the levels of particulates or gaseous pollution exceed the specified limitations and result in equipment damage or failure, you may need to rectify the environmental conditions. Re-mediation of environmental conditions is the responsibility of the customer.

Table 22. Particulate contamination specifications

Particulate contamination	Specifications
Air filtration	Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit. **NOTE: This condition applies to data center environments only. Air filtration requirements do not apply to IT equipment designed to be used outside a data center, in environments such as an office or factory floor.** **NOTE: Air entering the data center must have MERV11 or MERV13 filtration.**
Conductive dust	Air must be free of conductive dust, zinc whiskers, or other conductive particles. **NOTE: This condition applies to data center and non-data center environments.**
Corrosive dust	• Air must be free of corrosive dust. • Residual dust present in the air must have a deliquescent point less than 60% relative humidity. **NOTE: This condition applies to data center and non-data center environments.**

Table 23. Gaseous contamination specifications

Gaseous contamination	Specifications
Copper coupon corrosion rate	<300 Å/month per Class G1 as defined by ANSI/ISA71.04-1985.
Silver coupon corrosion rate	<200 Å/month as defined by AHSRAE TC9.9.

NOTE: Maximum corrosive contaminant levels measured at ≤50% relative humidity.

Standard operating temperature

Table 24. Standard operating temperature specifications

Standard operating temperature	Specifications
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Humidity percentage range	10% to 80% Relative Humidity with 26°C (78.8°F) maximum dew point.

Expanded operating temperature

Table 25. Expanded operating temperature specifications

Expanded operating temperature	Specifications
Continuous operation	5°C to 40°C at 5% to 85% RH with 29°C dew point. **NOTE: Outside the standard operating temperature (10°C to 35°C), the system can operate continuously in temperatures as low as 5°C and as high as 40°C.** For temperatures between 35°C and 40°C, de-rate maximum allowable dry bulb temperature by 1°C per 175 m above 950 m (1°F per 319 ft).
Less than or equal to 1% of annual operating hours	–5°C to 45°C at 5% to 90% RH with 29°C dew point. **NOTE: Outside the standard operating temperature (10°C to 35°C), the system can operate down to –5°C or up to 45°C for a maximum of 1% of its annual operating hours.** For temperatures between 40°C and 45°C, de-rate maximum allowable temperature by 1°C per 125 m above 950 m (1°F per 228 ft).

NOTE: When operating in the expanded temperature range, system performance may be impacted.

NOTE: When operating in the expanded temperature range, ambient temperature warnings maybe reported on the LCD panel and in the System Event Log.

USB peripherals

The M640 supports the following USB 2.0 and USB 3.0 devices:

- DVD-ROM
- USB key
- External USB tape library RD1000
- Keyboard
- Mouse
- Floppy drive

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Appendix B. Standards compliance

The system conforms to the following industry standards.

Table 26. Industry standard documents

Standard	URL for information and specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	acpi.info
Ethernet IEEE 802.3-2005	standards.ieee.org/getieee802/802.3.html
HDG Hardware Design Guide Version 3.0 for Microsoft Windows Server	microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.mspx
IPMI Intelligent Platform Management Interface, v2.0	intel.com/design/servers/ipmi
DDR4 Memory DDR4 SDRAM Specification	jedec.org/standards-documents/docs/jesd79-4.pdf
PCI Express PCI Express Base Specification Rev. 2.0 and 3.0	pcisig.com/specifications/pciexpress
PMBus Power System Management Protocol Specification, v1.2	pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	t10.org
SATA Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2	sata-io.org
SMBIOS System Management BIOS Reference Specification, v2.7	dmtf.org/standards/smbios
TPM Trusted Platform Module Specification, v1.2 and v2.0	trustedcomputinggroup.org
UEFI Unified Extensible Firmware Interface Specification, v2.1	uefi.org/specifications
USB Universal Serial Bus Specification, Rev. 2.0	usb.org/developers/docs

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Appendix C Additional resources

Table 27. Additional resources

Resource	Description of contents	Location
Installation and Service Manual	This manual, available in PDF format, provides the following information: • Chassis features • System Setup program • System messages • System codes and indicators • System BIOS • Remove and replace procedures • Troubleshooting • Diagnostics • Jumpers and connectors	Dell.com/Support/Manuals
Getting Started Guide	This guide ships with the system, and is also available in PDF format. This guide provides the following information: • Initial setup steps • Key system features • Technical specifications	Dell.com/Support/Manuals
Rack Installation Instructions	This document ships with the rack kits, and provides instructions for installing a server in a rack.	Dell.com/Support/Manuals
Information Update	This document ships with the system, is also available in PDF format online, and provides information on system updates.	Dell.com/Support/Manuals
System Information Label	The system information label documents the system board layout and system jumper settings. Text is minimized due to space limitations and translation considerations. The label size is standardized across platforms.	Inside the system chassis cover
Quick Resource Locator (QRL)	This code on the chassis can be scanned by a phone application to access additional information and resources for the server, including videos, reference materials, service tag information, and Dell EMC contact information.	Inside the system chassis cover
Energy Smart Solution Advisor (ESSA)	The Dell EMC online ESSA enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use ESSA to calculate the power consumption of your hardware, power infrastructure, and storage.	Dell.com/calc

Appendix D. Support and deployment services

ProDeploy Enterprise Suite and Residency Services

ProDeploy Enterprise Suite gets your server out of the box and into optimized production - fast. Our elite deployment engineers with broad and deep experience utilizing best-in-class processes along with our established global scale can help you around the clock and around the globe. From simple to the most complex server installations and software integration, we take the guess work and risk out of deploying your new server technology. Who's better suited to implement the latest Dell EMC servers than the Dell EMC elite deployment engineers who do it every day?

		Basic Deployment	ProDeploy	ProDeploy Plus
Pre-deployment	Single point of contact for project management		●	In-region
	Site readiness review		●	●
	Implementation planning		●	●
	Technology Service Manager (TSM) engagement for ProSupport Plus entitled devices			●
Deployment	Deployment service hours	Business hours	24x7	24x7
	Onsite hardware installation*	●	●	●
	Packaging materials disposal	●	●	●
	Install and configure system software		●	Onsite
	Project documentation with knowledge transfer		●	●
Post-deployment	Deployment verification		●	●
	Configuration data transfer to Dell EMC technical support		●	●
	30-days of post-deployment configuration assistance			●
	Training credits for Dell EMC Education Services			●

Figure 4. ProDeploy Enterprise Suite capabilities

NOTE: Hardware installation not applicable on selected software products.

ProDeploy Plus

From beginning to end, ProDeploy Plus provides the skill and scale needed to successfully execute demanding deployments in today's complex IT environments. Certified Dell EMC experts start with extensive environmental assessments and detailed migration planning and recommendations. Software installation includes set up of most versions of Dell EMC SupportAssist and OpenManage system management utilities. Post-deployment configuration assistance, testing, and product orientation help you rest easy knowing your systems have been deployed and integrated by the best.

ProDeploy

ProDeploy provides full service installation and configuration of both server hardware and system software by certified deployment engineers including set up of most versions of Dell EMC SupportAssist and OpenManage system management utilities. To prepare for the deployment, we conduct a site readiness review and implementation planning. System testing, validation and full project documentation with knowledge transfer complete the process. We focus on getting you up and running so you can focus on your business and prepare for whatever comes next.

Basic Deployment

Basic Deployment delivers worry-free professional installation of your servers by experienced technicians who know Dell EMC servers inside and out.

Residency Services

Residency helps customers transition to new capabilities quickly through on-site or remote Dell EMC experts whose priorities and time you control. Residency experts can provide post implementation management and knowledge transfer related to a new technology acquisition or day-to-day operational management of the IT infrastructure.

Deployment services

Deployment services details and exceptions can be found in service description documents at the Enterprise Configuration and Deployment pageon Dell.com.

Remote Consulting Services

When you are in the final stages of your PowerEdge server implementation, you can rely on Dell Remote Consulting and our certified technical experts to help you optimize your configuration with best practices for your software, virtualization, server, storage, networking, and systems management.

Data Migration Service

Protect your business and data with our single point of contact to manage your data migration project. Your project manager will work with our experienced team of experts to create a plan using industry-leading tools and proven processes based on global best practices to migrate your existing files and data, so your business gets up and running quickly and smoothly.

ProSupport Enterprise Suite

With Dell EMC ProSupport Services, we can help you keep your operation running smoothly, so you can focus on running your business. We will help you maintain peak performance and availability of your most essential workloads. Dell EMC ProSupport is a suite of support services that enable you to build the solution that is right for your organization. Choose support models based on how you use technology and where you want to allocate resources. From the desktop to the data center, address everyday IT challenges, such as unplanned downtime, mission-critical needs, data and asset protection, support planning, resource allocation, software application management and more. Optimize your IT resources by choosing the right support model.

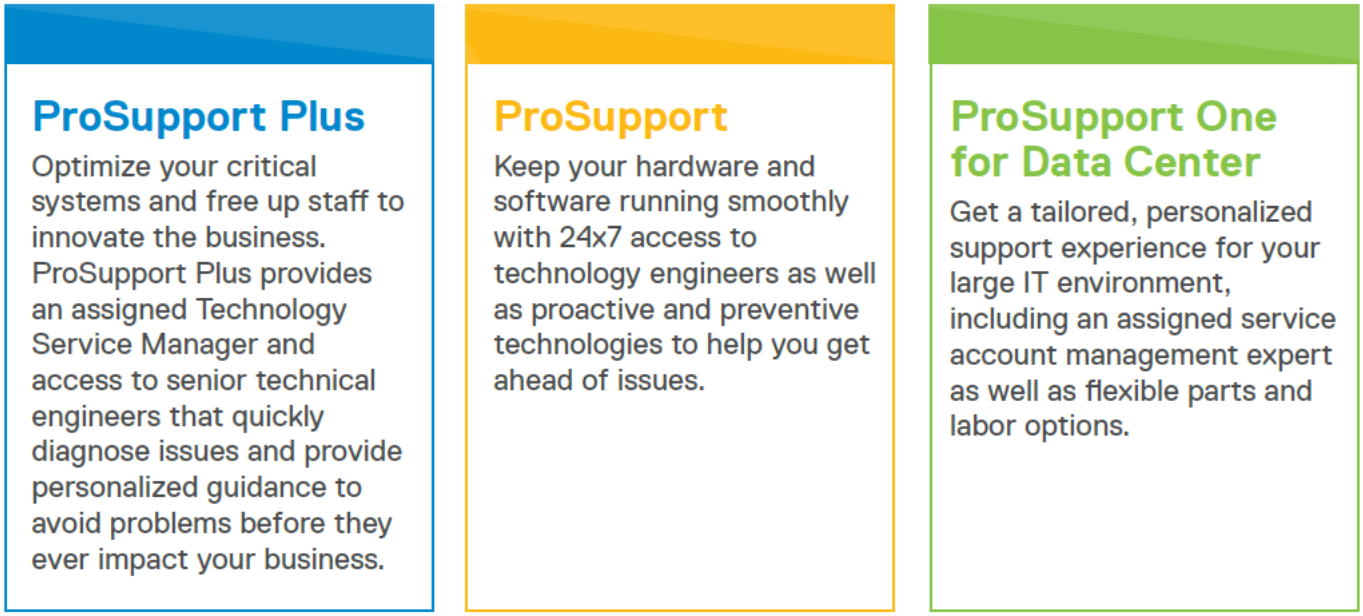

Figure 5. ProSupport Enterprise Suite

ProSupport Plus

When you purchase your PowerEdge server, we recommend ProSupport Plus, our proactive and preventative support for your business-critical systems. ProSupport Plus provides you with all the benefits of ProSupport, plus the following:

- A designated Technology Service Manager who knows your business and your environment
- Access to senior ProSupport engineers for faster issue resolution
- Personalized, preventive recommendations based on analysis of support trends and best practices from across the Dell EMC customer base to reduce support issues and improve performance
- Predictive analysis for issue prevention and optimization enabled by SupportAssist
- Proactive monitoring, issue detection, notification and automated case creation for accelerated issue resolution enabled by SupportAssist
- On-demand reporting and analytics-based recommendations enabled by SupportAssist and TechDirect

ProSupport

Our ProSupport service offers highly trained experts around the clock and around the globe to address your IT needs. We will help you minimize disruptions and maximize availability of your PowerEdge server workloads with:

- 24x7x365 access to certified hardware and software experts
- Collaborative 3rd party support
- Hypervisor and OS support
- Consistent level of support available for Dell EMC hardware, software and solutions
- Onsite parts and labor response options including next business day or four-hour mission critical

ProSupport One for Data Center

ProSupport One for Data Center offers flexible site-wide support for large and distributed data centers with more than 1,000 assets. This offering is built on standard ProSupport components that leverage our global scale but are tailored to your company's needs. While not for everyone, it offers a truly unique solution for Dell EMC's largest customers with the most complex environments.

- Team of designated Technology Services Managers with remote, on-site options
- Designated ProSupport One technical and field engineers who are trained on your environment and configurations
- On-demand reporting and analytics-based recommendations enabled by SupportAssist and TechDirect
- Flexible on-site support and parts options that fit your operational model
- A tailored support plan and training for your operations staff

Enterprise Support Services Feature Comparison	ProSupport	ProSupport Plus	ProSupport One for Data Center
Remote technical support	24x7	24x7	24x7
Onsite support	Next business day or Mission Critical	Next business day or Mission Critical	Flexible
Automated issue detection and case creation	●	●	●
Self-service case initiation and management	●	●	●
Hypervisor, Operating Environment Software and OS support	●	●	●
Priority access to specialized support experts		●	●
Designated Technology Service Manager		●	●
Personalized assessments and recommendations		●	●
On-demand support and utilization reports		●	●
Systems Maintenance guidance		Semiannual	Optional
Designated technical and field support teams			●

Figure 6. ProSupport One for Data Center model

Support Technologies

Powering your support experience with predictive, data-driven technologies.

SupportAssist

The best time to solve a problem is before it happens. The automated proactive and predictive technology SupportAssist* helps reduce your steps and time to resolution, often detecting issues before they become a crisis. Benefits include:

- Value - SupportAssist is available to all customer at no additional charge.
- Improve productivity - replace manual, high-effort routines with automated support.
- Accelerate time to resolution - receive issue alerts, automatic case creation and proactive contact from Dell EMC experts.
- Gain insight and control - optimize enterprise devices with on-demand ProSupport Plus reporting in TechDirect and get predictive issue detection before the problem starts.

SupportAssist is included with all support plans but features vary based on service level agreement.

	Basic Hardware Warranty	ProSupport	ProSupport Plus
Automated issue detection and system state information collection	•	•	•
Proactive, automated case creation and notification		•	•
Predictive issue detection for failure prevention			•
Recommendation reporting available on-demand in TechDirect			•

Figure 7. SupportAssist model

Get started at Dell.com/SupportAssist

TechDirect

Boost your IT teams productivity when supporting Dell EMC systems. With over 1.4 million self-dispatches processed each year, TechDirect has proven its effectiveness as a support tool. You can:

- Self-dispatch replacement parts
- Request technical support
- Integrate APIs into your help desk

Or, access all your Dell EMC certification and authorization needs. Train your staff on Dell EMC products as TechDirect allows you to:

- Download study guides
- Schedule certification and authorization exams
- View transcripts of completed courses and exams

Register at techdirect.dell.com

Additional professional services

Dell Education Services

Dell Education Services offers the PowerEdge server training courses designed to help you achieve more with your hardware investment. The curriculum is designed in conjunction with the server development team, as well as Dell EMC's technical support team, to ensure that the training delivers the information and practical, hands-on skills you and your team need to confidently manage and maintain your Dell EMC server solution. To learn more or register for a class today, visit LearnDell.com/Server.

Dell EMC Global Infrastructure Consulting Services

Dell EMC Global Infrastructure Consulting Services use skilled solution architects, innovative tools, automated analysis and Dell EMC's intellectual property to give you rapid insight into the root causes of unnecessary complexity. We seek better answers than traditional service models, and our strategy is to help you quickly identify high-impact, short-duration projects that deliver return on investment (ROI) and free up resources. The results are practical, action-oriented plans with specific, predictable, measurable outcomes. From data center optimization to server virtualization to systems management, our consulting services can help you build a more efficient enterprise.

Dell EMC Managed Services

Dell EMC Managed Services are a modular set of lifecycle services designed to help you automate and centrally configure, deploy, and manage your day-to-day data center operations. These services extend your existing on-premise IT infrastructure with off-premise cloud services designed to better address challenges with mobility, highly distributed organizations, security, compliance, business continuity, and disaster preparedness.