Dell PowerEdge R660

Technical Guide

Regulatory Model: E83S
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DELL Technologies

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.

Contents

1

System overview

The PowerEdge R660 system is a 1U server that supports:

The system features:

- Up to two 4th Generation Intel Xeon Scalable processors with up to 56 cores and optional Intel ® QuickAssist Technology
- Up to 32 RDIMMs with up to 8 TB of memory and speed up to 4800 MT/s
- Optional Direct Liquid Cooling
- Two redundant AC or DC power supply units
- Up to 10 x 2.5-inch or 8 x 2.5-inch SATA/SAS/NVMe (HDD/SSD) drives

NOTE: For more information about how to hot swap NVMe PCIe SSD U.2 device, see the *Dell Express Flash NVMe PCIe SSD User's Guide* at https://www.dell.com/support **> Browse all Products** > **Data Center Infrastructure** > **Storage Adapters & Controllers** > **Dell PowerEdge Express Flash NVMe PCIe SSD** > **Documentation** > **Manuals and Documents**.

NOTE: All instances of SAS, SATA drives are referred to as drives in this document, unless specified otherwise.

Topics:

Key workloads

The versatile R660 is designed to address data-intensive, diverse workloads including:

- High Density Virtualization
- Dense Database Analytics(VDI)
- Mixed Workload Standardization

New technologies

The table lists the new technologies that are featured on R660.

Table 1. New technologies

Technology	Detailed Description
Intel Sapphire Rapids Processor (Socket E)	Up to 56 core processor
	3 x Intel® Ultra Path Interconnect (UPI) per CPU at 12.8GT/s, 14.4GT/s, 16GGT/s
	80 PCIe Gen4 lanes at 32 GT/s per processor
	Up to 3.6 GHz
	Maximum TDP: 350 W
4800 MT/s DDR5 Memory	Max 16 DIMM per CPU and 32 DIMMs per System.
	Supports DDR5 ECC RDIMM up to 4800 MT/s (1 DPC) / 4400 MT/s (2 DPC)
Flex I/O	LOM board (optional), 2x1Gb with BCM5720 LAN controller

Table 1. New technologies (continued)

Technology	Detailed Description
	Rear I/O with: ● 1 x Dedicated iDRAC Ethernet port ● 1 x USB 3.0 ● 1 x USB 2.0 ● 1 x VGA port (optional for liquid cooling configuration)
	Serial Port Option with STD RIO board
	OCP Mezz 3.0 (supported by x8 PCIe lanes)
	Front I/O with: ● 1 x Dedicated iDRAC Direct micro-USB ● 1 x USB 2.0 ● 1 x VGA port
CPLD 1-wire	Support payload data of Front PERC, Riser, BP, and Rear I/O to BOSS-N1 and iDRAC.
Dedicated PERC	Front Storage module PERC with Front PERC11 & PERC12
Software RAID	OS RAID/S160
Power Supplies	60 mm dimension is the new PSU form factor with 15G on 16G design.
	Titanium 700 W AC/HVDC
	Platinum 800 W AC/HVDC
	Titanium 1100 W AC/HVDC
	Platinum 1400 W AC/HVDC
	1100 W LVDC -48- -60 VDC
	Titanium 1800 W AC/HVDC

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System features and generational comparison

The following table shows the comparison between the PowerEdge R660 with the PowerEdge R650.

Table 2. Features comparison

Features	PowerEdge R660	PowerEdge R650
Processors	Two 4th Generation Intel® Xeon® (Socket E) processors	Two 3rd Generation Intel® Xeon® (Socket P14) processors
CPU interconnect	Intel Ultra Path Interconnect (UPI)	Intel Ultra Path Interconnect (UPI)
Memory	• 32 DDR5 DIMM slots supports RDIMM 8 TB max, speeds up to 4800 MT/s.	• 32 DDR4 DIMM slots supports RDIMM 2 TB max or LRDIMM 8 TB max, speeds up to 3200 MT/s. • Up to 16 Intel Persistent Memory 200 series (BPS) slots, 12 TB max
Storage Controllers	• Internal: PERC H965i, PERC H755, PERC H755N, PERC H355, HBA355i • External: HBA355e • Software RAID: S160 • BOSS-N1	• Internal: PERC H755, PERC H755N, PERC H745, PERC H355, PERC H345, HBA355I • External: PERC H840, HBA355E • Software RAID: S150 • BOSS-S1 • BOSS-S2
Drive Bays	Front bays: Front bays: • Up to 8 x 2.5-inch NVMe SSD max 122.88 TB • Up to 10 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 153.6 TB Rear bays: • Up to 2 x 2.5-inch SAS4/SATA (HDD/SSD) max 30.72 TB	Front bays: Front bays: • Up to 4 x 3.5-inch SAS/SATA (HDD/SSD) max 64 TB • Up to 8 x 2.5-inch NVMe SSD max 122.88 TB • Up to 10 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 153.6 TB Rear bays: • Up to 2 x 2.5-inch SAS4/SATA (HDD/SSD) max 30.72 TB
Power Supplies	• 1800 W Titanium 200-240 VAC or 240 HVDC • 1400 W Platinum 100-240 VAC or 240 HVDC • 1100 W Titanium 100-240 VAC or 240 HVDC • 1100 W LVDC -48 - -60 VDC • 800 W Platinum 100-240 VAC or 240 HVDC • 700 W Titanium 200-240 VAC or 240 HVDC Hot swap PSUs with full redundancy.	• 1400 W Platinum 100-240 VAC or 240 HVDC • 1100 W Titanium 100-240 VAC or 240 HVDC • 1100 W LVDC -48 - -60 VDC • 800 W Platinum 100-240 VAC or 240 HVDC Hot swap PSUs with full redundancy.
Cooling Options	• Air Cooling • Optional Direct Liquid Cooling (DLC) **NOTE:** DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.	• Air Cooling • Optional Direct Liquid Cooling (DLC) **NOTE:** DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.

Table 2. Features comparison (continued)

Features	PowerEdge R660	PowerEdge R650
Fans	Standard (STD) fans /High performance Gold (VHP) fans	Standard (STD) fans /High performance Silver (HPR) fans/ High performance Gold (VHP) fans
	Up to 4 sets (dual fan module) hot plug fans	Up to 4 sets (dual fan module) hot plug fans
Dimension	Height — 42.8 mm (1.68 inches)	Height — 42.8 mm (1.68 inches)
	Width — 482 mm (18.97 inches)	Width — 482 mm (18.97 inches)
	Depth — 822.88 mm (32.39 inches) with bezel	Depth — 772.11 (30.39 inches) with bezel
	Depth — 809.04 mm (31.85 inches) without bezel	Depth — 758.27 mm (29.85 inches) without bezel
Form Factor	1U rack server	1U rack server
Embedded Management	• iDRAC9 • iDRAC Direct • iDRAC RESTful with Redfish • iDRAC Service Manual • Quick Sync 2 wireless module	• iDRAC9 • iDRAC Direct • iDRAC Service Module • Quick Sync 2 wireless module
Bezel	Optional LCD bezel or security bezel	Optional LCD bezel or security bezel
OpenManage Software	• OpenManage Enterprise • OpenManage Power Manager plug-in • OpenManage SupportAssist plug-in • OpenManage Update Manager plug-in	• OpenManage Enterprise • OpenManage Power Manager plug-in • OpenManage SupportAssist plug-in • OpenManage Update Manager plug-in
Mobility	OpenManage Mobile	OpenManage Mobile
Integrations and Connections	OpenManage Integrations • BMC TrueSight • Microsoft System Center • Red Hat Ansible Modules • VMware vCenter and vRealize Operations Manager	OpenManage Integrations • BMC TrueSight • Microsoft System Center • Red Hat Ansible Modules • VMware vCenter • IBM Tivoli Netcool/ OMNIbus • IBM Tivoli Network Manager IP Edition • Micro Focus Operations Manager • Nagios Core • Nagios XI
Security	• Cryptographically signed firmware • Data at Rest Encryption (SEDs with local or external key mgmt) • Secure Boot • Secure Erase • Secured Component Verification (Hardware integrity check) • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ	• Cryptographically signed firmware • Secure Boot • Secure Erase • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 1.2/2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ
Embedded NIC	2 x 1GbE LOM card (optional)	2 x 1GbE LOM card (optional)
Networking Options	1 x OCP card 3.0 (optional) **NOTE:** The system allows either LOM card or OCP card or both to be installed in the system.	1 x OCP card 3.0 (optional)
GPU Options	Up to 3 x 75 W SW	Up to 3 x 75 W SW

Table 2. Features comparison (continued)

Features	PowerEdge R660		PowerEdge R650	
Ports	Front Ports • 1 x Dedicated iDRAC Direct micro-USB • 1 x USB 2.0 • 1 x VGA	Rear Ports • 1 x USB 2.0 • 1 x Serial port (optional) • 1 x USB 3.0 • 1 x Dedicated iDRAC Ethernet port • 1 x VGA (optional for liquid cooling configuration)	Front Ports • 1 x Dedicated iDRAC Direct micro-USB • 1 x USB 2.0 • 1 x VGA	Rear Ports • 1 x USB 2.0 • 1 x Serial port (optional) • 1 x USB 3.0 • 2 x RJ45 • 1 x VGA (optional for liquid cooling configuration)
	Internal Port: 1 x USB 3.0 (optional)		Internal Port: 1 x USB 3.0 (optional)	
PCIe	Up to three PCIe slots • 2 x PCIe Gen5 slots • 3 x PCIe Gen4 slots		Up to three PCIe slots • 3 x PCIe Gen4 slots	
Operating System and Hypervisors	• Canonical Ubuntu Server LTS • Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.		• Canonical Ubuntu Server LTS • Citrix Hypervisor • Windows Server LTSC with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.	

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Chassis views and features

Topics:

- Chassis views

Chassis views

Front view of the system

Figure 1. Front view of 8 x 2.5-inch drive system

Figure 2. Front view of 10 x 2.5-inch drive system

Rear view of the system

Rear view of the system

Figure 3. Rear view of the R660 with 3x LP

Figure 4. Rear view of the R660 with 2x 2.5 inches Storage drives, 1x LP

Inside the system

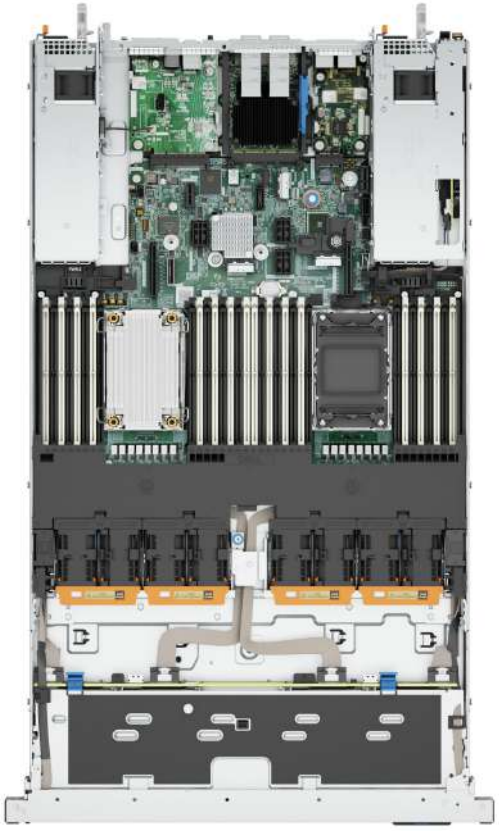

Figure 5. Inside view of the chassis without risers

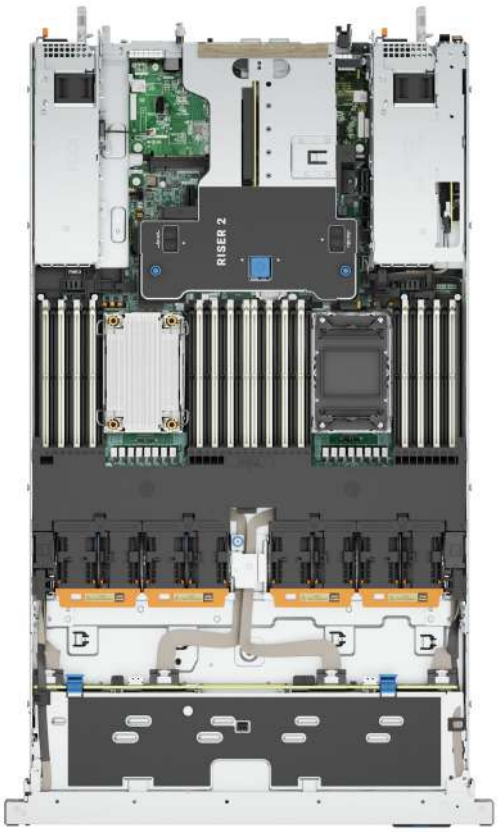

Figure 6. Inside view of the chassis with riser 2

Quick Resource Locator

The QRL on everything (SILs, GSG, Installation and Service Manual except on the EST) is a generic QRL for R660 that leads to a webpage for that product. That webpage has links for things like setup and service videos, iDRAC manual, and other things that apply to the platform. The QRL on the EST is unique and specific to that service tag and will contain the Service Tag number and the iDRAC password. The label and the QRL code within it are printed on demand at the L10 factories. This QRL links to a webpage that shows the exact configuration as built for that customer, and the specific warranty purchased. It is one click away from the same content of generic information that applies to R660 that is available in the other QRLs.

Figure 7. R660 Quick Resource Locator

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Processor

Topics:

Processor features

The Intel 4th Generation Xeon® Scalable Processors stack is the next generation data center processor offering with significant performance increases, integrated acceleration, and next generation memory and I/O. Sapphire Rapids accelerate customer usages with unique workload optimizations.

The following lists the features and functions that are in the upcoming 4th Generation Intel® Xeon Scalable Processor offering:

- Faster UPI with up to four Intel Ultra Path Interconnect (Intel UPI) at up to 16 GT/s, increasing multisocket bandwidth
- More, faster I/O with PCI Express 5 and up to 80 lanes (per socket)
- Enhanced Memory Performance with DDR5 support and memory speed up to 4800 MT/s in one DIMM per channel (1DPC) and 4400 MT/s in two DIMM per channel (2DPC)
- New built-in accelerators for data analytics, networking, storage, crypto, and data compression

Supported processors

The following table shows the Intel Sapphire Rapids SKUs that are supported on the R660.

Table 3. Supported Processors for R660

Processor	Clock Speed (GHz)	Cache (M)	UPI (GT/s)	Cores	Threads	Turbo	Memory Speed (MT/s)	Memory Capacity	TDP
8480+	2	105	16	56	112	Turbo	4800	6 TB	350 W
8471N	1.8	98	16	52	104	Turbo	4800	6 TB	300 W
8470Q *	2.1	98	16	52	104	Turbo	4800	6 TB	350 W
8470N	1.7	98	16	52	104	Turbo	4800	6 TB	300 W
8470	2	98	16	52	104	Turbo	4800	6 TB	350 W
8468	2.1	90	16	48	96	Turbo	4800	6 TB	350 W
8460Y+	2	75	16	40	80	Turbo	4800	6 TB	300 W
8452Y	2	68	16	36	72	Turbo	4800	6 TB	300 W
6454S	2.2	60	16	32	64	Turbo	4800	6 TB	270 W
6430	2.1	60	16	32	64	Turbo	4800	6 TB	270 W
6414U	2	60	16	32	64	Turbo	4800	6 TB	250 W

NOTE: *8470Q and 6458Q are supported only in liquid cooling configuration.

NOTE: Mixing of the processors are not recommended. If a liquid cooled processor is installed in one socket, then the second processor used must be of the same type.

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Memory subsystem

Topics:

- Supported memory

Supported memory

Table 4. Memory technology comparison

Feature	PowerEdge R660 (DDR5)
DIMM type	RDIMM
Transfer speed	4800 MT/s for 1 DIMM per channel, 4400 MT/s for 2 DIMMs per channel
Voltage	1.1 V

The following table lists the supported DIMMs for the R660. For the latest information about supported memory and memory configurations, reference the latest SDL.

Table 5. Supported DIMMs

DIMM Type	Max DIMM Speed (MT/s)	DIMM Capacity (GB)	Ranks per DIMM	Data Width	DIMM Volts (V)
RDIMM	4800	16	1	x8	1.1
RDIMM	4800	32	2	x8	1.1
RDIMM	4800	64	2	x4	1.1
RDIMM	4800	128	4	x4	1.1
RDIMM	4800	256	8	x4	1.1

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Storage

Topics:

Storage controllers

Dell RAID controller options offer performance improvements, including the fPERC solution. fPERC provides a base RAID HW controller without consuming a PCIe slot by using a small form factor and high-density connector to the base planar.

16G PERC Controller offerings are a heavy leverage of 15G PERC family. The Value and Value Performance levels carry over to 16G from 15G. New to 16G is the Avenger-based Premium Performance tier offering. This high-end offering drives IOPs performance and enhanced SSD performance.

Table 6. PERC Series controller offerings

Performance Level	Controller and Description
Entry	S160
Value	H355, HBA355 (internal/external)
Value Performance	H755, H755N
Premium Performance	H965i, Avenger 1 Memory: 8GB DDR4 NV cache 72-bit memory 2133 MHz Low profile form factors Dual A15 1.2 GHz CPU X8PCIe 3.0, x8 12Gb SAS

NOTE: For more information about the features of the Dell PowerEdge RAID controllers (PERC), Software RAID controllers, or BOSS card, and on deploying the cards, see the storage controller documentation at www.dell.com/storagecontrollermanuals.

NOTE: From December 2021, H355 replaces H345 as the entry raid controller. H345 is deprecated in January 2022.

Supported Drives

The table shown below lists the internal drives supported by the R660.

Table 7. Supported Drives

Form Factor	Type	Speed	Rotational Speed	Capacities
2.5 inches	vSAS	12 Gb	SSD	1.92 TB, 3.84 TB, 960 GB, 7.62 TB
2.5 inches	SAS	24 Gb	SSD	1.92 TB, 1.6 TB, 800 GB, 3.84 TB, 960 GB, 7.68 TB
2.5 inches	SATA	6 Gb	SSD	1.92 TB, 480 GB, 960 GB, 3.84 TB,
2.5 inches	NVMe	Gen4	SSD	1.6 TB, 3.2 TB, 6.4 TB, 1.92 TB, 3.84 TB, 15.63 TB, 7.68 TB, 800 GB, 400 GB
2.5 inches	DC NVMe	Gen4	SSD	3.84 TB, 960 GB
2.5 inches	SAS	12 Gb	10 K	600 GB, 1.2 TB, 2.4 TB

Internal storage configuration

R660 available internal storage configurations:

- Zero drives (no backplane)
- 8x2.5" (NVMe)
- 8x2.5" (NVMe RAID)
- 8x2.5" (SAS4/SATA)
- 8x2.5" Universal
- 10x2.5" (SAS4/SATA)
- 10x2.5" (SAS4/SATA) + 2x2.5" (SAS4/SATA)
- 10x2.5" (SAS4/SATA w/ 4 Universal
- 10x2.5" (NVMe)
- 10x2.5" (NVMe) + 2x2.5" (NVMe)
- 10x2.5" (SAS4/SATA w/ 2 Universal

External Storage

The R660 support the external storage device types listed in the table below.

Table 8. Support External Storage Devices

Device Type	Description
External Tape	Supports connection to external USB tape products
NAS/IDM appliance software	Supports NAS software stack
JBOD	Supports connection to 12Gb MD-series JBODs

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Networking

Topics:

Overview

PowerEdge offers a wide variety of options to get information moving to and from our servers. Industry best technologies are chosen, and systems management features are added by our partners to firmware to tie in with iDRAC. These adapters are rigorously validated for worry-free, fully supported use in Dell servers.

OCP 3.0 support

Table 9. OCP 3.0 feature list

Feature	OCP 3.0
Form factor	SFF
PCIe Gen	Gen4
Max PCIe width	x16
Max no.of ports	4
Port type	BT/SFP56
Max port speed	100 GbE
NC-SI	Yes
SNAPI	Yes
WoL	Yes
Power consumption	15 W - 75W

Supported OCP cards

Table 10. Supported OCP cards

Form factor	Vendor	Port type	Port speed	Port count
OCP 3.0	Intel	SFP28	25 GbE	4
	Broadcom	SFP28	25 GbE	4
	Intel	SFP28	25 GbE	2
	Broadcom	SFP28	25 GbE	2
	Broadcom	BT	10 GbE	4
	Intel	BT	10 GbE	2

Table 10. Supported OCP cards (continued)

Form factor	Vendor	Port type	Port speed	Port count
	Intel	BT	10 GbE	4
	Broadcom	BT	1 GbE	4
	Intel	BT	1 GbE	4

OCP NIC 3.0 vs. rack Network Daughter Card comparisons

Table 11. OCP 3.0, 2.0, and rNDC NIC comparison

Form Factor	Dell rNDC	OCP 2.0 (LOM Mezz)	OCP 3.0	Notes
PCIe Gen	Gen 3	Gen 3	Gen 4	Supported OCP3 are SFF (small form factor)
Max PCIe Lanes	x8	Up to x16	Up to x8	See server slot priority matrix
Shared LOM	Yes	Yes	Yes	This is iDRAC port redirect
Aux Power	Yes	Yes	Yes	Used for Shared LOM

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PCIe subsystem

The R660 supports up to 3 x16 low profile slots by riser2 and riser3. All PCIe ports are 75W card edge delivered power per slot.

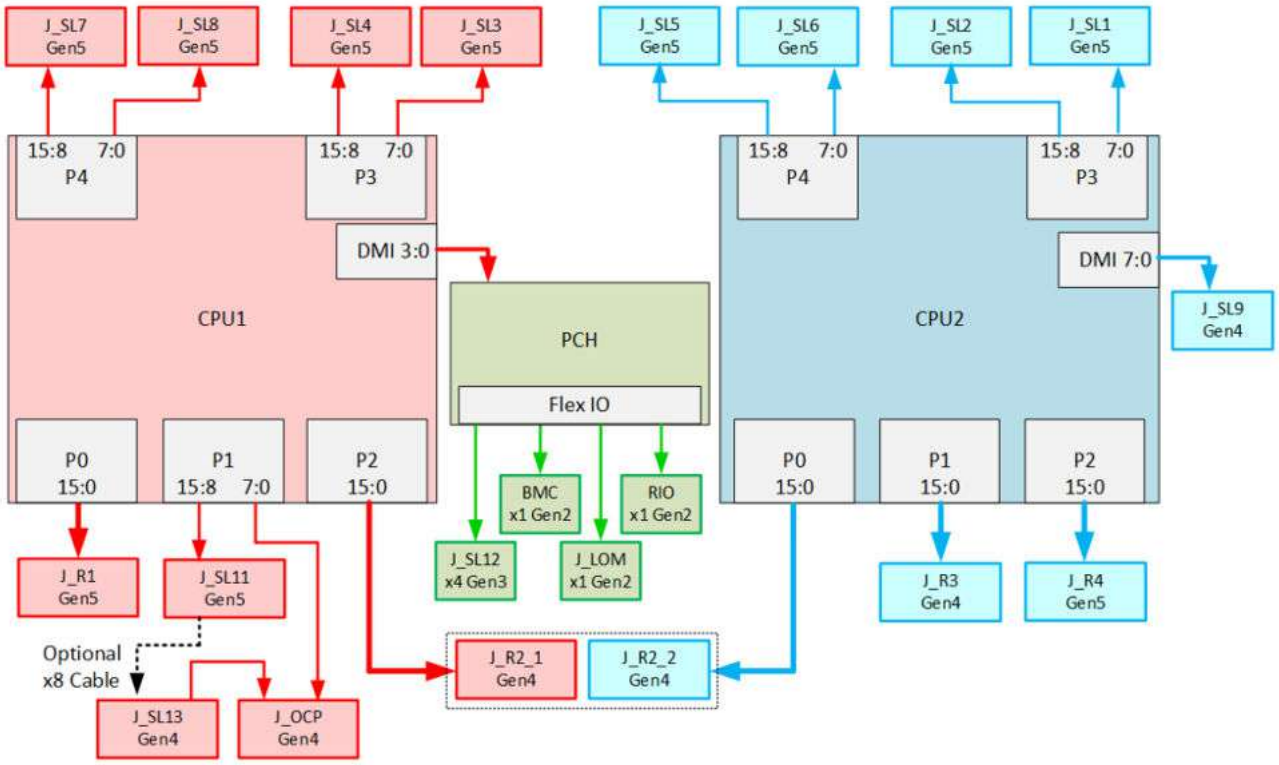

Figure 8. PCIe connection diagram

Topics:

- PCIe risers

PCIe risers

The PowerEdge R660 have a no riser option. Shown below are the riser offerings for the PowerEdge R660.

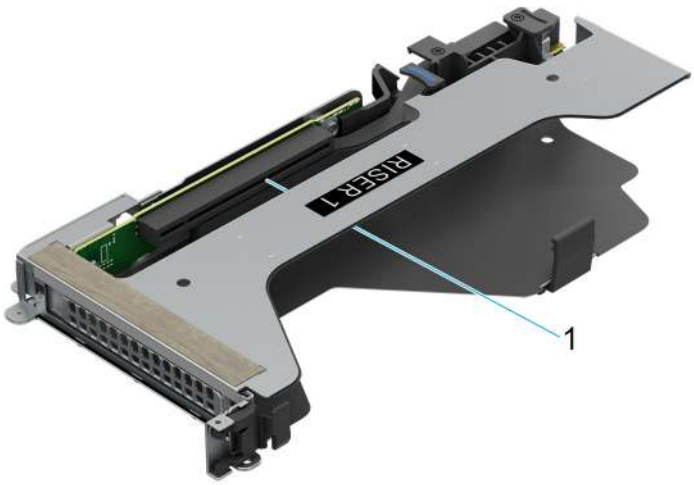

Figure 9. Riser 1P

1. Slot 1

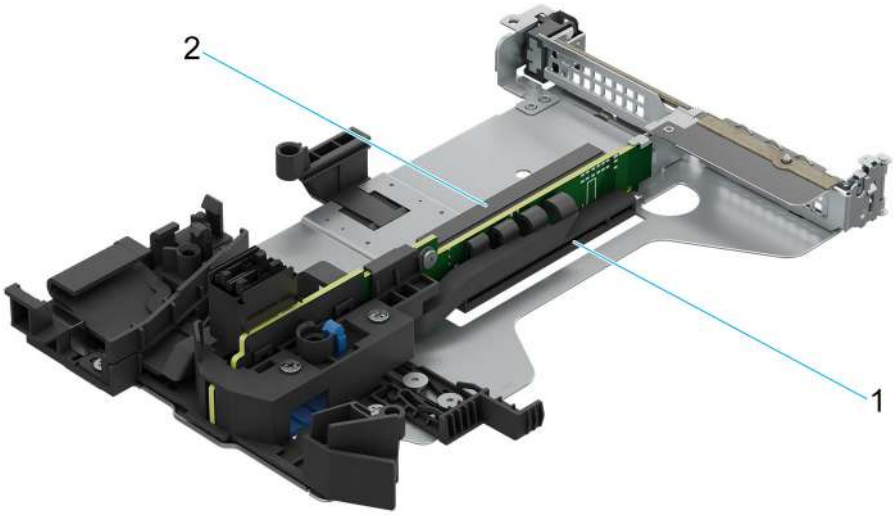

Figure 10. Riser 2P

1. Slot 1
2. Slot 2

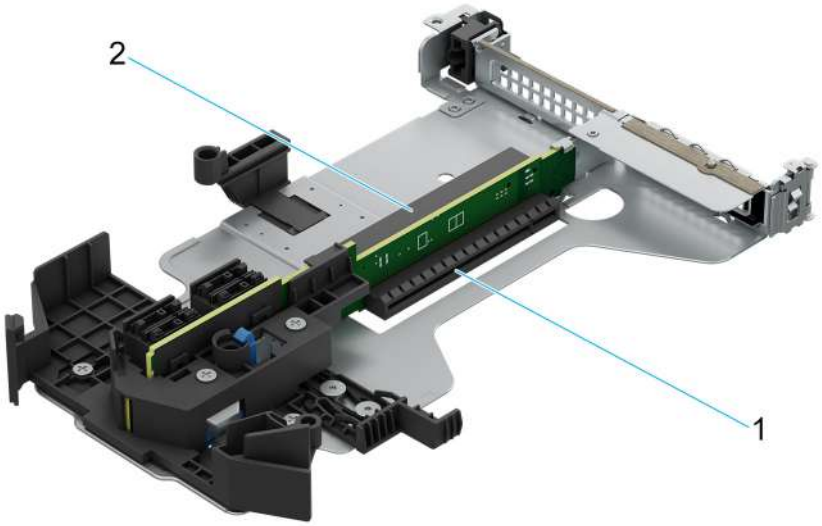

Figure 11. Riser 2A

1. Slot 1
2. Slot 2

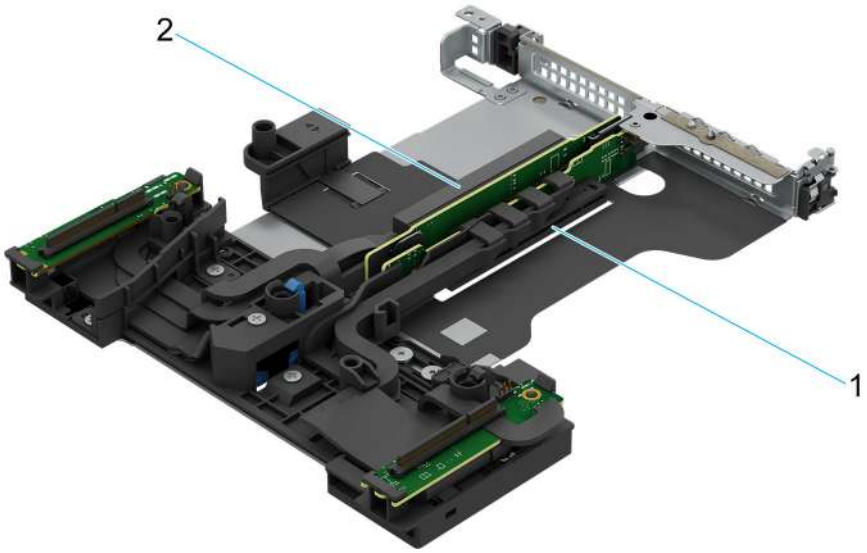

Figure 12. Riser 2Q

1. Slot 1
2. Slot 2

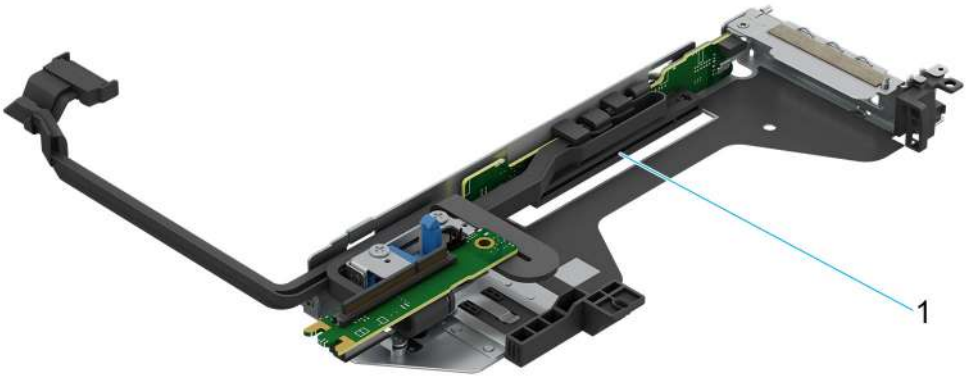

Figure 13. Riser 3P

1. Slot 3

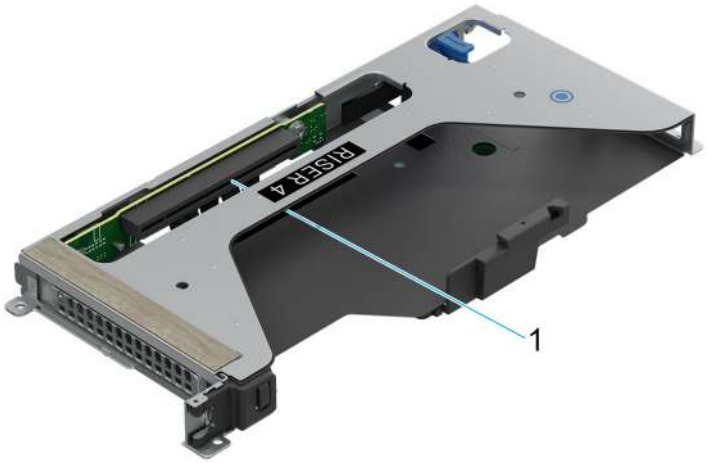

Figure 14. Riser 4P

1. Slot 2

Figure 15. Riser 2R

1. Slot 1

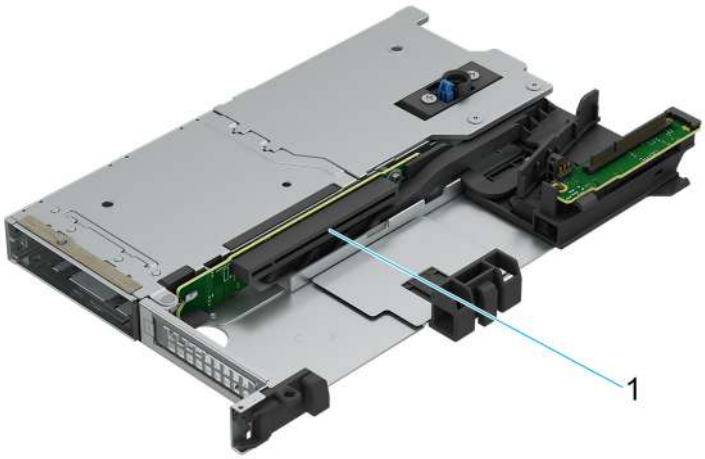

Figure 16. Riser 2S

1. Slot 1

Figure 17. Riser 3Q

1. Slot 3

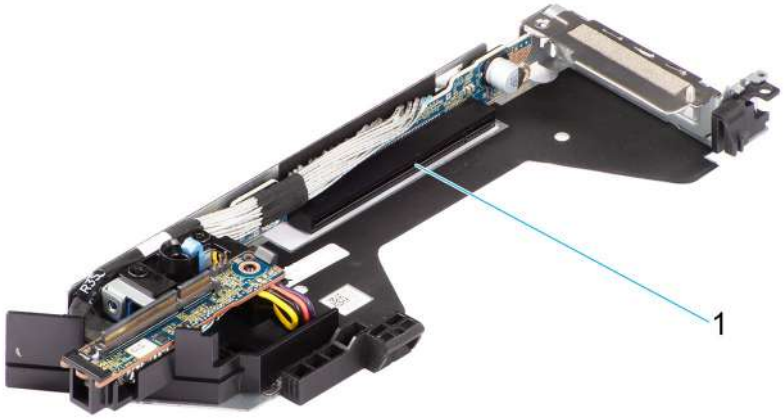

Figure 18. Riser 3S

1. Slot 3

Figure 19. Riser 3R

1. Slot 3

Table 12. PCIe Riser Configuration

Config No.	Riser configuration	No. of Processors	PERC type supported	Rear Storage Possible
0	No RSR	2	Front PERC	No
1	R2A+R3A	2	Front PERC / PERC Adapter	No
2	R2P+R3P	2	Front PERC	No
3	R1P+R4P	2	Front PERC / PERC Adapter	No
4	R2R+R3R	1	N/A	No
5	R2A+R3Q	2	Front PERC / PERC Adapter	No
6-1	R2Q (non A2)	2	Front PERC	No
6 -2	R2Q (only for A2)	2	Front PERC	No
7	R3P	2	Front PERC	Yes
8	R2A	1	Front PERC / PERC Adapter	No

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Power, thermal, and acoustics

PowerEdge servers have an extensive collection of sensors that automatically track thermal activity, which helps regulate temperature thereby reducing server noise and power consumption. The table below lists the tools and technologies Dell offers to lower power consumption and increase energy efficiency.

Topics:

Power

Table 13. Power tools and technologies

Feature	Description
Power Supply Units(PSU) portfolio	Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.
Tools for right sizing	Enterprise Infrastructure Planning Tool (EIPT) is a tool that can help you determine the most efficient configuration possible. With Dell's EIPT, you can calculate the power consumption of your hardware, power infrastructure, and storage at a given workload. Learn more at www.dell.com/calc.
Industry Compliance	Dell's servers are compliant with all relevant industry certifications and guide lines, including 80 PLUS, Climate Savers and ENERGY STAR.
Power monitoring accuracy	PSU power monitoring improvements include: ● Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5% ● More accurate reporting of power ● Better performance under a power cap
Power capping	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping.
Systems Management	iDRAC Enterprise and Datacenter provides server-level management that monitors, reports and controls power consumption at the processor, memory and system level. Dell OpenManage Power Center delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.
Active power management	Intel Node Manager is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC9 Datacenter and OpenManage Power Center that allows policy-based management of power and thermal at the individual server, rack, and data center level. Hot spare reduces power consumption of redundant power supplies. Thermal control off a speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption. Idle power enables Dell servers to run as efficiently when idle as when at full workload.
Fresh Air cooling	Refer to ASHRAE A3/A4 Thermal Restriction.

Table 13. Power tools and technologies (continued)

Feature	Description
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including: • Power distribution units (PDUs) • Uninterruptible power supplies (UPSs) • Energy Smart containment rack enclosures Find additional information at: https://www.delltechnologies.com/en-us/servers/power-and-cooling.htm.

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 table below shows the power supply unit options that are available for the R660.

Table 14. Power Supply Unit Options

Wattage	Frequency	Voltage/Current	Class	Heat dissipation
700 W mixed mode	50/60Hz	200-240 V AC/4.1 A	Titanium	2625 BTU/hr
	N/A	240 V DC/3.4 A	N/A	2625 BTU/hr
800 W mixed mode	50/60Hz	100–240 V AC/ 9.2-4.7 A	Platinum	3000 BTU/hr
	N/A	240 V DC/3.8 A	N/A	3000 BTU/hr
1100 W mixed mode	50/60 Hz	100–240 V AC/ 12-3.6 A	Titanium	4100 BTU/hr
	N/A	240 V DC/5.2 A	N/A	4100 BTU/hr
1100 W -48 VDC	N/A	-48 - -60 V DC/27A	N/A	4625 BTU/hr
1400 W mixed mode	50/60 Hz	100–240 V AC/ 12-8 A	Platinum	5250 BTU/hr
	N/A	240 V DC/6.6 A	N/A	5250 BTU/hr
1800 W mixed mode	50/60 Hz	200-240 V AC/10 A	Titanium	6610 BTU/hr
	N/A	240 V DC/8.2 A	N/A	6610 BTU/hr

NOTE: If a system with AC 1400 W or 1100 W PSUs operates at low line 100-120 Vac, and then the power rating per PSU is degraded to 1050 W.

Figure 20. PSU power cords

Table 15. PSU power cords

Form factor	Output	Power cord
Redundant 60 mm	700 W AC	C13
	800 W AC	C13
	1100 W AC	C13

Table 15. PSU power cords (continued)

Form factor	Output	Power cord
	1100 W -48 V DC	C13
	1400 W AC	C13
	1800 W AC	C15

NOTE: C13 power cord combined with C14 to C15 jumper power cord can be used to adapt 1800 W PSU.

Thermal

PowerEdge servers have an extensive collection of sensors that automatically track thermal activity, which helps regulate temperature thereby reducing server noise and power consumption.

Thermal design

Thermal management of the platform helps deliver high performance with the right amount of cooling to components, while maintaining the lowest fan speeds possible. This is done across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges.

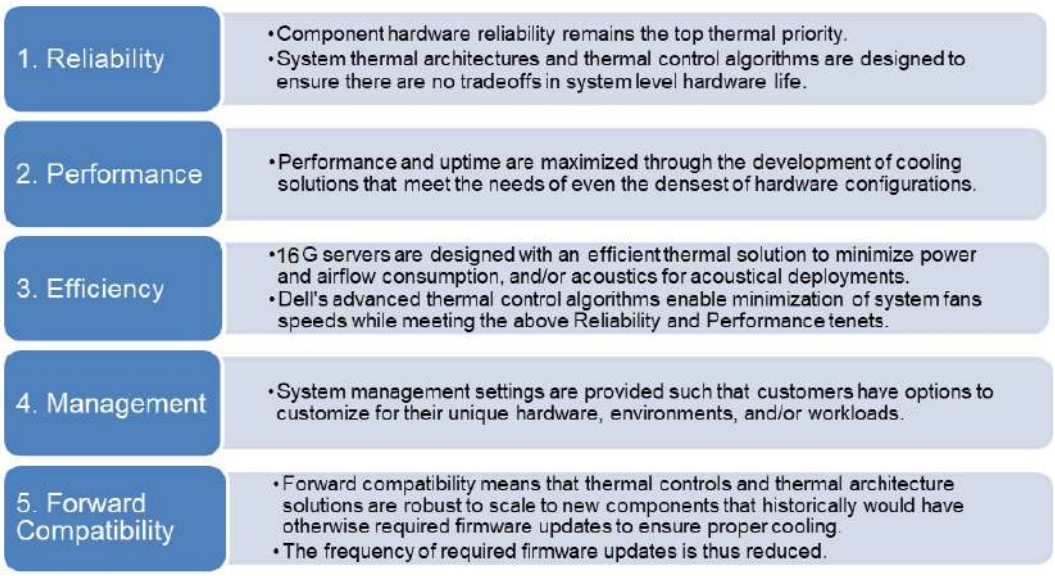

Figure 21. Thermal design characteristics

The thermal design of the PowerEdge R660 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 minimum expense of fan power.
- Comprehensive thermal management: The thermal control system regulates the fan speed based on several different responses from all system-component temperature sensors, as well as inventory for system configurations. Temperature monitoring includes components such as processors, DIMMs, chipset, the inlet air ambient, hard disk drives, and OCP.
- Open and closed loop thermal fan speed control: Open loop thermal control uses system configuration to determine fan speed based on inlet air ambient temperature. Closed loop thermal control method uses feedback temperatures to dynamically determine proper fan speeds.
- User-configurable settings: With the understanding and realization that every customer has unique set of circumstances or expectations from the system, in this generation of servers, we have introduced limited user- configurable settings residing in the iDRAC BIOS setup screen. For more information, see the Dell PowerEdge R660 Installation and Service Manual at www.dell.com/poweredgemanuals and “Advanced Thermal Control: Optimizing across Environments and Power Goals” on Dell.com.

- Cooling redundancy: The R660 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.
- Environmental Specifications: The optimized thermal management makes the R660 reliable under a wide range of operating environments.

Acoustics

Acoustical performance

Dell PowerEdge R660 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

Table 16. Acoustical Configurations of R660

Configuration	Volume - 1 (HPC)	Margin Rich
Acoustical Category	Category 4	Category 5
CPU TDP	165 W	300 W
CPU Quantity	2	2
Memory Type	64 GB DDR5 RDIMM	128 GB DDR5 RDIMM
DIMM Quantity	16	32
Backplane Type	10 x 2.5 inches	10 x 2.5 inches
HDD Type	2.5 inches NVMe SSD	2.5 inches NVMe SSD
HDD Quantity	10	10
PSU Type	1400 W	1400 W
PSU Quantity	2	2
PCI 1	Dual Port 25 GbE	N/A
PCI 2	Dual Port 25 GbE	N/A
Front PERC	N/A	N/A
OCP	Dual Port 25GbE	Dual Port 200GbE
M.2	Boss-N1	BOSS-N1

Table 17. Acoustical experience of R660 configurations

Configuration		Volume - 1 (HPC)	Feature Rich
Acoustical Performance: Idle/ Operating @ 25°C Ambient			
$L_{wA,m}$ (B)	Idle[4]	5.3	6.4
	Operating/Customer usage operating[5] [6]	5.3	6.5
K_v (B)	Idle [4]	0.4	0.4
	Operating/Customer usage operating[5] [6]	0.4	0.4
$L_{pA,m}$ (dB)	Idle[4]	41.3	52.3
	Operating/Customer usage operating[5] [6]	41.3	52.5
Prominent tones[3] Acoustical Performance: Idle @ 28°C Ambient			
$L_{wA,m}$[1] (B)		1/6~1/13	7.0

Table 17. Acoustical experience of R660 configurations (continued)

Configuration	Volume - 1 (HPC)	Feature Rich
K_v (B)	0.4	0.4
$L_{pA,m}$[2] (dB)	1/6~1/13	55.4
Acoustical Performance: Max. loading @ 35°C Ambient		
$L_{wA,m}$[1] (B)	1/6~1/13	8.5
K_v (B)	0.4	0.4
$L_{pA,m}$[2](dB)	1/6~1/13	72.2

[1]LwA,m: The declared mean A-weighted sound power level (LwA) is calculated per section 5.2 of ISO 9296 (2017) with data collected using the methods that are described in ISO 7779 (2010). Engineering data presented here may not be fully compliant with ISO 7779 declaration requirement.

[2]LpA,m: The declared mean A-weighted emission sound pressure level is at the bystander position per section 5.3 of ISO 9296 (2017) and measured using methods that are described in ISO 7779 (2010). The system is placed in a 24U rack enclosure, 75 cm above a reflective floor. Engineering data presented here may not be fully compliant with ISO 7779 declaration requirement.

[3]Prominent tones: Criteria of Annex D of ECMA-74 and Prominence Ratio method of ECMA-418 are followed to determine if discrete tones are prominent and to report them, if so.

[4]Idle mode: The steady-state condition in which the server is energized but not operating any intended function.

[5]Operating mode: The maximum of the steady state acoustical output at 50% of CPU TDP or active storage drives for the respective sections of Annex C of ECMA-74.

[6] Customer Usage Operating mode: The operating mode is represented by the maximum of the steady state acoustical output at 25%~30% of CPU TDP, 2.5%~10% IOPs load, and >80% GPU load as the components showed in the above configurations.

PowerEdge acoustical specifications

For more information on acoustical specifications, see ENG0019663. (See the category definitions.)

Dell typically categorizes servers in five categories of acoustically acceptable usage:

- Category 1: Table-top in Office Environment
- Category 2: Floor-standing in Office Environment
- Category 3: General Use Space
- Category 4: Attended Data Center
- Category 5: Unattended Data Center

Category 2: Floor-standing in Office Environment

When Dell determines that a specific Enterprise product is to be used primarily when it is sitting on the floor, that is, next to a user's feet, then the acoustical specification in the table below applies. Noise from the product should not annoy or otherwise interfere with the user's thoughts or speech, for example, on the telephone.

Table 18. Dell Enterprise Category 2, "Floor-standing in Office Environment" acoustical specification category

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	**Idle in 23±2° C Ambient**	**Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required**	**Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient**
Sound Power	LWA,m, B	≤ 4.9	≤ 5.1	≤ 5.4	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD and Rear Microphone	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 35	≤ 35	≤ 35	Report
	Loudness, sones	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" • Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB. • Startup behavior ○ Report Startup behavior re. AC0159 ○ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum • Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"			N/A
Any	Other	• No rattles, squeaks, or unexpected noises • Sound should be "even" around the EUT (one side should not be dramatically louder than another) • Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. • Specific operating conditions are defined in "Configurations and Configuration Dependencies" for each platform.			
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Category 4: Attended Data Center

When Dell determines that a specific Enterprise product is to be predominantly used in an attended data center, then the acoustical specification of the table applies. The phrase “attended data center” is used to mean a space in which many (from tens to 1000s) of Enterprise products are deployed in proximity (that is, in the same room) to personnel whose speech (perhaps with raised voices) is expected to be intelligible over the data center noise. Hearing protection or hearing monitoring programs are not expected in these areas. Examples in this category include monolithic rack products. When Dell determines that a specific Enterprise product is to be predominantly used in a general use space, then the acoustical specification of the above table applies. These products could be found in laboratories, schools, restaurants, open office space layouts, small ventilated closets, etc., though not in close proximity to any particular person nor in quantities greater than a few in any location. People within proximity of a few of these products should not experience any impact to speech intelligibility or annoyance from the noise of the product. A rack product sitting on a table in a common area is an example.

Table 19. Dell Enterprise Category 4, “Attended Data Center” acoustical specification category.

Measurement Position re AC0158	**Metric, re AC0159**	**Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)**				**Simulate (that is, set fan speeds representative) for 100% loading and maximum configuration, at 35° C Ambient**
		Standby in 23±2° C Ambient	**Idle in 23±2° C Ambient**	**Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required**	**Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient**	
Sound Power	LWA,m, B	Report	≤ 6.9	≤ 7.1	Report	≤ 8.5
Front Binaural HEAD	Tones, Hz, dB	Report	< 15 dB	< 15 dB	Report	< 20 dB
	Tonality, tu	Report	Report	Report	Report	Report
	Dell Modulation, %	Report	Report	Report	Report	Report
	Loudness, sones	Report	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report	Report
	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for “1.5 dB < ΔLpA < 3.0 dB” ○ Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB. ○ Startup behavior ▪ Report Startup behavior re. AC0159 ▪ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum ∞ Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”			N/A	
Any	Other	No rattles, squeaks, or unexpected noises Sound should be “even” around the EUT (one side should not be dramatically louder than another)				

Table 19. Dell Enterprise Category 4, "Attended Data Center" acoustical specification category. (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set fan speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient	
		Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.				
Sound Pressure	LpA-reported, dBA	Report for all mics	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Category 5: Unattended Data Center

When Dell determines that a specific Enterprise product is to be predominantly used in an unattended data center (and not blades or blade enclosures; these have their own category), then the acoustical specification in the table below applies. The phrase "unattended data center" is used to mean a space in which many (from tens to 1000s) of Enterprise products are deployed together, its own heating and cooling systems condition the space, and operators or servicers of equipment enter generally only to deploy, service, or decommission equipment. Hearing protection or hearing monitoring programs may be expected (per government or company guidelines) in these areas. Examples in this category include monolithic rack products.

Table 20. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient	
Sound Power	LWA,m, B	Report	≤ 7.5	≤ 7.7	Report	≤ 8.7
Front Binaural HEAD	Tones, Hz, dB	Report	< 15 dB	< 15 dB	Report	< 20 dB
	Tonality, tu	Report	Report	Report	Report	Report
	Dell Modulation, %	Report	Report	Report	Report	Report

Table 20. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient	
	Loudness, sones	Report	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" • Report Acoustical Jump (see AC0159) during air mover speed transition from Idle to Operating Mode. • Startup behavior ○ Report Startup behavior re. AC0159 ○ Startup must proceed smoothly, that is, no sudden or large jumps, and air mover speed during startup must not exceed 50% of its maximum • Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"				N/A	
Any	Other	No rattles, squeaks, or unexpected noises Sound should be "even" around the EUT (one side should not be dramatically louder than another) Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.				
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics	Report for all mics

10

Rack, rails, and cable management

Topics:

Rails and cable management information

The rail offerings for the PowerEdge R660 consist of two general types: sliding and static. The cable management offerings consist of an optional cable management arm (CMA) and an optional strain relief bar (SRB).

See the *Dell Technologies Enterprise Systems Rail Sizing and Rack Compatibility Matrix* available at https://i.dell.com/sites/csdocuments/Business_solutions_engineering-Docs_Documents/en/rail-rack-matrix.pdf for information regarding:

- Specific details about rail types.
- Rail adjustability ranges for various rack mounting flange types.
- Rail depth with and without cable management accessories.
- Rack types that are supported for various rack mounting flange types.

Key factors governing proper rail selection include the following:

- Spacing between the front and rear mounting flanges of the rack.
- Type and location of any equipment that is mounted in the back of the rack such as power distribution units (PDUs).
- Overall depth of the rack

Sliding rails features summary

The sliding rails allow the system to be fully extended out of the rack for service. There are two types of sliding rails available, ReadyRails II sliding rails and Stab-in/Drop-in sliding rails. The sliding rails are available with or without the optional cable management arm (CMA) or strain relief bar (SRB).

A15 ReadyRails II sliding rails for 4-post racks

- Supports drop-in installation of the chassis to the rails.
- Support for tool-less installation in 19" EIA-310-E compliant square or un-threaded round hole 4-post racks including all generations of the Dell racks.
- Support for tooled installation in 19" EIA-310-E compliant threaded hole 4-post racks.
- Support full extension of the system out of the rack to allow serviceability of key internal components.
- Support for optional strain relief bar (SRB).
- Support for optional cable management arm (CMA).

  NOTE: For situations where CMA support is not required, the outer CMA mounting brackets can be uninstalled from the sliding rails. This reduces the overall length of the rails and eliminates the potential interferences with rear mounted PDUs or the rear rack door.

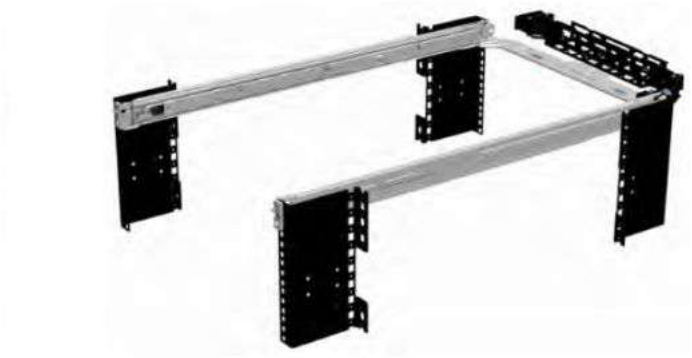

Figure 22. Sliding rails with optional CMA

Figure 23. Sliding rails with optional SRB

A16 Stab-in/Drop-in sliding rails for 4-post racks

- Supports drop-in or stab-in installation of the chassis to the rails.
- Support for tool-less installation in 19" EIA-310-E compliant square, un-threaded round hole racks including all generations of the Dell racks. Also supports tool-less installation in threaded round hole 4-post racks.
- Support for tool-less installation in Dell Titan or Titan-D racks
- Support full extension of the system out of the rack to allow serviceability of key internal components.
- Support for optional cable management arm (CMA).
- Support for optional strain relief bar (SRB).

NOTE: For situations where CMA support is not required, the outer CMA mounting brackets can be uninstalled from the sliding rails. This reduces the overall length of the rails and eliminates the potential interferences with rear mounted PDUs or the rear rack door.

Scan the QRL code for the documentation and trouble-shooting information regarding the installation procedures for Drop-in/ Stab-in rail types.

Figure 24. Quick resource locator for combo rails

A14 static rails summary

The static rails offer a greater adjustability range and a smaller overall mounting footprint than the sliding rails because of their reduced complexity and lack of need for CMA support. The static rails support a wider variety of racks than the sliding rails. However, they do not support serviceability in the rack and are thus not compatible with the CMA. The static rails are also not compatible with SRB.

Figure 25. Static rails

Static rails features summary

Static rails for 4-post and 2-post racks:

- Supports Stab-in installation of the chassis to the rails.
- Support tool-less installation in 19" EIA-310-E compliant square or un-threaded round hole 4-post racks including all generations of Dell racks.
- Support tooled installation in 19" EIA-310-E compliant threaded hole 4-post and 2-post racks.
- Support for tooled installation in Dell Titan or Titan-D rack.

NOTE:

- Screws are not included with the static rail kit since racks are offered with various thread types. The screws are provided for mounting static rails in racks with threaded mounting flanges.
- Screw head diameter should be 10 mm or less.

2-Post racks installation

If installing to 2-Post (Telco) racks, the ReadyRails II static rails (A14) must be used. Sliding rails support mounting in 4-post racks only.

Figure 26. Static rails in 2-post center mount configuration

Installation in the Dell Titan or Titan-D racks

For tool-less installation in Titan or Titan-D racks, the Stab-in/Drop-in sliding rails (A16) must be used. This rail collapses down sufficiently to fit in the rack with mounting flanges that are spaced about 24 inches apart from front to back. The Stab-in/Drop-in sliding rail allows bezels of the servers and storage systems to be aligned when installed in these racks. For tooled installation, Stab-in static rails (A14) must be used for bezel alignment with storage systems.

Cable management arm (CMA)

The optional cable management arm (CMA) organizes and secures the cords and cables exiting the back of the systems. It unfolds to allow the systems to extend out of the rack without having to detach the cables. Some key features of the CMA include:

- Large U-shaped baskets to support dense cable loads.
- Open vent pattern for optimal airflow.
- Ability to mount on either side by swinging the spring-loaded brackets from one side to the other.
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling.
- Includes a low-profile fixed tray to both support and retain the CMA in its fully closed position.
- Both the CMA and the tray mount without the use of tools by simple and intuitive snap-in designs.
- CMA is not supported in Direct Liquid Cooling (DLC) configuration.

The CMA can be mounted to either side of the sliding rails without the use of tools or the need for conversion. For systems with one power supply unit (PSU), it is recommended to mount on the side opposite to that of the power supply to allow easier access to it and the rear drives (if applicable) for service or replacement.

Figure 27. Sliding rails with CMA

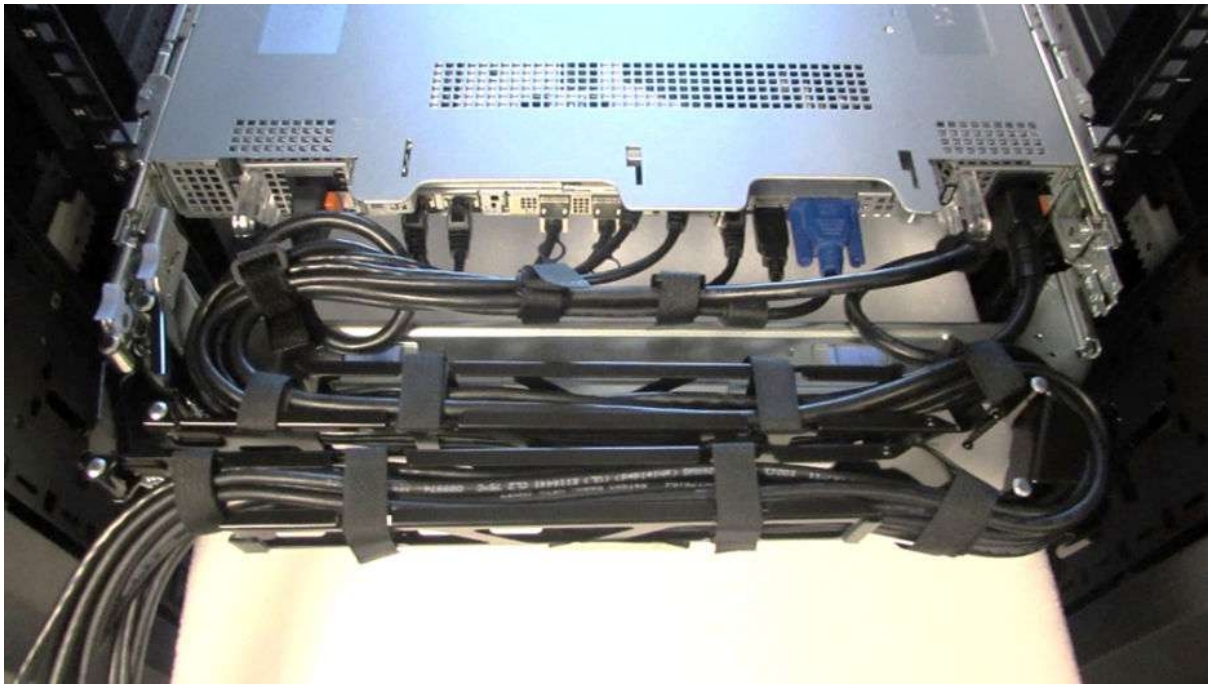

Figure 28. CMA Cabling

Strain Relief Bar (SRB)

The optional strain relief bar (SRB) for the PowerEdge R660 organizes and supports cable connections at the rear end of the server to avoid damage from bending.

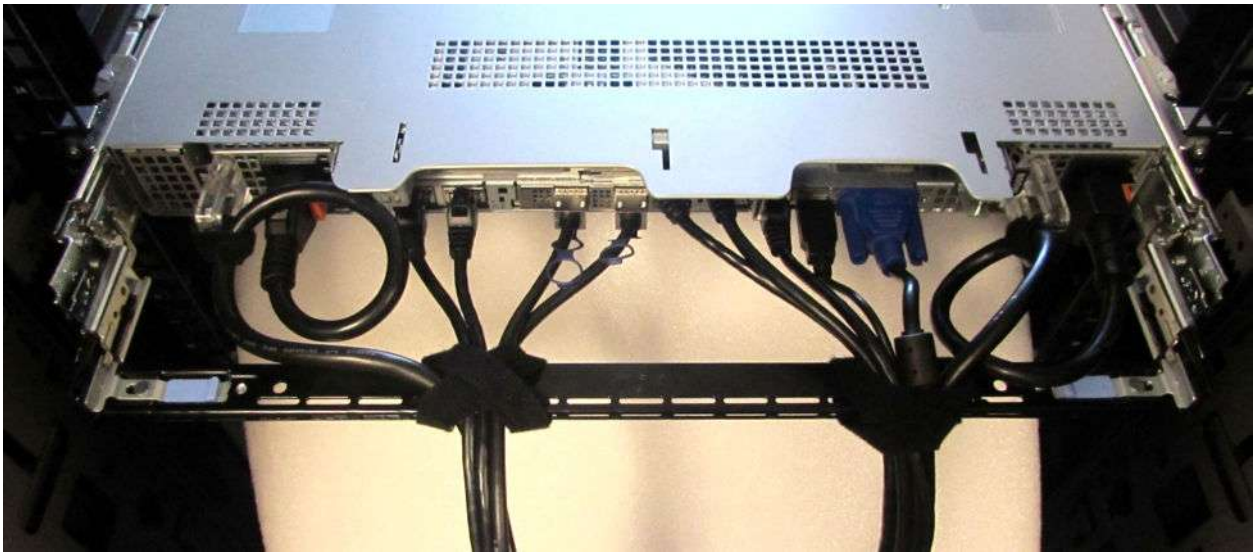

Figure 29. Cabled strain relief bar

- Tool-less attachment to the rails
- Two depth positions to accommodate various cable loads and rack depths
- Supports cable loads and controls stresses on server connectors
- Cables can be segregated into discrete purpose-specific bundles

Rack Installation

Drop-in design means that the system is installed vertically into the rails by inserting the standoffs on the sides of the system into the J-slots in the inner rail members with the rails in the fully extended position. The recommended method of installation is to first insert the rear standoffs on the system into the rear J-slots on the rails to free up a hand and then rotate the system down into the remaining J-slots while using the free hand to hold the rail against the side of the system.

Stab-in design means that the inner (chassis) rail members must first be attached to the sides of the system and then inserted into the outer (cabinet) members installed in the rack.

Installing system into the rack (option A: Drop-In)

1. Pull the inner rails out of the rack until they lock into place.

Figure 30. Pull out inner rail

2. Locate the rear rail standoff on each side of the system and lower them into the rear J-slots on the slide assemblies.
3. Rotate the system downward until all the rail standoffs are seated in the J-slots.

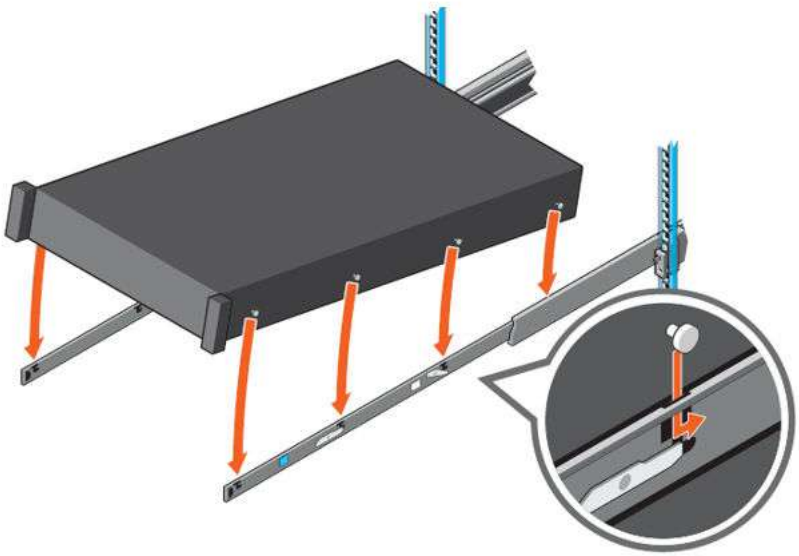

Figure 31. Rail standoffs seated in J-slots

4. Push the system inward until the lock levers click into place.
5. Pull the blue side release lock tabs forward or backward on both rails and slide the system into the rack until the system is in the rack.

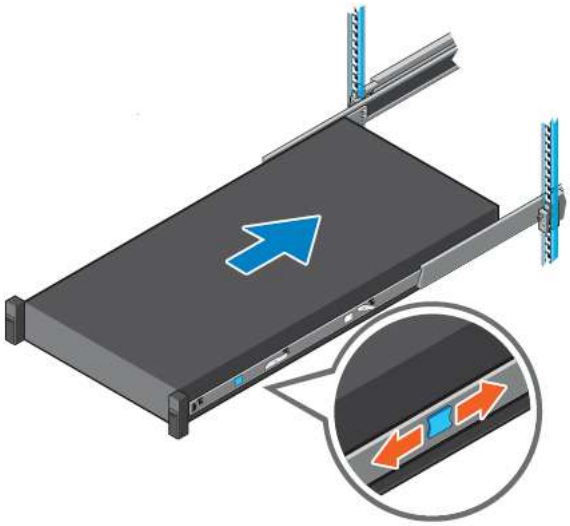

Figure 32. Slide system into the rack

Installing the system into the rack (option B: Stab-In)

1. Pull the intermediate rails out of the rack until they lock into place.
2. Release the inner rail lock by pulling forward on the white tabs and sliding the inner rail out of the intermediate rails.

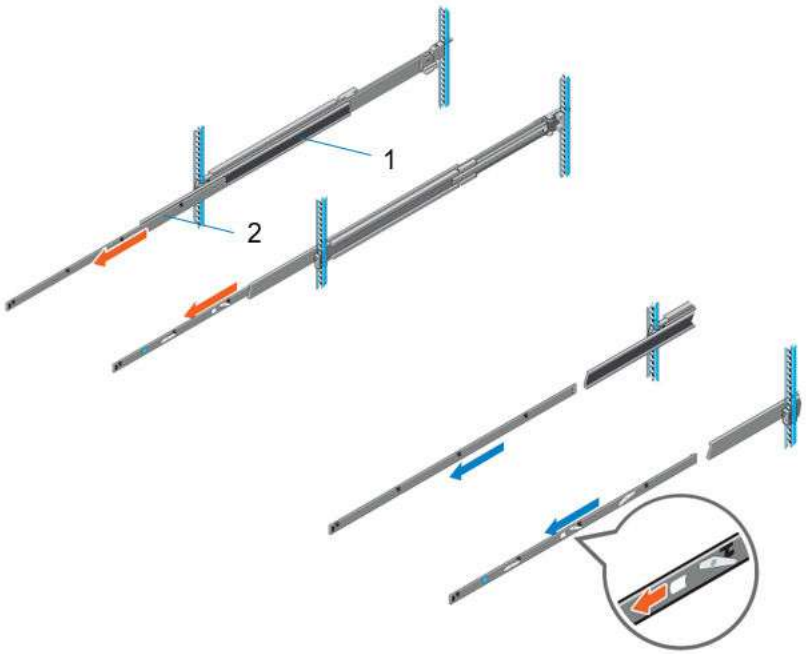

Figure 33. Pull out the intermediate rail

Table 21. Rail component label

Number	Component
1	Intermediate rail
2	Inner rail

3. Attach the inner rails to the sides of the system by aligning the J-slots on the rail with the standoffs on the system and sliding forward on the system until they lock into place.

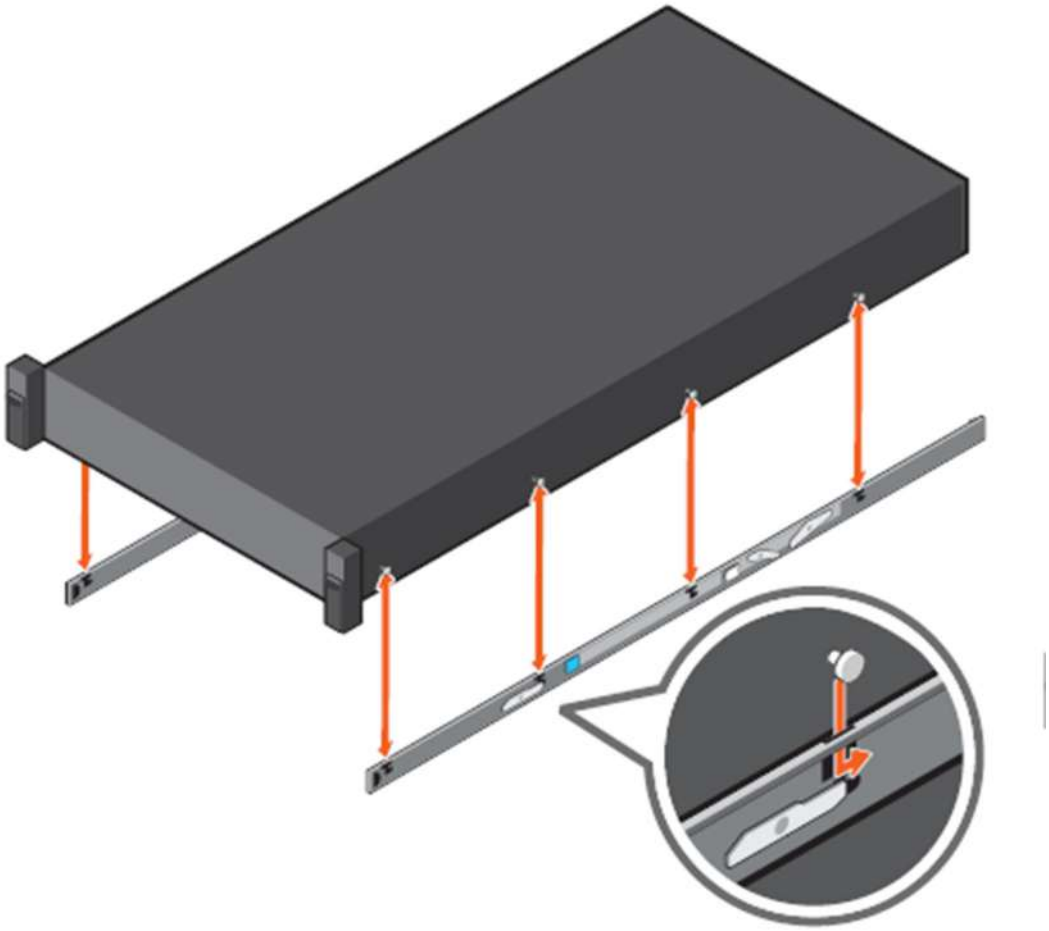

Figure 34. Attach the inner rails to the system

4. With the intermediate rails extended, install the system into the extended rails.

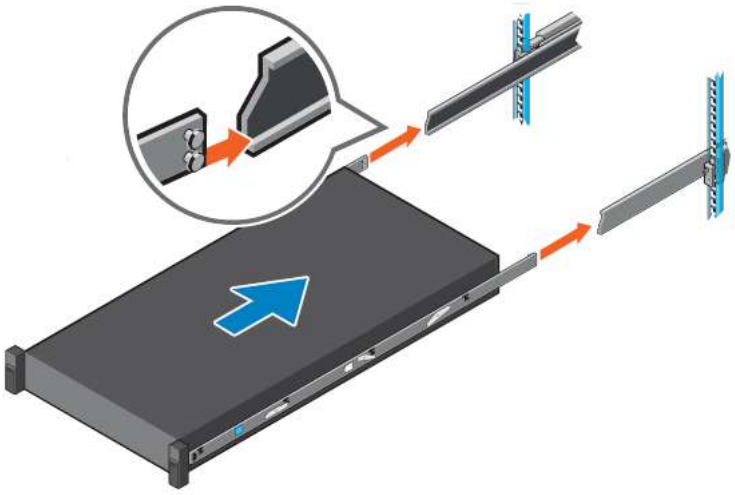

Figure 35. Install system into the extended rails

5. Pull blue slide release lock tabs forward or backward on both rails, and slide the system into the rack.

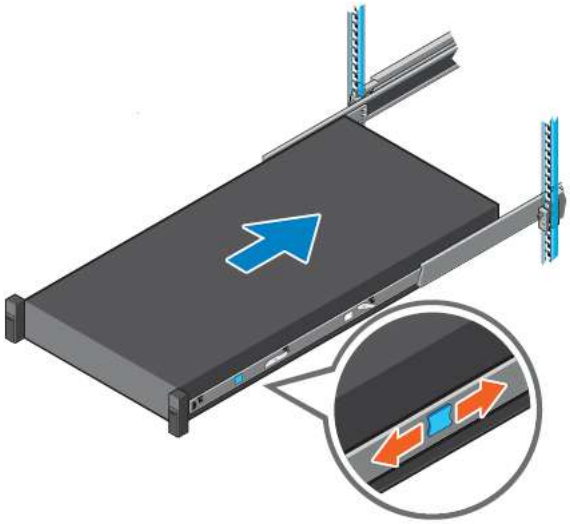

Figure 36. Slide system into the rack

11

Supported Operating Systems

The PowerEdge system supports the following operating systems:

- Canonical® Ubuntu® Server LTS
- Microsoft® Windows Server® with Hyper-V
- Red Hat® Enterprise Linux
- SUSE® Linux Enterprise server
- VMware® ESXi®

Links to specific OS versions and editions, certification matrices, Hardware Compatibility Lists (HCL) portal, and Hypervisor support are available at Dell Enterprise Operating Systems.

12

Dell OpenManage Systems Management

Dell 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 servers efficiently; in physical, virtual, local, and remote environments; all without the need to install an agent in the operating system.

The OpenManage portfolio includes:

- Innovative embedded management tools - integrated Dell Remote Access Controller (iDRAC)
- Consoles - OpenManage Enterprise
- Extensible with plug-ins - OpenManage Power Manager
- Update tools - Repository Manager

Dell has developed comprehensive systems management solutions that are based on open standards and has integrated with management consoles from partners such as Microsoft and VMware, allowing advanced management of Dell servers. Dell management capabilities extend to offerings from the industry's top systems management vendors and frameworks such as Ansible, Splunk, and ServiceNow. OpenManage tools automate the full span of server life cycle management activities along with powerful RESTful APIs to script or integrate with your choice of frameworks.

For more information about the entire OpenManage portfolio, see:

- The latest Dell Systems Management Overview Guide.

Topics:

Integrated Dell Remote Access Controller (iDRAC)

iDRAC9 delivers advanced, agent-free, local and remote server administration. Embedded in every PowerEdge server, iDRAC9 provides a secure means to automate a multitude of common management tasks. Because iDRAC is embedded within every PowerEdge server, there is no additional software to install; just plug in power and network cables, and iDRAC is ready to go. Even before installing an operating system (operating system) or hypervisor, IT administrators have a complete set of server management features at their fingertips.

With iDRAC9 in-place across the Dell PowerEdge portfolio, the same IT administration techniques and tools can be applied throughout. This consistent management platform allows easy scaling of PowerEdge servers as an organization's infrastructure grows. Customers can use the iDRAC RESTful API for the latest in scalable administration methods of PowerEdge servers. With this API, iDRAC enables support for the Redfish standard and enhances it with Dell extensions to optimize at-scale management of PowerEdge servers. By having iDRAC at the core, the entire OpenManage portfolio of Systems Management tools allows every customer to tailor an effective, affordable solution for any size environment.

Zero Touch Provisioning (ZTP) is embedded in iDRAC. ZTP - Zero Touch Provisioning is Intelligent Automation Dell's agent-free management puts IT administrators in control. Once a PowerEdge server is connected to power and networking, that system can be monitored and fully managed, whether you're standing in front of the server or remotely over a network. In fact, with no need for software agents, an IT administrator can: · Monitor · Manage · Update · Troubleshoot and remediate Dell servers With features like zero-touch deployment and provisioning, iDRAC Group Manager, and System Lockdown, iDRAC9 is purpose-built to make server administration quick and easy. For those customers whose existing management platform utilizes in-band management, Dell does provide iDRAC Service Module, a lightweight service that can interact with both iDRAC9 and the host operating system to support legacy management platforms.

When ordered with DHCP enabled from the factory, PowerEdge servers can be automatically configured when they are initially powered up and connected to your network. This process uses profile-based configurations that ensure each server is configured per your specifications. This feature requires an iDRAC Enterprise license.

iDRAC9 offers following license tiers:

Table 22. iDRAC9 license tiers

License	Description
iDRAC9 Basic	• Available only on 100-500 series rack/tower • Basic instrumentation with iDRAC web UI • For cost conscious customers that see limited value in management
iDRAC9 Express	• Default on 600+ series rack/tower, modular, and XR series • Includes all features of Basic • Expanded remote management and server life-cycle features
iDRAC9 Enterprise	• Available as an upsell on all servers • Includes all features of Basic and Express. Includes key features such as virtual console, AD/LDAP support, and more • Remote presence features with advanced, Enterprise-class, management capabilities
iDRAC9 Datacenter	• Available as an upsell on all servers • Includes all features of Basic, Express, and Enterprise. Includes key features such as telemetry streaming, Thermal Manage, automated certificate management, and more • Extended remote insight into server details, focused on high end server options, granular power, and thermal management

For a full list of iDRAC features by license tier, see Integrated Dell Remote Access Controller 9 User's Guide at Dell.com.

For more details on iDRAC9 including white papers and videos, see:

- Support for Integrated Dell Remote Access Controller 9 (iDRAC9) on the Knowledge Base page at Dell.com

Systems Management software support matrix

Table 23. Systems Management software support matrix

Categories	Features	PE mainstream
Embedded Management and In-band Services	iDRAC9 (Express, Enterprise, and Datacenter licenses)	Supported
	OpenManage Mobile	Supported
	OM Server Administrator (OMSA)	Supported
	iDRAC Service Module (iSM)	Supported
	Driver Pack	Supported
Change Management	Update Tools (Repository Manager, DSU, Catalogs)	Supported
	Server Update Utility	Supported
	Lifecycle Controller Driver Pack	Supported
	Bootable ISO	Supported
Console and Plug-ins	OpenManage Enterprise	Supported
	Power Manager Plug-in	Supported
	Update Manager Plug-in	Supported
	SupportAssist Plug-in	Supported
	CloudIQ	Supported
Integrations and connections	OM Integration with VMware Vcenter/vROps	Supported
	OM Integration with Microsoft System Center (OMIMSC)	Supported
	Integrations with Microsoft System Center and Windows Admin Center (WAC)	Supported

Table 23. Systems Management software support matrix (continued)

Categories	Features	PE mainstream
	ServiceNow	Supported
	Ansible	Supported
	Third-party Connectors (Nagios, Tivoli, Microfocus)	Supported
Security	Secure Enterprise Key Management	Supported
	Secure Component Verification	Supported
Standard operating system	Red Hat Enterprise Linux, SUSE, Windows Server 2021 Ubuntu, CentOS	Supported (Tier-1)

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Appendix D: Service and support

Topics:

Default support levels

This system offers 3 years Dell ProSupport Next Business Day (NBD), including 24x7 phone support and NBD parts and labor support.

Default deployment levels

This system is defaulted to ProDeploy Dell Server which includes onsite hardware installation and software configuration. Optionally, the customer may choose to any of the factory or field deployment offers listed below.

Other services and support information

Dell Technologies Services include a wide, customizable range of service options to simplify the assessment, design, implementation, management and maintenance of IT environments and to help transition from platform to platform.

Depending on the current business requirements and correct level of service for customers, we provide factory, onsite, remote, modular, and specialized services that fit the customer requirements and budget. We will help with a little or a lot, based on the customers choice, and provide access to our global resources.

Dell deployment services

Dell ProDeploy Infrastructure Suite

ProDeploy Infrastructure Suite provides a variety of deployment offerings that satisfy a customer's unique needs. It is made up of 5 offers: ProDeploy Configuration Services, ProDeploy Rack Integration Services, Basic Deployment, ProDeploy, and ProDeploy Plus.

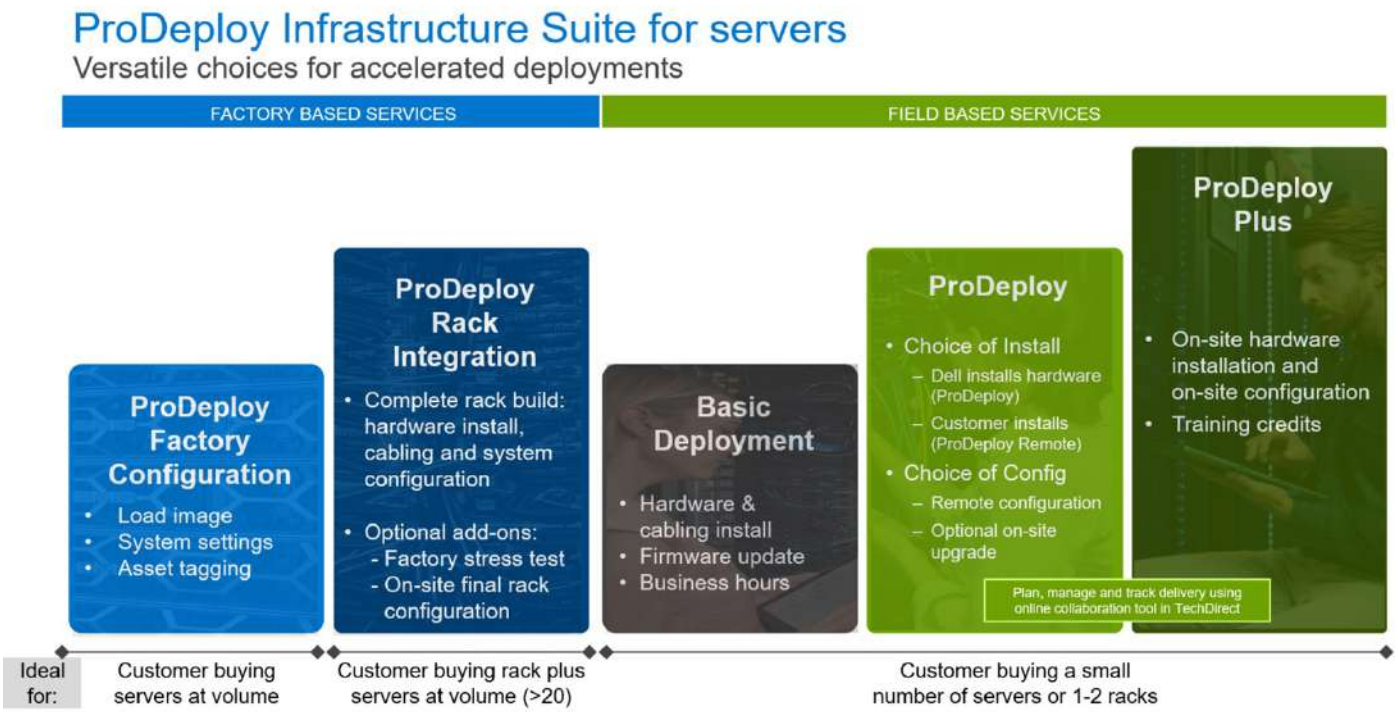

Figure 37. ProDeploy Infrastructure Suite for servers

The new Factory Services consist of two tiers of deployment that happen prior to shipping to the customer's site.

Factory Based Services:

- ProDeploy Factory Configuration - Ideal for customers buying servers in volume and seeking pre-configuration prior to shipping such as: custom image, system settings, and asset tagging so it arrives ready to use out of the box. Furthermore, servers can be packaged and bundled to meet specific shipping and distribution requirements for each customer location to facilitate the rollout process. Upsell one of the field based services (below) if a customer needs assistance with the final server installation.
- ProDeploy Rack Integration - Ideal for customers seeking to build out fully integrated racks prior to shipping. These rack builds include hardware install, cabling, and full system configuration. You can also add-on a factory stress test and optional on-site final rack configuration to complete the rack installation.
  - STANDARD SKUs for Rack Integration is available in US only and requires:
    - 20 or more devices (R and C series servers and all Dell or non-Dell switches). Use Informational SKUs for Dell switches or 3rd party products
    - Shipping to contiguous US
  - USE CUSTOM QUOTE for Rack Integration for:
    - All countries except USA
    - Racks containing less than 20 servers
    - Any rack that includes VxRail or Storage
    - Shipping outside contiguous US
    - Shipping to multiple locations

Field Based Services:

- Basic Deployment consists of the hardware installation, cabling and firmware update during normal standard business hours. Basic Deployment is traditionally sold to Competency Enabled Partners. Competency enabled partners often have Dell do the hardware installation while they complete the software configuration.
- ProDeploy consists of your hardware installation and configuration of the software using offshore resources. ProDeploy is great for customers who are price sensitive or who are remote from their data centers and don't require an onsite presence.
- ProDeploy Plus will give you in-region or onsite resources to complete the engagement for the customer. It also comes with additional features such as Post Deployment Configuration Assistance and Training Credits.

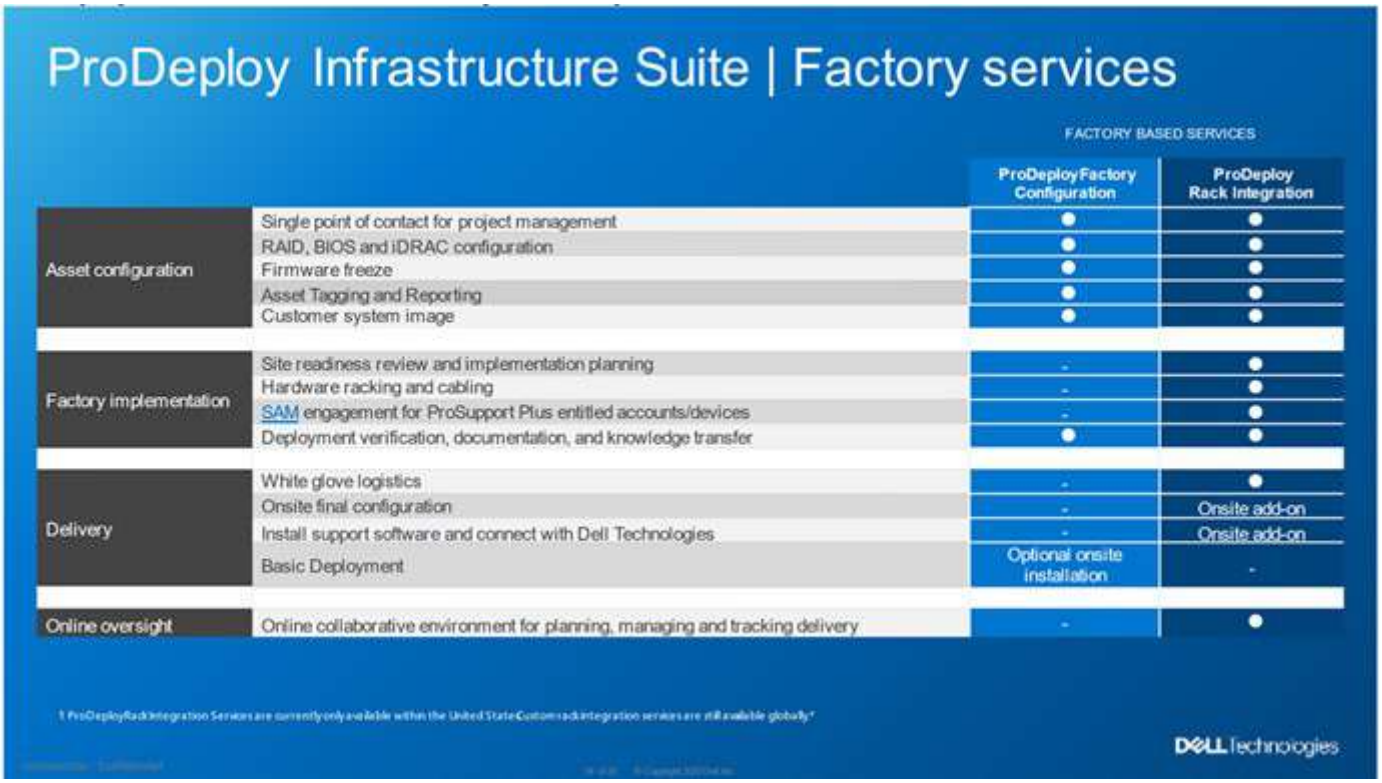

Figure 38. ProDeploy Infrastructure Suite - Factory services

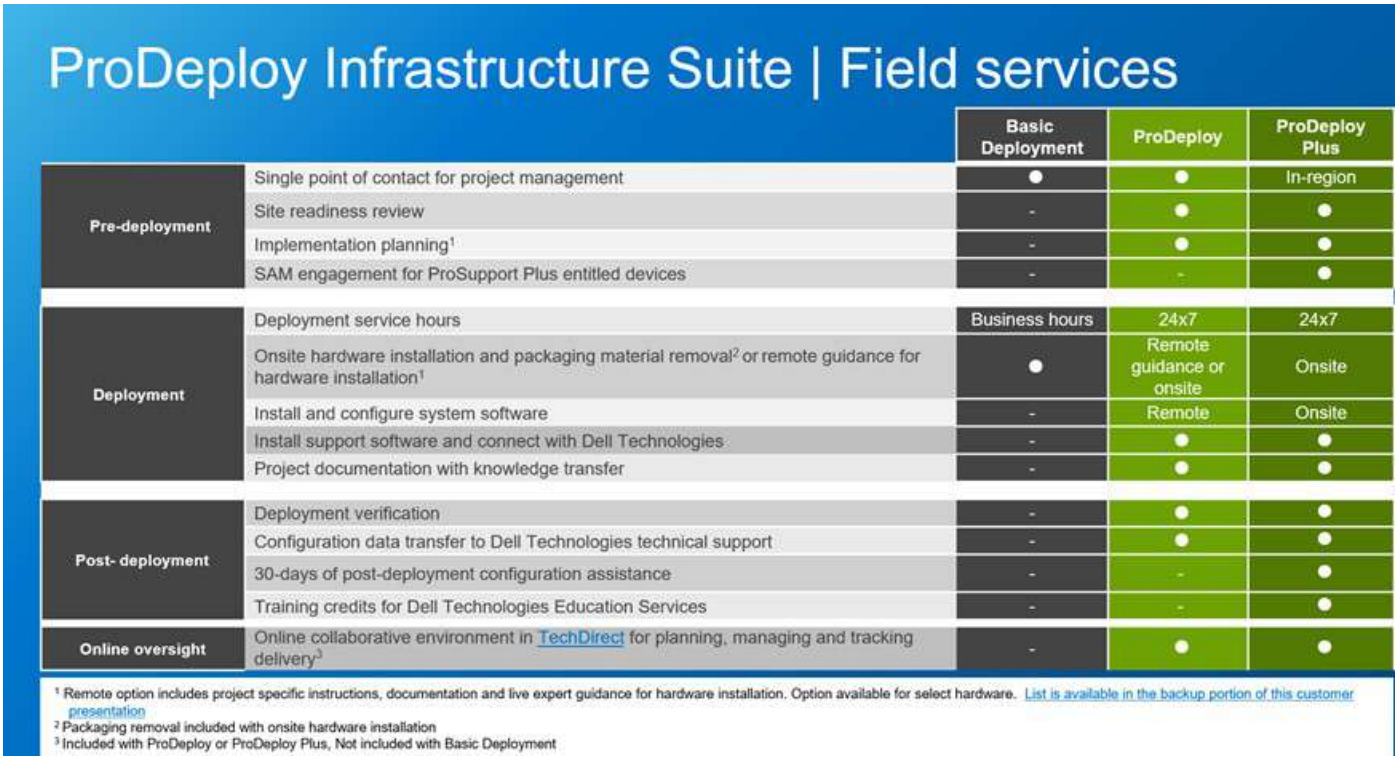

Figure 39. ProDeploy Infrastructure Suite - Field services

Dell ProDeploy Plus for Infrastructure

From beginning to end, ProDeploy Plus provides the skill and scale that is must successfully perform demanding deployments in today's complex IT environments. Certified Dell experts start with extensive environmental assessments and detailed migration

planning and recommendations. Software installation includes set up of our enterprise connectivity solution (secure connect gateway) and OpenManage system management utilities.

Postdeployment configuration assistance, testing, and product orientation services are also available.

Dell ProDeploy for Infrastructure

ProDeploy provides full-service installation and configuration of both server hardware and system software by certified deployment engineers including set up of leading operating systems and hypervisors as well our enterprise connectivity solution (secure connect gateway) and OpenManage system management utilities. To prepare for the deployment, we conduct a site readiness review and implementation planning exercise. System testing, validation, and full project documentation with knowledge transfer complete the process.

Dell Basic Deployment

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

Additional Deployment Services

You can tailor the ProDeploy Infrastructure Suite offer to meet your customer's unique needs by leveraging "Additional Deployment Time." ADT will cover additional tasks above the normal scope of the standard offers. ADT can be sold for Project Management or Technical Resources and is sold as blocks of four hours remote or eight hours on-site.

Dell ProDeploy for HPC (available in US/Canada only. All other regions use custom)

HPC deployments require specialists that understand that cutting edge is yesterday's news. Dell deploys the world 's fastest systems and understands the nuances that make them perform. ProDeploy for HPC provides:

- Global team of dedicated HPC specialists
- Proven track record, thousands of successful HPC deployments
- Design validation, benchmarking, and product orientation

Learn more at Dell.com/HPC-Services.

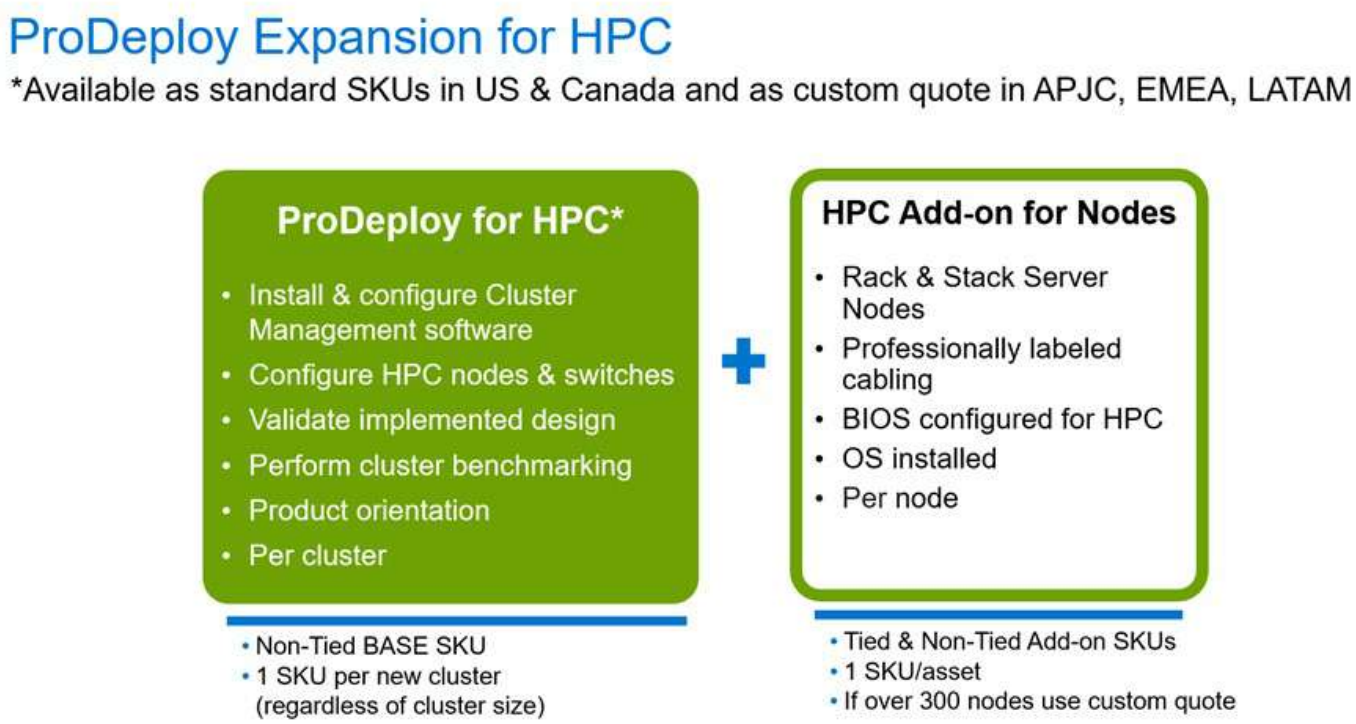

Figure 40. ProDeploy Expansion for HPC

Dell custom deployment Services

Dell custom rack integration and other Dell configuration services help customers save time by providing systems that are racked, cabled, tested, and ready to be integrated into the data center. Dell support preconfigure RAID, BIOS and iDRAC settings, install system images, and even install third-party hardware and software.

For more information, see Server Configuration Services.

Dell Residency Services

Residency Services help customers transition to new capabilities quickly with the assistance of onsite or remote Dell experts whose priorities and time they control.

Residency experts can provide post implementation management and knowledge transfer that is related to a new technology acquisition or day-to-day operational management of the IT infrastructure.

Dell Data Migration Services

Protect business and data of the customer with our single point of contact to manage data migration projects.

A customer project manager works with our experienced team of experts to create a plan using industry-leading tools and proven processes that are based on global best practices to migrate existing files and data, so business systems are up and running quickly and smoothly.

Dell Enterprise Support Services

Dell ProSupport Enterprise Suite

With the ProSupport Enterprise Suite, we help keep IT systems running smoothly, so customers can focus on running their business. We help maintain peak performance and availability of the most essential workloads. ProSupport Enterprise Suite is a suite of support services that enable customers to build the solution that is right for their organization. They choose support models that are based on how they use technology and where they 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 customer IT resources by choosing the right support model.

Table 24. ProSupport Enterprise Suite

Service	Support model	Description
ProSupport Enterprise Suite	ProSupport Plus for Enterprise	Proactive, predictive, and reactive support for systems that look after your business-critical applications and workloads
	ProSupport for Enterprise	Comprehensive 24 x 7 support
	Basic hardware support	Reactive hardware support during normal business hours

Dell ProSupport Plus for Enterprise

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

- An assigned Services Account Manager who knows their business and environment
- Immediate advanced troubleshooting from an engineer
- Personalized, preventive recommendations that are based on analysis of support trends and best practices from across the Dell Technologies infrastructure solutions customer base to reduce support issues and improve performance
- Predictive analysis for issue prevention and optimization that is enabled by secure connect gateway technology
- Proactive monitoring, issue detection, notification, and automated case creation for accelerated issue resolution enabled by secure connect gateway
- On-demand reporting and analytics-based recommendations that are enabled by secure connect gateway and TechDirect

Dell ProSupport for Enterprise

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

- 24x7 support through phone, chat and online
- Predictive, automated tools and innovative technology
- A central point of accountability for all hardware and software issues
- Collaborative third-party support
- Hypervisor, operating system and application support
- Consistent experience regardless of where customers are located or what language they speak

  NOTE: Subject to service offer country or region availability.
- Optional onsite parts and labor response options including next business day or four-hour mission critical

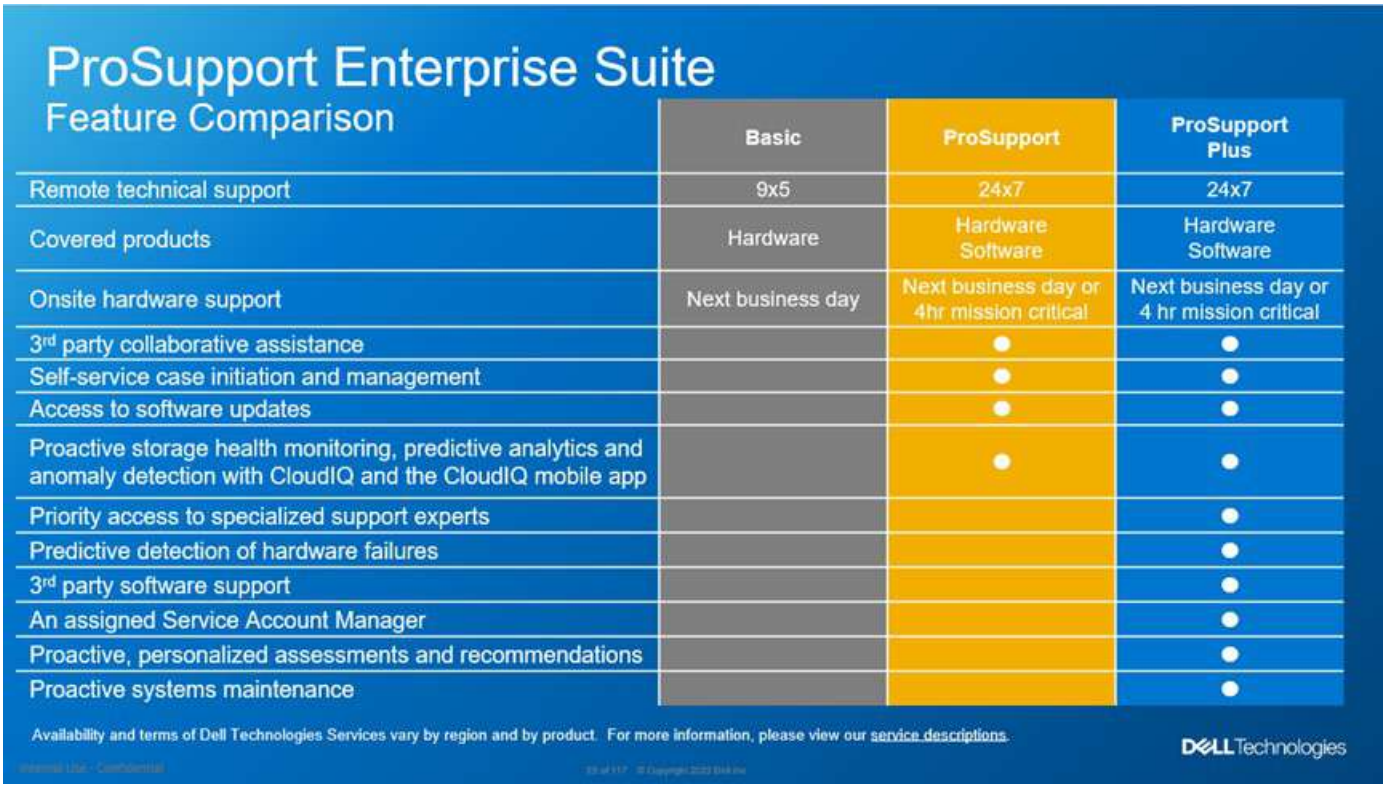

Figure 41. ProSupport Enterprise Suite

Dell 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 a customer's needs. While not for everyone, this service option offers a truly unique solution for Dell Technologies largest customers with the most complex environments.

- Team of assigned Services Account Managers with remote, on-site options
- Assigned ProSupport One technical and field engineers who are trained on the customer's environment and configurations
- On-demand reporting and analytics-based recommendations that are enabled by secure connect gateway and TechDirect
- Flexible on-site support and parts options that fit their operational model
- A tailored support plan and training for their operations staff

Dell ProSupport Add-on for HPC

The ProSupport Add-on for HPC provides solution-aware support including:

- Access to senior HPC experts
- Advanced HPC cluster assistance: performance, interoperability, and configuration
- Enhanced HPC solution level end-to-end support
- Remote presupport engagement with HPC Specialists during ProDeploy implementation

Learn more at Dell.com/HPC-Services.

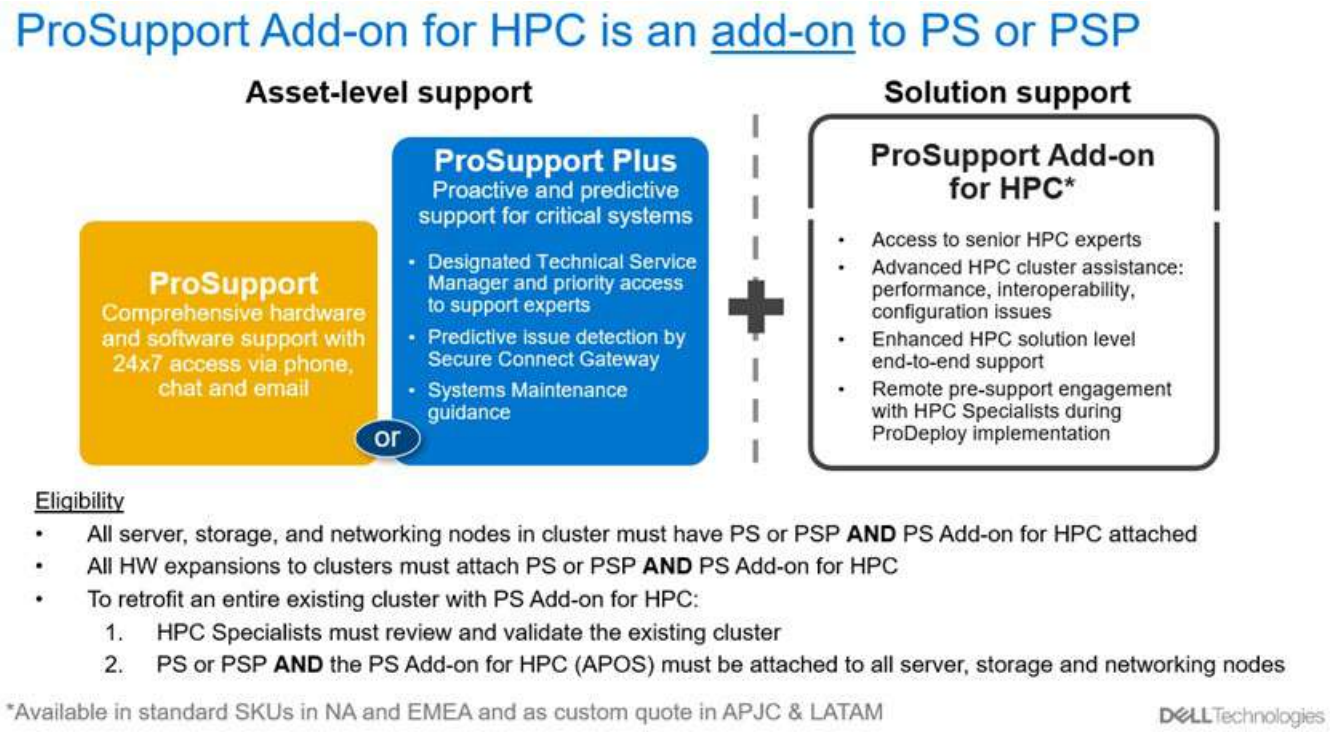

Figure 42. ProSupport Add-on for HPC is an add-on to PS or PSP

Support Technologies

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

NOTE: SupportAssist Enterprise capabilities are now part of the secure connect gateway technology.

Enterprise connectivity

The best time to solve a problem is before it happens. The automated proactive and predictive support features enabled by the secure connect gateway technology helps reduce steps and time to resolution, often detecting issues before they become a crisis. The gateway technology is available in virtual and application editions. It is also implemented as a direct connect version for select Dell hardware and a Services plugin within OpenManage Enterprise for PowerEdge servers. The legacy SupportAssist Enterprise solution has been retired and is now replaced by the secure connect gateway solutions.

Benefits include:

- Value: Our connectivity solutions are available to all customers 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 experts
- Gain insight and control: Optimize enterprise devices with insights in portals reporting like TechDirect, and get predictive issue detection before the problem starts

NOTE: Connect devices can access these features. Features vary depending on the service level agreement for the connected device. ProSupport Plus customers experience the full set of automated support capabilities.

Table 25. Features enabled by connectivity

—	Basic hardware warranty	ProSupport	ProSupport Plus
Automated issue detection and system state information collection	Supported	Supported	Supported
Proactive, automated case creation and notification	Not supported	Supported	Supported

Table 25. Features enabled by connectivity (continued)

—	Basic hardware warranty	ProSupport	ProSupport Plus
Predictive issue detection for failure prevention	Not supported	Not supported	Supported

Get started at DellTechnologies.com/secureconnectgateway.

Dell TechDirect

TechDirect helps boost IT team productivity when supporting Dell systems.

Boost your productivity with online servoce for Dell products from TechDirect. From deployment to technical support, TechDirect lets you do more with less effort and faster resolution. You can:

- OPen and manage support requests or in-warranty systems
- Execute online self-service for parts dispatch
- Collaborate on ProDeploy infrastructure deployment projects online
- Manage proactive and preditive alerts from secure connect gateway technology that help maximize uptime
- Integrate services functionality into your help desk with TechDirect APIs
- Join over 10,000 companies that choose TechDirect

Register at TechDirect.Dell.com.

Dell Technologies Consulting Services

Our expert consultants help customers transform faster, and quickly achieve business outcomes for the high value workloads Dell PowerEdge systems can handle. From strategy to full-scale implementation, Dell Technologies Consulting can help determine how to perform IT, workforce, or application transformation. We use prescriptive approaches and proven methodologies that are combined with portfolio and partner ecosystem of Dell Technologies to help achieve real business outcomes. From multi cloud, applications, DevOps, and infrastructure transformations, to business resiliency, data center modernization, analytics, workforce collaboration, and user experiences-we are here to help.

Dell Managed Services

Some customers prefer Dell to manage the complexity and risk of daily IT operations, Dell Managed Services utilizes proactive, AI enabled delivery operations and modern automation to help customers realize desired business outcomes from their infrastructure investments. With these technologies, our experts run, update and fine-tune customer environments aligned with service levels, while providing environment-wide and down-to-the-device visibility. There are two types of managed service offers. First the outsourcing model or CAPEX model where Dell manages the customer owned assets using our people and tools. The second is the as-a-Service model or OPEX model called APEX. In this service, Dell owns all technology and all the management of it. Many customers will have a blend of the two management types depending on the goals of the organization.

Figure 43. Dell Managed Services

Dell Technologies Education Services

Build the IT skills required to influence the transformational outcomes of the business. Enable talent and empower teams with the right skills to lead and perform transformational strategy that drives competitive advantage. Leverage the training and certification required for real transformation.

Dell Technologies Education Services offers PowerEdge server training and certifications that are designed to help customers achieve more from their hardware investment. The curriculum delivers the information and the practical, firsthand skills that their team must confidently install, configure, manage, and troubleshoot Dell servers.

To learn more or register for a class today, see Education.Dell.com.

14

Appendix A: Additional specifications

Topics:

Chassis dimension

The R660 has the following dimensions:

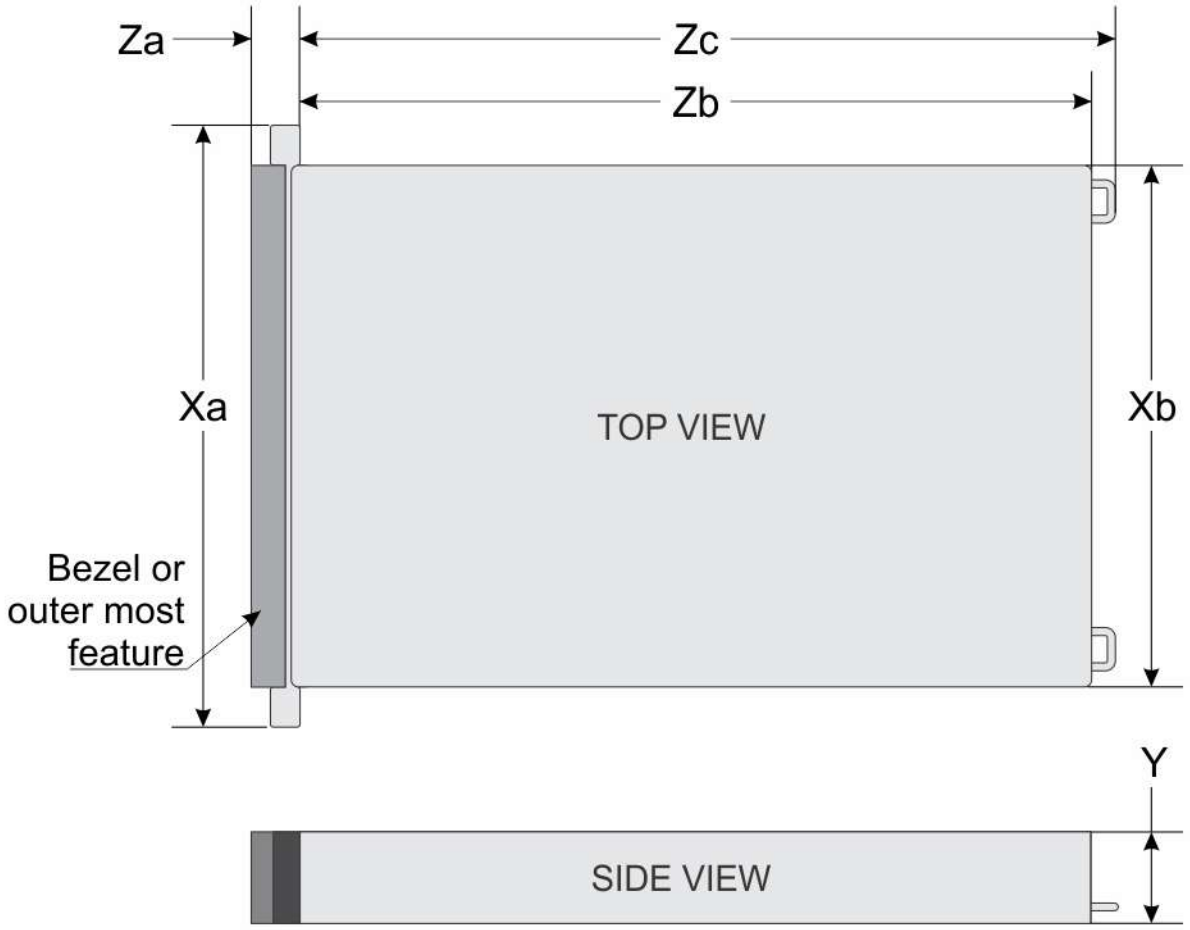

Figure 44. Chassis dimensions

Table 26. PowerEdge R660 system chassis dimension

Drives	Xa	Xb	Y	Za	Zb	Zc
8x2.5" drives / 10x2.5" drives	482.0 mm (18.97 inches)	434.0 mm (17.08 inches)	42.8 mm (1.68 inches)	35.84 mm (1.41 inches) With bezel 22 mm (0.86 inches) Without bezel	751.47 mm (17 inches) Ear to rear wall	787.04 mm (30 inches) Ear to PSU handle
0 drive	482.0 mm (18.97 inches)	434.0 mm (17.08 inches)	42.8 mm (1.68 inches)	35.84 mm (1.41 inches) With bezel 22 mm (0.86 inches) Without bezel	700.7 mm (27.5 inches) Ear to rear wall	736.27 mm (28 inches) Ear to rear wall
14xE3.S drives / 16xE3.S drives	482.0 mm (18.97 inches)	434.0 mm (17.08 inches)	42.8 mm (1.68 inches)	35.84 mm (1.41 inches) With bezel 22 mm (0.86 inches) Without bezel	751.47 mm (17 inches) Ear to rear wall	787.04 mm (30 inches) Ear to PSU handle

NOTE: E3.S drives are supported post RTS.

NOTE: Zb is the nominal rear wall external surface where the system board I/O connectors reside.

Chassis weight

Table 27. PowerEdge R660 system weight

System configuration	Maximum weight (with all drives/SSDs)
A server with fully populated drives	22.51 kg (49.62 lbs)
A server without drives and PSU installed	18.5 kg (40.78 lbs)

NIC port specifications

The system supports up to two 10/100/1000 Mbps Network Interface Controller (NIC) ports embedded on the LAN on Motherboard (LOM) and integrated on the optional OCP cards.

Table 28. NIC port specification for the system

Feature	Specifications
LOM card (optional)	1 GB x 2
OCP card (OCP 3.0) (optional)	1 GbE x 4, 10 GbE x 2, 25 GbE x 2, 25 GbE x 4

NOTE: The system allows either LOM card or an OCP card or both to be installed in the system.

NOTE: On the system board, the supported OCP PCIe width is x8; when x16 PCIe width is installed, it is downgraded to x8.

Video specifications

The platform supports the following video resolution and refresh rates:

Table 29. Video specifications for R660

Resolution	Refresh Rate	Freq.	Pixel Clock	DVO DisplayPort
1024 x 768	60 Hz	48.4 kHz	65.0 MHz	Yes*
1280 x 800	60 Hz	49.7 kHz	83.5 MHz	Yes*
1280 x 1024	60 Hz	64.0 kHz	108.0 MHz	Yes*
1360 x 768	60 Hz	47.71 kHz	85.5 MHz	Yes*
1440 x 900	60 Hz	55.9 kHz	106.5 MHz	Yes*
1600 x 900	60 Hz	55.54 kHz	97.75 MHz	Yes*
1600 x 1200	60 Hz	75.0 kHz	162.0 MHz	Yes*
1680 x 1050	60 Hz	64.7 kHz	119.0 MHz	Yes*
1920 x 1080	60 Hz (RB)	67.158 kHz	173.0 MHz	No
1920 x 1200	60 Hz (RB)	74.556 kHz	193.25 MHz	No

*DVO - DP is for investigation only, dependent on Nuvoton DVO capabilities to support up to 165MHz. Rear Panel Performance is TBD subject to final board design and losses to rear VGA connector.

*(RB) - Reduced Blanking for Digital Displays requiring less blank time. This was introduced for Signal Integrity improvements by reducing Pixel Clock rates for VGA- Analog input devices.

USB ports specifications

Table 30. PowerEdge R660 USB specifications

Front		Rear		Internal (Optional)	
USB port type	**No. of ports**	**USB port type**	**No. of ports**	**USB port type**	**No. of ports**
USB 2.0-compliant port	One	USB 2.0-compliant port	One	Internal USB 3.0-compliant port	One
iDRAC Direct port (Micro-AB USB 2.0-compliant port)	One	USB 3.0-compliant port	One		

NOTE: The micro USB 2.0 compliant port can only be used as an iDRAC Direct or a management port.

Front USB 2.0 port only supports output current up to 0.5A and can't support high power consumption devices such as CD-ROM. The bottom port of the rear USB connector can support USB3.0 to supply output current up to 0.9A.

Figure 45. R660 Front USB

Figure 46. R660 Rear USB

PSU rating

Table 31. PSUs Highline and Lowline ratings

Features	700 W Titanium	800 W Platinum	1100 W Titanium	1100 W -48VDC	1400 W Platinum	1800 W Platinum
Peak Power (Highline/-72 VDC)	1190 W	1360 W	1870 W	1870 W	2380 W	3060 W
Highline /-72 VDC	700 W	800 W	1100 W	1100 W	1400 W	1800 W
Peak Power (Lowline/-40 VDC)	N/A	1360 W	1785 W	N/A	1785 W	N/A
Lowline /-40 VDC	N/A	800 W	1050 W	N/A	1050 W	N/A
Highline 240 VDC	700 W	800 W	1100 W	N/A	1400 W	1800 W
DC -48- -60 V	N/A	N/A	N/A	1100 W	N/A	N/A

The PowerEdge R660 supports up to two AC or DC power supplies with 1+1 redundancy, autosensing, and auto-switching capability.

If two PSUs are present during POST, a comparison is made between the wattage capacities of the PSUs. In the event that the PSU wattages don't match, the larger of the two PSU's is enabled. Also, there is a PSU mismatch warning displayed in BIOS, iDRAC, or on the System LCD.

If a second PSU is added at run-time, in order for that particular PSU to be enabled, the wattage capacity of the first PSU must equal the second PSU. Otherwise, the PSU will be flagged as unmatched in iDRAC and the second PSU will not be enabled.

Dell PSUs have achieved Platinum efficiency levels as shown in the table below.

Table 32. PSU Efficiency Levels

Efficiency Targets by Load						
Form factor	**Output**	**Class**	**10%**	**20%**	**50%**	**100%**
Redundant 60mm	700 W AC	Titanium	90.00%	94.00%	96.00%	91.50%
	800 W AC	Platinum	89.00%	93.00%	94.00%	91.50%
	1100 W AC	Titanium	90.00%	94.00%	96.00%	91.50%
	1100 W -48 VDC	N/A	85.00%	90.00%	92.00%	90.00%
	1400 W AC	Platinum	89.00%	93.00%	94.00%	91.50%
	1800 W AC	Titanium	90.00%	94.00%	96.00%	94.00%

Environmental Specifications

See the PowerEdge R660 Technical Specifications on www.dell.com/poweredgemanuals for detailed environmental specifications.

The table below details the environmental specifications for the platform. For additional information about environmental measurements for specific system configurations, see Product Safety, and Environmental datasheets.

An important feature of having a broad menu of different categories is to allow the same platform model to have different operational ranges depending on the MRD defined.

A list of range categories for different configurations shall be identified by thermal team as early in the project as possible. Post release, it may be found in the Dell PowerEdge R660 Installation and Service Manual.

Table 33. Operational climatic range categories

Category A2	Allowable Operation
Temperature Ranges (For Altitude <900 meters or 2953 feet)	10 to 35°C (50 to 95°F) with no direct sunlight on the platform
Humidity Percent Ranges (Non-Condensing at all times)	8%RH with -12°C minimum dew point to 80%RH with 21°C (69.8°F) maximum dew point
Operational Altitude De-Rating	Maximum temperature is reduced by 1°C/300 meters (1.8°F/984 feet) above 900 meters (2,953 feet)

Table 33. Operational climatic range categories

Category A3	Allowable Operation
Temperature Ranges (For Altitude <900 meters or 2953 feet)	5 to 40°C (41 to 104°F) with no direct sunlight on the platform
Humidity Percent Ranges (Non-Condensing at all times)	8%RH with -12°C minimum dew point to 85%RH with 24°C (75.2°F) maximum dew point
Operational Altitude De-Rating	Maximum temperature is reduced by 1°C/175 meters (1.8°F/574 feet) above 900 meters (2,953 feet)

Table 33. Operational climatic range categories

Category A4	Allowable Operation
Temperature Ranges (For Altitude <900 meters or 2953 feet)	5 to 40°C (41 to 104°F) with no direct sunlight on the platform
Humidity Percent Ranges (Non-Condensing at all times)	8%RH with -12°C minimum dew point to 85%RH with 24°C (75.2°F) maximum dew point
Operational Altitude De-Rating	Maximum temperature is reduced by 1°C/175 meters (1.8°F/574 feet) above 900 meters (2,953 feet)

The table below shows the requirements shared across all environmental categories

Table 34. Shared requirements

Allowable Operation	
Maximum Temperature Gradient (applies to both operation and non-operation)	20°C in an hour* (36°F in an hour) and 5°C in 15 minutes (9°F in 15 minutes), 5°C in an hour* (9°F in an hour) for tape hardware
Non-Operational Temperature Limits	-40 to 65°C (-40 to 149°F)
Non-Operational Humidity Limits (Non-Condensing at all times)	5% to 95%RH with 27°C (80.6°F) maximum dew point.
Maximum Non-Operational Altitude	12,000 meters (39,370 feet)
Maximum Operational Altitude	3,048 meters (10,000 feet)

Table 35. Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.26Grms at 5Hz to 350Hz for 10min (all x, y, and z axes)
Storage	1.88Grms at 10Hz to 500Hz for 15min (all six sides tested)

Table 36. Maximum shock specifications

Maximum shock	Specifications
Operating	Six consecutively executed shock pulses in the positive and negative x, y, and z axes of 6G for up to 11ms
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.

Thermal air restrictions

ASHRAE A2 environment

- CPU > 300W are not supported in 10 x 2.5 inch storage configuration.
- CPU > 270W are not supported in 10 x 2.5 inch storage with rear drive configuration.
- Maximum 30°C (86°F) for CPU > 270 W in10 x 2.5 inch storage configuration..
- Maximum 30°C (86°F) for CPU > 250 W with rear drive in 10 x 2.5 inch storage configuration.
- Maximum 30°C (86°F) for CPU > 250 W with 256G RDIMM in 10 x 2.5 inch storage configuration.
- Maximum 30°C (86°F) for CPU > 225 W with 256G RDIMM in 10 x 2.5 rear drive configuration.
- CPU > 350W are not supported in no BP chassis storage configuration.
- Maximum 30°C (86°F) for CPU > 300W in no BP chassis storage configuration.
- CPU > 350W are not supported in 8 x 2.5 inch storage configuration.
- Maximum 30°C (86°F) for CPU > 300 W in 8 x 2.5 inch storage configuration.

ASHRAE A3 environment

- CPU > 185W are not supported in 10 x 2.5 inch storage configuration.
- CPU > 205W are not supported in 8 x 2.5 inch and no BP chassis storage configuration.
- 128 GB or greater capacity RDIMMs are not supported.
- 2.5 inch NVMe storage are not supported in a 8 x 2.5 inch and 10 x 2.5 inch storage configuration.
- Rear drives are not supported.
- Non Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- A2 GPU is not supported.
- 85°C (185°F) active optics cable is required.
- Two power supplies are required. System performance may be reduced in the event of a PSU failure.

ASHRAE A4 environment

- CPU > 125W are not supported in 10 x 2.5 inch storage configuration.
- 128 GB or greater capacity RDIMMs are not supported.
- Rear drives are not supported.
- 2.5 inch NVMe storage are not supported.
- BOSS N1 is not supported.
- A2 GPU is not supported.
- Two power supplies are required. System performance may be reduced in the event of a PSU failure.
- Non Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- OCP 3.0 card is not supported.
- 85°C (185°F) active optics cable is required.

ASHRAE A3 environment for liquid cooling configuration

- 128 GB or greater capacity RDIMMs are not supported.
- Rear drives are not supported.
- A2 GPU is not supported.

- Two power supplies are required. System performance may be reduced in the event of a PSU failure.
- Non Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- 85°C (185°F) active optics cable is required.

ASHRAE A4 environment for liquid cooling configuration

- 128 GB or greater capacity RDIMMs are not supported.
- Rear drives are not supported.
- 2.5 inch NVMe storage are not supported.
- BOSS N1 is not supported.
- A2 GPU is not supported.
- Two power supplies are required. System performance may be reduced in the event of a PSU failure.
- Non Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- OCP 3.0 card is not supported.
- 85°C (185°F) active optics cable is required.

Thermal restriction matrix

Table 37. Processor and heat sink matrix

Heat sink	Processor TDP
STD HSK	≤ 185 W
L-type HSK	> 185 W

Table 38. Label reference

Label	Description
STD	Standard
HPR (Gold)	High performance (gold grade)
HSK	Heat sink
LP	Low profile
FH	Full height
DLC	Direct Liquid Cooling

Table 39. Thermal restriction matrix for air cooled configuration

Configuration		No Backplane	8 x 2.5-inch NVMe / SAS/SATA	10x 2.5-inch SAS/ SATA	10x 2.5-inch SAS/ SATA	10 x 2.5-inch NVMe	10 x 2.5-inch NVMe	Ambient temperature
		C0	C04-01,C04-02,C04-03,C04-04,C04-05,C04-06,C04-07,C04-08,C04-09	C05-01,C05-03,C05-04,C05-06,C05-13	C05-02,C05-05	C05-07,C05-09	C05-10	
Rear storage		No Rear Drives	No Rear Drives	No Rear Drives	2 x 2.5-inch	No Rear Drives	2 x 2.5-inch	
CPU TDP/cTDP	T-Case max center (°C)	Fan						
125 W	79	STD fan	STD fan	STD fan	HPR Gold fan	STD fan	HPR Gold fan	35°C (95°F)

Table 39. Thermal restriction matrix for air cooled configuration (continued)

Configuration		No Backplane	8 x 2.5-inch NVMe / SAS/SATA	10x 2.5-inch SAS/ SATA	10x 2.5-inch SAS/ SATA	10 x 2.5-inch NVMe	10 x 2.5-inch NVMe	Ambient temperature
		C0	C04-01,C04-02,C04-03,C04-04,C04-05,C04-06,C04-07,C04-08,C04-09	C05-01,C05-03,C05-04,C05-06,C05-13	C05-02,C05-05	C05-07,C05-09	C05-10	
Rear storage		No Rear Drives	No Rear Drives	No Rear Drives	2 x 2.5-inch	No Rear Drives	2 x 2.5-inch	
CPU TDP/cTDP	T-Case max center (°C)	Fan						
150 W	78/79	STD fan	STD fan	STD fan	HPR Gold fan	STD fan	HPR Gold fan	35°C (95°F)
165 W	82/84	STD fan	STD fan	STD fan	HPR Gold fan	STD fan	HPR Gold fan	35°C (95°F)
185 W	80/81/85	STD fan	STD fan	STD fan	HPR Gold fan	STD fan	HPR Gold fan	35°C (95°F)
195 W	64	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	35°C (95°F)
205 W	76/84/85	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	35°C (95°F)
225 W	79	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	35°C (95°F)
250 W	76	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan	35°C (95°F)
270 W	75	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan*	HPR Gold fan	HPR Gold fan*	35°C (95°F)
270 W	71	HPR Gold fan	HPR Gold fan	HPR Gold fan	HPR Gold fan*	HPR Gold fan	HPR Gold fan*	35°C (95°F)
300 W	81	HPR Gold fan	HPR Gold fan	HPR Gold fan*	Required DLC	HPR Gold fan*	Required DLC	35°C (95°F)
300 W	76	HPR Gold fan	HPR Gold fan	HPR Gold fan*	Required DLC	HPR Gold fan*	Required DLC	35°C (95°F)
300 W	77	HPR Gold fan	HPR Gold fan	HPR Gold fan*	Required DLC	HPR Gold fan*	Required DLC	35°C (95°F)
300 W	75	HPR Gold fan	HPR Gold fan	HPR Gold fan*	Required DLC	HPR Gold fan*	Required DLC	35°C (95°F)
300 W	76	HPR Gold fan	HPR Gold fan	HPR Gold fan*	Required DLC	HPR Gold fan*	Required DLC	35°C (95°F)
330 W	77	HPR Gold fan*	HPR Gold fan*	Required DLC	Required DLC	Required DLC	Required DLC	35°C (95°F)
350 W	79	HPR Gold fan*	HPR Gold fan*	Required DLC	Required DLC	Required DLC	Required DLC	35°C (95°F)

Table 39. Thermal restriction matrix for air cooled configuration (continued)

Configuration		No Backplane	8 x 2.5-inch NVMe / SAS/SATA	10x 2.5-inch SAS/ SATA	10x 2.5-inch SAS/ SATA	10 x 2.5-inch NVMe	10 x 2.5-inch NVMe	Ambient temperature
		C0	C04-01,C04-02,C04-03,C04-04,C04-05,C04-06,C04-07,C04-08,C04-09	C05-01,C05-03,C05-04,C05-06,C05-13	C05-02,C05-05	C05-07,C05-09	C05-10	
Rear storage		No Rear Drives	No Rear Drives	No Rear Drives	2 x 2.5-inch	No Rear Drives	2 x 2.5-inch	
CPU TDP/cTDP	T-Case max center (°C)	Fan						
350 W	78	HPR Gold fan*	HPR Gold fan*	Required DLC	Required DLC	Required DLC	Required DLC	35°C (95°F)

NOTE:
- *Supported ambient temperature is 30°C (86°F) .
- Required DLC requires <30°C (86°F)

Table 40. Thermal restriction for memory

Configuration	No Backplane	8 x 2.5-inch NVMe /SAS/ SATA	10x 2.5-inch SAS/SATA	10x 2.5-inch SAS/SATA	10 x 2.5-inch NVMe	10 x 2.5-inch NVMe
	C0	C04-01,C04-02,C04-03,C04-04,C04-05,C04-06,C04-07,C04-08,C04-09	C05-01,C05-03,C05-04,C05-06,C05-13	C05-02,C05-05	C05-07,C05-09	C05-10
Rear storage	No Rear Drives	No Rear Drives	No Rear Drives	2 x 2.5-inch	No Rear Drives	2 x 2.5-inch
256 GB RDIMM	35°C (95°F)	35°C (95°F)	30°C (86°F) **NOTE:** 30°C (86°F) for CPU>250W (CPU<=250W could support 35°C (95°F))	30°C (86°F) **NOTE:** 30°C (86°F) for CPU>225 W (CPU<=225W could support 35°C (95°F))	30°C (86°F) **NOTE:** 30°C (86°F) for CPU>250W (CPU<=250 W could support 35°C (95°F))	30°C (86°F) **NOTE:** 30°C (86°F) for CPU>225W (CPU<=225 W could support 35°C (95°F))

NOTE:
- Install all fan modules for single CPU configuration.
  NOTE: Not required for C04-08 configuration.
- All air-cooling configurations require a CPU shroud.
- Install PCH shroud for no riser configuration.
- Install Rear drive shroud for air-cooling with 2x 2.5-inch rear drive configuration.
- Install A2 blank on R1p riser for FH riser configuration with A2 GPU.
- Install DIMM blanks in all empty DIMM slots for STD CPU heat sink or CPU TDP >=250W.

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Appendix B. Standards compliance

The system conforms to the following industry standards.

Table 41. Industry standard documents

Standard	URL for information and specifications
ACPIAdvance Configuration and Power Interface Specification, v2.0c	https://uefi.org/specsandtesttools
Ethernet IEEE 802.3-2005	https://standards.ieee.org/
HDGHardware 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
DDR5 Memory DDR5 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	http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_I_Rev_1-1_20070205.pdf
SAS Serial Attached SCSI, v1.1	http://www.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. 2.7	usb.org/developers/docs

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Appendix C Additional resources

Table 42. 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 indicator codes • System BIOS • Remove and replace procedures • 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	Dell.com/Support/Manuals
Rack Installation Guide	This document ships with the rack kits, and provides instructions for installing a server in a rack.	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 contact information.	Inside the system chassis cover
Enterprise Infrastructure Planning Tool (EIPT)	The Dell online EIPT enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use EIPT to calculate the power consumption of your hardware, power infrastructure, and storage.	Dell.com/calc

Category 3: General Use Space

When Dell determines that a specific Enterprise product is to be predominantly used in a general use space, then the acoustical specification of the table below applies. These products could be found in laboratories, schools, restaurants, open office space layouts, small ventilated closets, etc., though not in close proximity to any particular person nor in quantities greater than a few in any location. People within proximity of a few of these products should not experience any impact to speech intelligibility or annoyance from the noise of the product. A rack product sitting on a table in a common area is an example.

Table 20. Dell Enterprise Category 3, "General Use" acoustical specification category

Measurement Position re AC0158	**Metric, re AC0159**	**Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)**			
		Standby in 23±2° C Ambient	**Idle in 23±2° C Ambient**	**Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required**	**Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient and for 100% loading and maximum configuration, at 35° C Ambient**
Sound Power	LwA-m, bels	≤ 5.2	≤ 5.5	≤ 5.8	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD and Rear Microphone	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 40	≤ 40	≤ 40	Report
	Loudness, sones	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" • Report Acoustical Jump (see AC0159) during air mover speed transition from Idle to Operating Mode. • Startup behavior ○ Report Startup behavior re. AC0159 ○ Startup must proceed smoothly, that is, no sudden or large jumps, and air mover speed during startup must not exceed 50% of its maximum • Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"				N/A
Any	Other	No rattles, squeaks, or unexpected noises Sound should be "even" around the EUT (one side should not be dramatically louder than another) Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC.			

Table 20. Dell Enterprise Category 3, "General Use" acoustical specification category (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient and for 100% loading and maximum configuration, at 35° C Ambient
		Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.			
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Category 4: Attended Data Center

When Dell determines that a specific Enterprise product is to be predominantly used in an attended data center, then the acoustical specification of the table applies. The phrase "attended data center" is used to mean a space in which many (from tens to 1000s) of Enterprise products are deployed in proximity (that is, in the same room) to personnel whose speech (perhaps with raised voices) is expected to be intelligible over the data center noise. Hearing protection or hearing monitoring programs are not expected in these areas. Examples in this category include monolithic rack products.

Table 21. Dell Enterprise Category 4, "Attended Data Center" acoustical specification category.

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set fan speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient	
Sound Power	LwA-m, B	Report	≤ 6.9	≤ 7.1	Report	≤ 8.2
Front Binaural HEAD	Tones, Hz, dB	Report	< 15 dB	< 15 dB	Report	< 20 dB
	Tonality, tu	Report	Report	Report	Report	Report
	Dell Modulation, %	Report	Report	Report	Report	Report
	Loudness, sones	Report	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report	Report

Table 21. Dell Enterprise Category 4, "Attended Data Center" acoustical specification category. (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set fan speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient	
	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" ○ Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB. ○ Startup behavior ▪ Report Startup behavior re. AC0159 ▪ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum ∞ Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"				N/A	
Any	Other	No rattles, squeaks, or unexpected noises Sound should be "even" around the EUT (one side should not be dramatically louder than another) Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.				
Sound Pressure	LpA-reported, dBA	Report for all mics	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Category 5: Unattended Data Center

When Dell determines that a specific Enterprise product is to be predominantly used in an unattended data center (and not blades or blade enclosures; these have their own category), then the acoustical specification in the table below applies. The phrase "unattended data center" is used to mean a space in which many (from tens to 1000s) of Enterprise products are deployed together, its own heating and cooling systems condition the space, and operators or servicers of equipment enter generally only to deploy, service, or decommission equipment. Hearing protection or hearing monitoring programs may be expected (per government or company guidelines) in these areas. Examples in this category include monolithic rack products.

Table 22. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient	
Sound Power	LwA-m, bels	Report	≤ 7.5	≤ 7.7	Report	≤ 8.7
Front Binaural HEAD	Tones, Hz, dB	Report	< 15 dB	< 15 dB	Report	< 20 dB
	Tonality, tu	Report	Report	Report	Report	Report
	Dell Modulation, %	Report	Report	Report	Report	Report
	Loudness, sones	Report	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" • Report Acoustical Jump (see AC0159) during air mover speed transition from Idle to Operating Mode. • Startup behavior ○ Report Startup behavior re. AC0159 ○ Startup must proceed smoothly, that is, no sudden or large jumps, and air mover speed during startup must not exceed 50% of its maximum • Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"			N/A	
Any	Other	No rattles, squeaks, or unexpected noises Sound should be "even" around the EUT (one side should not be dramatically louder than another) Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.				

Table 22. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)				Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient	
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics	Report for all mics

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Rack, rails, and cable management

Topics:

Rails and cable management information

The rail offerings for the PowerEdge R760 consist of two general types: sliding and static. The cable management offerings consist of an optional cable management arm (CMA) and an optional strain relief bar (SRB).

See the *Enterprise Systems Rail Sizing and Rack Compatibility Matrix* available at https://i.dell.com/sites/csdocuments/Business_solutions_engineering-Docs_Documents/en/rail-rack-matrix.pdf for information regarding:

- Specific details about rail types.
- Rail adjustability ranges for various rack mounting flange types.
- Rail depth with and without cable management accessories.
- Rack types that are supported for various rack mounting flange types.

Key factors governing proper rail selection include the following:

- Spacing between the front and rear mounting flanges of the rack.
- Type and location of any equipment that is mounted in the back of the rack such as power distribution units (PDUs).
- Overall depth of the rack.

Sliding rails features summary

The sliding rails allow the system to be fully extended out of the rack for service. There are two types of sliding rails available, ReadyRails II sliding rails and Stab-in/Drop-in sliding rails. The sliding rails are available with or without the optional cable management arm (CMA) or strain relief bar (SRB).

B21 ReadyRails sliding rails for 4-post racks

- Supports drop-in installation of the chassis to the rails.
- Support for tool-less installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of the Dell racks.
- Support for tooled installation in 19" EIA-310-E compliant threaded hole 4-post racks.
- Support full extension of the system out of the rack to allow serviceability of key internal components.
- Support for optional strain relief bar (SRB).
- Support for optional cable management arm (CMA).

  NOTE: For situations where CMA support is not required, the outer CMA mounting brackets can be uninstalled from the sliding rails. This reduces the overall length of the rails and eliminates the potential interferences with rear-mounted PDUs or the rear rack door.

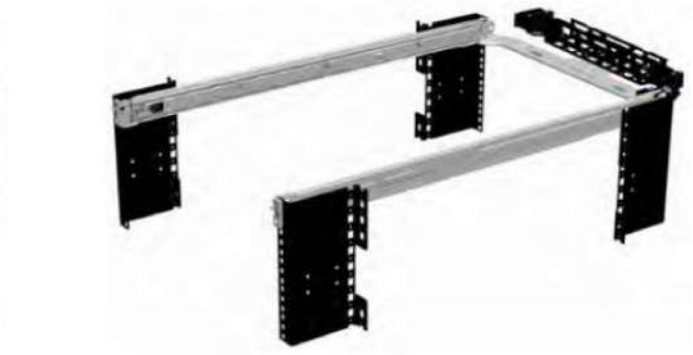

Figure 33. Sliding rails with optional CMA

Figure 34. Sliding rails with optional SRB

B22 Stab-in/Drop-in sliding rails for 4-post racks

- Supports drop-in or stab-in installation of the chassis to the rails.
- Support for tool-less installation in 19" EIA-310-E compliant square, unthreaded round hole racks including all generations of the Dell racks. Also supports tool-less installation in threaded round hole 4-post racks.
- Support for tool-less installation in Dell Titan or Titan-D racks.
- Support full extension of the system out of the rack to allow serviceability of key internal components.
- Support for optional cable management arm (CMA).
- Support for optional strain relief bar (SRB).

NOTE: For situations where CMA support is not required, the outer CMA mounting brackets can be uninstalled from the sliding rails. This reduces the overall length of the rails and eliminates the potential interferences with rear-mounted PDUs or the rear rack door.

Scan the QRL code for the documentation and trouble-shooting information regarding the installation procedures for Drop-in/ Stab-in rail types.

Figure 35. Quick resource locator for combo rails

B20 static rails summary

The static rails offer a greater adjustability range and a smaller overall mounting footprint than the sliding rails because of their reduced complexity and lack of need for CMA support. The static rails support a wider variety of racks than the sliding rails. However, they do not support serviceability in the rack and are thus not compatible with the CMA. The static rails are also not compatible with SRB.

Figure 36. Static rails

Static rails features summary

Static rails for 4-post and 2-post racks:

- Supports Stab-in installation of the chassis to the rails.
- Support tool-less installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks.
- Support tooled installation in 19" EIA-310-E compliant threaded hole 4-post and 2-post racks.
- Support for tooled installation in Dell Titan or Titan-D rack.

NOTE:

- Screws are not included with the static rail kit since racks are offered with various thread types. The screws are provided for mounting static rails in racks with threaded mounting flanges.
- Screw head diameter should be 10 mm or less.

2-Post racks installation

If installing to 2-Post (Telco) racks, the ReadyRails II static rails (B20) must be used. Sliding rails support mounting in 4-post racks only.

Figure 37. Static rails in 2-post center mount configuration

Installation in the Dell Titan or Titan-D racks

For tool-less installation in Titan or Titan-D racks, the Stab-in/Drop-in sliding rails (B22) must be used. This rail collapses down sufficiently to fit in the rack with mounting flanges that are spaced about 24 inches apart from front to back. The Stab-in/Drop-in sliding rail allows bezels of the servers and storage systems to be aligned when installed in these racks. For tooled installation, Stab-in Static rails (B20) must be used for bezel alignment with storage systems.

Cable management arm (CMA)

The optional cable management arm (CMA) organizes and secures the cords and cables exiting the back of the systems. It unfolds to allow the systems to extend out of the rack without having to detach the cables. Some key features of the CMA include:

- Large U-shaped baskets to support dense cable loads.
- Open vent pattern for optimal airflow.
- Ability to mount on either side by swinging the spring-loaded brackets from one side to the other.
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling.
- Includes a low-profile fixed tray to both support and retain the CMA in its fully closed position.
- Both the CMA and the tray mount without the use of tools by simple and intuitive snap-in designs.

NOTE: CMA is not supported in Direct Liquid Cooling configuration.

The CMA can be mounted to either side of the sliding rails without the use of tools or the need for conversion. For systems with one power supply unit (PSU), it is recommended to mount on the side opposite to that of the power supply to allow easier access to it and the rear drives (if applicable) for service or replacement.

Figure 38. Sliding rails with CMA

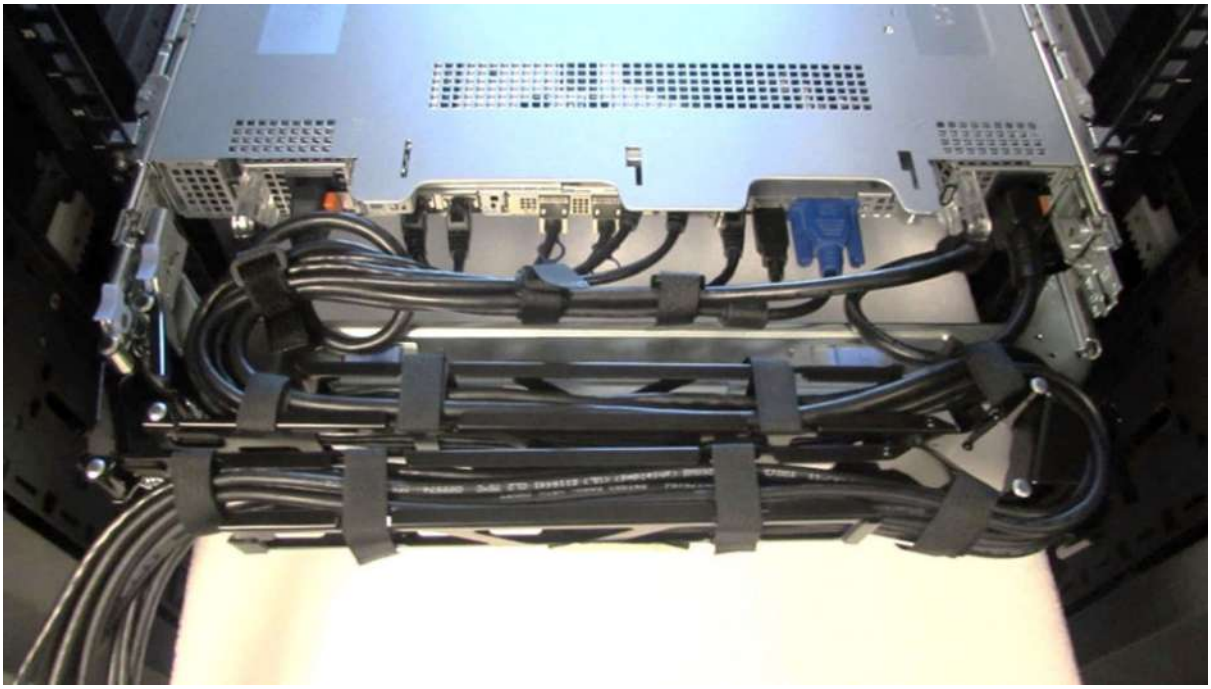

Figure 39. CMA Cabling

Strain Relief Bar (SRB)

The optional strain relief bar (SRB) for the PowerEdge R760 organizes and supports cable connections at the rear end of the server to avoid damage from bending.

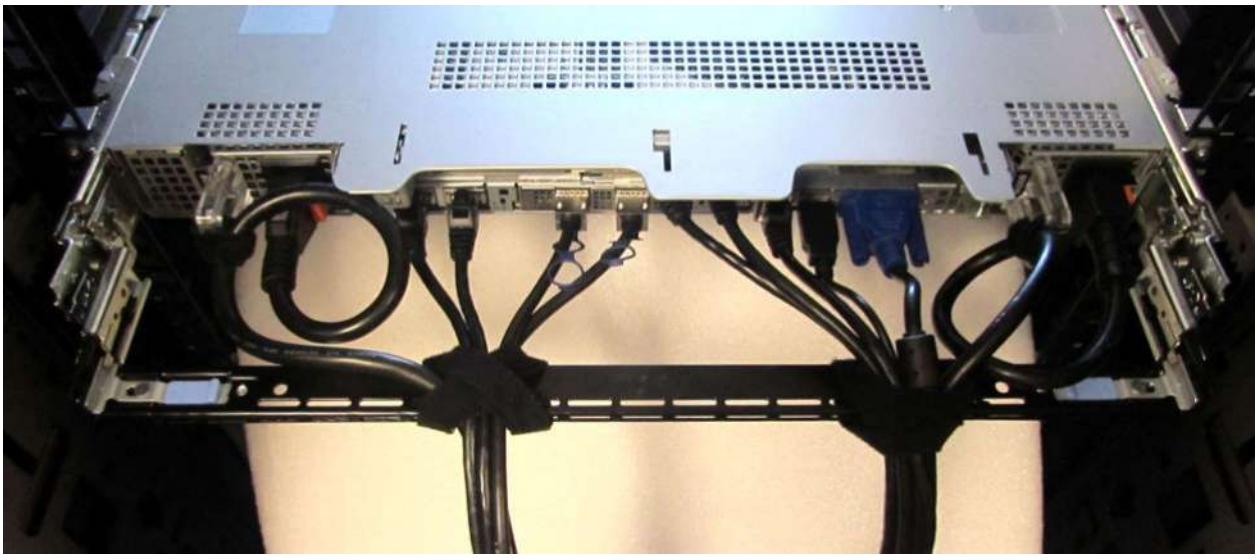

Figure 40. Cabled strain relief bar

- Tool-less attachment to the rails
- Two depth positions to accommodate various cable loads and rack depths
- Supports cable loads and controls stresses on server connectors
- Cables can be segregated into discrete purpose-specific bundles

Rack Installation

Drop-in design means that the system is installed vertically into the rails by inserting the standoffs on the sides of the system into the J-slots in the inner rail members with the rails in the fully extended position. The recommended method of installation is to first insert the rear standoffs on the system into the rear J-slots on the rails to free up a hand and then rotate the system down into the remaining J-slots while using the free hand to hold the rail against the side of the system.

Stab-in design means that the inner (chassis) rail members must first be attached to the sides of the system and then inserted into the outer (cabinet) members installed in the rack.

Installing system into the rack (option A: Drop-In)

1. Pull the inner rails out of the rack until they lock into place.

Figure 41. Pull out inner rail

2. Locate the rear rail standoff on each side of the system and lower them into the rear J-slots on the slide assemblies.
3. Rotate the system downward until all the rail standoffs are seated in the J-slots.

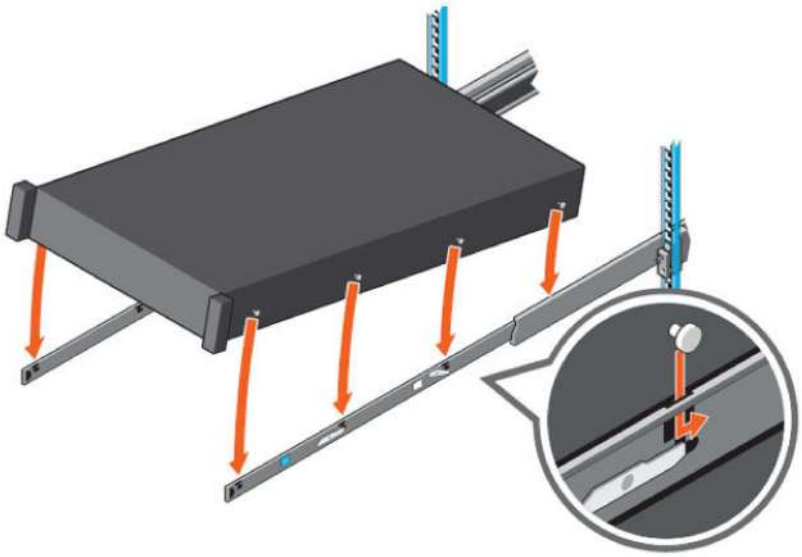

Figure 42. Rail standoffs seated in J-slots

4. Push the system inward until the lock levers click into place.

5. Pull the blue side release lock tabs forward or backward on both rails and slide the system into the rack until the system is in the rack.

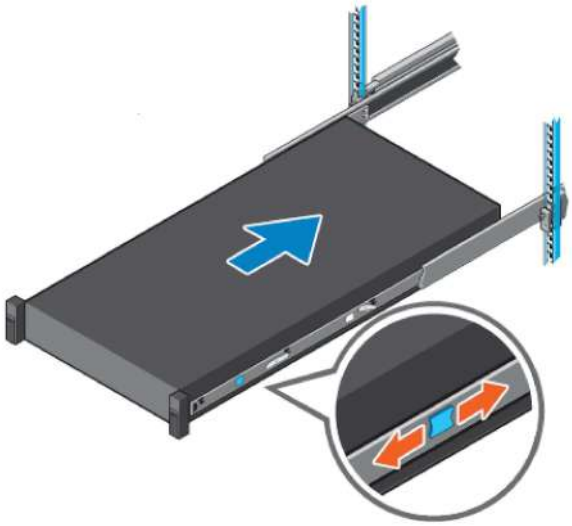

Figure 43. Slide system into the rack

Installing the system into the rack (option B: Stab-In)

1. Pull the intermediate rails out of the rack until they lock into place.
2. Release the inner rail lock by pulling forward on the white tabs and sliding the inner rail out of the intermediate rails.

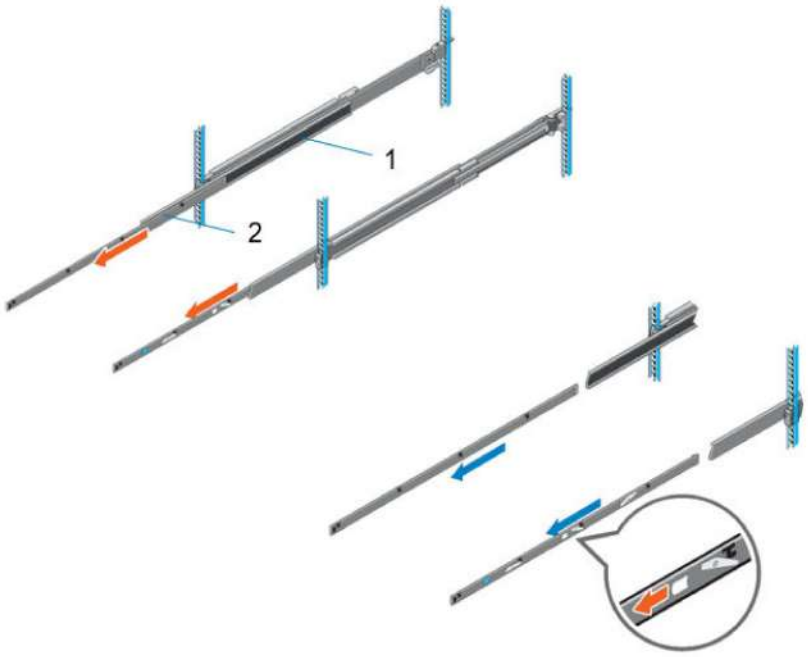

Figure 44. Pull out the intermediate rail

Table 23. Rail component label

Number	Component
1	Intermediate rail
2	Inner rail

3. Attach the inner rails to the sides of the system by aligning the J-slots on the rail with the standoffs on the system and sliding forward on the system until they lock into place.

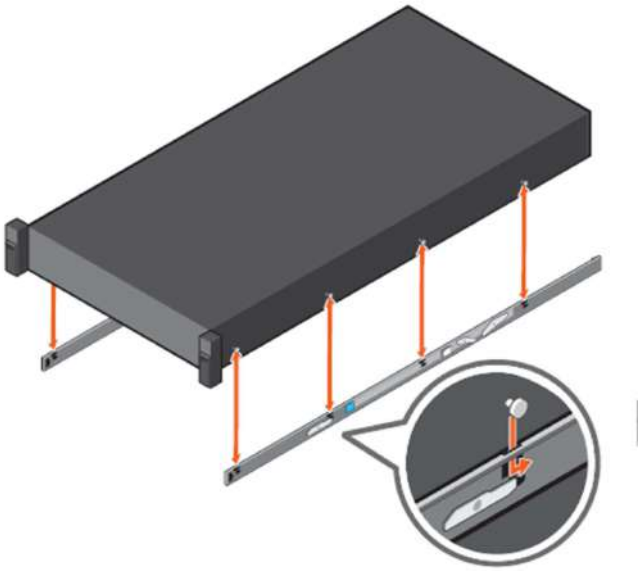

Figure 45. Attach the inner rails to the system

4. With the intermediate rails extended, install the system into the extended rails.

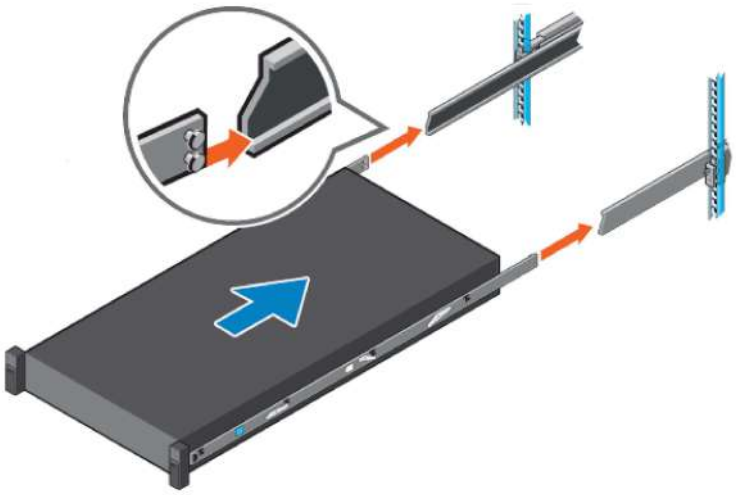

Figure 46. Install system into the extended rails

5. Pull blue slide release lock tabs forward or backward on both rails, and slide the system into the rack.

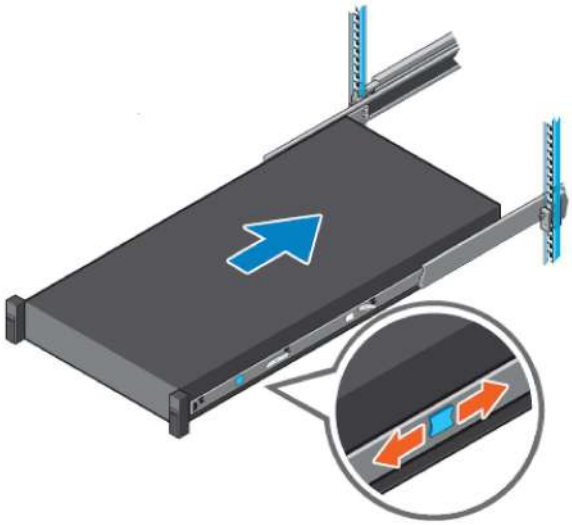

Figure 47. Slide system into the rack

11

Operating Systems and Virtualization

Topics:

- Supported Operating Systems

Supported Operating Systems

The PowerEdge system supports the following operating systems:

- Canonical® Ubuntu® Server LTS
- Microsoft® Windows Server® with Hyper-V
- Red Hat® Enterprise Linux
- SUSE® Linux Enterprise server
- VMware® ESXi®

Links to specific OS versions and editions, certification matrices, Hardware Compatibility Lists (HCL) portal, and Hypervisor support are available at Dell Enterprise Operating Systems.

12

Dell OpenManage Systems Management

Dell 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 servers efficiently; in physical, virtual, local, and remote environments; all without the need to install an agent in the operating system.

The OpenManage portfolio includes:

- Innovative embedded management tools - integrated Dell Remote Access Controller (iDRAC)
- Consoles - OpenManage Enterprise
- Extensible with plug-ins - OpenManage Power Manager
- Update tools - Repository Manager

Dell has developed comprehensive systems management solutions that are based on open standards and has integrated with management consoles from partners such as Microsoft and VMware, allowing advanced management of Dell servers. Dell management capabilities extend to offerings from the industry's top systems management vendors and frameworks such as Ansible, Splunk, and ServiceNow. OpenManage tools automate the full span of server life cycle management activities along with powerful RESTful APIs to script or integrate with your choice of frameworks.

For more information about the entire OpenManage portfolio, see:

- The latest Dell Systems Management Overview Guide.

Topics:

Integrated Dell Remote Access Controller (iDRAC)

iDRAC9 delivers advanced, agent-free, local and remote server administration. Embedded in every PowerEdge server, iDRAC9 provides a secure means to automate a multitude of common management tasks. Because iDRAC is embedded within every PowerEdge server, there is no additional software to install; just plug in power and network cables, and iDRAC is ready to go. Even before installing an operating system (operating system) or hypervisor, IT administrators have a complete set of server management features at their fingertips.

With iDRAC9 in-place across the Dell PowerEdge portfolio, the same IT administration techniques and tools can be applied throughout. This consistent management platform allows easy scaling of PowerEdge servers as an organization's infrastructure grows. Customers can use the iDRAC RESTful API for the latest in scalable administration methods of PowerEdge servers. With this API, iDRAC enables support for the Redfish standard and enhances it with Dell extensions to optimize at-scale management of PowerEdge servers. By having iDRAC at the core, the entire OpenManage portfolio of Systems Management tools allows every customer to tailor an effective, affordable solution for any size environment.

Zero Touch Provisioning (ZTP) is embedded in iDRAC. ZTP - Zero Touch Provisioning is Intelligent Automation Dell's agent-free management puts IT administrators in control. Once a PowerEdge server is connected to power and networking, that system can be monitored and fully managed, whether you're standing in front of the server or remotely over a network. In fact, with no need for software agents, an IT administrator can: · Monitor · Manage · Update · Troubleshoot and remediate Dell servers With features like zero-touch deployment and provisioning, iDRAC Group Manager, and System Lockdown, iDRAC9 is purpose-built to make server administration quick and easy. For those customers whose existing management platform utilizes in-band management, Dell does provide iDRAC Service Module, a lightweight service that can interact with both iDRAC9 and the host operating system to support legacy management platforms.

When ordered with DHCP enabled from the factory, PowerEdge servers can be automatically configured when they are initially powered up and connected to your network. This process uses profile-based configurations that ensure each server is configured per your specifications. This feature requires an iDRAC Enterprise license.

iDRAC9 offers following license tiers:

Table 24. iDRAC9 license tiers

License	Description
iDRAC9 Basic	• Available only on 100-500 series rack/tower • Basic instrumentation with iDRAC web UI • For cost conscious customers that see limited value in management
iDRAC9 Express	• Default on 600+ series rack/tower, modular, and XR series • Includes all features of Basic • Expanded remote management and server life-cycle features
iDRAC9 Enterprise	• Available as an upsell on all servers • Includes all features of Basic and Express. Includes key features such as virtual console, AD/LDAP support, and more • Remote presence features with advanced, Enterprise-class, management capabilities
iDRAC9 Datacenter	• Available as an upsell on all servers • Includes all features of Basic, Express, and Enterprise. Includes key features such as telemetry streaming, Thermal Manage, automated certificate management, and more • Extended remote insight into server details, focused on high end server options, granular power, and thermal management

For a full list of iDRAC features by license tier, see Integrated Dell Remote Access Controller 9 User's Guide at Dell.com.

For more details on iDRAC9 including white papers and videos, see:

- Support for Integrated Dell Remote Access Controller 9 (iDRAC9) on the Knowledge Base page at Dell.com

Systems Management software support matrix

Table 25. Systems Management software support matrix

Categories	Features	PE mainstream
Embedded Management and In-band Services	iDRAC9 (Express, Enterprise, and Datacenter licenses)	Supported
	OpenManage Mobile	Supported
	OM Server Administrator (OMSA)	Supported
	iDRAC Service Module (iSM)	Supported
	Driver Pack	Supported
Change Management	Update Tools (Repository Manager, DSU, Catalogs)	Supported
	Server Update Utility	Supported
	Lifecycle Controller Driver Pack	Supported
	Bootable ISO	Supported
Console and Plug-ins	OpenManage Enterprise	Supported
	Power Manager Plug-in	Supported
	Update Manager Plug-in	Supported
	SupportAssist Plug-in	Supported
	CloudIQ	Supported
Integrations and connections	OM Integration with VMware Vcenter/vROps	Supported
	OM Integration with Microsoft System Center (OMIMSC)	Supported
	Integrations with Microsoft System Center and Windows Admin Center (WAC)	Supported

Table 25. Systems Management software support matrix (continued)

Categories	Features	PE mainstream
	ServiceNow	Supported
	Ansible	Supported
	Third-party Connectors (Nagios, Tivoli, Microfocus)	Supported
Security	Secure Enterprise Key Management	Supported
	Secure Component Verification	Supported
Standard operating system	Red Hat Enterprise Linux, SUSE, Windows Server 2021 Ubuntu, CentOS	Supported (Tier-1)

13

Appendix D: Service and support

Topics:

Default support levels

This system offers 3 years Dell ProSupport Next Business Day (NBD), including 24x7 phone support and NBD parts and labor support.

Default deployment levels

This system is defaulted to the ProDeploy Dell Server which includes onsite hardware installation and remote software configuration. Optionally, the customer may choose to any of the factory or field deployment offers listed below.

Other services and support information

Dell Technologies Services include a wide, customizable range of service options to simplify the assessment, design, implementation, management and maintenance of IT environments and to help transition from platform to platform.

Depending on the current business requirements and correct level of service for customers, we provide factory, onsite, remote, modular, and specialized services that fit the customer requirements and budget. We will help with a little or a lot, based on the customers choice, and provide access to our global resources.

Dell deployment services

Dell ProDeploy Infrastructure Suite

ProDeploy Infrastructure Suite provides a variety of deployment offerings that satisfy a customer's unique needs. It is made up of 5 offers: ProDeploy Configuration Services, ProDeploy Rack Integration Services, Basic Deployment, ProDeploy, and ProDeploy Plus.

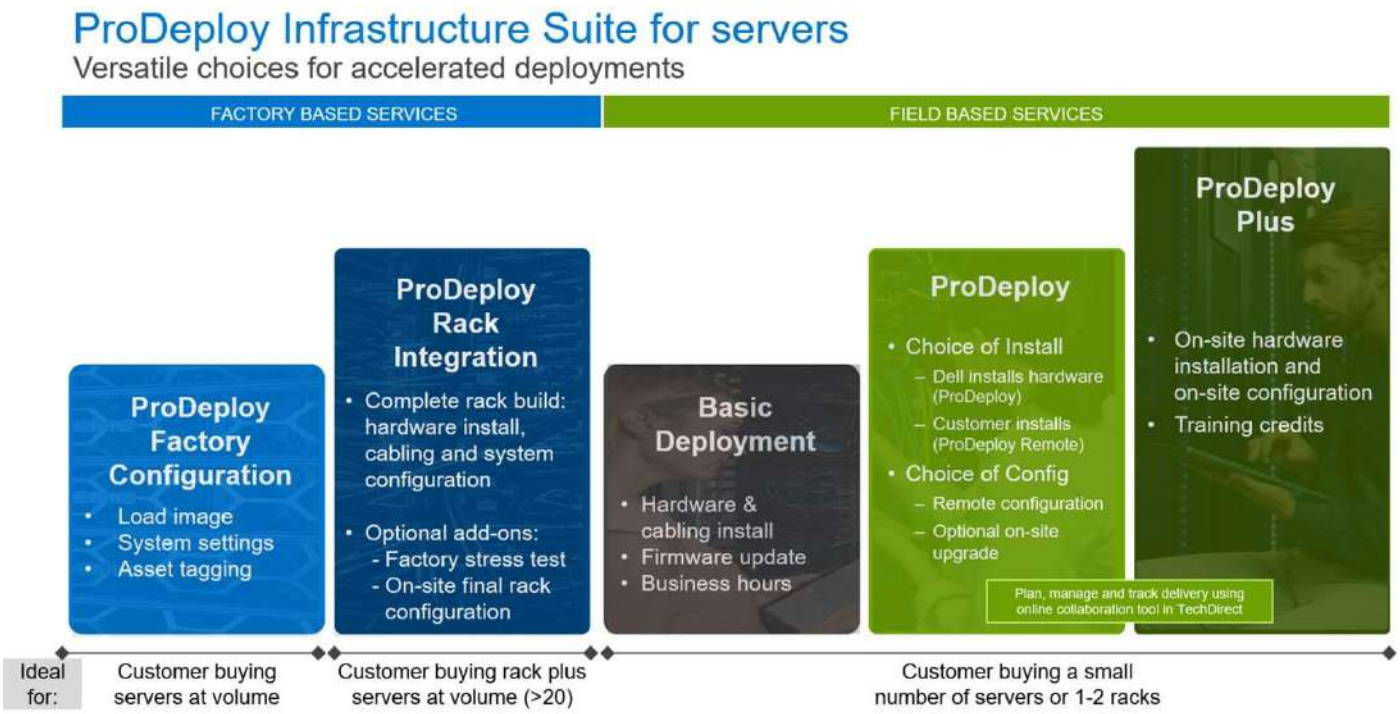

Figure 48. ProDeploy Infrastructure Suite for servers

The new Factory Services consist of two tiers of deployment that happen prior to shipping to the customer's site.

Factory Based Services:

- ProDeploy Factory Configuration - Ideal for customers buying servers in volume and seeking pre-configuration prior to shipping such as: custom image, system settings, and asset tagging so it arrives ready to use out of the box. Furthermore, servers can be packaged and bundled to meet specific shipping and distribution requirements for each customer location to facilitate the rollout process. Upsell one of the field based services (below) if a customer needs assistance with the final server installation.
- ProDeploy Rack Integration - Ideal for customers seeking to build out fully integrated racks prior to shipping. These rack builds include hardware install, cabling, and full system configuration. You can also add-on a factory stress test and optional on-site final rack configuration to complete the rack installation.
  - STANDARD SKUs for Rack Integration is available in US only and requires:
    - 20 or more devices (R and C series servers and all Dell or non-Dell switches). Use Informational SKUs for Dell switches or 3rd party products
    - Shipping to contiguous US
  - USE CUSTOM QUOTE for Rack Integration for:
    - All countries except USA
    - Racks containing less than 20 servers
    - Any rack that includes VxRail or Storage
    - Shipping outside contiguous US
    - Shipping to multiple locations

Field Based Services:

- Basic Deployment consists of the hardware installation, cabling and firmware update during normal standard business hours. Basic Deployment is traditionally sold to Competency Enabled Partners. Competency enabled partners often have Dell do the hardware installation while they complete the software configuration.
- ProDeploy consists of your hardware installation and configuration of the software using offshore resources. ProDeploy is great for customers who are price sensitive or who are remote from their data centers and don't require an onsite presence.
- ProDeploy Plus will give you in-region or onsite resources to complete the engagement for the customer. It also comes with additional features such as Post Deployment Configuration Assistance and Training Credits.

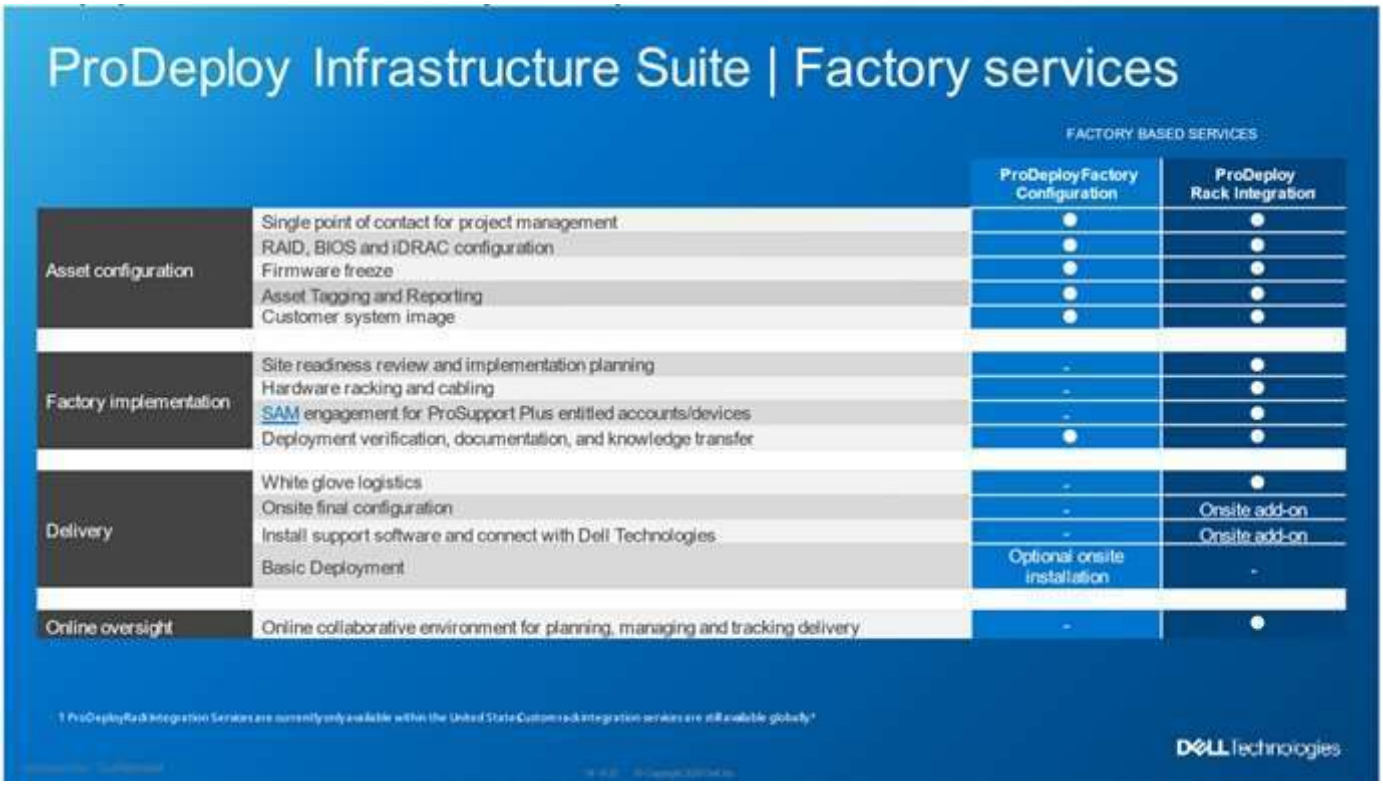

Figure 49. ProDeploy Infrastructure Suite - Factory services

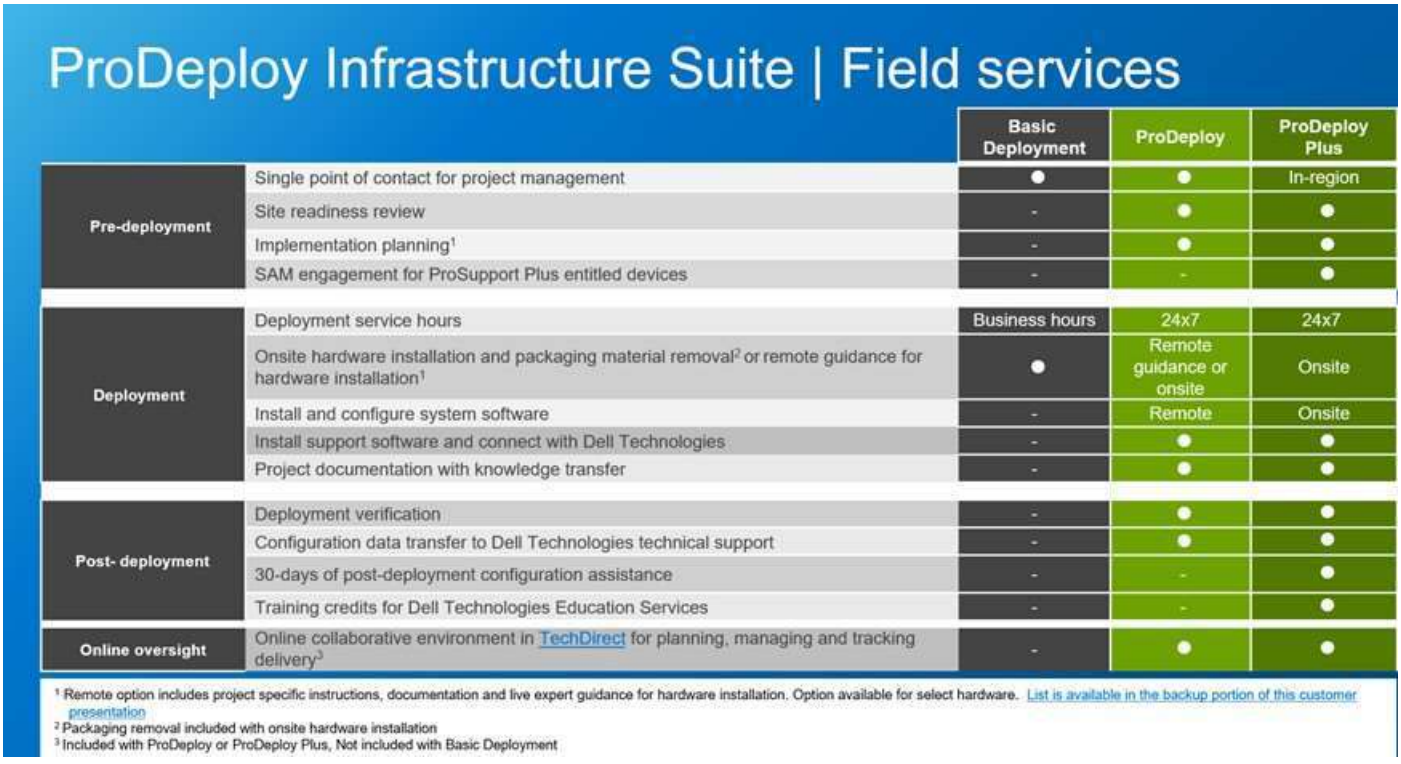

Figure 50. ProDeploy Infrastructure Suite - Field services

Dell ProDeploy Plus for Infrastructure

From beginning to end, ProDeploy Plus provides the skill and scale that is must successfully perform demanding deployments in today's complex IT environments. Certified Dell experts start with extensive environmental assessments and detailed migration

planning and recommendations. Software installation includes set up of our enterprise connectivity solution (secure connect gateway) and OpenManage system management utilities.

Postdeployment configuration assistance, testing, and product orientation services are also available.

Dell ProDeploy for Infrastructure

ProDeploy provides full-service installation and configuration of both server hardware and system software by certified deployment engineers including set up of leading operating systems and hypervisors as well our enterprise connectivity solution (secure connect gateway) and OpenManage system management utilities. To prepare for the deployment, we conduct a site readiness review and implementation planning exercise. System testing, validation, and full project documentation with knowledge transfer complete the process.

Dell Basic Deployment

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

Additional Deployment Services

You can tailor the ProDeploy Infrastructure Suite offer to meet your customer's unique needs by leveraging "Additional Deployment Time." ADT will cover additional tasks above the normal scope of the standard offers. ADT can be sold for Project Management or Technical Resources and is sold as blocks of four hours remote or eight hours on-site.

Dell ProDeploy for HPC (available in US/Canada only. All other regions use custom)

HPC deployments require specialists that understand that cutting edge is yesterday's news. Dell deploys the world 's fastest systems and understands the nuances that make them perform. ProDeploy for HPC provides:

- Global team of dedicated HPC specialists
- Proven track record, thousands of successful HPC deployments
- Design validation, benchmarking, and product orientation

Learn more at Dell.com/HPC-Services.

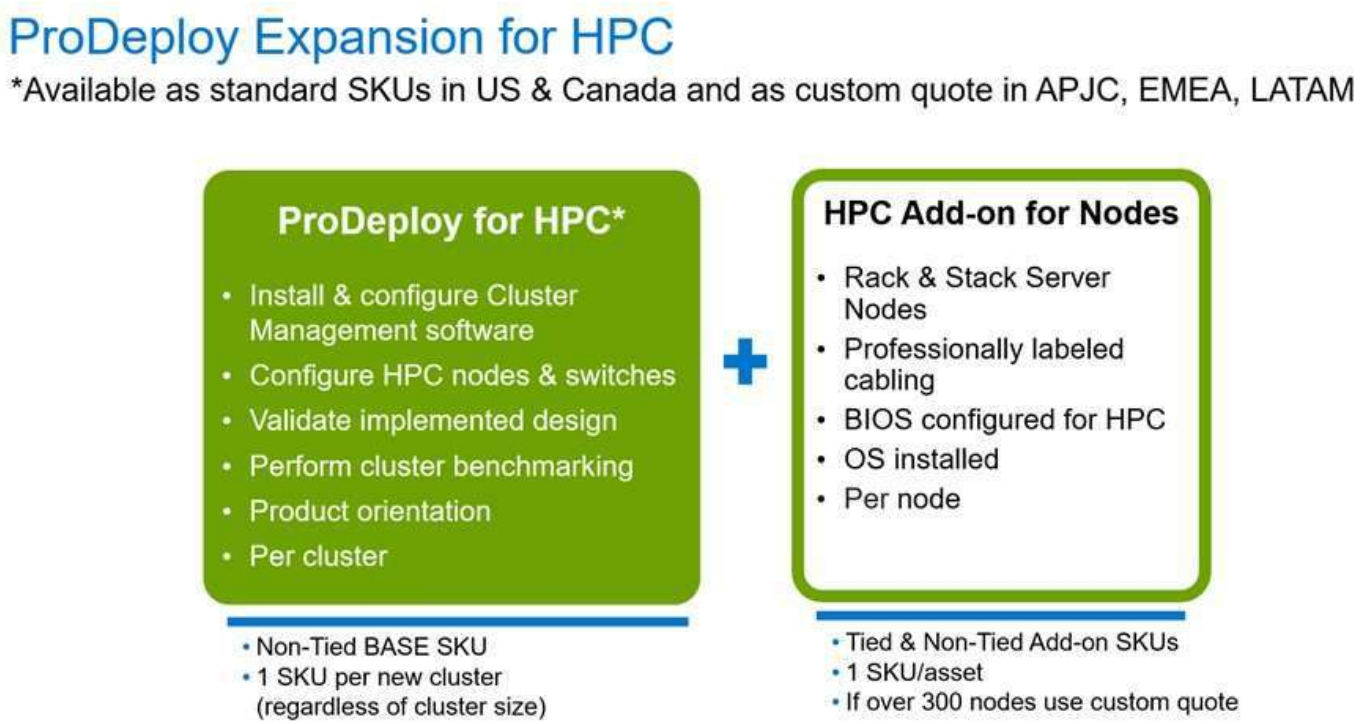

Figure 51. ProDeploy Expansion for HPC

Dell custom deployment Services

Dell custom rack integration and other Dell configuration services help customers save time by providing systems that are racked, cabled, tested, and ready to be integrated into the data center. Dell support preconfigure RAID, BIOS and iDRAC settings, install system images, and even install third-party hardware and software.

For more information, see Server Configuration Services.

Dell Residency Services

Residency Services help customers transition to new capabilities quickly with the assistance of onsite or remote Dell experts whose priorities and time they control.

Residency experts can provide post implementation management and knowledge transfer that is related to a new technology acquisition or day-to-day operational management of the IT infrastructure.

Dell Data Migration Services

Protect business and data of the customer with our single point of contact to manage data migration projects.

A customer project manager works with our experienced team of experts to create a plan using industry-leading tools and proven processes that are based on global best practices to migrate existing files and data, so business systems are up and running quickly and smoothly.

Dell Enterprise Support Services

Dell ProSupport Enterprise Suite

With the ProSupport Enterprise Suite, we help keep IT systems running smoothly, so customers can focus on running their business. We help maintain peak performance and availability of the most essential workloads. ProSupport Enterprise Suite is a suite of support services that enable customers to build the solution that is right for their organization. They choose support models that are based on how they use technology and where they 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 customer IT resources by choosing the right support model.

Table 26. ProSupport Enterprise Suite

Service	Support model	Description
ProSupport Enterprise Suite	ProSupport Plus for Enterprise	Proactive, predictive, and reactive support for systems that look after your business-critical applications and workloads
	ProSupport for Enterprise	Comprehensive 24 x 7 support
	Basic hardware support	Reactive hardware support during normal business hours

Dell ProSupport Plus for Enterprise

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

- An assigned Services Account Manager who knows their business and environment
- Immediate advanced troubleshooting from an engineer
- Personalized, preventive recommendations that are based on analysis of support trends and best practices from across the Dell Technologies infrastructure solutions customer base to reduce support issues and improve performance
- Predictive analysis for issue prevention and optimization that is enabled by secure connect gateway technology
- Proactive monitoring, issue detection, notification, and automated case creation for accelerated issue resolution enabled by secure connect gateway
- On-demand reporting and analytics-based recommendations that are enabled by secure connect gateway and TechDirect

Dell ProSupport for Enterprise

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

- 24x7 support through phone, chat and online
- Predictive, automated tools and innovative technology
- A central point of accountability for all hardware and software issues
- Collaborative third-party support
- Hypervisor, operating system and application support
- Consistent experience regardless of where customers are located or what language they speak

  NOTE: Subject to service offer country or region availability.
- Optional onsite parts and labor response options including next business day or four-hour mission critical

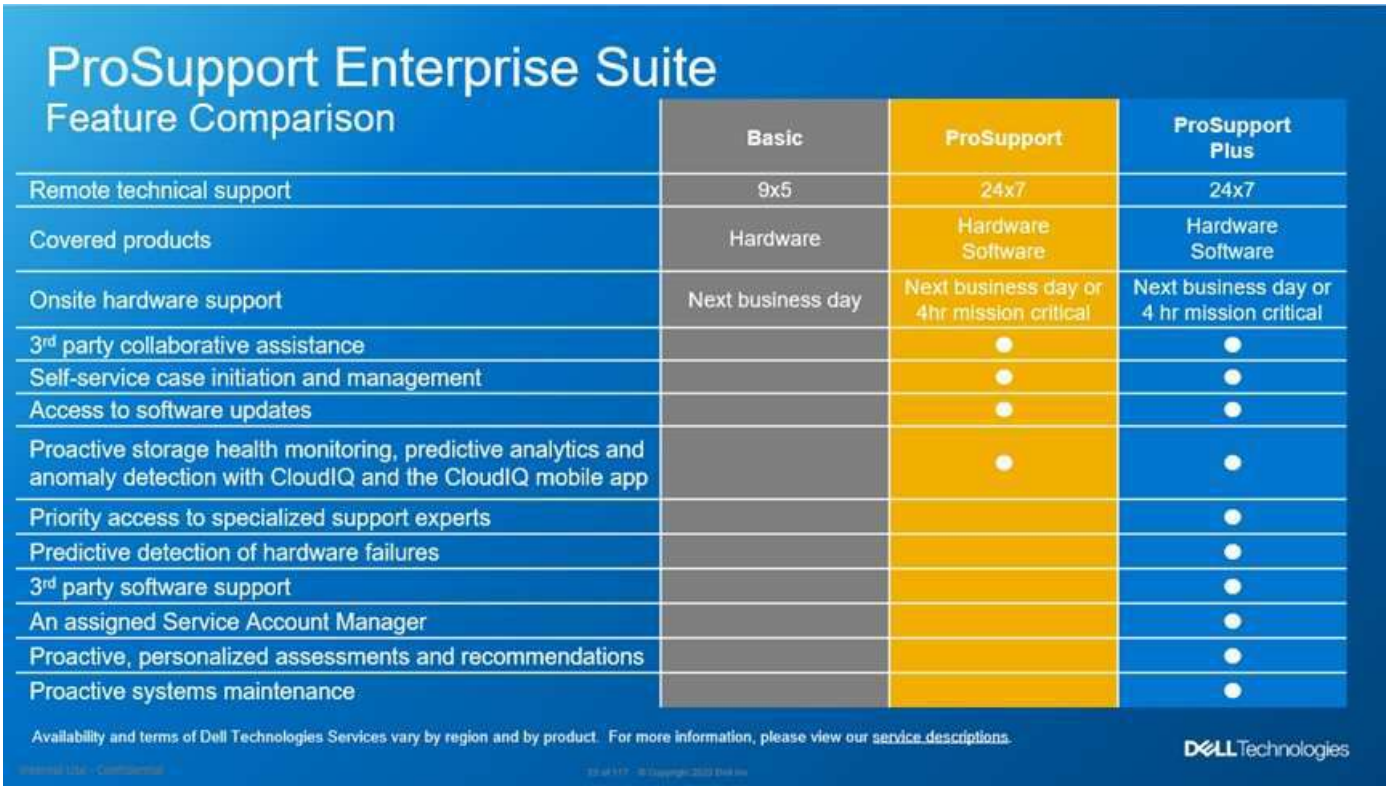

Figure 52. ProSupport Enterprise Suite

Dell 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 a customer's needs. While not for everyone, this service option offers a truly unique solution for Dell Technologies largest customers with the most complex environments.

- Team of assigned Services Account Managers with remote, on-site options
- Assigned ProSupport One technical and field engineers who are trained on the customer's environment and configurations
- On-demand reporting and analytics-based recommendations that are enabled by secure connect gateway and TechDirect
- Flexible on-site support and parts options that fit their operational model
- A tailored support plan and training for their operations staff

Dell ProSupport Add-on for HPC

The ProSupport Add-on for HPC provides solution-aware support including:

- Access to senior HPC experts
- Advanced HPC cluster assistance: performance, interoperability, and configuration
- Enhanced HPC solution level end-to-end support
- Remote presupport engagement with HPC Specialists during ProDeploy implementation

Learn more at Dell.com/HPC-Services.

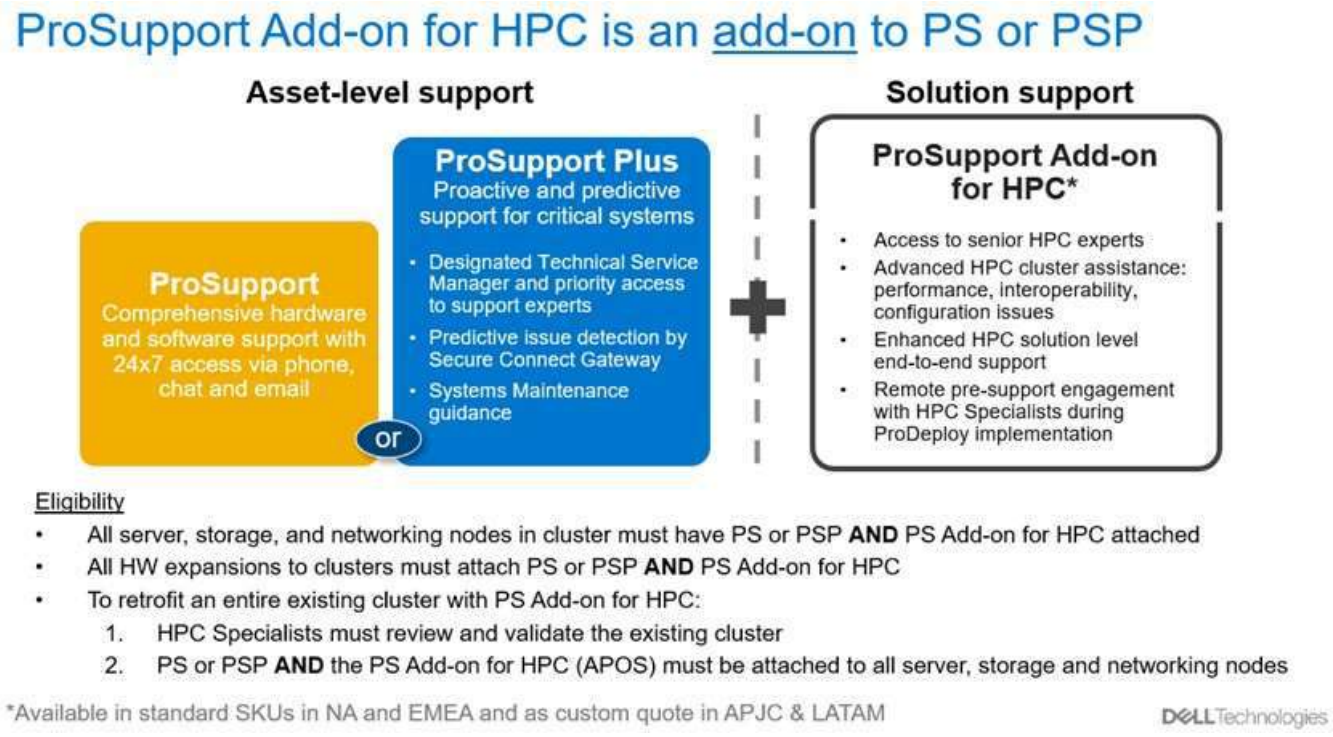

Figure 53. ProSupport Add-on for HPC is an add-on to PS or PSP

Support Technologies

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

NOTE: SupportAssist Enterprise capabilities are now part of the secure connect gateway technology.

Enterprise connectivity

The best time to solve a problem is before it happens. The automated proactive and predictive support features enabled by the secure connect gateway technology helps reduce steps and time to resolution, often detecting issues before they become a crisis. The gateway technology is available in virtual and application editions. It is also implemented as a direct connect version for select Dell hardware and a Services plugin within OpenManage Enterprise for PowerEdge servers. The legacy SupportAssist Enterprise solution has been retired and is now replaced by the secure connect gateway solutions.

Benefits include:

- Value: Our connectivity solutions are available to all customers 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 experts
- Gain insight and control: Optimize enterprise devices with insights in portals reporting like TechDirect, and get predictive issue detection before the problem starts

NOTE: Connect devices can access these features. Features vary depending on the service level agreement for the connected device. ProSupport Plus customers experience the full set of automated support capabilities.

Table 27. Features enabled by connectivity

—	Basic hardware warranty	ProSupport	ProSupport Plus
Automated issue detection and system state information collection	Supported	Supported	Supported
Proactive, automated case creation and notification	Not supported	Supported	Supported

Table 27. Features enabled by connectivity (continued)

—	Basic hardware warranty	ProSupport	ProSupport Plus
Predictive issue detection for failure prevention	Not supported	Not supported	Supported

Get started at DellTechnologies.com/secureconnectgateway.

Dell TechDirect

TechDirect helps boost IT team productivity when supporting Dell systems.

Boost your productivity with online servoce for Dell products from TechDirect. From deployment to technical support, TechDirect lets you do more with less effort and faster resolution. You can:

- OPen and manage support requests or in-warranty systems
- Execute online self-service for parts dispatch
- Collaborate on ProDeploy infrastructure deployment projects online
- Manage proactive and preditive alerts from secure connect gateway technology that help maximize uptime
- Integrate services functionality into your help desk with TechDirect APIs
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Figure 54. Dell Managed Services

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Appendix A: Additional specifications

Topics:

Chassis dimension

The R760 has the following dimensions:

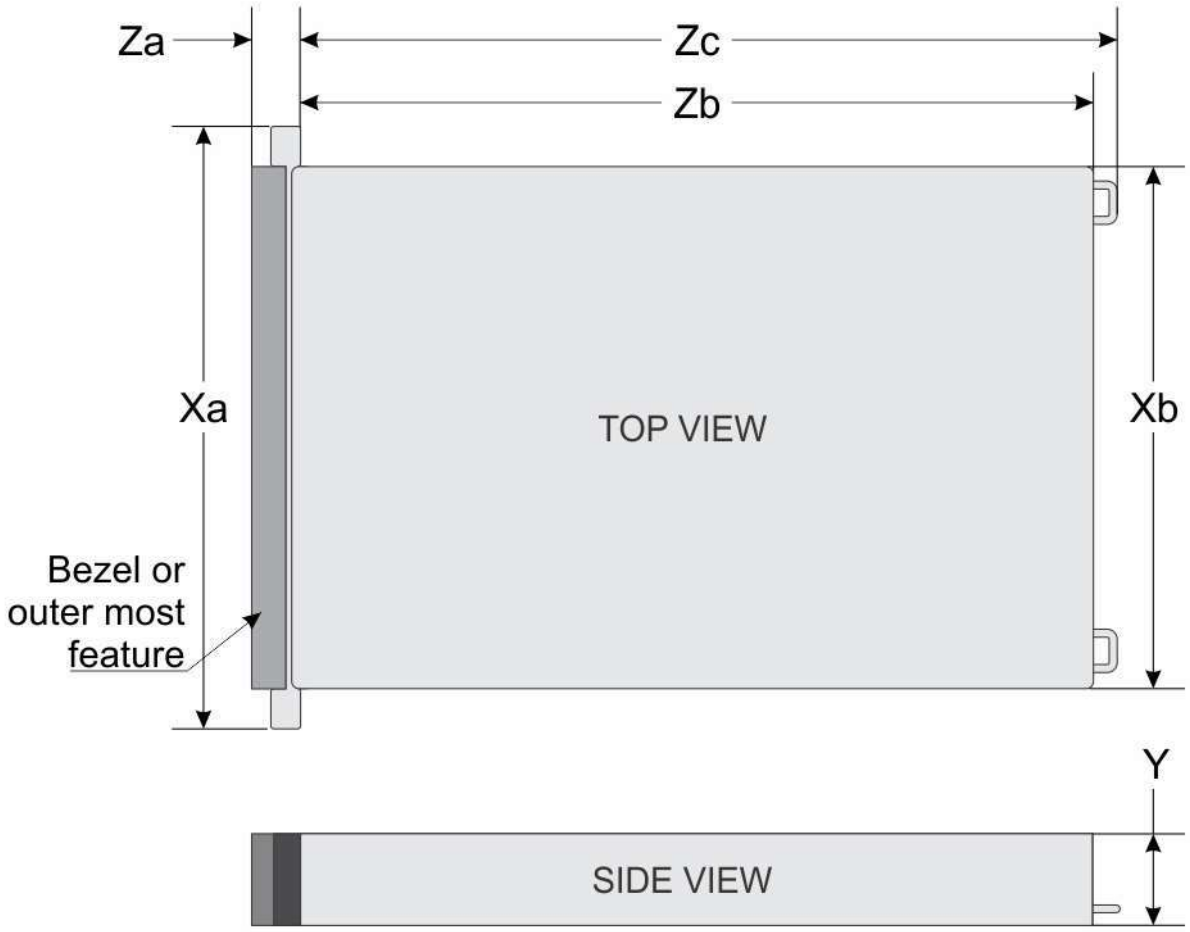

Figure 55. Chassis dimensions

Table 28. Chassis dimensions

Model number	Xa	Xb	Y	Za with bezel	Za without bezel	Zb	Zc	Max Sys Wgt	Chassis
R760	482 mm	434 mm	86.8 mm	35.84 mm	22 mm	700.7 mm	736.29 mm	36.1 kg	2U

Chassis weight

Table 29. Chassis weight

System Configuration	Maximum Weight
A server with fully populated drives	36.1 kg (79.58 lbs)
A server without drives and PSU installed	25.1 kg (55.33 lbs)

NIC port specifications

The PowerEdge R760 system supports up to two Netwodk Interface Controller (NIC) ports embedded on the LAN on Motherboard (LOM) card and up to four ports integrated on the Open Compute Project (OCP) card.

Table 30. NIC port specification for the system

Feature	Specifications
LOM card (optional)	1 GbE x 2
OCP card (OCP 3.0) (optional)	1GbE x 4, 10 GbE x 2, 10 GbE x 4, 25 GbE x 2, 25 GbE x 4

NOTE: The system allows either LOM card or an OCP card or both to be installed in the system.

NOTE: On the system board, the supported OCP PCIe width is x8; when x16 PCIe width is installed, it is downgraded to x8.

Video specifications

The platform supports the following video resolution and refresh rates:

Table 31. Video specifications for R760

Resolution	Refresh Rate	Sestotal Freq.	Pixel Clock	DVO DisplayPort
1024 x 768	60 Hz	48.4 kHz	65.0 MHz	Yes*
1280 x 800	60 Hz	49.7 kHz	83.5 MHz	Yes*
1280 x 1024	60 Hz	64.0 kHz	108.0 MHz	Yes*
1360 x 768	60 Hz	47.71 kHz	85.5 MHz	Yes*
1440 x 900	60 Hz	55.9 kHz	106.5 MHz	Yes*
1600 x 900	60 Hz	55.54 kHz	97.75 MHz	Yes*
1600 x 1200	60 Hz	75.0 kHz	162.0 MHz	Yes*
1680 x 1050	60 Hz	64.7 kHz	119.0 MHz	Yes*
1920 x 1080	60 Hz (RB)	67.158 kHz	173.0 MHz	No
1920 x 1200	60 Hz (RB)	74.556 kHz	193.25 MHz	No

*DVO - DP is for investigation only, dependent on Nuvoton DVO capabilities to support up to 165 MHz.

*(RB) - Reduced Blanking for Digital Displays requiring less blank time. It was introduced for Signal Integrity improvements by reducing Pixel Clock rates for VGA- Analog input devices.

USB Ports

Figure 56. Front USB Port

Figure 57. Rear USB Port

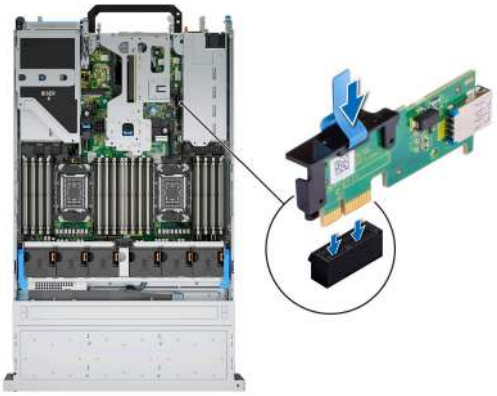

Figure 58. Internal USB Port

Table 32. Systems USB Specifications

Front		Rear		Internal	
USB port type	No. of ports	USB port type	No. of ports	USB port type	No. of ports
USB x.2.0 – compliant port	1	USB x.2.0 – compliant port	1	USB x.3.0 – compliant port	1
		USB x.3.0 – compliant port	1		

PSU rating

Below table lists the power capacity the PSUs in high/low line operation mode.

Table 33. PSUs highline and lowline ratings

—	700 W Titanium	800 W Platinum	1100 W Titanium	1100 W -48 VDC	1400 W Platinum	1800 W Titanium	2400 W Platinum	2800 W Titanium
Peak Power (Highline/-72 VDC)	1190 W	1360 W	1870 W	1870 W	2380 W	3060 W	4080 W	4760 W
Highline/-72 VDC	700 W	800 W	1100 W	1100 W	1400 W	1800 W	2400 W	2800 W
Peak Power (Lowline/-40 VDC)	N/A	1360 W	1785 W	N/A	1785 W	N/A	2380 W	N/A
Lowline/-40 VDC	N/A	800 W	1050 W	N/A	1050 W	N/A	1400 W	N/A
Highline 240 VDC	700 W	800 W	1100 W	N/A	1400 W	1800 W	2400 W	2800 W
DC-48-60 V	N/A	N/A	N/A	1100 W	N/A	N/A	N/A	N/A

The PowerEdge R760 supports up to two AC power supplies with 1+1 redundancy, autosensing, and auto switching capability.

If two PSUs are present during POST, a comparison is made between the wattage capacities of the PSUs. In case the PSU wattages do not match, the larger of the two PSUs is enabled. Also, there is a PSU mismatch warning that is displayed in BIOS, iDRAC, or on the system LCD.

If a second PSU is added at run-time, in order for that particular PSU to be enabled, the wattage capacity of the first PSU must equal the second PSU. Otherwise, the PSU is flagged as unmatched in iDRAC and the second PSU is not enabled.

Dell PSUs have achieved Platinum efficiency levels as shown in the table below.

Table 34. PSU efficiency level

Efficiency Targets by Load						
Form factor	**Output**	**Class**	**10%**	**20%**	**50%**	**100%**
Redundant 60 mm	700 W AC	Titanium	90.00%	94.00%	96.00%	91.50%
	800 W AC	Platinum	89.00%	93.00%	94.00%	91.50%
	1100 W AC	Titanium	90.00%	94.00%	96.00%	91.50%
	1100 W -48 VDC	N/A	85.00%	90.00%	92.00%	90.00%
	1400 W AC	Platinum	89.00%	93.00%	94.00%	91.50%
	1800 W AC	Titanium	90.00%	94.00%	96.00%	94.00%
Redundant 86 mm	2400 W AC	Platinum	89.00%	93.00%	94.00%	91.50%
	2800 W AC	Titanium	90.00%	94.00%	96.00%	94%

Environmental specifications

NOTE: For additional information about environmental certifications, refer to the *Product Environmental Datasheet* located with the *Documentation* on www.dell.com/support/home.

Table 35. Continuous Operation Specifications for ASHRAE A2

Temperature	Specifications
Allowable continuous operations	
Temperature range for altitudes <= 900 m (<= 2953 ft)	10–35°C (50–95°F) with no direct sunlight on the equipment
Humidity percent range (non-condensing at all times)	8% RH with -12°C (10.4°F) minimum dew point to 80% RH with 21°C (69.8°F) maximum dew point
Operational altitude de-rating	Maximum temperature is reduced by 1°C/300 m (1.8°F/984 Ft) above 900 m (2953 Ft)

Table 36. Continuous Operation Specifications for ASHRAE A3

Temperature	Specifications	
Allowable continuous operations		
Temperature range for altitudes <= 900 m (<= 2953 ft)	5–40°C (41–104°F) with no direct sunlight on the equipment	
	Excursion Limited Operation	5-35°C (41-95°F) Continuous Operation
		35-40°C (95-104°F) 10% Annual Runtime
Humidity percent range (non-condensing at all times)	8% RH with -12°C (10.4°F) minimum dew point to 85% RH with 24°C (75.2°F) maximum dew point	
Operational altitude de-rating	Maximum temperature is reduced by 1°C/175 m (1.8°F/574 Ft) above 900 m (2953 Ft)	

Table 37. Continuous Operation Specifications for ASHRAE A4

Temperature	Specifications	
Allowable continuous operations		
Temperature range for altitudes <= 900 m (<= 2953 ft)	5–45°C (41–113°F) with no direct sunlight on the equipment	
	Excursion Limited Operation	5-35°C (41-95°F) Continuous Operation
		35-40°C (95-104°F) 10% Annual Runtime
		40-45°C (104-113°F) 1% Annual Runtime
Humidity percent range (non-condensing at all times)	8% RH with -12°C (10.4°F) minimum dew point to 90% RH with 24°C (75.2°F) maximum dew point	
Operational altitude de-rating	Maximum temperature is reduced by 1°C/125 m (1.8°F/410 Ft) above 900 m (2953 Ft)	

Table 38. Common Environmental Specifications for ASHRAE A2, A3 and A4

Temperature	Specifications
Allowable continuous operations	
Maximum temperature gradient (applies to both operation and non-operation)	20°C in an hour* (36°F in an hour) and 5°C in 15 minutes (9°F in 15 minutes), 5°C in an hour* (9°F in an hour) for tape hardware

Table 38. Common Environmental Specifications for ASHRAE A2, A3 and A4 (continued)

Temperature	Specifications
	NOTE: * - Per ASHRAE thermal guidelines for tape hardware, these are not instantaneous rates of temperature change.
Non-operational temperature limits	-40 to 65°C (-40 to 149°F)
Non-operational humidity limits	5% to 95% RH with 27°C (80.6°F) maximum dew point
Maximum non-operational altitude	12,000 meters (39,370 feet)
Maximum operational altitude	3,050 meters (10,006 feet)

Table 39. Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.21 G_{rms} at 5 Hz to 500 Hz for 10 minutes (all operation orientations)
Storage	1.88 G_{rms} at 10 Hz to 500 Hz for 15 minutes (all six sides tested)

Table 40. Maximum shock pulse specifications

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

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. Remediation of environmental conditions is the responsibility of the customer.

Table 41. 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 41. Particulate contamination specifications (continued)

Particulate contamination	Specifications
Walk-Up Edge Data Center or Cabinet (sealed, closed loop environment)	Filtration is not required for cabinets that are anticipated to be opened 6 times or less per year. Class 8 per ISO 1466-1 filtration as defined above is required otherwise **NOTE:** In environments commonly above ISA-71 Class G1 or that may have known challenges, special filters may be required.

Table 42. Gaseous contamination specifications

Gaseous contamination	Specifications
Copper coupon corrosion rate	<300 Å/month per Class G1 as defined by ANSI/ISA71.04-2013
Silver coupon corrosion rate	<200 Å/month as defined by ANSI/ISA71.04-2013

Thermal restriction matrix

Table 43. Processor and heat sink matrix

Heat sink	Processor TDP
STD HSK	≤ 165 W (supports only 2.5-inch drives and non-GPU configuration)
2U HPR HSK	125 W–250 W (supports 3.5-inch drives and non-GPU configuration)
	165 W–350 W (supports 2.5-inch drives and non-GPU configuration)
L-type HSK	Supports all GPU/FPGA configurations

NOTE: All GPU/FGPA cards require 1U L-type HSK and GPU shroud.

Table 44. Label reference

Label	Description
STD	Standard
HPR (Silver)	High performance Silver (HPR) fan
HPR (Gold)	High performance Gold (VHP) fan
HSK	Heat sink
LP	Low profile
FH	Full height
DLC	Direct Liquid Cooling

NOTE: The ambient temperature of the configuration is determined by the critical component in that configuration. For example, if the processor's supported ambient temperature is 35°C (95°F), the DIMM is 35°C (95°F), and the GPU is 30°C (86°F), the combined configuration can only support 30°C (86°F).

Table 45. Thermal restriction matrix for air cooled configuration

Configuration		No backplane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe	12 x 3.5-inch		Ambient temperature
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	No rear drives	No rear drives	No rear drives	2.5-inch rear drives with rear fan	
CPU TDP/ cTDP	T-Case max center (°C)	Fan									HPR GOLD fan 70%^		
125 W	79	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	STD fan	HPR GOLD fan	HPR SLVR fan	HPR GOLD fan	35°C (95°F)
150 W	72/78/79	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	STD fan	HPR GOLD fan	HPR SLVR fan	HPR GOLD fan	35°C (95°F)
165 W	82/84	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	STD fan	HPR GOLD fan	HPR SLVR fan	HPR GOLD fan	35°C (95°F)
185 W	80/81/85	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
195 W	96	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
205 W	76/84/85	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
225 W	79	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	HPR GOLD fan*	HPR GOLD fan*	35°C (95°F)
250 W	76	STD fan	STD fan	STD fan	STD fan	STD fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
270 W	71/75	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	Required DLC	Required DLC	35°C (95°F)
300 W	75/76/81	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan	Required DLC	Required DLC	35°C (95°F)
350 W	79	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan*	Required DLC	Required DLC	35°C (95°F)
350 W	57/66	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	35°C (95°F)

NOTE: ^The fan speed in the 3.5-inch chassis is limited to 70% due to the drive dynamic profile.

NOTE: *Supported ambient temperature is 30°C (86°F).

Table 46. Thermal restriction matrix for memory with air cooled configuration (non-GPU)

Configuration		No backplane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe	12 x 3.5-inch	
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	No rear drives	No rear drives	No rear drives	2.5-inch rear drives with rear fan
DIMM Configuration	2DPC/ Power	STD fan (CPU TDP <= 250 W)					HPR SLVR fan (CPU TDP up to 350 W)		STD fan (CPU TDP <= 165 W)	HPR GOLD fan (CPU TDP up to 350 W)	HPR GOLD fan 70% (CPU TDP up to 250 W)^	
256 GB RDIMM	12.7 W	30°C (86°F)	N/A	N/A	N/A	N/A	35°C (95°F)	35°C (95°F)	N/A	N/A	N/A	N/A
128 GB RDIMM	8.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
64 GB RDIMM	6.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
32 GB RDIMM	4.1 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
16 GB RDIMM	3 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
DIMM Configuration	2DPC/ Power	HPR SLVR fan (CPU TDP up to 350 W)								HPR GOLD fan (CPU TDP up to 350 W)	HPR GOLD fan 70% (CPU TDP up to 250 W)	
256 GB RDIMM	12.7 W	30°C (86°F)	Required DLC	Required DLC	Required DLC	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	Required DLC	30°C (86°F), Required DLC	30°C (86°F), Required DLC
128 GB RDIMM	8.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
64 GB RDIMM	6.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
32 GB RDIMM	4.1 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
16 GB RDIMM	3 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)

NOTE: In 12 x 3.5-inch with rear module configuration, for CPU TDP greater than 270 W and specific Low Temperature-case CPUs are not supported.

NOTE: ^The fan speed in the 3.5-inch chassis is limited to 70% due to the drive dynamic profile.

Table 47. Thermal restriction matrix for rear NVMe drives with air cooled configuration (non-GPU)

Configuration			24 x 2.5-inch SAS		12 x 3.5-inch	
Rear storage			2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan
Drive type	Drives capacity	Power	HPR SLVR fan		HPR GOLD fan 70%	
Kioxia CD7	15.36 TB	19 W	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
Samsung PM9A3	7.68 TB	14 W	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)
Samsung PM1733	15.36 TB	22 W	30°C (86°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)
Samsung PM1733a	15.36 TB	19.7 W	35°C (95°F)	30°C (86°F)	30°C (86°F)	N/A
Samsung PM1735a	12.8 TB	19.8 W	35°C (95°F)	30°C (86°F)	30°C (86°F)	N/A
Intel P5520	15.36 TB	20 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)

Table 48. Thermal restriction matrix for GPU configurations

Configuration		No backplane	8 x 2.5-inch NVMe	8 x 2.5-inch NVMe + 8 x 2.5-inch SAS	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS	16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives
CPU TDP/ cTDP	T-Case max center (°C)	HPR GOLD fan with 1U HPR L-Type HSK							
125 W	79	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
150 W	72/78/79	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
165 W	82/84	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
185 W	80/81/85	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
195 W	96	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)
205 W	76/84/85	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
225 W	79	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
250 W	76	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
270 W	75	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
270 W	71	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)

Table 48. Thermal restriction matrix for GPU configurations (continued)

Configuration		No backplane	8 x 2.5-inch NVMe	8 x 2.5-inch NVMe + 8 x 2.5-inch SAS	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS	16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives
CPU TDP/ cTDP	T-Case max center (°C)	HPR GOLD fan with 1U HPR L-Type HSK							
300 W	75/76/81	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)
350 W	79	30°C (86°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)	Required DLC	Required DLC	Required DLC
350 W	57/66	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC	Required DLC

Table 49. GPU type support thermal restriction for both Air cooling and Liquid cooling configuration

Configuration	8 x 2.5-inch NVMe	16 x 2.5-inch SAS and split NVMe-SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS	16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe
Rear storage	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	No rear drives
GPU	HPR GOLD fan with 1U HPR L-Type HSK					
A40 (Max 2)	35°C (95°F)	35°C (95°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)
A100 80 GB (Max 2)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
A16 (Max 2)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
A30 (Max 2)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
A2 (Max 6)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
H100 (Max 2)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
A800 (Max 2)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)

Table 50. Thermal restriction matrix for memory with air cooled configuration (GPU)

Configuration		No backplane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS*	16 x 2.5-inch NVMe**	24 x 2.5-inch SAS*	16 x 2.5-inch SAS + 8 x 2.5-inch NVMe***	24 x 2.5-inch NVMe***
DIMM Configuration	2DPC/ Power	HPR GOLD fan with 1U HPR L-Type HSK						
256 GB RDIMM	12.7 W	30°C (86°F)	30°C (86°F)	30°C (86°F)	30°C (86°F)	Required DLC	Required DLC	Required DLC
128 GB RDIMM	8.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
64 GB RDIMM	6.9 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)
32 GB RDIMM	4.1 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)

Table 50. Thermal restriction matrix for memory with air cooled configuration (GPU) (continued)

Configuration		No backplane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS*	16 x 2.5-inch NVMe**	24 x 2.5-inch SAS*	16 x 2.5-inch SAS + 8 x 2.5-inch NVMe***	24 x 2.5-inch NVMe***
DIMM Configuration	2DPC/ Power	HPR GOLD fan with 1U HPR L-Type HSK						
16 GB RDIMM	3 W	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)	35°C (95°F)

NOTE: *In 16 x 2.5-inch SAS and 8 x 2.5-inch NVMe configurations, for CPU TDP 350 W supported ambient temperature is 30°C (86°F).

NOTE: **In 16 x 2.5-inch NVMe configuration, for CPU TDP greater than 300 W supported ambient temperature is 30°C (86°F).

NOTE: ***In 24 x 2.5-inch SAS/NVMe configuration and 16 x 2.5-inch SAS + 8 x 2.5-inch NVMe, for CPU TDP 270 W - 300 W and specific Low Temperature-case CPUs supported ambient temperature is 30°C (86°F).

Table 51. Thermal restriction for memory with liquid cooled configuration(non-GPU)

Configuration		No back plane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe	12 x 3.5-inch^			Ambient temperature
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	No rear drives	No rear drives	No rear drives	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	
DIMM Configuration	Power	Fan												
256 GB RDIMM	12.7 W	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR SLVR fan	HPR GOLD fan*	HPR GOLD fan*	HPR GOLD fan*	35°C (95°F)
128 GB RDIMM	8.9 W	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
64 GB RDIMM	6.9 W	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
32 GB RDIMM	4.1 W	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)
16 GB RDIMM	3 W	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	STD fan	HPR GOLD fan	HPR GOLD fan	HPR GOLD fan	35°C (95°F)

NOTE: ^The fan speed in the 3.5-inch chassis is limited to 70% due to the drive dynamic profile.

NOTE: *Supported ambient temperature is 30°C (86°F).

Table 52. Thermal restriction for memory with liquid cooled configuration(GPU)

Configuration		No backplane	8 x 2.5-inch NVMe	16 x 2.5-inch SAS	16 x 2.5-inch NVMe	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch NVMe	24 x 2.5-inch NVMe	Ambient temperature
Rear storage		No rear drives	No rear drives	No rear drives	No rear drives	No rear drives	2 x 2.5-inch with rear fan	4 x 2.5-inch with rear fan	No rear drives	No rear drives	
DIMM Configuration	Power	Fan									
256 GB RDIMM	12.7 W	HPR GOLD fan									35°C (95°F)
128 GB RDIMM	8.9 W										
64 GB RDIMM	6.9 W										
32 GB RDIMM	4.1 W										
16 GB RDIMM	3 W										

Thermal air restrictions

Table 53. Air cooling configurations thermal restriction for AHSRAE A3 and A4

ASHRAE	A3/40°C (104°F)	A4/45°C (113°F)
PSU	Two PSUs are required in redundant mode. If there is PSU failure, system performance may be reduced.	
PCIe card	Non-Dell qualified peripheral cards and peripheral cards greater than 25 W are not supported.	
GPU/FPGA	Not supported	
DIMM	128 GB, or greater capacity DIMMs are not supported.	
PCIe SSD	Not supported	
Front storage	Not supported in 12 x 3.5-inch SAS configuration.	
Rear storage	Not supported	
Fan	HPR SLVR fans are required.	
Processor	≤ 165 W	≤ 125 W
OCP	Supported with 85°C (185°F) active optic cable.	Supported with 85°C (185°F) active optic cable and cards tier ≤4.
BOSS	BOSS-N1 is supported.	BOS-N1 is not supported.

Table 54. Liquid cooling configurations thermal restriction for AHSRAE A3 and A4

ASHRAE	A3/40°C (104°F)	A4/45°C (113°F)
PSU	Two PSUs are required in redundant mode. If there is PSU failure, system performance may be reduced.	
PCIe card	Non-Dell qualified peripheral cards and peripheral cards greater than 25 W are not supported.	
GPU/FPGA	Not supported	

Table 54. Liquid cooling configurations thermal restriction for AHSRAE A3 and A4 (continued)

ASHRAE	A3/40°C (104°F)	A4/45°C (113°F)
DIMM	128 GB, or greater capacity DIMMs are not supported.	
PCIe SSD	Not supported	
Front storage	Not supported in 12 x 3.5-inch SAS configuration.	
Rear storage	Not supported	
Fan	HPR SLVR fans are required in 2.5-inch configurations systems.	
OCP	Supported with 85°C (185°F) active optic cable.	Supported with 85°C (185°F) active optic cable and cards tier ≤4.
BOSS	BOSS-N1 is supported.	BOSS-N1 is not supported.

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Appendix B. Standards compliance

The system conforms to the following industry standards.

Table 55. Industry standard documents

Standard	URL for information and specifications
ACPIAdvance Configuration and Power Interface Specification, v2.0c	https://uefi.org/specsandtesttools
Ethernet IEEE 802.3-2005	https://standards.ieee.org/
HDGHardware 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
DDR5 Memory DDR5 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	http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_I_Rev_1-1_20070205.pdf
SAS Serial Attached SCSI, v1.1	http://www.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. 2.7	usb.org/developers/docs

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Appendix C Additional resources

Table 56. 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 indicator codes • System BIOS • Remove and replace procedures • 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	Dell.com/Support/Manuals
Rack Installation Guide	This document ships with the rack kits, and provides instructions for installing a server in a rack.	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 contact information.	Inside the system chassis cover
Enterprise Infrastructure Planning Tool (EIPT)	The Dell online EIPT enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use EIPT to calculate the power consumption of your hardware, power infrastructure, and storage.	Dell.com/calc

Dell PowerEdge R760

Technical Guide

Regulatory Model: E82S Series
Regulatory Type: E82S001
February 2023
Rev. A00

DELL Technologies

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.

Contents

1

System overview

The Dell PowerEdge R760 is Dell's latest two-socket, rack server that is designed to run complex workloads using highly scalable memory, I/O, and network options.

The system features:

- Up to 2 x 4th Gen Intel® Xeon® Scalable Processors with up to 56 cores
- Optional Direct Liquid Cooling for required CPU SKU and/or configurations
- 32 DDR5 DIMM slots
- Two redundant AC or DC power supply units
- Up to 12 x 3.5-inch SAS/SATA, or 24 x 2.5-inch, 16 x 2.5-inch, 8 x 2.5-inch, or 2 x 2.5-inch(rear), 4 x 2.5-inch(rear) SAS, SATA, or NVMe (HDD/SSD) drives
- PCI Express® (PCIe) 5.0 enabled expansion slots
- Network interface technologies to cover Network Interface Card (NIC)

Topics:

Key workloads

The Dell PowerEdge R760 offers powerful performance in a purpose-built, cyber resilient, mainstream server. Ideal for:

- Mixed Workload Standardization
- Database and Analytics
- Virtual Desktop Infrastructure
- Artificial Intelligence and Machine Learning

New technologies

Table 1. New technologies

Technology	Detailed Description
4th Gen Intel® Xeon® Scalable Processors	Core count: Up to 56 core processor
	UPI speed: Up to 4 links per CPU, speed: 12.8 GT/s, 14.4 GT/s, 16 GT/s
	Maximum number of PCIe lanes per CPU: Integrated 80 PCIe 5.0 lanes @ 32GT/s PCIe Gen5
	Maximum TDP: 350 W
4800 MT/s DDR5 Memory	Max 16 DIMM per processor and 32 DIMMs per system
	Supports DDR5 ECC RDIMM
Flex I/O	Optional LOM board, 2x1Gb with BCM5720 LAN controller
	Rear I/O with: • 1x Dedicated iDRAC Ethernet port • 1 x USB 3.0 • 1 x USB 2.0 • 1 x VGA port (optional for Direct Liquid Cooling configuration)

Table 1. New technologies (continued)

Technology	Detailed Description
	Serial Port Option with STD RIO board
	Optional OCP Mezz 3.0 (supported by x8 PCIe lanes)
	Front I/O with: • 1 x USB 2.0 • 1x iDRAC Direct (Micro-AB USB) port • 1 x VGA port
CPLD 1-wire	Support payload data of Front PERC, Riser, BP and Rear IO to BOSS-N1 and iDRAC
Dedicated PERC	Front Storage module PERC with Front PERC11 & PERC12
Software RAID	OS RAID / S160
Power Supplies	60 mm dimension is the new PSU form factor on 15G design
	Titanium 700 W AC/HVDC
	Platinum 800 W AC/HVDC
	Titanium 1100 W AC/HVDC
	Platinum 1400 W AC/HVDC
	1100 W -48 LVDC
	Titanium 1800 W AC/HVDC
	86 mm dimension PSU
	Platinum 2400 W AC/HVDC
	Titanium 2800 W AC/HVDC

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System features and generational comparison

The following table shows the comparison between the PowerEdge R760 with the PowerEdge R750.

Table 2. Features comparison

Features	PowerEdge R760	PowerEdge R750
Processors	2 x 4th Gen Intel® Xeon® Scalable Processors	2 x 3rd Generation Intel® Xeon® Processor Scalable Family
CPU interconnect	Intel Ultra Path Interconnect (UPI)	Intel Ultra Path Interconnect (UPI)
Memory	• 32 x DDR5 RDIMM • Up to 4800 MT/s (1 DPC) / 4400 MT/s (2 DPC)	• 32 x DDR4 RDIMM, LRDIMM • 16 x PMem (Intel Optane Persistent Memory 200 Series)
Storage Controllers	• PERC 11G: H755, H755N, H355 • PERC 12G: H965i • HBA 11: HBA355i, HBA355e • BOSS-N1 • Software RAID: S160	• PERC 10G: H345, H745, H840 • PERC 11G: H755, H755N, H355 • HBA 11: HBA355i, HBA355e • BOSS-S1 adapter • BOSS-S2 • Software RAID: S150
Drive Bays	Front bays: • 3.5 inches, 2.5 inches - 24Gb SAS, 6Gb SATA • 2.5 inches - Gen3/4 NVMe Rear bay: • 2.5 inches - 24Gb SAS, 6Gb SATA, Gen3/4 NVMe	Front bays: • 3.5 inches, 2.5 inches - 12Gb SAS, 6Gb SATA • 2.5 inches - Gen3/4 NVMe Rear bay: • 2.5 inches - 12Gb SAS, 6Gb SATA, Gen3/4 NVMe
Power Supplies	• AC (Platinum): 800 W, 1400 W, 2400 W • AC (Titanium): 700 W, 1100 W, 1800 W, 2800 W • LVDC @-48VDC Input: 1100 W	• AC (Platinum): 800 W, 1400 W, 2400 W • AC (Titanium): 700 W, 1100 W • LVDC @-48VDC Input: 1100 W
Cooling Options	• Air Cooling • Optional Direct Liquid Cooling (DLC)	• Air Cooling • Optional Direct Liquid Cooling (DLC)
	NOTE: DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.	**NOTE:** DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.
Fans	Standard (STD) fans /High performance Silver (HPR) fans/ High performance Gold (VHP) fans	Standard (STD) fans /High performance Silver (HPR) fans/ High performance Gold (VHP) fans
	Up to six hot swap fans	Up to six hot swap fans
Dimension	Height: 86.8 mm (3.41 inches)	Height: 86.8 mm (3.41 inches)
	Width: 482 mm (18.97 inches)	Width: 482 mm (18.97 inches)
	Depth: 772.13 mm (30.39 inches) with bezel	Depth: 772.13 mm (30.39 inches) with bezel
	758.29 mm (29.85 inches) without bezel	758.29 mm (29.85 inches) without bezel

Table 2. Features comparison (continued)

Features	PowerEdge R760	PowerEdge R750
Form Factor	2U rack server	2U rack server
Embedded Management	• iDRAC9 • iDRAC Direct • iDRAC RESTful with Redfish • iDRAC Service Manual • Quick Sync 2 wireless module	• iDRAC9 • iDRAC Direct • iDRAC Service Module • Quick Sync 2 wireless module
Bezel	Optional LCD bezel or security bezel	Optional LCD bezel or security bezel
OpenManage Software	• CloudIQ for PowerEdge plug in • OpenManage Enterprise • OpenManage Enterprise Integration for VMware vCenter • OpenManage Integration for Microsoft System Center • OpenManage Integration with Windows Admin Center • OpenManage Power Manager plugin • OpenManage Service plugin • OpenManage Update Manager plugin	• OpenManage Enterprise • OpenManage Power Manager plugin • OpenManage SupportAssist plugin • OpenManage Update Manager plugin
Mobility	OpenManage Mobile	OpenManage Mobile
Integrations and Connections	OpenManage Integrations • BMC TrueSight • Microsoft System Center • OpenManage Integration with ServiceNow • Red Hat Ansible Modules • Terraform Providers • VMware vCenter and vRealize Operations Manager	OpenManage Integrations • BMC TrueSight • Microsoft System Center • Red Hat Ansible Modules • VMware vCenter • IBM Tivoli Netcool/ OMNIbus • IBM Tivoli Network Manager IP Edition • Micro Focus Operations Manager • Nagios Core • Nagios XI
Security	• Cryptographically signed firmware • Secure Boot • Secure Erase • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ • Secured Component Verification (Hardware integrity check) • Data at Rest Encryption (SEDs with local or external key mgmt)	• Cryptographically signed firmware • Secure Boot • Secure Erase • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 1.2/2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ
Embedded NIC	2 x 1 GbE LOM (optional)	2 x 1 GbE LOM
Networking Options	OCP x8 (optional) Mezz 3.0 **NOTE:** The system allows either LOM card or an OCP card or both to be installed in the system.	OCP x8 Mezz 3.0
GPU Options	Up to two double wide 350 W, or six single wide 75 W accelerators	Up to two double wide 300 W, or eight single wide 75 W accelerators
Ports	Front Ports • 1 x USB 2.0 • 1 x USB 3.0 Rear Ports • 1 x USB 2.0	Front Ports • 1 x USB 2.0 • 1 x USB 3.0 Rear Ports • 1 x USB 2.0 • 1 x Dedicated iDRAC Ethernet port

Table 2. Features comparison (continued)

Features	PowerEdge R760		PowerEdge R750	
	• 1 x iDRAC Direct (Micro-AB USB) port	• 1 x Dedicated iDRAC Ethernet port • 1 x USB 3.0 • 1 x Serial port (optional) • 1 x VGA (optional for Direct Lliquid Cooling configuration)	• 1 x iDRAC Direct (Micro-AB USB) port	• 1 x USB 3.0 • 1 x Serial port (optional) • 1 x VGA (optional for Direct Liquid Cooling configuration)
	Internal Port: 1 x USB 3.0 (optional)		Internal Port: 1 x USB 3.0 (optional)	
PCIe	Up to 8 x PCIe Gen4 or up to 4 x PCIe Gen5 slots		UP to 8 x PCIe Gen4 slots	
Operating System and Hypervisors	• Canonical Ubuntu Server LTS • Microsoft Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.		• Canonical Ubuntu Server LTS • Citrix Hypervisor • Windows Server LTSC with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.	

3

Chassis views and features

Topics:

- Front view of the system
- Rear view of the system
- Inside the system
- Quick Resource Locator

Front view of the system

Figure 1. Front view of 24 x 2.5-inch drive system

Figure 2. Front view of 16 x 2.5-inch drive system

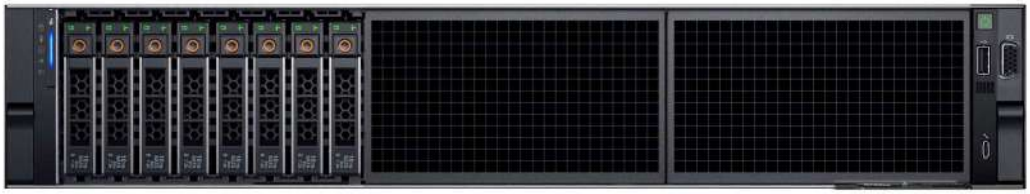

Figure 3. Front view of 8 x 2.5-inch drive system

Figure 4. Front view of 12 x 3.5-inch drive system

Rear view of the system

Figure 5. Rear view of the system

Figure 6. Rear view of the system with optional liquid cooling

Figure 7. Rear view of the system with 2 x 2.5-inch rear drive module

Figure 8. Rear view of the system with 4 x 2.5-inch rear drive module

Inside the system

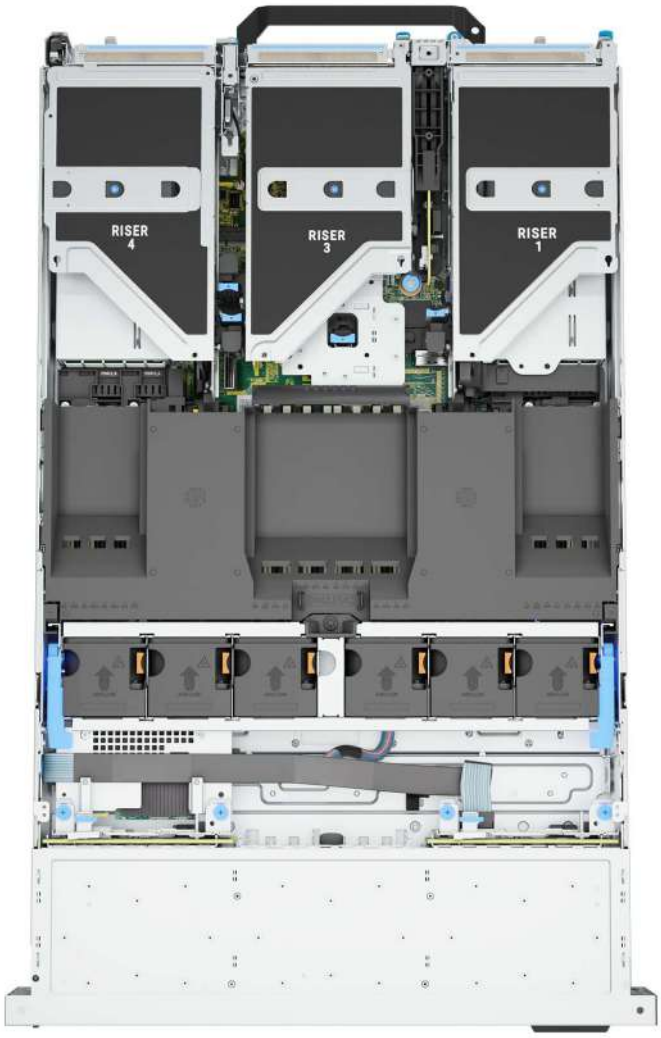

Figure 9. Inside the system

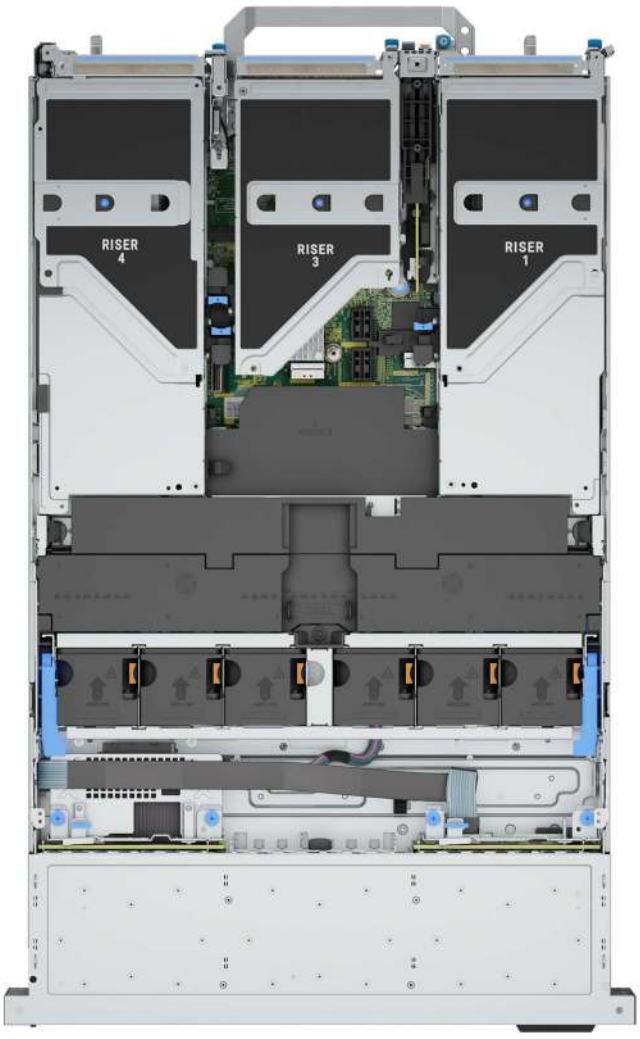

Figure 10. Inside the system with full length risers and GPU shroud

Figure 11. Inside the system with processor liquid cooling module

NOTE: Air shroud is hidden in the above image to show the processor liquid cooling configuration.

Quick Resource Locator

The QRL on everything (SILs, GSG, Owner's Manual except on the EST) is a generic QRL for R760 that leads to a webpage for that product. That webpage has links for things like setup and service videos, iDRAC manual, and other things that apply to the platform. The QRL on the EST is unique and specific to that service tag and will contain the Service Tag number and the iDRAC password. The label and the QRL code within it are printed on demand at the L10 factories. This QRL links to a webpage that shows the exact configuration as built for that customer, and the specific warranty purchased. It is one click away from the same content of generic information that applies to R760 that is available in the other QRLs.

Figure 12. Quick Resource Locator for PowerEdge R760 system

4

Processor

Topics:

- Processor features

Processor features

The Intel 4th Generation Xeon® Scalable Processors stack is the next generation data center processor offering with significant performance increases, integrated acceleration, and next generation memory and I/O. Sapphire Rapids accelerate customer usages with unique workload optimizations.

The following lists the features and functions that are in the upcoming 4th Generation Intel® Xeon Scalable Processor offering:

- Faster UPI with up to four Intel Ultra Path Interconnect (Intel UPI) at up to 16 GT/s, increasing multisocket bandwidth
- More, faster I/O with PCI Express 5 and up to 80 lanes (per socket)
- Enhanced Memory Performance with DDR5 support and memory speed up to 4800 MT/s in one DIMM per channel (1DPC) and 4400 MT/s in two DIMM per channel (2DPC)
- New built-in accelerators for data analytics, networking, storage, crypto, and data compression

Supported processors

The following table shows the Intel Sapphire Rapids SKUs that are supported on the R760.

Table 3. Supported Processors for R760

Processor	Clock Speed (GHz)	Cache (M)	UPI (GT/s)	Cores	Threads	Turbo	Memory Speed (MT/s)	Memory Capacity	TDP
8480+	2	105	16	56	112	Turbo	4800	6 TB	350 W
8471N	1.8	98	16	52	104	Turbo	4800	6 TB	300 W
8470Q *	2.1	98	16	52	104	Turbo	4800	6 TB	350 W
8470N	1.7	98	16	52	104	Turbo	4800	6 TB	300 W
8470	2	98	16	52	104	Turbo	4800	6 TB	350 W
8468	2.1	90	16	48	96	Turbo	4800	6 TB	350 W
8460Y+	2	75	16	40	80	Turbo	4800	6 TB	300 W
8452Y	2	68	16	36	72	Turbo	4800	6 TB	300 W
6454S	2.2	60	16	32	64	Turbo	4800	6 TB	270 W
6430	2.1	60	16	32	64	Turbo	4800	6 TB	270 W
6414U	2	60	16	32	64	Turbo	4800	6 TB	250 W

NOTE: *8470Q is supported only in liquid cooling configuration.

5

Memory subsystem

Topics:

- Supported memory

Supported memory

Table 4. Memory technology comparison

Feature	PowerEdge R760 (DDR5)
DIMM type	RDIMM
Transfer speed	4800 MT/s (1DPC), 4400 MT/s (2DPC)
Voltage	1.1 V

Table 5. Supported memory matrix

DIMM type	Rank	Capacity	DIMM rated voltage and speed	Operating Speed	
				1 DIMM per channel (DPC)	2 DIMMs per channel (DPC)
RDIMM	1 R	16 GB	DDR5 (1.1 V), 4800 MT/s	4800 MT/s	4400 MT/s
	2 R	32 GB, 64 GB	DDR5 (1.1 V), 4800 MT/s	4800 MT/s	4400 MT/s
	4 R	128 GB	DDR5 (1.1 V), 4800 MT/s	4800 MT/s	4400 MT/s
	8 R	256 GB	DDR5 (1.1 V), 4800 MT/s	4800 MT/s	4400 MT/s

NOTE: The processor may reduce the performance of the rated DIMM speed.

6

Storage

Topics:

Storage controllers

Dell RAID controller options offer performance improvements, including the fPERC solution. fPERC provides a base RAID HW controller without consuming a PCIe slot by using a small form factor and high-density connector to the base planar.

16G PERC Controller offerings are a heavy leverage of 15G PERC family. The Value and Value Performance levels carry over to 16G from 15G. New to 16G is the Avenger-based Premium Performance tier offering. This high-end offering drives IOPs performance and enhanced SSD performance.

Table 6. PERC Series controller offerings

Performance Level	Controller and Description
Entry	S160
Value	H355, HBA355 (internal/external)
Value Performance	H755, H755N
Premium Performance	H965i, Avenger 1 Memory: 8GB DDR4 NV cache 72-bit memory 2133 MHz Low profile form factors Dual A15 1.2 GHz CPU X8PCIe 3.0, x8 12Gb SAS

NOTE: For more information about the features of the Dell PowerEdge RAID controllers (PERC), Software RAID controllers, or BOSS card, and on deploying the cards, see the storage controller documentation at www.dell.com/storagecontrollermanuals.

NOTE: From December 2021, H355 replaces H345 as the entry raid controller. H345 is deprecated in January 2022.

Supported Drives

The table shown below lists the internal drives supported by the R760.

Table 7. Supported Drives

Form Factor	Type	Speed	Rotational Speed	Capacities
2.5 inches	vSAS	12 Gb	SSD	1.92 TB, 3.84 TB, 960 GB, 7.62 TB
2.5 inches	SAS	24 Gb	SSD	1.92 TB, 1.6 TB, 800 GB, 3.84 TB, 960 GB, 7.68 TB
2.5 inches	SATA	6 Gb	SSD	1.92 TB, 480 GB, 960 GB, 3.84 TB
2.5 inches	NVMe	Gen4	SSD	1.6 TB, 3.2 TB, 6.4 TB, 1.92 TB, 3.84 TB, 15.63 TB, 7.68 TB, 800 GB, 400 GB
2.5 inches	DC NVMe	Gen4	SSD	3.84 TB, 960 GB
2.5 inches	SAS	12 Gb	10 K	600 GB, 1.2 TB, 2.4 TB
3.5 inches	SATA	6 Gb	7.2 K	2 TB, 4 TB, 8 TB, 12 TB, 16 TB, 20 TB
3.5 inches	SAS	12 Gb	7.2 K	2 TB, 4 TB, 8 TB, 12 TB, 16 TB, 20 TB

Internal storage configuration

R760 available internal storage configurations:

- Zero drives (no backplane)
- 12x3.5" (SAS/SATA)
- 12x3.5" w/ rear 2x2.5" (SAS/SATA)
- 12x3.5" w/ rear 2x2.5" NVMe
- 12x3.5" + 4x2.5" (SAS/SATA)
- 12x3.5" (SAS/SATA) + 4x2.5" (NVMe)
- 8x2.5" NVMe
- 8x2.5" (NVMe RAID)
- 8x2.5" Universal
- 16x2.5" (NVMe RAID)
- 16x2.5" (NVMe)
- 16x2.5" (SAS4/SATA)
- 16x2.5"(SAS4/SATA)+ 8x2.5" NVMe
- 24x2.5" (SAS4/SATA) with 8x Universal slots
- 24x2.5" (SAS4/SATA)
- 24x2.5" (SAS4/SATA) + 2x2.5" (NVMe)
- 24x2.5"(SAS4/SATA) + 2x2.5" (SAS/SATA)
- 24x2.5"(SAS4/SATA) + 4x2.5" (SAS/SATA)
- 24x2.5" (SAS4/SATA) + 4x2.5" (NVMe)
- 24x2.5" (SAS4/SATA) - Dual Controller
- 24x2.5" + 2x2.5" (SAS4/SATA) - Dual Controller
- 24x2.5" (SAS4/SATA) with 8x Universal slots
- 24x2.5" (SAS4/SATA)
- 24x2.5" (SAS4/SATA) - Dual Controller
- 24x2.5" (SAS4/SATA) with 4x Universal slots + 4x2.5" (SAS4/SATA)
- 16x2.5" (8x SAS4/SATA + 8x NVMe RAID)
- 16x2.5" (8x NVMe RAID + 8x SAS4/SATA)
- 24x2.5" (NVMe Gen4) Passive

External Storage

The R760 support the external storage device types listed in the table below.

Table 8. Support External Storage Devices

Device Type	Description
External Tape	Supports connection to external USB tape products
NAS/IDM appliance software	Supports NAS software stack
JBOD	Supports connection to 12 Gb MD-series JBODs

7

Networking

Topics:

Overview

PowerEdge offers a wide variety of options to get information moving to and from our servers. Industry best technologies are chosen, and systems management features are added by our partners to firmware to tie in with iDRAC. These adapters are rigorously validated for worry-free, fully supported use in Dell servers.

OCP 3.0 support

Table 9. OCP 3.0 feature list

Feature	OCP 3.0
Form factor	SFF
PCIe Gen	Gen4
Max PCIe width	x8
Max no. of ports	4
Port type	BT/SFP/SFP+/SFP28/SFP56
Max port speed	100 GbE
NC-SI	Yes
SNAPI	Yes
WoL	Yes
Power consumption	15 W–150 W

Supported OCP cards

Table 10. Supported OCP cards

Form factor	Vendor	Port type	Port speed	Port count
OCP 3.0	Intel	SFP28	25 GbE	4
	Broadcom	SFP28	25 GbE	4
	Intel	SFP28	25 GbE	2
	Broadcom	SFP28	25 GbE	2
	Broadcom	BT	10 GbE	4
	Intel	BT	10 GbE	2

Table 10. Supported OCP cards (continued)

Form factor	Vendor	Port type	Port speed	Port count
	Intel	BT	10 GbE	4
	Broadcom	BT	1 GbE	4
	Intel	BT	1 GbE	4

OCP NIC 3.0 vs. rack Network Daughter Card comparisons

Table 11. OCP 3.0, 2.0, and rNDC NIC comparison

Form Factor	Dell rNDC	OCP 2.0 (LOM Mezz)	OCP 3.0	Notes
PCIe Gen	Gen 3	Gen 3	Gen 4	Supported OCP3 are SFF (small form factor)
Max PCIe Lanes	x8	Up to x16	Up to x8	See server slot priority matrix
Shared LOM	Yes	Yes	Yes	This is iDRAC port redirect
Aux Power	Yes	Yes	Yes	Used for Shared LOM

8

PCIe subsystem

Topics:

- PCIe risers

PCIe risers

Shown below are the riser offerings for the platform.

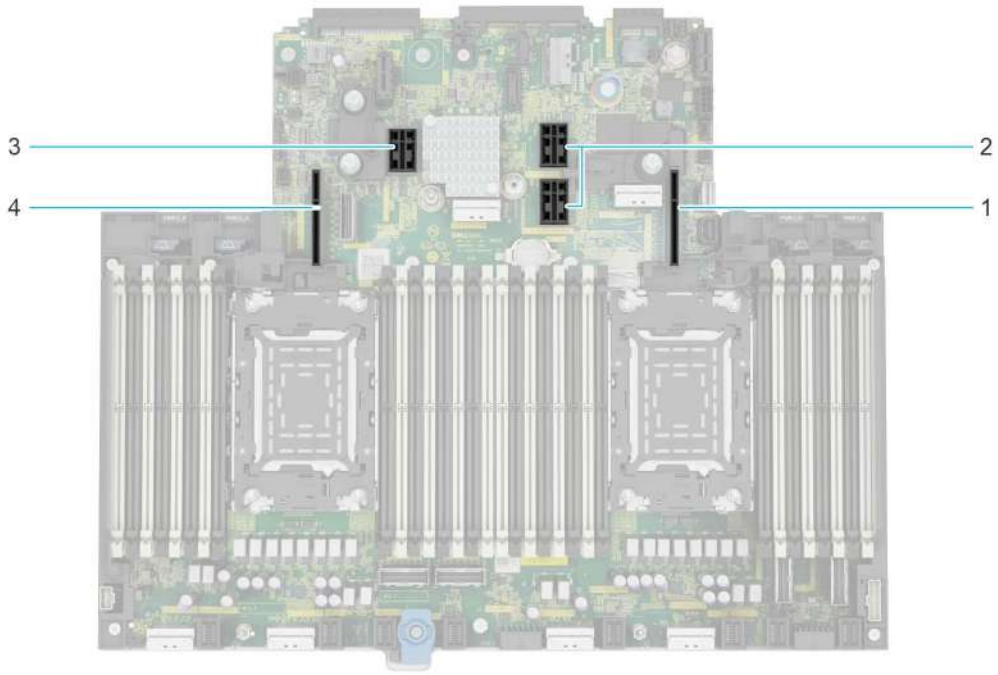

Figure 13. Riser connector location on system board

1. Riser 1
2. Riser 2
3. Riser 3
4. Riser 4

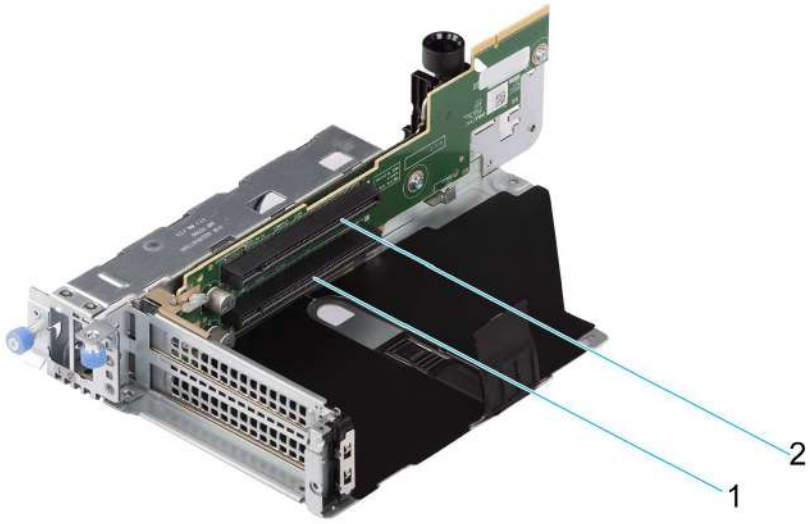

Figure 14. Riser 1B

1. Slot 1
2. Slot 2

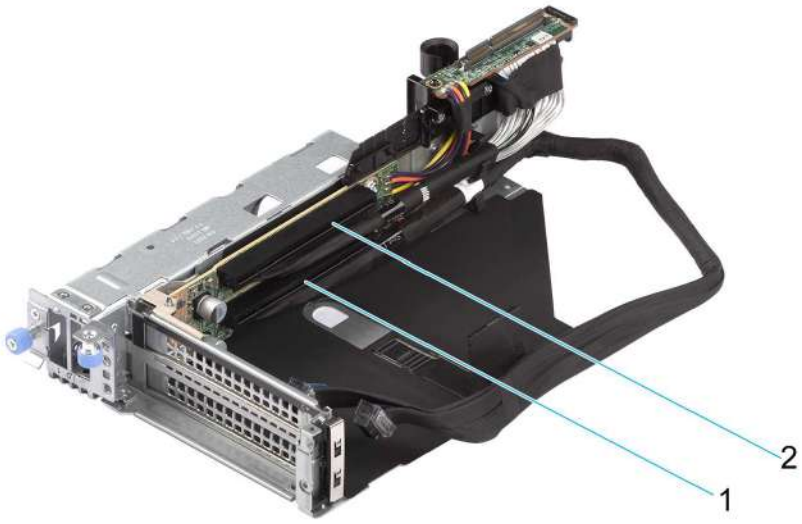

Figure 15. Riser 1R

1. Slot 1
2. Slot 2

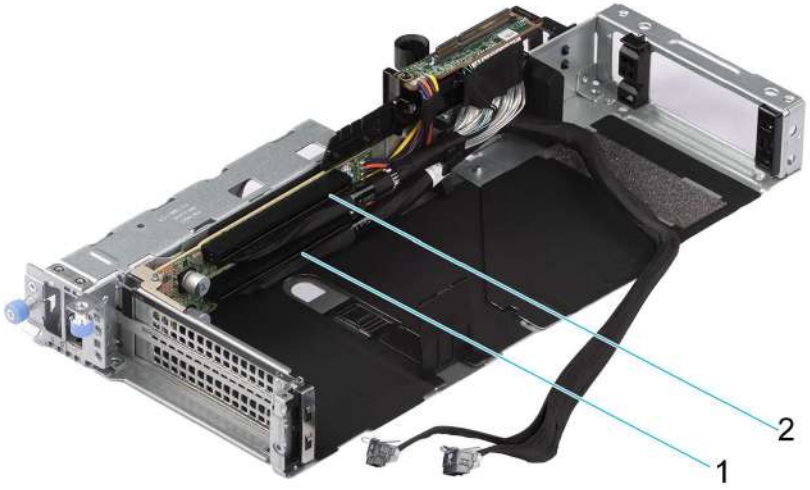

Figure 16. Riser 1R FL

1. Slot 1
2. Slot 2

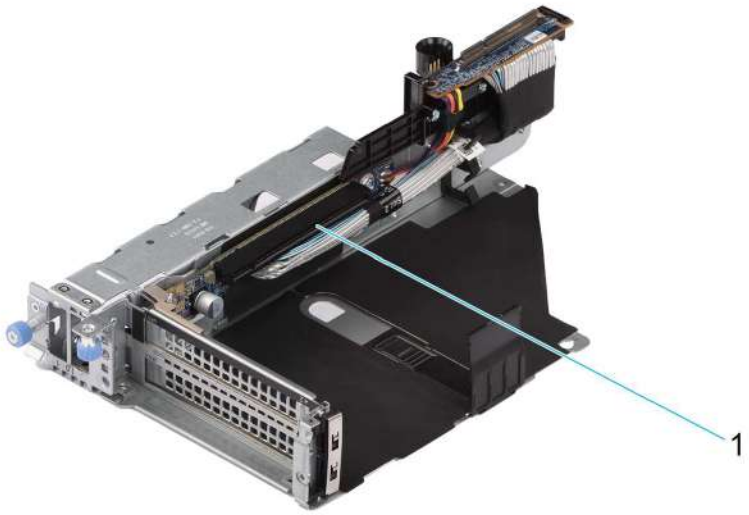

Figure 17. Riser 1P

1. Slot 2

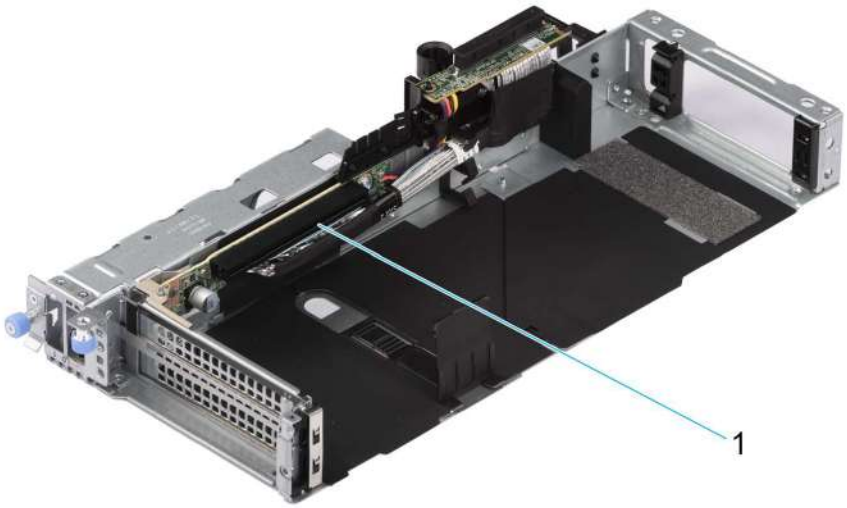

Figure 18. Riser 1P FL

1. Slot 2

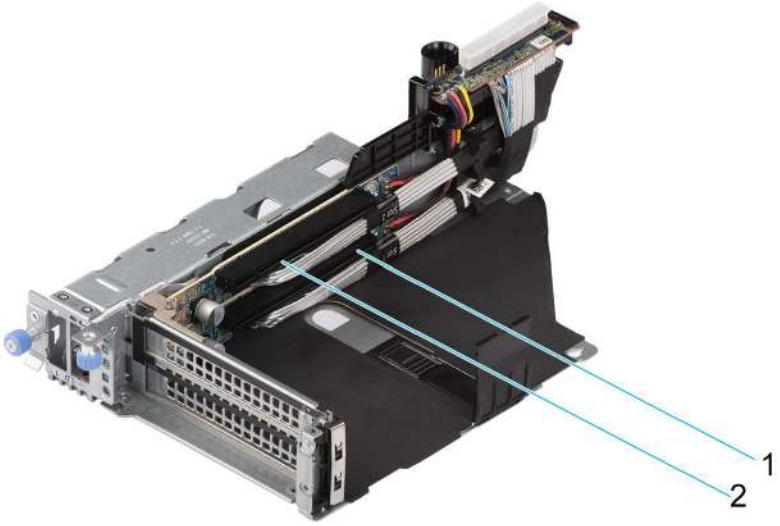

Figure 19. Riser 1Q

1. Slot 1
2. Slot 2

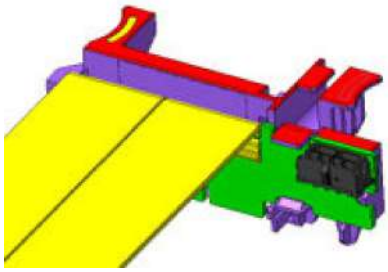

Figure 20. Riser R1 Paddle

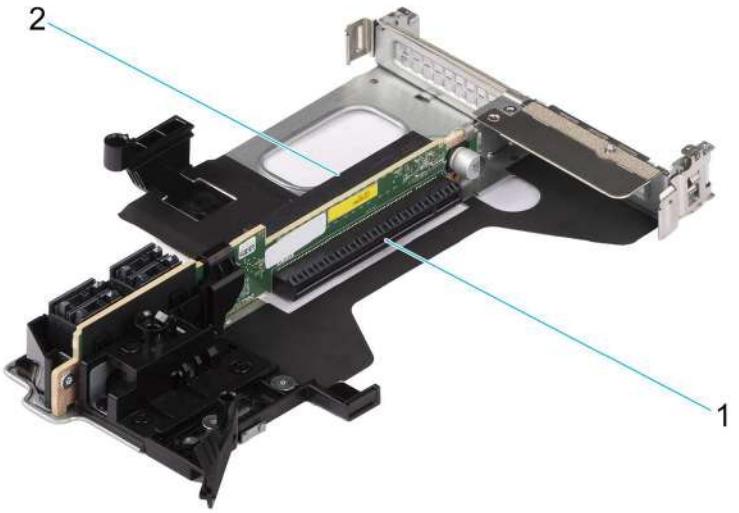

Figure 21. Riser 2A

1. Slot 6
2. Slot 3

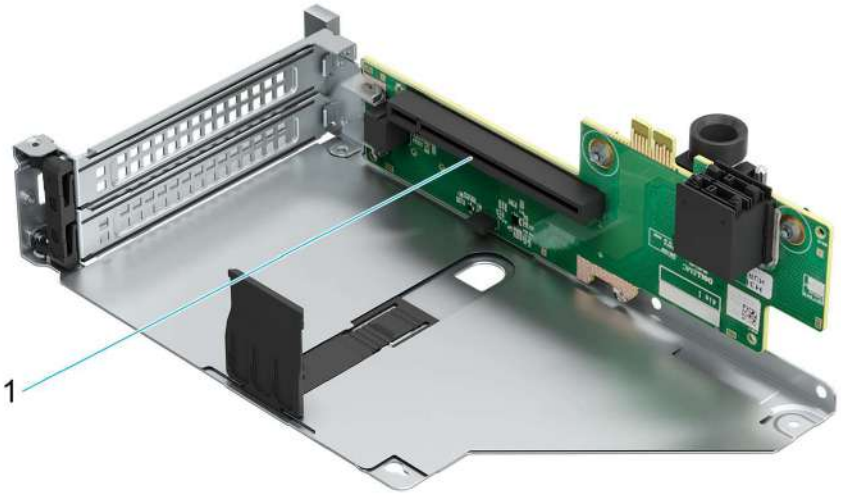

Figure 22. Riser 3A

1. Slot 5

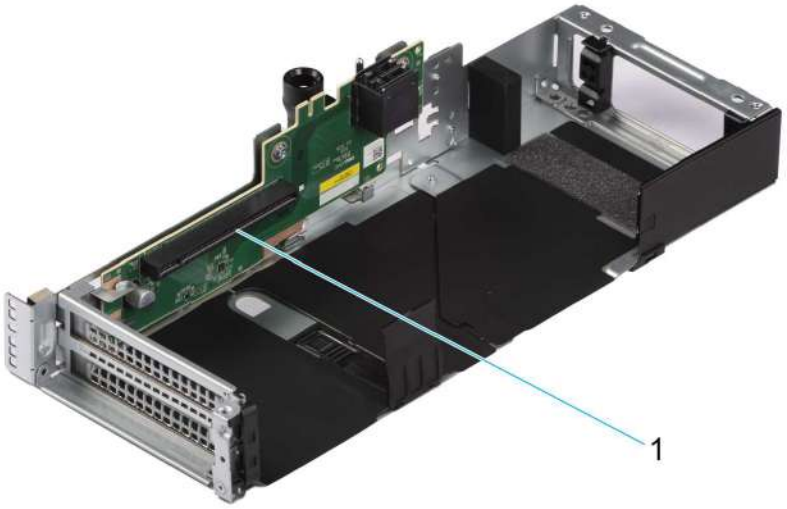

Figure 23. Riser 3A FL

1. Slot 5

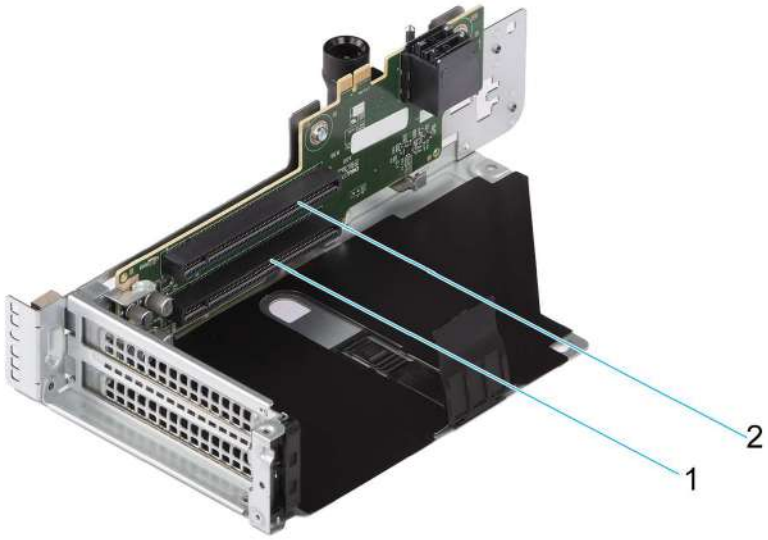

Figure 24. Riser 3B

1. Slot 4
2. Slot 5

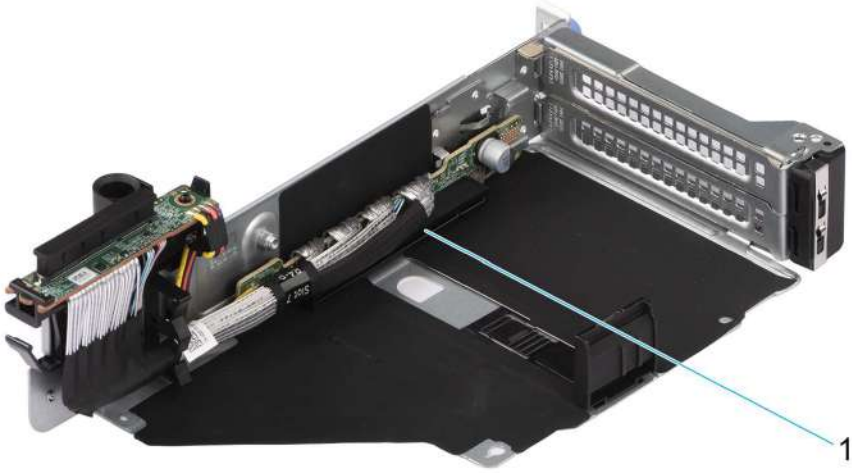

Figure 25. Riser 4P

1. Slot 7

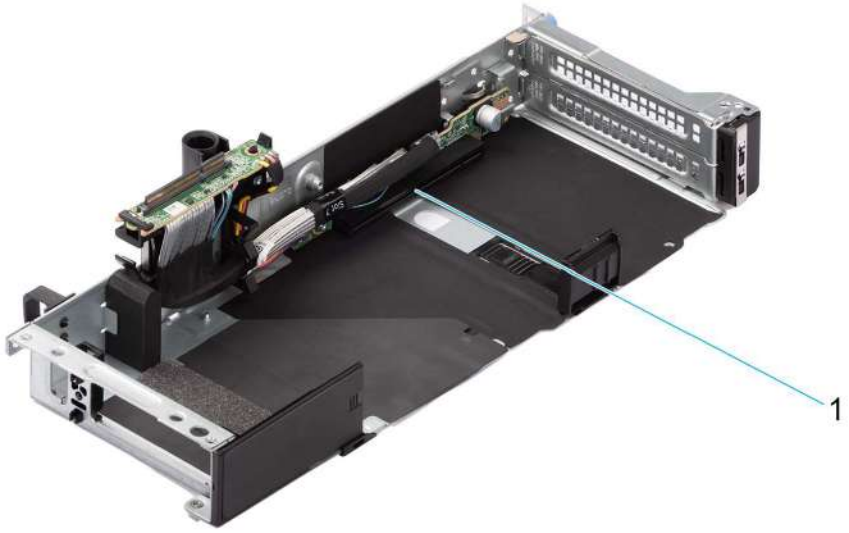

Figure 26. Riser 4P - FL

1. Slot 7

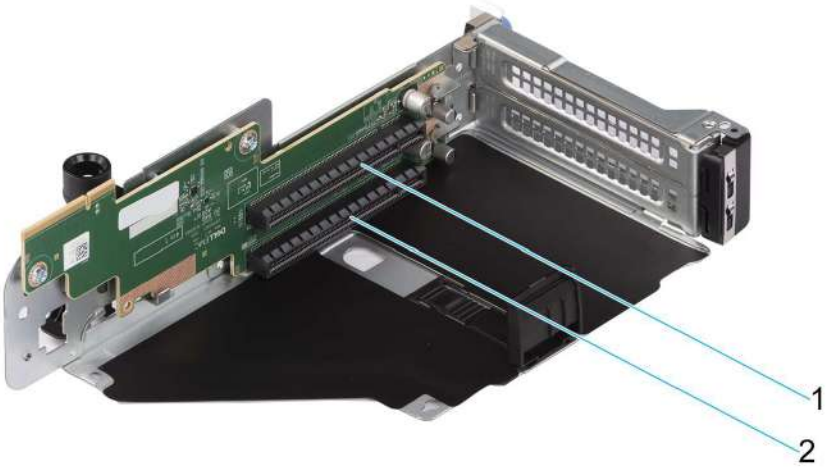

Figure 27. Riser 4B

1. Slot 8
2. Slot 7

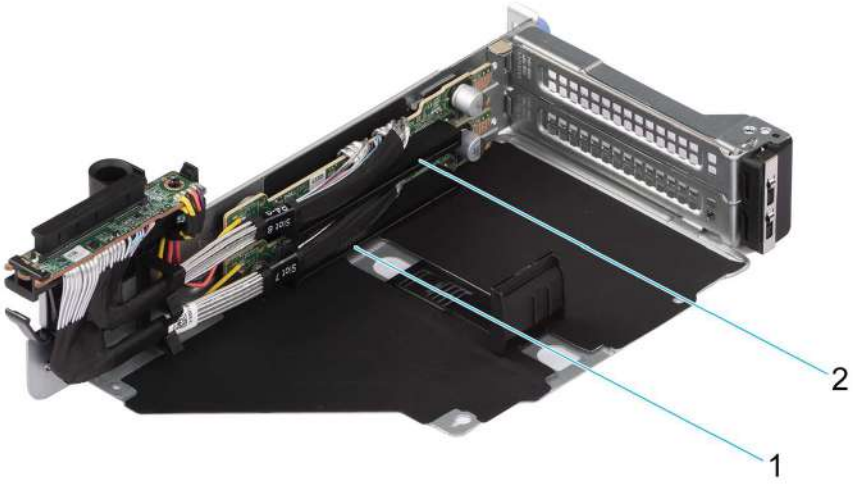

Figure 28. Riser 4Q

1. Slot 7
2. Slot 8

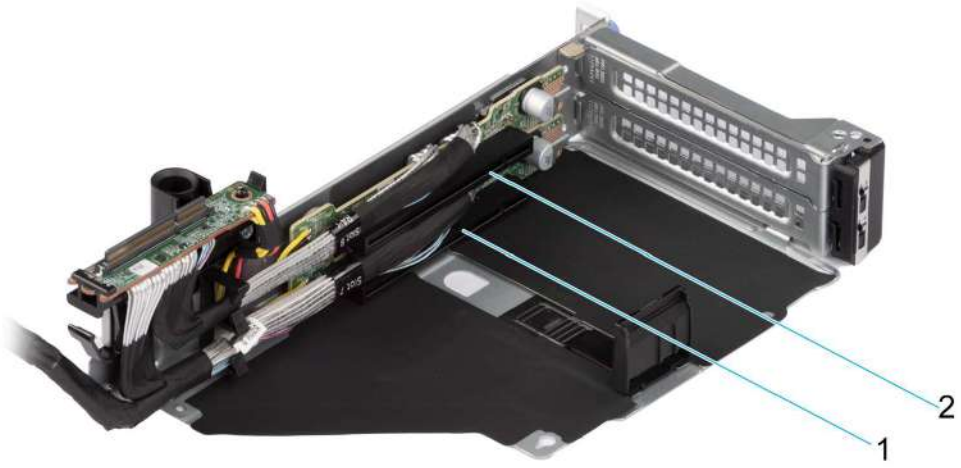

Figure 29. Riser 4R

1. Slot 7
2. Slot 8

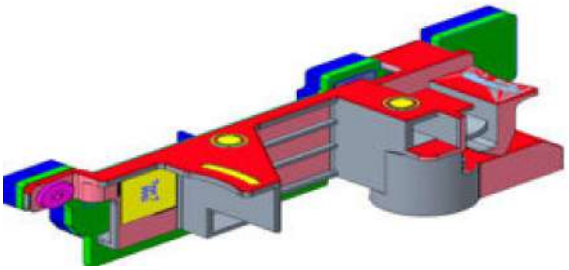

Figure 30. Riser R4 Paddle

Table 12. PCIe Riser Configurations

Config No.	Riser configuration	No. of Processors	PERC type supported	Rear storage possible
0	NO RSR	2	Front PERC	No
1	R1B+R2A+R3B+R4B	2	Front PERC/PERC Adapter	No
2	R1Q+R2A+R3B+R4Q	2	Front PERC/PERC Adapter	No
3-1	R1P+R2A+R3B+R4P (HL)	2	Front PERC/PERC Adapter	No
3-2	R1P+R2A+R3B+R4P (FL)	2	Front PERC/PERC Adapter	No
4-1	R1P+R2A+R3B+R4R (HL)	2	Front PERC/PERC Adapter	No
5-1	R1R+R2A+R3A+R4P (HL)	2	Front PERC/PERC Adapter	No
5-2	R1R+R2A+R3A+R4P (FL)	2	Front PERC/PERC Adapter	No
6	R2A+R4Q	2	Front PERC/PERC Adapter	Yes

Table 12. PCIe Riser Configurations (continued)

Config No.	Riser configuration	No. of Processors	PERC type supported	Rear storage possible
7	R1Q+R2A+R4Q	2	Front PERC/PERC Adapter	Yes
8	R1B+R2A	1	PERC Adapter	No
9	R1Q+R2A+R4R	1	Front PERC	No
10-1	R1P+R2A+R4R (HL)	1	Front PERC	No
10-2	R1P+R2A+R4R (FL)	1	Front PERC	No
11	R1 Paddle + R2A + R3B + R4 Paddle	2	N/A	No
12	R1Q+R2A+R4Q	2	Front PERC/PERC Adapter	Yes

9

Power, thermal, and acoustics

PowerEdge servers have an extensive collection of sensors that automatically track thermal activity, which helps to regulate temperature by reducing server noise and power consumption. The table below lists the tools and technologies Dell offers to lower power consumption and increase energy efficiency.

Topics:

Power

Table 13. Power tools and technologies

Feature	Description
Power Supply Units(PSU) portfolio	Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.
Tools for right sizing	Enterprise Infrastructure Planning Tool (EIPT) is a tool that can help you determine the most efficient configuration possible. With Dell's EIPT, you can calculate the power consumption of your hardware, power infrastructure, and storage at a given workload. Learn more at www.dell.com/calc.
Industry Compliance	Dell's servers are compliant with all relevant industry certifications and guide lines, including 80 PLUS, Climate Savers and ENERGY STAR.
Power monitoring accuracy	PSU power monitoring improvements include: • Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping.
Systems Management	iDRAC Enterprise and Datacenter provides server-level management that monitors, reports and controls power consumption at the processor, memory and system level. Dell OpenManage Power Center delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.
Active power management	Intel Node Manager is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC9 Datacenter and OpenManage Power Center that allows policy-based management of power and thermal at the individual server, rack, and data center level. Hot spare reduces power consumption of redundant power supplies. Thermal control off a speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption. Idle power enables Dell servers to run as efficiently when idle as when at full workload.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including:

Table 13. Power tools and technologies (continued)

Feature	Description
	• Power distribution units (PDUs) • Uninterruptible power supplies (UPSs) • Energy Smart containment rack enclosures Find additional information at: https://www.delltechnologies.com/en-us/servers/power-and-cooling.htm.

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 table below shows the power supply unit options that are available for the R760.

Table 14. Power Supply Unit Options

Wattage	Frequency	Voltage/Current	Class	Heat dissipation
700 W mixed mode	50/60 Hz	200–240 Vac/4.1 A	Titanium	2625 BTU/hr
	N/A	240 Vdc/3.4 A	N/A	2625 BTU/hr
800 W mixed mode	50/6 0Hz	100–240 Vac/9.2—4.7 A	Platinum	3000 BTU/hr
	N/A	240 Vdc/3.8 A	N/A	3000 BTU/hr
1100 W mixed mode	50/60 Hz	100–240 Vac/12—3.6 A	Titanium	4100 BTU/hr
	N/A	240 Vdc/5.2 A	N/A	4100 BTU/hr
1100 W -48 LVDC	N/A	-48—-60 Vdc/ 27 A	N/A	4625 BTU/hr
1400 W mixed mode	50/60 Hz	100–240 Vac/12—8 A	Platinum	5250 BTU/hr
	N/A	240 Vdc/6.6 A	N/A	5250 BTU/hr
1800 W mixed mode	50/60 Hz	200–240 Vac/10 A	Titanium	6750 BTU/hr
	N/A	240 Vdc/8.2 A	N/A	6750 BTU/hr
2400 W mixed mode	50/60 Hz	100–240 Vac/ 16—13.5 A	Platinum	9000 BTU/hr
	N/A	240 Vdc/11.2 A	N/A	9000 BTU/hr
2800 W mixed mode	50/60 Hz	200–240 Vac/15.6 A	Titanium	10,500 BTU/hr
	N/A	240 Vdc/13.6 A	N/A	10,500 BTU/hr

NOTE: If a system with AC 2400 W PSUs operates at low line 100-120 Vac, and then the power rating per PSU is degraded to 1400 W.

NOTE: If a system with AC 1400 W or 1100 W PSUs operates at low line 100-120 Vac, and then the power rating per PSU is degraded to 1050 W.

Figure 31. PSU power cords

Table 15. PSU power cords

Form factor	Output	Power cord
Redundant 60 mm	700 W AC	C13
	800 W AC	C13
	1100 W AC	C13
	1100 W -48 LVDC	C13
	1400 W AC	C13
	1800 W AC	C15
Redundant 86 mm	2400 W AC	C19
	2800 W AC	C21

NOTE: C19 power cord combined with C20 to C21 jumper power cord can be used to adapt 2800 W PSU.

NOTE: C13 power cord combined with C14 to C15 jumper power cord can be used to adapt 1800 W PSU.

Thermal

PowerEdge servers have an extensive collection of sensors that automatically track thermal activity, which helps regulate temperature thereby reducing server noise and power consumption.

Thermal design

Thermal management of the platform helps deliver high performance with the right amount of cooling to components, while maintaining the lowest fan speeds possible. This is done across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges.

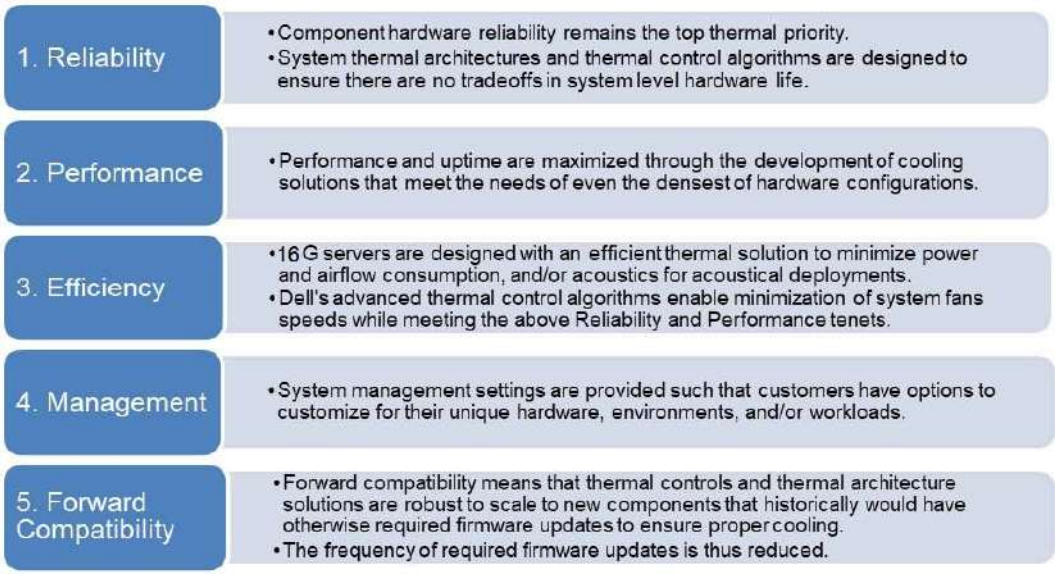

Figure 32. Thermal design characteristics

The thermal design of the PowerEdge R760 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 minimum expense of fan power.

- Comprehensive thermal management: The thermal control system regulates the fan speed based on several different responses from all system-component temperature sensors, and inventory for system configurations. Temperature monitoring includes components such as processors, DIMMs, chipset, the inlet air ambient, hard disk drives, and OCP.
- Open and closed loop thermal fan speed control: Open loop thermal control uses system configuration to determine fan speed based on inlet air ambient temperature. Closed loop thermal control method uses feedback temperatures to dynamically determine proper fan speeds.
- User-configurable settings: With the understanding and realization that every customer has unique set of circumstances or expectations from the system, in this generation of servers, we have introduced limited user- configurable settings residing in the iDRAC BIOS setup screen. For more information, see the Dell PowerEdge R760 Installation and Service Manual at www.dell.com/poweredgemanuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- Cooling redundancy: The R760 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.
- Environmental Specifications: The optimized thermal management makes the R760 reliable under a wide range of operating environments.

Acoustics

Acoustical configurations of R760

Dell PowerEdge R760 is a rack or tower server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

Table 16. Configurations tested for acoustical experience

Configuration	Quietest GPU configuration	Entry/ Quietest configuration	Typical-1, 2.5-inch	Typical-2, 3.5-inch	GPU configuration	NVMe Box
CPU TDP	125 W	125 W	150 W	150 W	165 W	270 W
CPU Quantity	2	2	2	2	2	2
RDIMM Memory	16 GB DDR5	16 GB DDR5	16 GB DDR5	32 GB DDR5	32 GB DDR5	16 GB DDR5
Memory Quantity	8	8	8	16	32	32
Backplane Type	8 x 2.5-inch BP	12x 3.5-inch BP	16 x 2.5-inch exp BP	12 x 3.5-inch BP + 2 x 2.5-inch rear BP	16 x 2.5-inch exp BP	24 x 2.5-inch exp BP (NVMe)
HDD Type	X	SATA 3.5-inch 4 TB	X	12 x 3.5-inch front 12 TB, 2 x 2.5-inch rear SSD	X	X
HDD Quantity	X	2	X	12 + 2	X	X
Flash Drives	PCIe SSD	X	PCIe SSD	X	PCIe SSD	PCIe SSD
Flash Quantity	8	X	8	X	16	24
PSU Type	1400 W	800 W	800 W	1400 W	2400 W	2400 W
PSU Quantity	2	2	2	2	2	2
OCP	2x10 G	2x10 G	10/25 2-port	10/25 2-port	10/25 2-port	2x25 G
PCI 1	X	X	X	X	X	X
PCI 2	X	X	X	X	GPU	100 Gb PCI
PCI 3	X	H755	X	H755	X	X
PCI 4	X	X	2-port 25 Gb	1-port 10 Gb	2-port 25 Gb	X

Table 16. Configurations tested for acoustical experience (continued)

Configuration	Quietest GPU configuration	Entry/ Quietest configuration	Typical-1, 2.5-inch	Typical-2, 3.5-inch	GPU configuration	NVMe Box
PCI 5	X	X	2-port 25 Gb	1-port 10 Gb	2-port 25 Gb	X
PCI 6	X	X	X	Adapt H745	X	X
PCI 7	A30	X	X	X	GPU	100 Gb PCI
PCI 8	X	X	X	X	X	X
PERC	Front H755n	Adapt H755	Front H7455n	Adapt H755	Front H755n	Front H755n

Table 17. Acoustical experience of R760 configurations

Configuration		Quietest GPU configuration	Entry/ Quietest configuration	Typical-1, 2.5-inch	Typical-2, 3.5-inch	GPU configuration	NVMe Box
Acoustical Performance: Idle/ Operating @ 25°C Ambient							
$L_{wA,m}$ (B)	Idle[4]	6.8	5.1	5.5	6.4	6.9	6.8
	Operating/ Customer usage operating[5][6]	8.1	5.1	5.5	6.4	8.5	6.8
K_v (B)	Idle [4]	0.4	0.4	0.4	0.4	0.4	0.4
	Operating/ Customer usage operating[5][6]	0.4	0.4	0.4	0.4	0.4	0.4
$L_{pA,m}$ (dB)	Idle[4]	47	32	41	42	48	47
	Operating/ Customer usage operating[5][6]	62	32	41	42	67	47
Prominent discrete tones[3]		Prominence ratio < 17 dB	No audible tones		Prominence ratio < 15 dB	Prominence ratio < 17 dB	Prominence ratio < 15 dB
Acoustical Performance: Idle @ 28°C Ambient							
$L_{wA,m}$[1] (B)		7.3	5.4	5.9	6.7	7.3	7.1
K_v (B)		0.4	0.4	0.4	0.4	0.4	0.4
$L_{pA,m}$[2] (dB)		52	35	45	45	52	49
Acoustical Performance: Max. loading @ 35°C Ambient							
$L_{wA,m}$[1] (B)		9.0	40.3	7.0	7.8	9.0	7.8
K_v (B)		0.4	0.4	0.4	0.4	0.4	0.4
$L_{pA,m}$[2](dB)		70	35	58	59	70	58

[1]LwA,m: The declared mean A-weighted sound power level (LwA) is calculated per section 5.2 of ISO 9296 (2017) with data collected using the methods that are described in ISO 7779 (2010). Engineering data presented here may not be fully compliant with ISO 7779 declaration requirement.

[2]LpA,m: The declared mean A-weighted emission sound pressure level is at the bystander position per section 5.3 of ISO 9296 (2017) and measured using methods that are described in ISO 7779 (2010). The system is placed in a 24U rack enclosure, 25 cm above a reflective floor. Engineering data presented here may not be fully compliant with ISO 7779 declaration requirement.

[3]Prominent tones: Criteria of Annex D of ECMA-74 and Prominence Ratio method of ECMA-418 are followed to determine if discrete tones are prominent and to report them, if so.

[4]Idle mode: The steady-state condition in which the server is energized but not operating any intended function.

[5]Operating mode: The maximum of the steady state acoustical output at 50% of CPU TDP or active storage drives for the respective sections of Annex C of ECMA-74.

[6] Customer Usage Operating mode: The operating mode is represented by the maximum of the steady state acoustical output at 25%~30% of CPU TDP, 2.5%~10% IOPs load, and >80% GPU load as the components showed in the above configurations.

PowerEdge acoustical specifications

For more information about acoustical specifications, see ENG0019663. (See the category definitions.)

Dell typically categorizes servers in five categories of acoustically acceptable usage:

- Category 1: Table-top in Office Environment
- Category 2: Floor-standing in Office Environment
- Category 3: General Use Space
- Category 4: Attended Data Center
- Category 5: Unattended Data Center

Category 1: Floor-standing in Office Environment

When Dell determines that a specific Enterprise product is to be used on a table-top in office environment, for example, on a desk around a seated user's head height, and then the acoustical specification of the following table applies. Small, light-weight towers are examples of these types of products.

Table 18. Dell Enterprise Category 1, "Table-top in Office Environment" acoustical specification category.

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient
Sound Power	LwA-m, bels	≤ 4.2	≤ 4.7	≤ 5.0	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD and Rear Microphone	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 35	≤ 35	≤ 35	Report
	Loudness, sones	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" ○ Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB.			N/A

Table 18. Dell Enterprise Category 1, "Table-top in Office Environment" acoustical specification category. (continued)

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	**Idle in 23±2° C Ambient**	**Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required**	**Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient**

		• Startup behavior
		  ○ Report Startup behavior re. AC0159
		  ○ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum
		• Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"			

Any	Other	No rattles, squeaks, or unexpected noises Sound should be "even" around the EUT (one side should not be dramatically louder than another) Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. Specific operating conditions will be defined in "Configurations & Configuration Dependencies" for each platform.			
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Category 2: Floor-standing in Office Environment

When Dell determines that a specific Enterprise product is to be used primarily when it is sitting on the floor, that is, next to a user's feet, then the acoustical specification in the table below applies. Noise from the product should not annoy or otherwise interfere with the user's thoughts or speech, for example, on the telephone.

Table 19. Dell Enterprise Category 2, "Floor-standing in Office Environment" acoustical specification category

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	**Idle in 23±2° C Ambient**	**Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required**	**Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient**
Sound Power	LwA-m, bels	≤ 4.9	≤ 5.1	≤ 5.4	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD and Rear Microphone	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 35	≤ 35	≤ 35	Report
	Loudness, sones	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report
Front Binaural HEAD	Transients	• Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: ○ Max. {ΔLpA} < 3.0 dB ○ Event count < 3 for "1.5 dB < ΔLpA < 3.0 dB" • Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB. • Startup behavior ○ Report Startup behavior re. AC0159 ○ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum • Transient inputs: Report time-history sound pressure levels re AC0159 "Train of Step Functions on Processor"			N/A
Any	Other	• No rattles, squeaks, or unexpected noises • Sound should be "even" around the EUT (one side should not be dramatically louder than another) • Unless otherwise specified, the "default" thermal-related settings shall be selected for BIOS and iDRAC. • Specific operating conditions are defined in "Configurations and Configuration Dependencies" for each platform.			
Sound Pressure	LpA-reported, dBA, re AC0158 and program configuration document	Report for all mics	Report for all mics	Report for all mics	Report for all mics

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Eldorado do Sul, 26 de julho de 2023

À
ENTERPRISE COMERCIO E SOLUCOES EM TI LTDA
A/C Sr. Fábio Mesquita de Souza

Ref: Pregão eletrônico 50/2023 – Prefeitura Municipal de Sabará

ASSISTÊNCIAS TÉCNICAS

A **DELL COMPUTADORES DO BRASIL LTDA. ("Dell"),** inscrita no CNPJ/MF sob o nº 72.381.189/0001-10, com sede na Av. Industrial Belgraf, 400 – Medianeira – Cep 92990-000, Eldorado do Sul/RS, vem, através da presente, informar as suas assistências técnicas autorizadas:

PROXXI TECNOLOGIA LTDA

Nome	Endereço	Cidade	UF	
Sede Técnica Almenara (MG)	Praça Benedito Valadares, 70 - Térreo - Centro	Almenara	MG	3
Regional Belo Horizonte (MG)	Rua Rio de Janeiro, 328 - 4° andar - Centro	Belo Horizonte	MG	3
Sede Técnica Curvelo (MG)	Praça Tiradentes, 568 - Térreo - Centro	Curvelo	MG	3
Sede Técnica Frutal (MG)	Praça da Matriz, 39 - 1º andar - Centro	Frutal	MG	3
Sede Técnica Governador Valadares (MG)	Avenida Minas Gerais, 395	Governador Valadares	MG	3
Sede Técnica Ipatinga (MG)	Avenida 28 de Abril, 176 - Térreo - Centro	Ipatinga	MG	3
Sede Técnica Januária (MG)	Avenida Marechal Teodoro da Fonseca, 55 - Térreo - Centro	Januária	MG	3
Sede Técnica Juiz de Fora (MG)	Av dos Andradas, 97-99 - Centro	Juiz de Fora	MG	3
Sede Técnica Montes Claros (MG)	Rua Governador Valadares, 265	Montes Claros	MG	3
Sede Técnica Paracatu (MG)	Avenida Dep. Quintino Vargas, 431 - 1º andar - Centro	Paracatu	MG	3
Sede Técnica Passos (MG)	Avenida Arouca, 504 - Térreo - Centro	Passos	MG	3
Sede Técnica Ponte Nova (MG)	Avenida Dr. Otávio Soares, 195 - 1º andar - Centro	Ponte Nova	MG	3
Sede Técnica Pouso Alegre (MG)	Avenida Dr. Lisboa, 31 - 1º andar - Centro	Pouso Alegre	MG	3
Sede Técnica Teófilo Otoni (MG)	Rua Teodorico Tourino, 345 - 1º andar - Centro	Teófilo Otoni	MG	3
Sede Técnica Uberlândia (MG)	Avenida Afonso Pena, 273	Uberlândia	MG	3
Sede Técnica Varginha (MG)	Praça José Resende Paiva, 02	Varginha	MG	3

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Dell Computadores do Brasil Ltda

Juliane Casagrande Rodrigues – Gerente de Vendas

Esta declaração é válida pelo prazo de 90 (noventa dias) da sua emissão.

Eldorado do Sul, 25 de julho de 2023

Declaração do Fabricante

A **DELL COMPUTADORES DO BRASIL LTDA.** ("Dell"), inscrita no CNPJ sob o n. 72.381.189/0001-10, na qualidade de fabricante do(s) equipamento(s) de marca Dell (abaixo identificado(s)), ofertado(s) pela empresa ENTERPRISE COMERCIO E SOLUCOES EM TI LTDA , no certame licitatório n. **PREGÃO ELETRÔNICO N.º 50/2023**, promovido pelo Prefeitura Municipal de Sabará, vem, através desta, declarar que:

- o(s) modelo(s) DELL PowerEdge R660, PowerEdge R760, PowerVault ME5024, ME412, possui(em) garantia de 84 meses, on-site, com atendimento telefônico **24 horas por dia, 7 dias na semana e 1 dia útil de tempo de atendimento no local.**

- o(s) modelo(s) PowerSwitch S4148Fpossui(em) garantia de 60 meses, on-site, com atendimento telefônico **24 horas por dia, 7 dias na semana e 1 dia útil de tempo de atendimento no local.**

Declaramos, ainda, que:

- Os equipamentos por nós fabricados serão novos, sem uso e não são produtos descontinuados.

- A ENTERPRISE COMERCIO E SOLUCOES EM TI LTDA está autorizada a comercializar os equipamentos propostos para esse certame.

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Dell Computadores do Brasil Ltda

Juliane Casagrande Rodrigues – Gerente de Vendas

Esta declaração é válida pelo prazo de 90 (noventa dias) da sua emissão.

Eldorado do Sul, 25 de julho de 2023

À
ENTERPRISE COMERCIO E SOLUCOES EM TI LTDA
A/C Sr. Fábio Mesquita de Souza

Ref: Pregão eletrônico 50/2023 – Prefeitura Municipal de Sabará

DECLARAÇÃO TÉCNICA

DELL COMPUTADORES DO BRASIL LTDA. ("Dell"), inscrita no CNPJ/MF sob o n° 72.381.189/0001-10, com sede na Av. Industrial Belgraf, 400 – Medianeira – CEP 92990-000, Eldorado do Sul/RS, com o objetivo de complementar as informações que não constam no Catálogo Técnico Oficial do(s) produto(s) abaixo ofertado(s), vem, através da presente, declarar o que segue:

Objeto: PowerVault ME5024, ME412
possui as funcionalidades de pré-provisionamento (thin provisioning), reclamação de espaço não utilizado (space reclamation/ reclaimable storage), reconstrução automática do array em caso de substituição de disco defeituoso (rebuild), armazenamento em camadas (tierização), replicação de dados, cópia de volumes e snapshots, ADAPT (RAID distribuído): recurso de proteção de dados aprimorado que oferece tempos de reconstrução de unidade mais rápidos, Cache de leitura de SSD: maior velocidade de execução de aplicativos armazenando os dados de leitura anteriormente em cache, Armazenamento automático em camadas de 3 níveis: otimize o desempenho dos dados com menos despesas e Integração da virtualização: integre com o VMware vSphere, o vCenter SRM e o Microsoft Hyper-V
permite gerenciamento através de interface web (gui) ou linha de comando (cli);.
realiza o monitoramento de saúde do sistema incluindo parâmetros obtidos pelos sensores de hardware tais como temperatura interna.
Possui fonte de alimentação elétrica redundante, do tipo hot-swap, de alta potência, que opere automaticamente em tensão entre ""100 e 240vac"", de 580w, tal como ventiladores redundantes integrados, com recurso de tolerância a falha;

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Dell Computadores do Brasil Ltda

Juliane Casagrande Rodrigues – Gerente de Vendas

Esta declaração é válida pelo prazo de 90 (noventa dias) da sua emissão.

Eldorado do Sul, 17 de julho de 2023

À
ENTERPRISE COMERCIO E SOLUCOES EM TI LTDA
A/C Sr. Fábio Mesquita de Souza

Ref: Pregão eletrônico 50/2023 – Prefeitura Municipal de Sabará

DECLARAÇÃO TÉCNICA

DELL COMPUTADORES DO BRASIL LTDA. ("Dell"), inscrita no CNPJ/MF sob o n° 72.381.189/0001-10, com sede na Av. Industrial Belgraf, 400 – Medianeira – CEP 92990-000, Eldorado do Sul/RS, com o objetivo de complementar as informações que não constam no Catálogo Técnico Oficial do(s) produto(s) abaixo ofertado(s), vem, através da presente, declarar o que segue:

Objeto: DELL PowerEdge R660, PowerEdge R760, PowerVault ME5024, ME412, PowerSwitch S4148F
Placa Mãe é do mesmo fabricante do equipamento ofertado, não sendo de livre comercialização no mercado, com modelo e fabricante serigrafados na PCB (Printed Circuit Board) em processo industrial;
BIOS é implementada em memória "flash", atualizável diretamente pelo Windows, projetada e desenvolvida pela DELL;
Possui chip TPM (Trusted Platform Module) versão 2.0 V3 integrado à placa-mãe em conformidade com as especificações do Trusted Computing Group, com fornecimento do software para implementação e gerenciamento centralizado e remoto do mesmo;
Suporta boot por dispositivo USB, pendrive, CD-ROM, rede ou disco conectado a uma porta USB;
Placa mãe Possui recursos de gerenciamento compatível com os padrões do DMTF (Distribuited Management Task Force;
BIOS é implementada em memória "flash", atualizável diretamente pelo Windows, projetada e desenvolvida pela DELL;
BIOS suporta tecnologias de integração à rede com PXE, configuração e controle remotos;
BIOS possui a interface de configuração em idioma inglês;
As atualizações da BIOS, quando necessárias, são disponibilizadas no site doa DELL;
BIOS Lançada a partir de 2018 e entregue na versão mais atual disponibilizada pela DELL;
BIOS possui interface gráfica acessível através de teclado e mouse;
Os módulos de memória são homologados pela DELL e são idênticos em marca/modelo para cada computador fornecido;
Possui suporte a PXE (Pre-Boot eXecution), para realizar instalação remota através da rede;
Possui suporte em gerenciamento no padrão ACPI;
Possui LEDs indicadores de atividade de rede;
A Fonte possui potência suficiente para suportar todos os dispositivos internos na configuração fornecida no equipamento (placa principal, interfaces, discos rígidos, memória RAM e demais periféricos;
O sistema de refrigeração e adequado ao processador e demais componentes internos ao gabinete, e garanti a temperatura de funcionamento e vida útil dos componentes. Solução de refrigeração é monitorada pela BIOS ou por ACPI, dimensionado para a perfeita refrigeração dos componentes internos, operando em sua capacidade máxima, pelo período de 24h;
Possui acabamento interno com superfícies não cortantes, inclusive nas entradas de ar;
As unidades do equipamento são entregues devidamente acondicionadas em embalagens individuais adequadas, que utilizam preferencialmente materiais recicláveis, de forma a garantir a máxima proteção durante o transporte e a armazenagem;
O Sistema Operacional possui integrado ou está disponível para download software desenvolvido pelo fabricante do equipamento com suporte a efetuar download de atualizações de drivers, consultar vigência de garantia entre outros;
Possui integrado ou está disponível para download software que possibilite apagar de forma definitiva e irrecuperável todos os dados armazenados no disco rígido, permitindo o descarte seguro de seus equipamentos;

Esta declaração é válida pelo prazo de 90 (noventa dias) da sua emissão.

Possui integrado ou está disponível para download software que permite a verificação e instalação das últimas atualizações de todas as ferramentas disponíveis pelo fabricante;
Os equipamentos são novos e sem uso e são entregues nas caixas lacradas pelo fabricante;
A garantia é prestada diretamente pelo fabricante ou por rede de assistência técnica credenciada, com atendimento no local no máximo no próximo dia útil;
Storage
Possui leds e/ou display frontais para exibição de alertas de funcionamento dos componentes internos, tais como falhas em fontes de alimentação, discos rígidos, ventiladores e temperatura;
O Storage é um equipamento com arquitetura comercialmente categorizada como storage system, especificamente desenvolvido e otimizado para a finalidade de armazenamento de dados consolidados, possui eletrônica do mesmo fabricante do equipamento DELL;
O storage possui as funcionalidades de pré-provisionamento (thin provisioning), reclamação de espaço não utilizado (space reclamation/ reclaimable storage), reconstrução automática do array em caso de substituição de disco defeituoso (rebuild), armazenamento em camadas (tierização), replicação de dados, cópia de volumes e snapshots, ADAPT (RAID distribuído): recurso de proteção de dados aprimorado que oferece tempos de reconstrução de unidade mais rápidos, Cache de leitura de SSD: maior velocidade de execução de aplicativos armazenando os dados de leitura anteriormente em cache, Armazenamento automático em camadas de 3 níveis: otimize o desempenho dos dados com menos despesas e Integração da virtualização: integre com o VMware vSphere, o vCenter SRM e o Microsoft Hyper-V;
Permite gerenciamento através de interface web (gui) ou linha de comando (cli);
Realiza o monitoramento de saúde do sistema incluindo parâmetros obtidos pelos sensores de hardware tais como temperatura interna, ventiladores e fonte de alimentação;
Tem suporte para envio de alertas por e-mail;
Mantem registros de interações e eventos do sistema (logs);
Permite atualizações de firmware do equipamento remotamente via interface web;
A conectividade para apresentação dos volumes (lun) aos demais hosts da rede san (storage area network) é compatível com switchs (fabric) e interfaces de barramento de host (hba) de diferentes fabricantes, não usando protocolos proprietários;
Possui interface específica para conectividade com módulos adicionais (enclosures), por controladora, no contexto de expansão da capacidade de armazenamento de dados do equipamento;
Tem compatibilidade com sistemas operacionais windows server 2016/2019 e 2022, linux rhel 7.8/8.2, e vmware esxi 6.7, 7 ou superior;
Switch
Suporte à funcionalidade do gateway VXLAN para ponte e roteamento do redes de sobreposição não virtualizadas e virtualizadas com taxa de linha desempenho;
Possui suporte de rede convergente com DCB;
Possui fluxo de ar PSU para painel IO;
É compatível com IEEE 1588v2 (somente hardware);
Possui estrutura de DevOps consistente em computação, armazenamento e elementos de rede;
Possui recursos de rede padrão, interfaces e funções de script para integração de operações de rede legadas;
Possui abstração de hardware de comutação baseada em padrões via SWITCH ABSTRACTION INTERFCE” (SAI);
Possui ambiente de desenvolvedor abrangente e irrestrito via Control Plane Services (CPS);
Possui comutação Ethernet L2 e L3 escalável com QoS, ACL e um complemento de recursos IPv4 e IPv6 baseados em padrões, incluindo OSPF, BGP e PBR;
Possui recursos de espelhamento aprimorados, incluindo espelhamento local, porta remota Espelhamento (RPM) e Espelhamento de Porta Remota Encapsulada (ERPM);
Possui suporte de rede convergente para Data Center Bridging, com prioridade controle de fluxo (802.1Qbb), ETS (802.1Qaz), DCBx e iSCSI TLV;

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Dell Computadores do Brasil Ltda

Juliane Casagrande Rodrigues – Gerente de Vendas

Processador Intel® Xeon® Gold 6334

18 M de cache, 3,60 GHz

Processador Intel® Xeon® Gold 6334

18 M de cache, 3,60 GHz

Adicionar para comparar

Especificações

Baixe as especificações ↓

Essenciais

Coleção de produtos	Processadores escaláveis Intel® Xeon® da 3ª Geração
Codinome	Produtos com denominação anterior Ice Lake
Segmento vertical	Server
Número do processador	6334
Litografia	10 nm
Preço recomendado para o cliente	$2607.00

Especificações da CPU

Número de núcleos	8
Nº de threads	16
Frequência turbo max	3.70 GHz
Frequência baseada em processador	3.60 GHz
Cache	18 MB
Velocidade do Intel® UPI	11.2 GT/s
Nº de links de UPI	3
TDP	165 W

Informações complementares

Status	Launched

Data de introdução	Q2'21
Servicing Status	Baseline Servicing
Opções integradas disponíveis	Não

Especificações de memória

Tamanho máximo de memória (de acordo com o tipo de memória)	6 TB
Tipos de memória	DDR4-3200
Velocidade máxima de memória	3200 MHz
Nº máximo de canais de memória	8
Memória persistente Intel® Optane™ DC com suporte	Sim
Compatibilidade com memória ECC ‡	Sim

Opções de expansão

Escalabilidade	2S
Revisão de PCI Express	4.0
Nº máximo de linhas PCI Express	64

Especificações de encapsulamento

Soquetes suportados	FCLGA4189
T_{CASE}	69°C
Tamanho do pacote	77.5mm x 56.5mm

Tecnologias avançadas

Intel® Speed Select Technology – Core Power	Sim
Intel® Speed Select Technology – Turbo Frequency	Sim
Intel® Deep Learning Boost (Intel® DL Boost)	Sim
Intel® Speed Select Technology – Frequência básica	Sim
High Priority Cores	4
High Priority Core Frequency	3.70 GHz
Low Priority Cores	4
Low Priority Core Frequency	3.40 GHz
Intel® Resource Director Technology (Intel® RDT)	Sim
Tecnologia Intel® Speed Shift	Sim
Tecnologia Intel® Turbo Boost ‡	2.0

Tecnologia Hyper-Threading Intel® ‡	Sim
Intel® TSX-NI	Sim
Intel® 64 ‡	Sim
Extensões do conjunto de instruções	Intel® SSE4.2, Intel® AVX, Intel® AVX2, Intel® AVX-512
Nº de unidades de FMA de AVX-512	2
Intel® Volume Management Device (VMD - Dispositivo de Gerenciamento de Volume)	Sim

Segurança e confiabilidade

Intel® Crypto Acceleration	Sim
Suporte para Resiliência de firmware de plataforma Intel®	Sim
Intel® Total Memory Encryption	Sim
Novas instruções Intel® AES	Sim
Intel® Software Guard Extensions (Intel®SGX)	Yes with Intel® SPS
Tamanho máximo do cache de página de enclave (EPC) para Intel® SGX	64 GB
Intel® Trusted Execution Technology ‡	Sim
Bit de desativação de execução ‡	Sim
Tecnologia Intel® Run Sure	Sim
Controle de Execução baseado em Modo (MBE — Mode-based Execute Control)	Sim
Tecnologia de virtualização Intel® (VT-x) ‡	Sim
Tecnologia de virtualização Intel® para E/S dirigida (VT-d) ‡	Sim
Intel® VT-x com Tabelas de páginas estendidas (EPT) ‡	Sim

SKUs "anunciados" ainda não estão disponíveis. Favor consultar a data de lançamento para a disponibilidade no mercado.

Frequência máxima de turbo refere-se à frequência máxima do processador de núcleo único que pode ser atingida com a Tecnologia Intel® Turbo Boost. Mais informações estão disponíveis no site https://www.intel.com/content/www/br/pt/architecture-and-technology/turbo-boost/turbo-boost-technology.html

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Consulte https://www.intel.com.br/content/www/br/pt/architecture-and-technology/hyper-threading/hyper-threading-technology.html?wapkw=hyper+threading

para obter mais informações, incluindo detalhes sobre quais processadores são compatíveis com a Tecnologia Hyper-Threading Intel®.

Os processadores compatíveis com a computação de 64 bits na arquitetura Intel® requerem BIOS habilitados para arquitetura Intel 64.

Alguns produtos suportam as novas instruções AES com uma atualização da Configuração do processador, em particular, i7-2630QM/i7-2635QM, i7-2670QM/i7-2675QM, i5-2430M/i5-2435M, i5-2410M/i5-2415M. Favor entrar em contato com o OEM para o BIOS que inclui a mais recente atualização da Configuração do processador.

CPU Benchmarks

Over 1,000,000 CPUs Benchmarked

Intel Xeon Gold 6334 @ 3.60GHz

Price and performance details for the Intel Xeon Gold 6334 @ 3.60GHz can be found below. This is made using thousands of PerformanceTest benchmark results and is updated daily.

- The first graph shows the relative performance of the CPU compared to the 10 other common (single) CPUs in terms of PassMark CPU Mark.
- The 2nd graph shows the value for money, in terms of the CPUMark per dollar.
- The pricing history data shows the price for a single Processor. For multiple Processors, multiply the price shown by the number of CPUs.

CPUS

High End
High Mid Range
Low Mid Range
Low End

Best Value (On Market)
Best Value XY Scatter
Best Value (All time)

New Desktop
New Laptop

Single Thread
Systems with Multiple CPUs
Overclocked
Power Performance
CPU Mark by Socket Type
Cross-Platform CPU Performance
Top Gaming CPUs

CPU Mega List
Search Model

Intel Xeon Gold 6334 @ 3.60GHz

Description:

Class: Server	**Socket:** FCLGA4189
Clockspeed: 3.6 GHz	**Turbo Speed:** 3.7 GHz
Cores: 8	**Typical TDP:** 165 W
Threads: 16	

Cache Size: L1: 1280 KB, L2: 20.0 MB, L3: 36 MB

Other names: Intel(R) Xeon(R) Gold 6334 CPU @ 3.60GHz

CPU First Seen on Charts: Q3 2021

CPUmark/$Price: 9.54

Overall Rank: 367

Last Price Change: $2,322.50 USD (2023-06-02)

Average CPU Mark

22160

Single Thread Rating: 2592
Samples: 1*
*Margin for error: High

+ COMPARE

CPU Test Suite Average Results for Intel Xeon Gold 6334 @ 3.60GHz

Compare 0

CPU Benchmarks

Most Benchmarked

AMD vs Intel Market Share

Year on Year Performance

Floating Point Math	40,451 MOps/Sec
Random String Sorting	31,681 Thousand Strings/Sec
Data Encryption	13,523 MBytes/Sec
Data Compression	248,147 KBytes/Sec
Physics	1,827 Frames/Sec
Extended Instructions	21,631 Million Matrices/Sec
Single Thread	2,592 MOps/Sec

From submitted results to PerformanceTest V10 as of 19th of July 2023.

CPU Mark Distribution for Intel Xeon Gold 6334 @ 3.60GHz

Submitted Baseline Distribution Graph as of 15th of July 2023

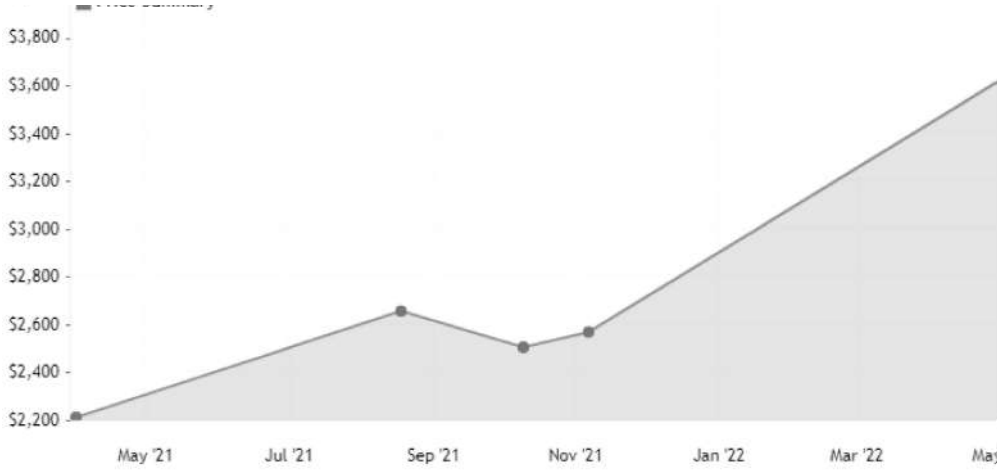
Not Enough Data from Current Version of PerformanceTest to Create Distribution Graph.

From submitted results to PerformanceTest V10 as of 15th of July 2023.

Merchant	Price	Purchase
amazon	$2,322.50 USD	BUY NOW!
newegg	NA	CPU Not Available. See Other Models
BEST BUY	NA	CPU Not Available. See Other Models

Note: PassMark Software may earn compensation for sales from links on this site through affiliate programs.

Pricing History



Machines with this CPU (or similar)

Configure System with Intel Xeon Gold 6334 @ 3.60GHz

	HUNSN Micro Firewall Appliance, Mini PC, OPNsense, VPN, Router PC, Intel N5105, RS03k, AES-NI, 6 x Intel I226-V 2.5Gbe, 2 x USB, COM, VGA, SIM Slot, 16G RAM, 128G SSD	$414.99 (www.amazon.com)
	Intel NUC 9 NUC9i9QNX Home & Entertainment Mini Desktop Black i9-9980HK, 64GB RAM, 1TB PCIe SSD, UHD 630, WiFi, Bluetooth, 1xHDMI, SD Card, Win 10 Home with Hub	$969.99 (www.amazon.com)
	Intel Xeon E5-2699x1 Pro, Max @3.6Ghz, 18Core 36Thread, 2GB Graphics Card, 32GB ECC RAM, 240GB SSD, 1TB HDD, Win 10 Pro	$1031.00 (www.amazon.com)

Note: PassMark Software may earn compensation for sales from links on this site through affiliate programs.

CPU Mark Relative to Top 10 Common Server CPUs

As of 19th of July 2023 - Higher results represent better performance

Processor	Average CPU Mark
AMD Ryzen Threadripper PRO 3995WX	83,417
AMD Ryzen Threadripper PRO 3975WX	62,992
AMD Ryzen Threadripper PRO 3955WX	40,292
AMD Ryzen Threadripper PRO 3945WX	33,532
AMD Ryzen Threadripper 2990WX	32,379
Intel Xeon Gold 6334 @ 3.60GHz	22,160
Intel Xeon E5-1650 v3 @ 3.50GHz	10,435
Intel Xeon E5-2689 @ 2.60GHz	9,740

Intel Xeon E5-2620 v3 @ 2.40GHz		7,839

CPU Value (CPU Mark / $Price)

As of 19th of July 2023 - Higher results represent better value

Processor	CPU Mark / $Price	
Intel Xeon E5-2620 v3 @ 2.40GHz		603.45
Intel Xeon E5-1650 v3 @ 3.50GHz		75.34
Intel Xeon E5-2689 @ 2.60GHz		53.30
AMD Ryzen Threadripper PRO 3955WX		40.67
Intel Xeon E5-1650 v2 @ 3.50GHz		39.24
AMD Ryzen Threadripper PRO 3975WX		21.02
AMD Ryzen Threadripper 2990WX		16.19
Intel Xeon E5-1620 @ 3.60GHz		13.23
AMD Ryzen Threadripper PRO 3995WX		12.15
Intel Xeon Gold 6334 @ 3.60GHz		9.54
AMD Ryzen Threadripper PRO 3945WX		NA

Single Thread Rating

As of 19th of July 2023 - Higher results represent better performance

Processor	Average Thread Rating	
AMD Ryzen Threadripper PRO 3945WX		2,701
AMD Ryzen Threadripper PRO 3955WX		2,682
AMD Ryzen Threadripper PRO 3975WX		2,668
AMD Ryzen Threadripper PRO 3995WX		2,597
Intel Xeon Gold 6334 @ 3.60GHz		2,592
AMD Ryzen Threadripper 2990WX		2,293
Intel Xeon E5-1650 v3 @ 3.50GHz		2,130

Intel Xeon E5-1620 @ 3.60GHz		1,774
Intel Xeon E5-2689 @ 2.60GHz		1,580

Last 4 Baselines for Intel Xeon Gold 6334 @ 3.60GHz

Most recent listed first

Baseline	CPU Mark
BL1859656 - Jul 13 2023 [Excluded]	12333
BL1859601 - Jul 13 2023 [Excluded]	8370
BL1818936 - May 15 2023 [Excluded]	16677
BL1437437 - Aug 17 2021	22160

Additional baselines can be obtained using Windows version of PerformanceTest's Manage Baselines feature.

Popular comparisons for Intel Xeon Gold 6334 @ 3.60GHz

As of 19th of July 2023 - Higher results represent better performance

Processor	Average CPU Mark
Intel Xeon Gold 6334 @ 3.60GHz	22,160
AMD EPYC 72F3 vs Intel Xeon Gold 6334	27,252 *(+23.0%)*
AMD EPYC 7F32 vs Intel Xeon Gold 6334	23,311 *(+5.2%)*
Intel Xeon Gold 6250 @ 3.90GHz vs Intel Xeon Gold 6334	20,915 *(-5.6%)*
Intel Xeon Gold 5315Y @ 3.20GHz vs Intel Xeon Gold 6334	20,724 *(-6.5%)*
Intel Xeon Gold 5315Y @ 3.20GHz vs Intel Xeon Gold 6334	20,724 *(-6.5%)*
Intel Xeon W-3235 @ 3.30GHz vs Intel Xeon Gold 6334	26,092 *(+17.7%)*
Intel Xeon W-11955M @ 2.60GHz vs Intel Xeon Gold 6334	22,967 *(+3.6%)*
Intel Xeon Gold 6144 @ 3.50GHz vs Intel Xeon Gold 6334	20,852 *(-5.9%)*
AMD EPYC 7252 vs Intel Xeon Gold 6334	19,411 *(-12.4%)*
Intel Xeon W-1390P @ 3.50GHz vs Intel Xeon Gold 6334	25,451 *(+14.8%)*
Intel Xeon E-2388G @ 3.20GHz vs Intel Xeon Gold 6334	23,750 *(+7.2%)*
	,215 *(2.3%)*

DELL Technologies

Specification Sheet

Dell PowerEdge R660

Provides performance and versatility as needed to address your most demanding applications

The new Dell PowerEdge R660 is a 1U, two-socket rack server. Gain the performance you need with this full-featured enterprise server, designed to optimize even the most demanding workloads like dense database analytics and high-density virtualization.

Max Performance

- Add up to two Next Generation Intel® Xeon® Scalable processors with up to 56 cores for faster and more accurate processing performancet.
- Accelerate in-memory workloads with up to 32 DDR5 RDIMMS up to 4400 MT/sec (2DPC) or 4800 MT/sec for 1DPC (16 DDR5 RDIMMs max).
- Support for GPUs including 2* x single-wide for workloads requiring acceleration.

Air cooled at peak performance

- New Smart Flow chassis optimizes airflow to support the highest core count CPUs in an air-cooled environment within the current IT infrastructure.
- Support for up to 8 x 2.5” drives and 2 x 350 watt processors.

Gain agility

- Achieve maximum efficiency with multiple chassis designs that tailor to your desired workloads and business objectives.
- Storage options include up to 8 x 2.5” NVMe/SAS4/SATA, plus up to 10 x 2.5” NVMe/SAS4/SATA, 14/16 x NVME E3.S Gen5*.
- Multiple Gen4 and Gen5 riser configurations (up to 3 x PCIe slots) with interchangeable components that seamlessly integrate to address customer needs over time.

Cyber Resilient Architecture for Zero Trust IT environment & operations

Security is integrated into every phase of the PowerEdge lifecycle, including protected supply chain and factory-to-site integrity assurance. Silicon-based root of trust anchors end-to-end boot resilience while Multi-Factor Authentication (MFA) and role-based access controls ensure trusted operations.

Increase efficiency and accelerate operations with an autonomous infrastructure

The Dell OpenManage™ systems management portfolio delivers a secure, efficient, and comprehensive solution for PowerEdge servers. Simplify, automate and centralize one-to-many management with the OpenManage Enterprise console and iDRAC.

Sustainability

From recycled materials in our products and packaging, to thoughtful, innovative options for energy efficiency, the PowerEdge portfolio is designed to make, deliver, and recycle products to help reduce the carbon footprint and lower your operation costs. We even make it easy to retire legacy systems responsibly with Dell Technologies Services.

Rest easier with Dell Technologies Services

Maximize your PowerEdge Servers with comprehensive services ranging from Consulting, to ProDeploy and ProSupport suites, Data Migration and more – available across 170 locations and backed by our 60K+ employees and partners.

PowerEdge R660

The Dell PowerEdge R660 offers powerful performance in a purpose-built, cyber resilient, mainstream server. Ideal for:

- High Density Virtualization
- Dense Database Analytics
- Mixed Workload Standardization

Feature	Technical Specifications
Processor	Up to two 4th Generation Intel Xeon Scalable processors, with up to 56 cores and optional Intel® QuickAssist Technology.
Memory	• 32 DDR5 DIMM slots, supports RDIMM 8 TB max, speeds up to 4800 MT/s • Supports registered ECC DDR5 DIMMs only
Storage controllers	• Internal Controllers (RAID): PERC H965i, PERC H755, PERC H755N, PERC H355, HBA355i • Internal Boot: Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 NVMe SSD drives, or USB • External HBAs (non-RAID): HBA355e • Software RAID: S160
Drive Bays	Front bays: • Up to 10 x 2.5-inch, SAS/SATA/NVMe (HDD/SSD) max 153.6 TB • Up to 8 x 2.5-inch, SAS/SATA/NVMe, (HDD/SSD) max 122.88 TB Rear bays: • Up to 2 x 2.5-inch, SAS/SATA/NVMe, max 30.72 TB
Power Supplies	• 1800W Titanium 200—240 VAC or 240 HVDC, hot swap with full redundant • 1400W Platinum 100—240 VAC or 240 HVDC, hot swap with full redundant • 1100W Titanium 100—240 VAC or 240 HVDC, hot swap with full redundant • 1100W LVDC -48 — -60 VDC, hot swap with full redundancy • 800W Platinum 100—240 VAC or 240 HVDC, hot swap with full redundant • 700 W Titanium 200—240 VAC or 240 HVDC, hot swap with full redundant
Cooling Options	• Air cooling • Optional Direct Liquid Cooling (DLC) Note: DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.
Fans	• Standard (STD) fans/High performance Gold (VHP) fans • Up to 4 sets (dual fan module) hot plug fans
Dimensions	• Height – 42.8 mm (1.68 inches) • Width – 482 mm (18.97 inches) • Depth – 822.88 mm (32.39 inches) with bezel 809.04 mm (31.85 inches) without bezel
Form Factor	1 U rack server
Embedded Management	• iDRAC9 • iDRAC Direct • iDRAC RESTful API with Redfish • iDRAC Service Module • Quick Sync 2 wireless module
Bezel	Optional LCD bezel or security bezell
OpenManage Software	• OpenManage Enterprise • OpenManage Power Manager plugin • OpenManage Service plugin • OpenManage Update Manager plugin • CloudIQ for PowerEdge plug in • OpenManage Enterprise Integration for VMware vCenter • OpenManage Integration for Microsoft System Center • OpenManage Integration with Windows Admin Center
Mobility	OpenManage Mobile
OpenManage Integrations	• BMC Truesight • Microsoft System Center • OpenManage Integration with ServiceNow • Red Hat Ansible Modules • Terraform Providers • VMware vCenter and vRealize Operations Manager
Security	• Cryptographically signed firmware • Data at Rest Encryption (SEDs with local or external key mgmt) • Secure Boot • Secure Erase • Secured Component Verification (Hardware integrity check) • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ
Embedded NIC	2 x 1 GbE LOM card (optional)
Network options	1 x OCP card 3.0 (optional) Note: The system allows either LOM card or an OCP card or both to be installed in the system.
GPU Options	Up to 2* x 75 W SW
Ports	Front Ports • 1 x iDRAC Direct (Micro-AB USB) port • 1 x USB 2.0 • 1 x VGA Rear Ports • 1 x Dedicated iDRAC Ethernet port • 1 x USB 2.0 • 1 x USB 3.0 • 1 x Serial (optional) • 1 x VGA (optional for Direct Liquid Cooling configuration)l Internal Ports • 1 x USB 3.0 (optional)

Feature	Technical Specifications
PCIe	Up to three PCIe slots : • Slot 1 : 1 x16 Gen5 Full height, 3/4 length, Half length or 1 x8/ 1 x16 Gen 5 or 1 x16 Gen 4 Low profile, Half length • Slot 2 : 1 x16 Gen5 Full height, 3/4 length, Half length or 1 x16 Gen 5 or 1 x16 Gen 4 Low profile, Half length • Slot 3 : 1 x8/ 1 x16 Gen 5 or 1 x16 Gen 4 Low profile, Half length
Operating System and Hypervisors	• Canonical Ubuntu Server LTS • Microsoft Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell.com/OSsupport.
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com -> Solutions -> OEM Solutions.

*Future releases will include additional form factors.
*Future releases will include additional slots for GPU.

APEX Flex on demand

Acquire the technology you need to support your changing business with payments that scale to match actual usage. For more information, visit: www.delltechnologies.com/en-us/payment-solutions/flexible-consumption/flex-on-demand.htm.

Discover more about PowerEdge servers

Learn more about our PowerEdge servers

Learn more about our systems management solutions

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Contact a Dell Technologies Expert for Sales or Support

Febuary 2023

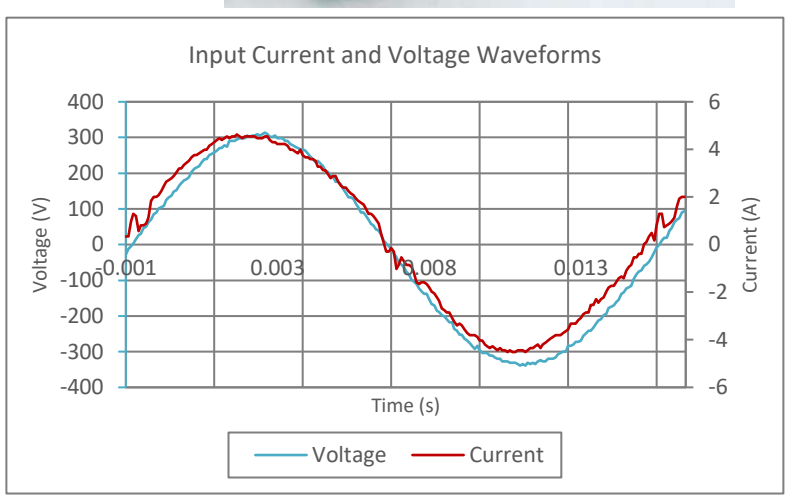
80 PLUS Verification and Testing Report

TYPICAL EFFICIENCY (50% Load):	**96.22%**
AVERAGE EFFICIENCY :	**95.55%**
80 PLUS COMPLIANT:	**YES**

ID Number	SO-1871
Manufacturer	Dell
Model Number	D1400E-S0
Serial Number	N/A
Year	2021
Type	1U
Test Date	04/07/21

Rated Specifications	Value	Units
Input Voltage	**100-240**	Volts
Input Current	**12-8**	Amps
Input Frequency	**50/60**	Hz
Rated Output Power	**1,400**	**Watts**

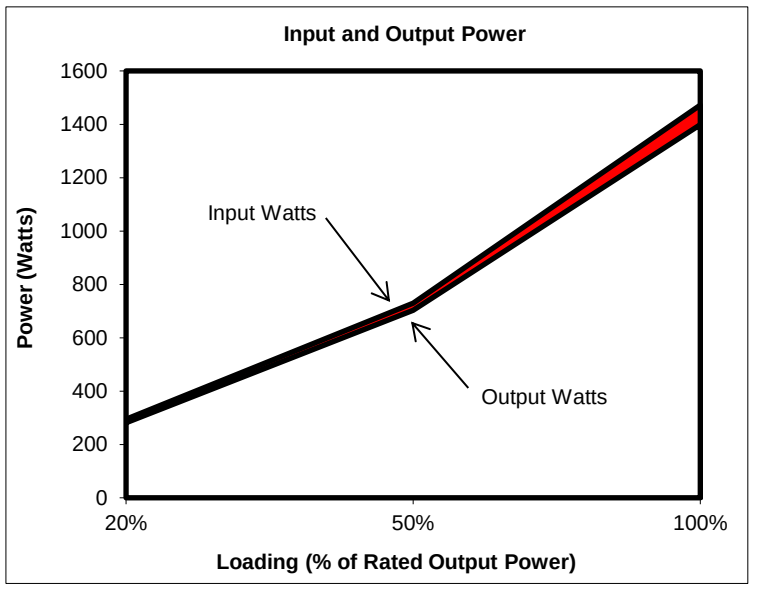
Note: All measurements were taken with input voltage at 230 V nominal and 60 Hz.

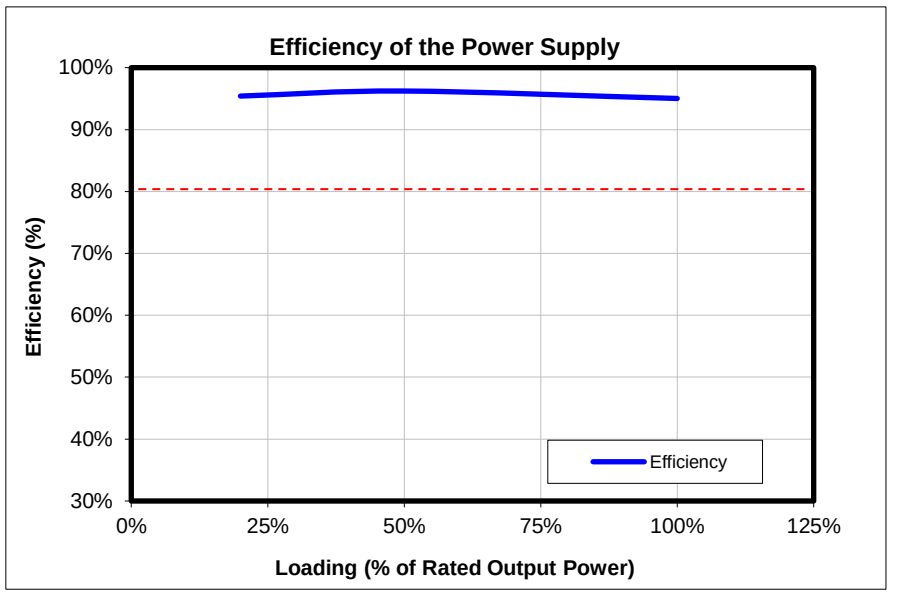


Input AC Current Waveform (ITHD = 4.26%, 50% Load)

I_{RMS}	PF	I_{THD}	Load	Fraction of Load	Input Watts	External Fan (W)*	DC Terminal Voltage (V)/ DC Load Current (A)		Output Watts	Efficiency
							12.2V	12Vsb		
0.69	0.95	7.75%	10%	**Low**	151	19.08	12.26/11.31	11.93/0.2	141	**93.39%**
1.30	0.99	7.13%	20%	**Light**	295	19.08	12.24/22.62	11.9/0.4	282	**95.41%**
3.19	0.99	4.26%	50%	**Typical**	730	18.53	12.21/56.54	11.99/0.99	702	**96.22%**
6.41	1.00	3.26%	100%	**Full**	1472	18.25	12.16/113.09	11.97/1.98	1399	**95.02%**

* Fan power is not included in the efficiency calculations





These tests were conducted by a third party independent testing firm on behalf of the 80 PLUS® Program. 80 PLUS is a certification program to promote highly-efficient power supplies (greater than 80% efficiency in the active mode) in technology applications. http://www.80plus.org/

DELL Technologies

Specification Sheet

PowerEdge R760

Provides performance and versatility as needed to address your most demanding applications

The new Dell PowerEdge R760 is a 2U, two-socket rack server. Gain the performance you need with this full-featured enterprise server, designed to optimize even the most demanding workloads like Artificial Intelligence and Machine Learning.

Max Performance

- Add up to two Next Generation Intel® Xeon® Scalable processors with up to 56 cores for faster and more accurate processing performance.
- Accelerate in-memory workloads with up to 32 DDR5 RDIMMS up to 4400 MT/sec (2DPC) or 4800 MT/sec for 1DPC (16 DDR5 RDIMMs max).
- Support for GPUs including 2 x double-wide or 6 x single-wide for workloads requiring acceleration.

Air cooled at peak performance

- New Smart Flow chassis optimizes airflow to support the highest core count CPUs in an air-cooled environment within the current IT infrastructure.
- Support for up to 16 x 2.5” drives and 2 x 350 watt processors.

Gain agility

- Achieve maximum efficiency with multiple chassis designs that tailor to your desired workloads and business objectives.
- Storage options include up to 12 x 3.5” SAS3/SATA; or up to 24 x 2.5” SAS4/SATA, plus up to 24 x NVMe U.2 Gen4, 16 x NVME E3.S Gen5*.
- Multiple Gen4 and Gen5 riser configurations (up to 8 x PCIe slots) with interchangeable components that seamlessly integrate to address customer needs over time.

Cyber Resilient Architecture for Zero Trust IT environment & operations

Security is integrated into every phase of the PowerEdge lifecycle, including protected supply chain and factory-to-site integrity assurance. Silicon-based root of trust anchors end-to-end boot resilience while Multi-Factor Authentication (MFA) and role-based access controls ensure trusted operations.

Increase efficiency and accelerate operations with autonomous collaboration

The Dell OpenManage™ systems management portfolio delivers a secure, efficient, and comprehensive solution for PowerEdge servers. Simplify, automate and centralize one-to-many management with the OpenManage Enterprise console and iDRAC.

Sustainability

From recycled materials in our products and packaging, to thoughtful, innovative options for energy efficiency, the PowerEdge portfolio is designed to make, deliver, and recycle products to help reduce the carbon footprint and lower your operation costs. We even make it easy to retire legacy systems responsibly with Dell Technologies Services.

Rest easier with Dell Technologies Services

Maximize your PowerEdge Servers with comprehensive services ranging from Consulting, to ProDeploy and ProSupport suites, Data Migration and more – available across 170 locations and backed by our 60K+employees and partners.

PowerEdge R760

The Dell PowerEdge R760 offers powerful performance in a purpose-built, cyber resilient, mainstream server. Ideal for:

- Mixed Workload Standardization
- Database and Analytics
- Virtual Desktop Infrastructure

Feature	Technical Specifications
Processor	Up to two 4th Generation Intel Xeon Scalable processor with up to 56 cores per processor and with optional Intel® QuickAssist Technology
Memory	• 32 DDR5 DIMM slots, supports RDIMM 8 TB max, speeds up to 4800 MT/s • Supports registered ECC DDR5 DIMMs only
Storage controllers	• Internal Controllers: PERC H965i, PERC H755, PERC H755N, PERC H355, HBA355i • Internal Boot: Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 NVMe SSDs or USB • External HBA (non-RAID): HBA355e • Software RAID: S160
Drive Bays	Front bays: • Up to 12 x 3.5-inch SAS/SATA (HDD/SSD) max 240 TB • Up to 8 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 122.88 TB • Up to 16 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 245.76 TB • Up to 24 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 368.64 TB Rear bays: • Up to 2 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 30.72 TB • Up to 4 x 2.5-inch SAS/SATA/NVMe (HDD/SSD) max 61.44 TB
Power Supplies	• 2800 W Titanium 200—240 VAC or 240 HVDC, hot swap redundant • 2400 W Platinum 100—240 VAC or 240 HVDC, hot swap redundant • 1800 W Titanium 200—240 VAC or 240 HVDC, hot swap redundant • 1400 W Platinum 100—240 VAC or 240 HVDC, hot swap redundant • 1100 W Titanium 100—240 VAC or 240 HVDC, hot swap redundant • 1100 W LVDC -48 — -60 VDC, hot swap redundant • 800 W Platinum 100—240 VAC or 240 HVDC, hot swap redundant • 700 W Titanium 200—240 VAC or 240 HVDC, hot swap redundant
Cooling Options	• Air cooling • Optional Direct Liquid Cooling (DLC) Note: DLC is a rack solution and requires rack manifolds and a cooling distribution unit (CDU) to operate.
Fans	• Standard (STD) fans/High performance Silver (HPR) fans/ High performance Gold (VHP) fans • Up to 6 hot plug fans
Dimensions	• Height – 86.8 mm (3.41 inches) • Width – 482 mm (18.97 inches) • Depth – 772.13 mm (30.39 inches) with bezel 758.29 mm (29.85 inches) without bezel
Form Factor	2U rack server
Embedded Management	• iDRAC9 • iDRAC Direct • iDRAC RESTful API with Redfish • iDRAC Service Module • Quick Sync 2 wireless module
Bezel	Optional LCD bezel or security bezel
OpenManage Software	• CloudIQ for PowerEdge plug in • OpenManage Enterprise • OpenManage Enterprise Integration for VMware vCenter • OpenManage Integration for Microsoft System Center • OpenManage Integration with Windows Admin Center • OpenManage Power Manager plugin • OpenManage Service plugin • OpenManage Update Manager plugin
Mobility	OpenManage Mobile
OpenManage Integrations	• BMC Truesight • Microsoft System Center • OpenManage Integration with ServiceNow • Red Hat Ansible Modules • Terraform Providers • VMware vCenter and vRealize Operations Manager
Security	• Cryptographically signed firmware • Data at Rest Encryption (SEDs with local or external key mgmt) • Secure Boot • Secure Erase • Secured Component Verification (Hardware integrity check) • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ
Embedded NIC	2 x 1 GbE LOM card (optional)
Network options	1 x OCP card 3.0 (optional) Note: The system allows either LOM card or an OCP card or both to be installed in the system.
GPU Options	Up to 2 x 350 W DW and 6 x 75 W SW

Feature	Technical Specifications	
Ports	Front Ports • 1 x iDRAC Direct (Micro-AB USB) port • 1 x USB 2.0 • 1 x VGA	Rear Ports • 1 x Dedicated iDRAC Ethernet port • 1 x USB 2.0 • 1 x USB 3.0 • 1 x VGA • 1 x Serial (optional) • 1 x VGA (optional for Direct Liquid Cooling configuration)
	Internal Ports • 1 x USB 3.0 (optional)	
PCIe	Up to eight PCIe slots: • Slot 1: 1 x8 Gen5 or 1 x8/1 x16 Gen4 Full height, Half length or 1 x16 Gen4 Full height, Full length • Slot 2: 1 x8/1 x16 Gen5 or 1 x8 Gen4 Full height, Half length or 1 x16 Gen5 Full height, Full length • Slot 3: 1 x16 Gen4 Low profile, Half length • Slot 4: 1 x8 Gen4 Full height, Half length • Slot 5: 1 x8/1 x16 Gen4 Full height, Half length or 1 x16 Gen4 Full height, Full length • Slot 6: 1 x16 Gen4 Low profile, Half length • Slot 7: 1 x8/1 x16 Gen5 or 1 x8 Gen4 Full height, Half length • Slot 7 SNAPI: 1 x16 Gen5 Full height, Half length • Slot 8: 1 x8 Gen5 or 1 x8 Gen4 Full height, Half length	
Operating System and Hypervisors	• Canonical Ubuntu Server LTS • Microsoft Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell.com/OSsupport.	
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com -> Solutions -> OEM Solutions.	

*Future releases will include additional capacity/form factor.

APEX Flex on Demand

Acquire the technology you need to support your changing business with payments that scale to match actual usage. For more information, visit https://www.delltechnologies.com/en-us/payment-solutions/flexible-consumption/flex-on-demand.htm.

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February 2023

CPU Benchmarks

Over 1,000,000 CPUs Benchmarked

Intel Xeon Gold 5415+

Price and performance details for the Intel Xeon Gold 5415+ can be found below. This is made using thousands of PerformanceTest benchmark results and is updated daily.

- The first graph shows the relative performance of the CPU compared to the 10 other common (single) CPUs in terms of PassMark CPU Mark.
- The 2nd graph shows the value for money, in terms of the CPUMark per dollar.
- The pricing history data shows the price for a single Processor. For multiple Processors, multiply the price shown by the number of CPUs.

CPUS

High End
High Mid Range
Low Mid Range
Low End

Best Value (On Market)
Best Value XY Scatter
Best Value (All time)

New Desktop
New Laptop

Single Thread
Systems with Multiple CPUs
Overclocked
Power Performance
CPU Mark by Socket Type
Cross-Platform CPU Performance
Top Gaming CPUs

CPU Mega List
Search Model

Intel Xeon Gold 5415+

Description:

Class: Server	**Socket:** FCLGA4677
Clockspeed: 2.9 GHz	**Turbo Speed:** 4.1 GHz
Cores: 8	**Typical TDP:** 150 W
Threads: 16	

Cache Size: L1: 640 KB, L2: 16.0 MB, L3: 23 MB

Memory Support: Max. Memory Size: 4.0 TB (Up to DDR5 4400 MT/s 1DPC and 2DPC, ECC Supported)

Other names: Intel(R) Xeon(R) Gold 5415+

CPU First Seen on Charts: Q1 2023

CPUmark/$Price: 23.48

Overall Rank: 286

Last Price Change: $1,066.00 USD (2023-01-01)

Average CPU Mark

25033

Single Thread Rating: 3310
Samples: 2*
*Margin for error: High

+ COMPARE

Floating Point Math	57,803 MOps/Sec
Random String Sorting	32,987 Thousand Strings/Sec
Data Encryption	14,469 MBytes/Sec
Data Compression	291,158 KBytes/Sec
Physics	1,750 Frames/Sec
Extended Instructions	23,641 Million Matrices/Sec
Single Thread	3,310 MOps/Sec

From submitted results to PerformanceTest V10 as of 19th of July 2023.

CPU Mark Distribution for Intel Xeon Gold 5415+

Submitted Baseline Distribution Graph as of 16th of July 2023

Not Enough Data from Current Version of PerformanceTest to Create Distribution Graph.

From submitted results to PerformanceTest V10 as of 16th of July 2023.

Search for Intel Xeon Gold 5415+

from the Featured Merchants below:

Pricing History

Machines with this CPU (or similar)

	Intel NUC 9 Extreme Kit, NUC9i5QNX, w/US Cord, Single Pack	$479.99 (www.amazon.com)
	HUNSN Micro Firewall Appliance, Mini PC, OPNsense, VPN, Router PC, Intel N5105, RS03k, AES-NI, 6 x Intel I226-V 2.5Gbe, 2 x USB, COM, VGA, SIM Slot, 16G RAM, 128G SSD	$414.99 (www.amazon.com)
	Intel NUC 9 NUC9i9QNX Home & Entertainment Mini Desktop Black i9-9980HK, 64GB RAM, 1TB PCIe SSD, UHD 630, WiFi, Bluetooth, 1xHDMI, SD Card, Win 10 Home with Hub	$969.99 (www.amazon.com)

CPU Mark Relative to Top 10 Common Server CPUs

As of 19th of July 2023 - Higher results represent better performance

Processor	Average CPU Mark
AMD Ryzen Threadripper PRO 3995WX	83,417
AMD Ryzen Threadripper PRO 3975WX	62,992
AMD Ryzen Threadripper PRO 3955WX	40,292
AMD Ryzen Threadripper PRO 3945WX	33,532

Intel Xeon Gold 5415+		25,033
Intel Xeon E5-2689 @ 2.60GHz		9,740
Intel Xeon E5-1650 v2 @ 3.50GHz		9,339
Intel Xeon E5-2620 v3 @ 2.40GHz		7,839
Intel Xeon E5-1620 @ 3.60GHz		5,862

CPU Value (CPU Mark / $Price)

As of 19th of July 2023 - Higher results represent better value

Processor	CPU Mark / $Price	
Intel Xeon E5-2620 v3 @ 2.40GHz		603.45
Intel Xeon E5-1650 v3 @ 3.50GHz		75.34
Intel Xeon E5-2689 @ 2.60GHz		53.30
AMD Ryzen Threadripper PRO 3955WX		40.67
Intel Xeon E5-1650 v2 @ 3.50GHz		39.24
Intel Xeon Gold 5415+		23.48
AMD Ryzen Threadripper PRO 3975WX		21.02
AMD Ryzen Threadripper 2990WX		16.19
Intel Xeon E5-1620 @ 3.60GHz		13.23
AMD Ryzen Threadripper PRO 3995WX		12.15
AMD Ryzen Threadripper PRO 3945WX		NA

Single Thread Rating

As of 19th of July 2023 - Higher results represent better performance

Processor	Average Thread Rating	
Intel Xeon Gold 5415+		3,310
AMD Ryzen Threadripper PRO 3945WX		2,701
AMD Ryzen Threadripper PRO 3955WX		2,682

AMD Ryzen Threadripper PRO 3995WX		2,597
Intel Xeon E5-1650 v3 @ 3.50GHz		2,130
Intel Xeon E5-1650 v2 @ 3.50GHz		2,041
Intel Xeon E5-1620 @ 3.60GHz		1,774
Intel Xeon E5-2620 v3 @ 2.40GHz		1,693
Intel Xeon E5-2689 @ 2.60GHz		1,580

Last 2 Baselines for Intel Xeon Gold 5415+

Most recent listed first

Baseline	CPU Mark	
BL1782646 - Mar 30 2023		24973
BL1781941 - Mar 30 2023		25093

Additional baselines can be obtained using Windows version of PerformanceTest's Manage Baselines feature.

Popular comparisons for Intel Xeon Gold 5415+

As of 19th of July 2023 - Higher results represent better performance

Processor	Average CPU Mark	
Intel Xeon Gold 5415+		25,033
Intel Xeon D-1747NTE @ 2.50GHz vs Intel Xeon Gold 5415+		19,822 *(-20.8%)*
Intel Xeon W-2245 @ 3.90GHz vs Intel Xeon Gold 5415+		19,466 *(-22.2%)*
Intel Xeon Gold 5317 @ 3.00GHz vs Intel Xeon Gold 5415+		27,402 *(+9.5%)*
Intel Xeon w3-2435 vs Intel Xeon Gold 5415+		27,391 *(+9.4%)*
Intel Xeon Gold 5317 @ 3.00GHz vs Intel Xeon Gold 5415+		27,402 *(+9.5%)*
Intel Xeon w5-2445 vs Intel Xeon Gold 5415+		33,616 *(+34.3%)*
Intel Xeon Silver 4410T vs Intel Xeon Gold 5415+		28,859 *(+15.3%)*
Intel Xeon W-2265 @ 3.50GHz vs Intel Xeon Gold 5415+		25,965 *(+3.7%)*
Intel Xeon W-3323 @ 3.50GHz vs Intel Xeon Gold 5415+		25,875 *(+3.4%)*
		2,967 *8.3%)*

Intel Xeon Silver 4410Y vs Intel Xeon Gold 5415+		29,585 (+18.2%)

CPU Benchmarks

Dell PowerEdge RAID Controller 12 User's Guide PERC H965i Adapter, PERC H965i Front, and PERC H965i MX

Technical specifications of PERC 12 cards

The following table lists the specifications of PERC 12 cards:

Table 1. Technical specifications of PERC 12 cards

FEATURE	PERC H965I ADAPTER	PERC H965I FRONT	PERC H965I MX
RAID levels	0, 1, 5, 6, 10, 50, 60	0, 1, 5, 6, 10, 50, 60	0, 1, 5, 6, 10, 50, 60
Non–RAID	Yes	Yes	Yes
Enclosures per port	Not applicable	Not applicable	Not applicable
Processor	Broadcom RAID-on-chip, SAS4116W chipset	Broadcom RAID-on-chip, SAS4116W chipset	Broadcom RAID-on-chip, SAS4116W chipset
Battery (Energy Pack) backup unit	Yes	Yes	Yes
Local Key Management security	Yes	Yes	Yes
Secure enterprise key manager security	Yes	Yes	No
Controller queue depth	8,192	8,192	8,192
Non-volatile cache	Yes	Yes	Yes
Cache memory	8 GB DDR4 3200 MT/s cache	8 GB DDR4 3200 MT/s cache	8 GB DDR4 3200 MT/s cache
Cache function	Write-back, write-through, always write-back, no read-ahead	Write-back, write-through, always write-back, no read-ahead	Write-back, write-through, always write-back, no read-ahead
Max no of VDs in RAID mode	64	64	64
Max no of disk groups	64	64	64
Max no of VDs per disk group	16	16	16
Hot-swap devices supported	Yes	Yes	Yes

FEATURE	PERC H965I ADAPTER	PERC H965I FRONT	PERC H965I MX
Auto-Configure behavior (Primary and Execute once)	Yes	Yes	Yes
Hardware XOR engine	Yes	Yes	Yes
Online capacity expansion	No	No	No
Dedicated and global hot-spare	Yes	Yes	Yes
Supported Drive Types	22.5 Gbps SAS, 12 Gbps SAS, and 6 Gbps SATA/SAS. Gen3 (8 GT/s) and Gen4 (16 GT/s) NVMe	22.5 Gbps SAS, 12 Gbps SAS, and 6 Gbps SATA/SAS. Gen3 (8 GT/s) and Gen4 (16 GT/s) NVMe	22.5 Gbps SAS, 12 Gbps SAS, and 6 Gbps SATA/SAS. Gen3 (8 GT/s) and Gen4 (16 GT/s) NVMe
VD strip element size	64 KB, 256 KB	64 KB, 256 KB	64 KB, 256 KB
PCIe support	Gen 4	Gen 4	Gen 4
SAS/SATA maximum drive support	• Without SAS Expander: 16 drives per controller • With SAS Expander: Limited by platform offerings	• Without SAS Expander: 16 drives per controller • With SAS Expander: Limited by platform offerings	Limited by platform: 8 drives per controller
NVMe maximum drive support	• Without PCIe Switch Expander: 8 drives per controller • With PCIe Switch Expander: Limited by platform offerings	• Without PCIe Switch Expander: 8 drives per controller • With PCIe Switch Expander: Limited by platform offerings	Limited by platform: 8 drives per controller
Maximum physical disks supported	• 64 (SAS or SATA or both) • 16 NVMe disks	• 64 (SAS or SATA or both) • 16 NVMe disks	• 64 (SAS or SATA or both) • 16 NVMe disks
Drive sector size supported	512B, 512e, and 4Kn	512B, 512e, and 4Kn	512B, 512e, and 4Kn

Intel® Xeon® Gold 5415+ Processor
22.5M Cache, 2.90 GHz

Intel® Xeon® Gold 5415+ Processor
22.5M Cache, 2.90 GHz

Adicionar para comparar

Especificações

Baixe as especificações ↓

Essenciais

Coleção de produtos	Processadores escaláveis Intel® Xeon® da 4ª Geração
Codinome	Produtos com denominação anterior Sapphire Rapids
Segmento vertical	Server
Número do processador	5415+
Litografia	Intel 7
Preço recomendado para o cliente	$1066.00 - $1076.00
Condições de uso	Server/Enterprise

Especificações da CPU

Número de núcleos	8
Nº de threads	16
Frequência turbo max	4.10 GHz
Frequência baseada em processador	2.90 GHz
Cache	22.5 MB
Velocidade do Intel® UPI	16 GT/s
Nº de links de UPI	3
TDP	150 W

Informações complementares

Status	Launched
Data de introdução	Q1'23
Servicing Status	Baseline Servicing
Opções integradas disponíveis	Sim

Especificações de memória

Tamanho máximo de memória (de acordo com o tipo de memória)	4 TB
Tipos de memória	Up to DDR5 4400 MT/s 1DPC and 2DPC
Nº máximo de canais de memória	8
Compatibilidade com memória ECC ‡	Sim

Opções de expansão

Escalabilidade	2S
Revisão de PCI Express	5
Nº máximo de linhas PCI Express	80

Especificações de encapsulamento

Soquetes suportados	FCLGA4677
Package Carrier	E1B
DTS Max	99 °C
T_{CASE}	78
Tamanho do pacote	77.5mm x 56.5mm

Atualizações disponíveis do Intel® On Demand

Activation Model Products	QAT	DLB	DSA	IAA	SGX512
Communications & Storage Suite 2	2	2			
SGX512					512

Tecnologias avançadas

Ativação do recurso Intel® On Demand	Sim
Intel® QuickAssist Technology (QAT)	1 default devices
Intel® Dynamic Load Balancer (DLB)	1 default devices
Intel® Data Streaming Accelerator (DSA)	1 default devices
Intel® In-memory Analytics Accelerator (IAA)	1 default devices
Intel® Advanced Matrix Extensions (AMX)	Sim

Intel® Speed Select Technology – Core Power	Sim
Intel® Speed Select Technology – Turbo Frequency	Sim
Intel® Deep Learning Boost (Intel® DL Boost)	Sim
Intel® Speed Select Technology – Frequência básica	Sim
High Priority Cores	2
High Priority Core Frequency	3.10 GHz
Low Priority Cores	6
Intel® Resource Director Technology (Intel® RDT)	Sim
Tecnologia Intel® Speed Shift	Sim
Tecnologia Intel® Turbo Boost ‡	2.0
Tecnologia Hyper-Threading Intel® ‡	Sim
Intel® TSX-NI	Sim
Intel® 64 ‡	Sim
Extensões do conjunto de instruções	Intel® AMX, Intel® SSE4.2, Intel® AVX, Intel® AVX2, Intel® AVX-512
Nº de unidades de FMA de AVX-512	2

Segurança e confiabilidade

Intel® Crypto Acceleration	Sim
Aceleração de software Intel® QuickAssist	Sim
Suporte para Resiliência de firmware de plataforma Intel®	Sim
Intel® Control-Flow Enforcement Technology	Sim
Intel® Total Memory Encryption	Sim
Novas instruções Intel® AES	Sim
Intel® Software Guard Extensions (Intel®SGX)	Yes with Intel® SPS
Tamanho máximo do cache de página de enclave (EPC) para Intel® SGX	128 GB
Intel® OS Guard	Sim
Intel® Trusted Execution Technology ‡	Sim
Bit de desativação de execução ‡	Sim
Intel® Boot Guard	Sim
Tecnologia Intel® Run Sure	Sim
Controle de Execução baseado em Modo (MBE — Mode-based Execute Control)	Sim

Tecnologia de virtualização Intel® (VT-x) ‡	Sim
Tecnologia de virtualização Intel® para E/S dirigida (VT-d) ‡	Sim
Intel® VT-x com Tabelas de páginas estendidas (EPT) ‡	Sim

Todas as informações fornecidas estão sujeitas a alterações a qualquer momento, sem aviso prévio. A Intel pode alterar o ciclo de vida da fabricação, as especificações e as descrições dos produtos a qualquer momento, sem aviso prévio. As informações aqui contidas são fornecidas "no estado em que se encontram" e a Intel não atribui qualquer declaração ou garantias relacionadas à precisão das informações, nem sobre os recursos dos produtos, disponibilidade, funcionalidade ou compatibilidade dos produtos listados. Para obter mais informações sobre os produtos ou sistemas, entre em contato com o fornecedor do sistema.

As classificações da Intel são apenas para fins gerais, educacionais e de planejamento e consistem nos números ECCN (Número de Classificação de Controle de Exportações) e HTS (Programa de Tarifas Harmonizadas). Quaisquer usos das classificações da Intel são sem os recursos da Intel e não devem ser interpretados como uma representação ou garantia relacionada ao ECCN ou HTS apropriado. Como exportadora e/ou importadora, sua empresa é responsável por determinar a classificação correta de sua transação.

Consulte a Ficha técnica para obter definições formais de propriedades e recursos de produtos.

‡ Este recurso pode não estar disponível em todos os sistemas de computação. Verifique com o fornecedor do sistema para determinar se seu sistema oferece este recurso ou consulte as especificações de seu sistema (motherboard, processador, chipset, alimentação, HDD, controle gráfico, memória, BIOS, drivers, monitor de máquina virtual [VMM], software de plataforma e/ou sistema operacional) para saber sobre a compatibilidade do recurso. A funcionalidade, o desempenho e outros benefícios deste recurso podem variar, dependendo das configurações do sistema.

Os números dos processadores Intel não são indicação de desempenho. Os números dos processadores diferenciam recursos dentro de cada família de processador, e não entre famílias diferentes de processadores. Consulte https://www.intel.com.br/content/www/br/pt/processors/processor-numbers.html para obter mais detalhes.

O TDP máximo e do sistema se baseiam nos piores casos. O TDP real pode ser inferior, se nem todas as E/Ss para chipsets forem utilizadas.

SKUs "anunciados" ainda não estão disponíveis. Favor consultar a data de lançamento para a disponibilidade no mercado.

Frequência máxima de turbo refere-se à frequência máxima do processador de núcleo único que pode ser atingida com a Tecnologia Intel® Turbo Boost. Mais informações estão disponíveis no site https://www.intel.com/content/www/br/pt/architecture-and-technology/turbo-boost/turbo-boost-technology.html .

Consulte https://www.intel.com.br/content/www/br/pt/architecture-and-technology/hyper-threading/hyper-threading-technology.html?wapkw=hyper+threading para obter mais informações, incluindo detalhes sobre quais processadores são compatíveis com a Tecnologia Hyper-Threading Intel®.

Os processadores compatíveis com a computação de 64 bits na arquitetura Intel® requerem BIOS habilitados para arquitetura Intel 64.

Alguns produtos suportam as novas instruções AES com uma atualização da Configuração do processador, em particular, i7-2630QM/i7-2635QM, i7-2670QM/i7-2675QM, i5-2430M/i5-2435M, i5-2410M/i5-2415M. Favor entrar em contato com o OEM para o BIOS que inclui a mais recente atualização da Configuração do processador.

Privacidade

Transparência da cadeira de fornecimento

As tecnologias Intel® podem exigir ativação de hardware, software específico ou de serviços. // Nenhum produto ou componente pode ser totalmente seguro. // Os seus custos e resultados podem variar. // O desempenho varia de acordo com o uso, a configuração e outros fatores. // Veja nossos Avisos e isenções de responsabilidade legais completos

. // A Intel está comprometida em respeitar os direitos humanos e evitar cumplicidade com abusos de direitos humanos. Consulte Princípios Globais de Direitos Humanos da Intel. Os produtos e software da Intel são destinados a serem utilizados apenas em aplicações que não causem ou contribuam com a violação de um direito humano reconhecido internacionalmente.

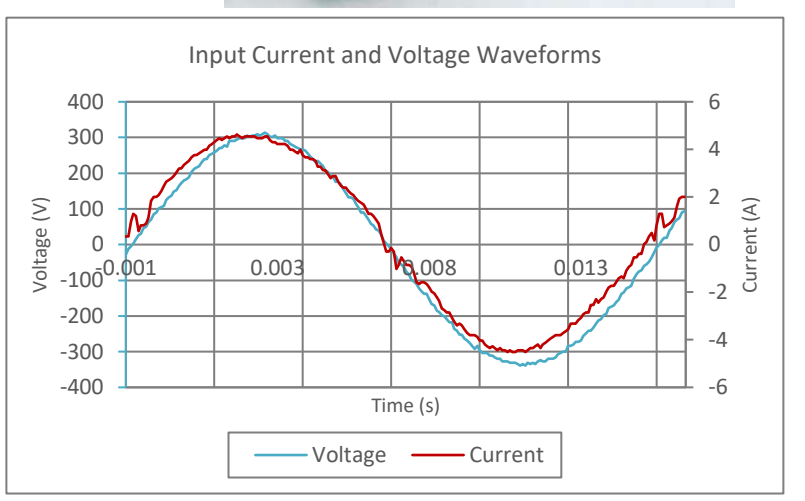
80 PLUS Verification and Testing Report

TYPICAL EFFICIENCY (50% Load):	**96.22%**
AVERAGE EFFICIENCY :	**95.55%**
80 PLUS COMPLIANT:	**YES**

ID Number	SO-1871
Manufacturer	Dell
Model Number	D1400E-S0
Serial Number	N/A
Year	2021
Type	1U
Test Date	04/07/21

Rated Specifications	Value	Units
Input Voltage	**100-240**	Volts
Input Current	**12-8**	Amps
Input Frequency	**50/60**	Hz
Rated Output Power	**1,400**	**Watts**

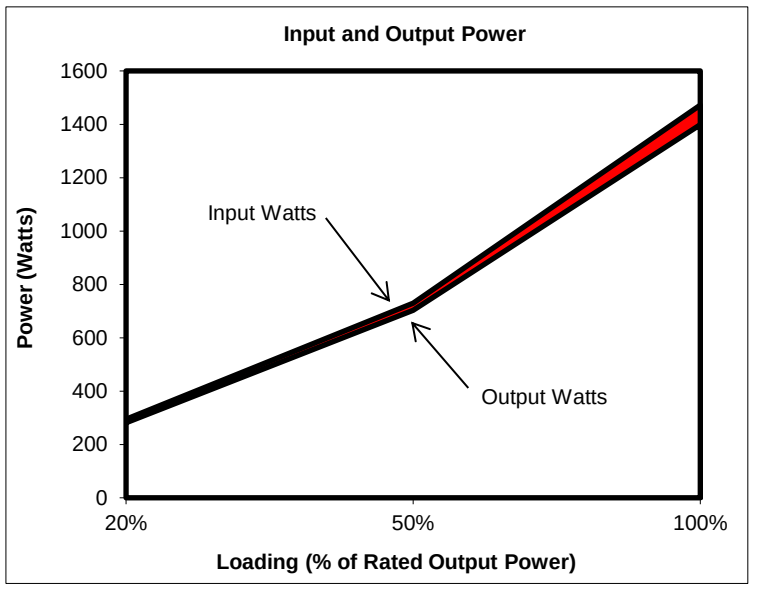
Note: All measurements were taken with input voltage at 230 V nominal and 60 Hz.

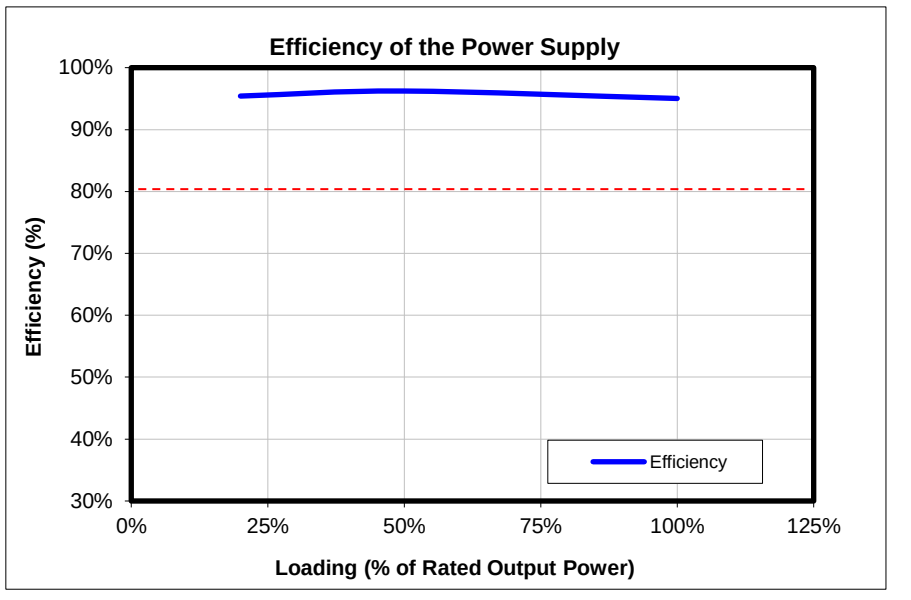


Input AC Current Waveform (ITHD = 4.26%, 50% Load)

I_{RMS}	PF	I_{THD}	Load	Fraction of Load	Input Watts	External Fan (W)*	DC Terminal Voltage (V)/ DC Load Current (A)		Output Watts	Efficiency
							12.2V	12Vsb		
0.69	0.95	7.75%	10%	**Low**	151	19.08	12.26/11.31	11.93/0.2	141	**93.39%**
1.30	0.99	7.13%	20%	**Light**	295	19.08	12.24/22.62	11.9/0.4	282	**95.41%**
3.19	0.99	4.26%	50%	**Typical**	730	18.53	12.21/56.54	11.99/0.99	702	**96.22%**
6.41	1.00	3.26%	100%	**Full**	1472	18.25	12.16/113.09	11.97/1.98	1399	**95.02%**

* Fan power is not included in the efficiency calculations





These tests were conducted by a third party independent testing firm on behalf of the 80 PLUS® Program. 80 PLUS is a certification program to promote highly-efficient power supplies (greater than 80% efficiency in the active mode) in technology applications. http://www.80plus.org/

ENERGY STAR CERTIFIED

Data Center Storage

DELL - Dell EMC PowerVault ME5024 : Dell EMC PowerVault ME5024

Specifications

ENERGY STAR Unique ID:	2395279
ENERGY STAR Partner:	Dell Inc.
Brand Name:	DELL
Model Name:	Dell EMC PowerVault ME5024
Model Number:	Dell EMC PowerVault ME5024
Storage Model Connectivity:	Block I/O
Product Type:	Disk Set Online 2
Storage Controller Configuration:	Scale-Up Storage
Storage Controller Advanced Data Recovery Type:	RAID
Capacity Optimized Method Available (COMs):	Thin Provisioning
Workload Optimization Type:	Streaming
Automated Storage Tiering Capable:	Yes
Automated Storage Tiering Enabled in Hardware on Shipment:	Yes
Markets:	United States
ENERGY STAR Certified:	Yes

Additional Model Information

,E10J,	
UPC Codes	

Captured On:
05/18/2022

DELL Technologies

SPECIFICATION SHEET

PowerVault ME5 Specification Sheet

Simple. Fast. Affordable.

Entry storage purpose-built and optimized for SAN/DAS

The simple, fast and affordable Dell PowerVault ME5 storage platforms are optimized to run a variety of mixed workload applications – physical and virtual – for small to medium size businesses. Whether you need to consolidate your block storage, support applications without the need for low latency flash and NVMe, take advantage of intelligent data management or scale capacity to keep pace with data growth, then PowerVault ME5 is ready to meet your growing business needs. The flexibility of PowerVault ME5 offers multiple protocols, supports a wide range of drive types and capacities, scales up to 8PB[1] capacity, validated with Dell PowerEdge Servers (16G ready) and is delivered to you with all-inclusive software – so you'll have the needed data services to store, manage, and protect your data.

Using fast Intel Xeon processors, Dell PowerVault ME5 storage implements a dual-active controller architecture, 12GB/sec read, and 10GB/sec write throughput and uses a 12Gb SAS backend protocol for rapid capacity expansion.

Dell PowerVault ME5 base system and expansion models

The two non-dense ME5 base arrays start at 2U and the dense ME5 array starts at 5U. The base models all support dual-active controllers with each controller including 16GB of memory.

ME5012
12 drive / 2U

ME5024
24 drive / 2U

ME5084
84 drive / 5U

Optional ME5 expansion enclosures let you scale up to 336 drives or 8PB[1]. PowerVault ME412 and ME424 expansion enclosures can only be used with either ME5012 or ME5024 base arrays. The ME484 dense expansion enclosure is supported behind any of the ME5 base arrays. A variety of SSD, 10K and NLSAS drives (including FIPS-certified SEDs) are available.

ME412 Expansion Enclosure
12 drive / 2U

ME424 Expansion Enclosure
24 drive / 2U

ME484 Expansion Enclosure
84 drive / 5U

PowerVault ME5 Specifications

Chassis Overview

Chassis format	All-in-one: dual controllers, internal drive bays, networking and with expansion options
Rack size	2U or 5U
Controllers	2 hot-swappable per chassis (dual-active) Single/dual controller support for 2U models Dual controller support only for 5U model
Processor	Intel® Xeon Processor
Internal storage	**ME5012:** 12 x 3.5” drive bays (2.5” drive carriers supported) **ME5024:** 24 x 2.5” drive bays **ME5084:** 84x 3.5” drive bays (2.5” drive carriers supported)
System memory	16GB per controller (32GB total)

Expansion Capacity

Expansion enclosures	**ME412:** 12 x 3.5” drive bays (12Gb SAS) **ME424:** 24 x 2.5” drive bays (12Gb SAS) **ME484:** 84 x 3.5” drive bays (12Gb SAS)
Min/Max drive count	**ME5012:** 2/264 **ME5024:** 2/276 **ME5084:** 28/336
Max raw capacity[1]	**ME5012:** Up to 2.64PB (total with 9 ME412) **ME5012:** Up to 1.92PB (total with 9 ME424) **ME5012:** Up to 5.80PB (total with 3 ME484) **ME5024:** Up to 2.56PB (total with 9 ME412) **ME5024:** Up to 1.83PB (total with 9 ME424) **ME5024:** Up to 5.72PB (total with 3 ME484) **ME5084:** Up to 7.39PB (total with 3 ME484) **ME5084:** Up to 5.54PB (total with 2 ME484)
NAS Support	Supported with NX Series Windows NAS appliance
Storage media	SAS and NL-SAS drives; different drive types, transfer rates, rotational speeds can be mixed in the same system: • NLSAS 7.2K 3.5” – 4TB, 8TB, 12TB, 16TB, 16TB FIPS, 20TB, 22TB • SAS 10K 2.5” – 1.2TB, 2.4TB, 2.4TB FIPS • SSD – 960GB RI, 1.6TB MU, 1.92TB, 3.84TB, 3.84TB FIPS, 7.68TB RI • SDD and HDD: FIPS-certified SEDs

Network, Expansion Enclosure and I/O

Host interface	FC, iSCSI (optical or BaseT), SAS
Max 32Gb FC ports	8 per array (support auto-negotiate to 16Gb)
Max 25Gb iSCSI ports	8 SFP+ or SFP28 ports per array
Max 10Gb iSCSI ports	8 BaseT ports per array (only support auto negotiate to 1Gb)
Max 12Gb SAS ports	8 12Gb SAS ports
Max management ports	2 per array (1Gb BASE-T)
Disk expansion protocol	12Gb SAS

Disk interface expansion ports	2 x 12Gb SAS (wide-Port) per array (1 port per controller) Up to 9 2U expansion enclosures per 2U base array Up to 3 5U expansion enclosures per 2U base array Up to 3 5U expansion enclosures per 5U base array
Functional	
Array configurations	All-flash, hybrid flash, HDD only arrays
Storage format	Native block-level SAN or DAS

Data Optimization	
Auto-tiering	Up to 3 primary (media-based) tiers
RAID support	RAID 1, 5, 6, 10, or ADAPT RAID; any combination of RAID levels can exist in single array
ADAPT RAID	Distributed erasure coding that reduces rebuild times when drive failures occur
Thin provisioning	Active by default on all volumes, operates at full performance across all features
Snapshots	1024 maximum re-direct-on-write snapshots per array
Data Mobility and Migration	
Replication	Asynchronous replication via FC or iSCSI – ME4 to ME5; ME5 to ME4; ME5 to ME5 Target/source relationships may be one-to-many or many-to-one
Volume copy	Copy complete standalone volumes
Data Protection, Disaster Recovery, Security	
Business continuity	VMware Site Recovery Manager
Data-at-rest encryption	Self-encrypting drives (SEDs) in SSD or HDD formats Full Disk Encryption (FDE) based on AES-256 Drives certified to FIPS 140-2 Level 2
Key manager	Internal controller key management

Management	
Management support	PowerVault Manager HTML5 GUI element manager, CLI, OpenManage Enterprise 3.9
VMware vCenter	VMware vCenter plugin to manage ME5 arrays through vCenter.
Scripting	CLI API Redfish/Swordfish REST API
Supported host OS	Windows 2022, 2019 and 2016 RHEL 8.2 and 7.8 SLES 15.2 and 12.5 VMware 7.0 and 6.7 Citrix XenServer 8.x and 7.x
Virtualization integration	VMware vSphere (ESXi) vCenter; SRM Microsoft Hyper-V
Physical Base System	
Rack size	ME5012 (2U), ME5024 (2U), ME5084 (5U)
Base system height	**ME5012:** 8.79 cm (3.46 inches) **ME5024:** 8.79 cm (3.46 inches) **ME5084:** 22.23 cm (8.75 inches)
Base system width	**ME5012:** 48.30 cm (19.01 inches) **ME5024:** 48.30 cm (19.01 inches) **ME5084:** 48.30 cm (19.01 inches)
Base system depth	**ME5012:** 61.87mm (24.36 inches) **ME5024:** 54.78mm (21.56 inches) **ME5084:** 981mm (38.62 inches)
Weight (max configuration)	**ME5012:** 32.00 kg (71.00 lbs) **ME5024:** 30.00 kg (66.00 lbs) **ME5084:** 135.00 kg (298.00 lbs)
Weight (empty)	**ME5012:** 4.80 kg (10.56 lbs) without drives **ME5024:** 4.80 kg (10.56 lbs) without drives **ME5084:** 64.00 kg (141.00 lbs) without drives
Physical Expansion Enclosure	
Rack size	**ME412** (2U)**, ME424** (2U), **ME484** (5U)
Expansion height	**ME412:** 8.79 cm (3.46 inches) **ME424:** 8.79 cm (3.46 inches) **ME484:** 22.23 cm (8.75 inches)
Expansion width	**ME412:** 48.30 cm (19.01 inches) **ME424:** 48.30 cm (19.01 inches) **ME484:** 48.30 cm (19.01 inches)
Expansion depth	**ME412:** 60.29 cm (23.74 inches) **ME424:** 60.29 cm (23.74 inches) **ME484:** 97.47 cm (38.31 inches)
Weight (max configuration)	**ME412:** 28.00 kg (62.00 lbs) **ME424:** 25.00 kg (55.00 lbs) **ME484:** 130.00 kg (287.00 lbs)
Weight (empty)	**ME412:** 4.80 kg (10.56 lbs) without drives **ME424:** 4.80 kg (10.56 lbs) without drives **ME484:** 64.00 kg (141.00 lbs) without drives
Base System Power	
Power/wattage	**ME5012:** 580W **ME5024:** 580W **ME5084:** 2200W
Heat dissipation	**ME5012:** 1980 BTU **ME5024:** 1980 BTU **ME5084:** 7507 BTU

Voltage	**ME5012:** 100-240 VAC **ME5024:** 100-240 VAC **ME5084:** 200-240 VAC
Frequency	50/60 Hz
Amperage	**ME5012:** 7.6-3.0A (x2) **ME5024:** 7.6-3.0A (x2) **ME5084:** 11.07-9.23A (x2)

Expansion Power

Power/wattage	**ME412:** 580W **ME424:** 580W **ME484:** 2200W
Heat dissipation	**ME412:** 1980 BTU **ME424:** 1980 BTU **ME484:** 7507 BTU
Voltage	**ME412:** 100-240 VAC **ME424:** 100-240 VAC **ME484:** 200-240 VAC
Frequency	50/60 Hz
Amperage	**ME412:** 7.6-3.0A (x2) **ME424:** 7.6-3.0A (x2) **ME484:** 11.07-9.23A(x2)

Environmental Operating Conditions

Operating temperature	5°C - 35°C (41°F - 95°F, derated by 1°C per 300mm above 900m)
Non-operating temperature	-40°C to 70°C (-40 to 158°F) Maximum temperature changes in an hour: 20°C
Operating humidity ranges (non-condensing)	-12C dew point minimum, 8% to 85% maximum, non-condensing
Non-operating humidity (non-condensing)	21°C dew point maximum, 5% to 100% maximum, non-condensing

Service & Warranty

Services	Dell ProSupport Enterprise Suite and Dell ProDeploy Enterprise Suite. Optional ProSupport Plus is available offering pro-active and preventative services to improve performance and stability.
System sizing	Dell Power Sizer (https://powersizer.dell.com)

OEM-Ready

From bezel to BIOS to packaging, your storage arrays can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM

1 Firmware designed to support 8PB with higher drive capacities when they become available.

DELL POWERVAULT ME5

Simple. Fast. Affordable.

Learn more about Dell PowerVault ME5

Contact a Dell Technologies Expert

DELL Technologies

Product Compliance Datasheet

MARKETING NAME……: See Section I. Regulatory Model Reference Information

REGULATORY MODEL…..…: E10J

REGULATORY TYPE……..…: E10J001

EMC EMISSIONS CLASS…...: A

EFFECTIVE DATE……..…...: December 14, 2021

Table of contents

I. Regulatory Model Reference Information

Dell EMC storage, data protection and converged infrastructure *systems* are configured-to-order from combinations of different storage *platforms* and/or *server* appliances. This Product Compliance Datasheet applies strictly to the single *platform* or *appliance* as designated in the Regulatory Model field on the title page. This datasheet does NOT apply to the parent *systems* that incorporate this Regulatory Model, nor does it apply to any other Regulatory Models that may be peers integrated alongside this Regulatory Model in parent *systems*.

For reference purposes, the table below provides a list of the Marketing Names of the systems that may incorporate this Regulatory Model. The listed systems may include one or more additional Regulatory Models. A Regulatory Model Reference Letter that lists all the Regulatory Models included in each system is available for each Marketing Name at https://support.dellproductcompliance.com/hc/en-us/requests/new .

Regulatory Model to Marketing Name Reference	
Platform or Appliance Type	Storage Array Enclosure
Regulatory Model Number	E10J
System Trade Name / Trademark	Dell EMC or DELL
System Marketing Name(s) that incorporate this Regulatory Model	PowerVault ME5024, PowerVault OEMR ME5024, PowerVault ME4024, PowerVault OEMR ME4024, PowerVault ME424, PowerVault OEMR ME424, Dell Storage SCv2020, Dell Compellent SC2020

II. Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed. The product is affixed with regulatory marking and text as necessary for the country/agency. Dell manufacturers and markets Multimedia Equipment (MME), Information Technology Equipment (ITE), Audio Visual Equipment (A/V), Industrial, Scientific, Medical Equipment (ISM) or combinations of these. Generally, products Electromagnetic Compatibility (EMC) and Product Safety compliance is based on International IEC and CISPR standards and their national equivalent along with national standards for Radio (wireless), Telecommunications (Modem) and Energy. Dell products have been verified to comply with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU of the European Parliament and the Council. Dell product does not contain any of the restricted substances in concentrations and applications not permitted by the RoHS Directive.

EMC Emissions Class refers to one of the following use environments:

- EMC Class B product is intended for use in residential/domestic environments but may also be used in nonresidential/non-domestic environments.
- EMC Class A product is intended for use in non-residential/non-domestic environments. Class A product may also be utilized in residential/domestic environments but may cause interference and require the user to take adequate corrective measures.

For Product Safety and EMC compliance, this product has been assigned a unique regulatory model and regulatory type that is imprinted on the product regulatory labeling to provide traceability to the

regulatory approvals noted on this datasheet. This datasheet applies to any product that utilizes the assigned regulatory model and type including marketing names other than those listed on this datasheet. Dell products with the CE marking have been verified to comply with Energy Related Products (ErP) Directive 2009/125/EC of the European Parliament and of the Council. https://www.dell.com/ErP User Information. REACH (Registration, Evaluation, Authorization and Restriction of Chemicals), Regulation (EC) 1907/2006 of the European Parliament and of the Council is the European Union's (EU) chemical substances regulatory framework. Dell complies with the REACH regulation. For information on SVHC (Substances of Very High Concern), see www.dell.com/REACH. This products compliance documentation, such as this datasheet and the European Union Declaration of Conformity are available on the product support page, manuals tab http://www.dell.com/support. Additional compliance documentation for the product is available upon submitting a request at http://www.dell.com/regulatory_compliance. Please include product identifiers such as marketing name, regulatory model, regulatory type, and country that compliance information is needed in the email request.

III. Global Environmental Information

Environmental (Voluntary Marks)		
Country	**Approval**	**Compliance**
Global	ENERGY STAR (Configuration Dependent)	*2.0*
Varies by Country See EPEAT.net	EPEAT (Configuration Dependent)	Refer to EPEAT.net for specific registration levels and countries

IV. NFPA 99 Conformity

Select Dell systems have been tested and found to comply with the touch current requirements as defined in 10.3.5 of National Fire Protection Association standard NFPA 99:2012. The touch current does not exceed 100 µA with ground wire intact (if a ground wire is provided) and 500 µA with ground disconnected at 127 V AC, 60 Hz when tested in accordance with 10.3.5 of NFPA 99: 2012. To determine if this product complies with the above requirements, send a request to Product_Compliance@Dell.com. Please include product identifiers such as marketing name, regulatory type and country for which compliance information is needed.

V. Declaration of Similarity

Dell Inc. herby declares that the platforms or appliances designated by the Regulatory Model listed in this declaration are strictly identical in design (shape, opening, etc.) components, materials, manufacturing process, and markings except for product designation – Trade Name and/or Trade Mark as specified in this declaration.

The platforms or appliances may have very minor differences which do not impact the level of conformity. All platforms or appliances identified by the Regulatory Model designations in this declaration have the same level of conformity according to the certificate(s) provided.

The Trade Name / Trademark and/or Marketing Name(s) are the property of Dell Inc. Any differences in the product designation are for marketing purposes only

Date of Issue	December 14, 2021	Signature on behalf of Dell Inc.	Dell Inc. Dell Global Product Compliance and Environmental Affairs
Title	Dell Global Product Compliance and Environmental Affairs		

VI. Power Cords and User Documentation

Dell products are provided with the power cord and user documentation suitable for the intended country of delivery. Products that are relocated to other countries should use nationally certified power cords and plugs to ensure safe operation of the product. Contact Dell to determine if alternate power cords or user documentation in other languages is available for your market.

VII. Trade (Import/Export) Compliance Data

For any questions related to importing & exporting classification of Dell products, please obtain information from the following link: http://www.dell.com/learn/us/en/uscorp1/import-export or send email request to WW_Export_Compliance@dell.com. Please include product identifiers such as marketing name, regulatory model, regulatory type, and country that compliance information is needed in the email request.

VIII. Product Dimensions and Weight

Depth, mm/cm	Width, mm/cm	Height, mm/cm	Weight, kg
523 mm	482 mm	87.9 mm	24 Kg (depending upon installed options)

IX. Performance Data

ErP Lot 9 information is in Appendix A.

For additional information on how Dell's commitment to energy efficiency benefits you go to: Reducing your Footprint

For additional information on ENERGY STAR models refer to the following database: ENERGY STAR Product Finder

X. Product Materials Information

Information on Dell's material use is available here.
Dell's Restricted Material for Use guidance document is available at www.dell.com/restrictedsubstanceslist.

- The case material is Steel

Mechanical plastic parts[1] > 25 g are BFR/PVC free	☒ Yes ☐ No ☐ NA
Marking of plastics parts greater than 25 grams is in accordance with ISO 11469 (see below)	☒ Yes ☐ No ☐ NA
Printed circuit boards (without components) >25g are BFR PVC free [2]	☐ Yes ☒ No ☐ NA
Insulation materials of external electrical cables are PVC free	☐ Yes ☒ No ☐ NA
Insulation materials of internal electrical cables are PVC free	☐ Yes ☒ No ☐ NA
Product is BFR/PVC Free (Accessories & Options may not be BFR/PVC-Free, refer to spec ENV0199)	☐ Yes ☒ No

Flame Retardants Used in Motherboard

Part	Flame Retardant
Motherboard	TBBPA

Flame Retardants Used in Mechanical Plastic Parts > 25 grams

Resin Material Name	Plastic Part Marking per ISO 11469:2016	Flame Retardant Marking per ISO 1043-4 (i.e. FR(16), FR(40), etc.)	Flame Retardant (i.e. TBBPA, triaryl phosphate ester, etc.)	List applicable R-Phrase(s) or Hazard Statement(s) per EU Directive 67/548/EEG or 1272/2008
PC+ABS	>PC+ABS FR(40)<	FR(40)	TPP (Triphenyl phosphate)	N/A

Mercury Information

Number of bulbs	Average per bulb
0	0 mg

Additional information:

- Refer to Dell Technologies' Chemical Use Policy for more information on RoHS and REACH.
- Products MSDS (Material Safety Data Sheets):
  - Batteries: Battery MSDS Documentation and Declaration
  - Printer Toner and Ink: MSDS Documentation

XI. Packaging

Information on Dell's sustainable packaging effort available here. Additional materials restricted in Packaging as per Dell's Material Restricted for Use Standard document can be found at www.dell.com/restrictedsubstanceslist.

[1] Mechanical plastic part: plastic parts that do not internally carry an electrical signal such as housings, brackets, bezels, latches, etc. that form the basic structure of the product and/or have mechanical functions. Plastic parts such as fans, connectors, printer fuser assemblies, etc. are not considered "mechanical plastic parts" in the context of this specification. Plastics parts do not contain more than 0,1% weight (1000 ppm) bromine and 0,1% weight (1000 ppm) chlorine attributable to brominated flame retardants, chlorinated flame retardants, and polyvinyl chloride (Per Dell Spec ENV0424)

[2] Dell will adopt the BFR/CFR/PVC-free definition as set forth in the "iNEMI Position Statement on the Definition of 'Low-Halogen' Electronics (BFR/CFR/PVC-Free)." Plastic parts contain <1000 ppm (0.1 percent) of bromine (if the Br source is from BFRs) and <1000 ppm (0.1 percent) of chlorine if the Cl source is from CFRs, PVC, or PVC copolymers. All printed circuit board (PCB) and substrate laminates contain bromine/chlorine totaling less than 1,500 ppm (0.15 percent), with maximum chlorine of 900 ppm (0.09 percent) and maximum bromine of 900 ppm (0.09 percent)

XII. Batteries

Below is a listing of batteries that could be present in the product:

Battery Description – Batteries	Battery Type	Battery Weight (kg)	Rating
CR-2032 coin cell	Lithium Metal	0.003	3Vdc

XIII. Design for Environment

Dell systems are, when applicable, designed for easy assembly, disassembly, and servicing. For more information on Dell's Environmental product attributes please visit https://www.dell.com/learn/is/en/iscorp1/dell-environment-greener-products

XIV. Recycling / End-of-Life Service Information

Take back and recycling services are offered for this product in certain countries. If you want to dispose of system components, please visit www.dell.com/recyclingworldwide and select the relevant country.

XV. Helpful Links

- **Environmental Policy**
  https://i.dell.com/sites/csdocuments/Corporate_corp-Comm_Documents/en/dell-global-environmental-policy.pdf
- **Social Impact - Progress Made Real**
  https://corporate.delltechnologies.com/en-id/social-impact.htm
- **Advancing Sustainability**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability.htm
- **ISO 14001 Certification**
  http://i.dell.com/sites/content/corporate/corp-comm/en/Documents/dell-iso14001-worldwide.pdf
- **Materials Restricted for Use**
  www.dell.com/restrictedsubstanceslist
- **Chemical Use Policy**
  http://i.dell.com/sites/doccontent/corporate/environment/en/Documents/chemical-use-policy.pdf
- **Product Carbon Footprint**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability/sustainable-products-and-services/product-carbon-footprints.htm
- **RoHS Compliance**
  https://support.dellproductcompliance.com/hc/en-us/articles/360036876153-Materials-Restricted-Material-Compliance
- **REACH Compliance**
  www.dell.com/REACH
- **Recycling Information**
  http://www.dell.com/recycling
- **Supplier Responsibility – Champion the Many People**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability/champion-the-many-people.htm

Appendix A: ErP Lot 9 Servers and Data Storage Products: Information for end-users

The EU Commission Regulation (EU) 2019/424 (ErP Lot 9) ANNEX II Section 3.0 defines the information requirements to be provided by Manufacturers. This information is documented below or via a link is provided to a free access website where the information is maintained. A reference column is included to align the information with the format in the annex of the regulation. Where the information has already been recorded in the body of the Product Compliance Datasheet a note is made to avoid duplication.
For any follow up a request should be sent to: http://support.dellproductcompliance.com

Annex II Sect 1.2.3	Reporting Requirement	Link to Firmware / Security Updates
	Latest available version of firmware including latest security update	https://www.dell.com/support

Annex II Sect 3.2	Reporting Requirement	Information Requirements / link to free access website
a.	product type	reference product compliance datasheet
b.	manufacturer's name, registered trade name and registered trade address at which they can be contacted;	reference product compliance datasheet
c.	product model number, and if applicable the low-end performance configuration and the high-end performance configuration model numbers;	reference product compliance datasheet
d.	year of manufacture;	2015
e.	PSU efficiency at 10 % (if applicable), 20 %, 50 % and 100 % of rated output power,	reference ErP Lot 9 storage power supply table
f.	power factor at 50 % of the rated load level, with the exception of direct current servers, rounded to three decimal places	reference ErP Lot 9 storage power supply table
g.	declared operating condition class	This product has been tested to verify that it will function within the boundaries of the declared operating condition class' A2
h.	secure data deletion	https://i.dell.com/media-sanitization

Storage PSU Efficiency and Power Factor Requirements

URL Link to Manufacturer's PSU Efficiency Data and Report

https://www.clearesult.com/80plus/

Manufacturer Name	Model Number	Single/Multi-Output	Search Tab	Search Model Number
Seagate Systems (UK) Ltd	TDPS-580AB A	Single-Output	230V Internal	SP-PCM01-HE580-AC
Seagate Systems (UK) Ltd	FS580FS104G-00	Single-Output	230V Internal	SP-PCM02-HE580-AC-DELL

Annex II Sect 3.3	Reporting Requirement	Information Requirement / link to free access website
h.	indicative weight range of the following CRMs: (a) Cobalt in the batteries. (b) Neodymium in the HDDs	Contact: http://support.dellproductcompliance.com
i.	instructions on the disassembly operations;	reference user manual in documentation tab on https://www.dell.com/support

Product Compliance Datasheet

MARKETING NAME/MODEL NO……: See Section I. Regulatory Model Reference Information

REGULATORY MODEL…..…..: E09J

REGULATORY TYPE…..…..…: E09J001

EMC EMISSIONS CLASS…....: A

EFFECTIVE DATE……..…....: October 21, 2022

Table of contents

I. Regulatory Model Reference Information

Dell EMC storage, data protection and converged infrastructure *systems* are configured-to-order from combinations of different storage *platforms* and/or *server* appliances. This Product Compliance Datasheet applies strictly to the single *platform* or *appliance* as designated in the Regulatory Model field on the title page. This datasheet does NOT apply to the parent *systems* that incorporate this Regulatory Model, nor does it apply to any other Regulatory Models that may be peers integrated alongside this Regulatory Model in parent *systems*.

For reference purposes, the table below provides a list of the Marketing Names of the systems that may incorporate this Regulatory Model. The listed systems may include one or more additional Regulatory Models. A Regulatory Model Reference Letter that lists all the Regulatory Models included in each system is available for each Marketing Name at https://support.dellproductcompliance.com .

Regulatory Model to Marketing Name Reference	
Platform or Appliance Type	Storage Array Enclosure
Regulatory Model Number	E09J
System Trade Name / Trademark	Dell EMC or DELL
System Marketing Name(s) that incorporate this Regulatory Model	PowerVault ME5012, PowerVault OEMR ME5012, PowerVault ME4012, PowerVault OEMR ME4012, PowerVault ME412, PowerVault OEMR ME412, Dell Storage SCv2000, Dell Compellent SC2000

II. Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed. The product is affixed with regulatory marking and text as necessary for the country/agency. Dell manufacturers and markets Multimedia Equipment (MME), Information Technology Equipment (ITE), Audio Visual Equipment (A/V), Industrial, Scientific, Medical Equipment (ISM) or combinations of these. Generally, products Electromagnetic Compatibility (EMC) and Product Safety compliance is based on International IEC and CISPR standards and their national equivalent along with national standards for Radio (wireless), Telecommunications (Modem) and Energy. Dell products have been verified to comply with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU of the European Parliament and the Council. Dell product does not contain any of the restricted substances in concentrations and applications not permitted by the RoHS Directive.

EMC Emissions Class refers to one of the following use environments:

- EMC Class B product is intended for use in residential/domestic environments but may also be used in nonresidential/non-domestic environments.
- EMC Class A product is intended for use in non-residential/non-domestic environments. Class A product may also be utilized in residential/domestic environments but may cause interference and require the user to take adequate corrective measures.

For Product Safety and EMC compliance, this product has been assigned a unique regulatory model and regulatory type that is imprinted on the product regulatory labeling to provide traceability to the regulatory approvals noted on this datasheet. This datasheet applies to any product that utilizes the assigned regulatory model and type including marketing names other than those listed on this datasheet. Dell products with the CE marking have been verified to comply with Energy Related Products (ErP) Directive 2009/125/EC of the European Parliament and of the Council. https://www.dell.com/ErP User Information. REACH (Registration, Evaluation, Authorization and Restriction of Chemicals), Regulation (EC) 1907/2006 of the European Parliament and of the Council is the European Union's (EU) chemical substances regulatory framework. Dell complies with the REACH regulation. For information on SVHC (Substances of Very High Concern), see www.dell.com/REACH. This products compliance documentation, such as this datasheet and the European Union Declaration of Conformity are available on the product support page, manuals tab http://www.dell.com/support. Additional compliance documentation for the product is available upon submitting a request at https://support.dellproductcompliance.com Please include product identifiers such as marketing name, regulatory model, regulatory type, and country that compliance information is needed in the email request.

III. Global Environmental Information

Environmental (Voluntary Marks)		
Country	**Approval**	**Compliance**
Global	ENERGY STAR (Configuration Dependent)	*2.0*
Varies by Country See EPEAT.net	EPEAT (Configuration Dependent)	Refer to EPEAT.net for specific registration levels and countries

IV. NFPA 99 Conformity

Select Dell systems have been tested and found to comply with the touch current requirements as defined in 10.3.5 of National Fire Protection Association standard NFPA 99:2021. The touch current does not exceed 100 µA with ground wire intact (if a ground wire is provided) and 500 µA with ground disconnected at 127 V AC, 60 Hz when tested in accordance with 10.3.5 of NFPA 99: 2021. To determine if this product complies with the above requirements, send a request to https://support.dellproductcompliance.com. Please include product identifiers such as marketing name, regulatory type and country for which compliance information is needed.

V. Declaration of Similarity

Dell Inc. hereby declares that the platforms or appliances identified by the Regulatory Model listed in this declaration are strictly identical in design (shape, opening, etc.) components, materials, manufacturing process, and markings except for product designation – Trade Name and/or Trademark as specified in this declaration.

The platforms or appliances may have very minor differences which do not impact the level of conformity. All platforms or appliances identified by the Regulatory Model designations in this declaration have the same level of conformity according to the certificate(s) provided.

The Trade Name / Trademark and/or Marketing Name(s) are the property of Dell Inc.
Any differences in the product designation are for marketing purposes only.

Date of Issue	October 21, 2022	Signature on behalf of Dell Inc.	Dell Inc. Dell Global Product Compliance and Environmental Affairs
Title	Dell Global Product Compliance and Environmental Affairs		

VI. Power Cords and User Documentation

Dell products are provided with the power cord and user documentation suitable for the intended country of delivery. Products that are relocated to other countries should use nationally certified power cords and plugs to ensure safe operation of the product. Contact Dell to determine if alternate power cords or user documentation in other languages is available for your market.

VII. Trade (Import/Export) Compliance Data

For any questions related to importing & exporting classification of Dell products, please obtain information from the following link: http://www.dell.com/learn/us/en/uscorp1/import-export or send email request to WW_Export_Compliance@dell.com. Please include product identifiers such as marketing name, regulatory model, regulatory type, and country that compliance information is needed in the email request.

VIII. Product Dimensions and Weight

Depth, mm/cm	Width, mm/cm	Height, mm/cm	Weight, kg
584 mm	482 mm	87.9 mm	32 Kg (depending upon installed options)

IX. Product Energy Performance Data

ErP Lot 9 information is in Appendix A.

For additional information on how Dell's commitment to energy efficiency benefits you go to: Reducing your Footprint

For additional information on ENERGY STAR models refer to the following database: ENERGY STAR Product Finder

X. Product Materials Information

Information on Dell's material use is available here.
Dell's Restricted Material for Use guidance document is available here.

Mechanical plastic parts[1] are BFR/PVC free	☒ Yes ☐ No ☐ NA
Marking of plastics parts is in accordance with ISO 11469 (see below)	☒ Yes ☐ No ☐ NA
Printed circuit boards (without components) >0.5g are BFR PVC free [1]	☐ Yes ☒ No ☐ NA
Insulation materials of external electrical cables are PVC free	☐ Yes ☒ No ☐ NA
Product is BFR/PVC Free (Accessories & Options may not be BFR/PVC-Free	☐ Yes ☒ No

Flame Retardants Used in Motherboard

Part	List the Flame Retardants
PCB[1]	**TBBPA**

Flame Retardants Used in Mechanical Plastic Parts

The case material is > _Steel_ <

Resin Material Name	Plastic Part Marking per ISO 11469:2016	Flame Retardant Marking per ISO 1043-4 (i.e. FR(16), FR(40), etc.)	List the Flame Retardants used on (i.e. BPA, etc)	List applicable R-Phrase(s) or Hazard Statement(s) per EU Directive 67/548/EEG or 1272/2008
PC+ABS	>PC+ABS FR(40)<	FR(40)	TPP (Triphenyl phosphate)	N/A

Mercury Information

Number of bulbs	Average per bulb
0	0 mg

Additional information:

- Refer to Dell Technologies' Chemical Use Policy for more information on RoHS and REACH.
- Products MSDS (Material Safety Data Sheets):
  - Batteries: Battery MSDS Documentation and Declaration
  - Printer Toner and Ink: MSDS Documentation

XI. Packaging

Information on Dell's sustainable packaging effort available here. Additional materials restricted in Packaging as per Dell's Material Restricted for Use Standard document can be found at www.dell.com/restrictedsubstanceslist.

[1] A PCB is a blank circuit board with no electronic components attached

XII. Batteries

Below is a listing of batteries that could be present in the product:

Battery Description – Batteries	Battery Type	Battery Weight (kg)	Rating
CR-2032 coin cell	Lithium Metal	0.003	3Vdc

XIII. Design for Environment

Dell systems are, when applicable, designed for easy assembly, disassembly, and servicing. For more information on Dell's Environmental product attributes click here.

XIV. Recycling / End-of-Life Service Information

Take back and recycling services are offered for this product in certain countries. If you want to dispose of system components, please visit How to Recycle | Dell Technologies US and select the relevant country.

XV. Helpful Links

- **Environmental Policy**
  https://i.dell.com/sites/csdocuments/Corporate_corp-Comm_Documents/en/dell-global-environmental-policy.pdf
- **Social Impact - Progress Made Real**
  https://corporate.delltechnologies.com/en-id/social-impact.htm
- **Advancing Sustainability**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability.htm
- **ISO 14001 Certification**
  ISO Certification Certificate Environmental 14001 (delltechnologies.com)
- **Materials Restricted for Use**
  www.dell.com/restrictedsubstanceslist
- **Chemical Use Policy**
  http://i.dell.com/sites/doccontent/corporate/environment/en/Documents/chemical-use-policy.pdf
- **Product Carbon Footprint**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability/sustainable-products-and-services/product-carbon-footprints.htm
- **RoHS Compliance**
- https://dellproductcompliance.atlassian.net/servicedesk/customer/portal/6/topic/4ef197b3-28bb-4ff8-96ce-0fcb642ecf8f/article/10289411
- **REACH Compliance**
  www.dell.com/REACH
- **Recycling Information**
  http://www.dell.com/recycling
- **Supplier Responsibility – Champion the Many People**
  https://corporate.delltechnologies.com/en-us/social-impact/advancing-sustainability/champion-the-many-people.htm

Appendix A: ErP Lot 9 Servers and Data Storage Products: Information for end-users

The EU Commission Regulation (EU) 2019/424 (ErP Lot 9) ANNEX II Section 3.0 defines the information requirements to be provided by Manufacturers. This information is documented below or via a link is provided to a free access website where the information is maintained. A reference column is included to align the information with the format in the annex of the regulation. Where the information has already been recorded in the body of the Product Compliance Datasheet a note is made to avoid duplication.
For any follow up a request should be sent to: http://support.dellproductcompliance.com

Annex II Sect 1.2.3	Reporting Requirement	Link to Firmware / Security Updates
	Latest available version of firmware including latest security update	https://www.dell.com/support

Annex II Sect 3.2	Reporting Requirement	Information Requirements / link to free access website
a.	product type	reference product compliance datasheet
b.	manufacturer's name, registered trade name and registered trade address at which they can be contacted;	reference product compliance datasheet
c.	product model number, and if applicable the low-end performance configuration and the high-end performance configuration model numbers;	reference product compliance datasheet
d.	year of manufacture;	2015
e.	PSU efficiency at 10 % (if applicable), 20 %, 50 % and 100 % of rated output power,	reference ErP Lot 9 storage power supply table
f.	power factor at 50 % of the rated load level, with the exception of direct current servers, rounded to three decimal places	reference ErP Lot 9 storage power supply table
g.	declared operating condition class	This product has been tested to verify that it will function within the boundaries of the declared operating condition class A2
h.	secure data deletion	https://i.dell.com/media-sanitization

Storage PSU Efficiency and Power Factor Requirements				
URL Link to Manufacturer's PSU Efficiency Data and Report **https://www.clearesult.com/80plus/**				
Manufacturer Name	**Model Number**	**Single/Multi-Output**	**Search Tab**	**Search Model Number**
Seagate Systems (UK) Ltd	TDPS-580AB A	Multi-Output	230V Internal	SP-PCM01-HE580-AC
Seagate Systems (UK) Ltd	FS580FS104G-00	Multi-Output	230V Internal	SP-PCM02-HE580-AC-DELL
Seagate Systems (UK) Ltd	SGT-S-0580ADU00	Multi-Output	230V Internal	SP-PCM4-PT580-AC

Annex II Sect 3.3	Reporting Requirement	Information Requirement / link to free access website
h.	indicative weight range of the following CRMs: (a) Cobalt in the batteries. (b) Neodymium in the HDDs	Contact: http://support.dellproductcompliance.com
i.	instructions on the disassembly operations;	reference user manual in documentation tab on https://www.dell.com/support

Dell EMC ME4 Series ME412 and ME424 Expansion Enclosures

Getting Started Guide

Regulatory Model: E09J, E10J
Regulatory Type: E09J001, E10J001
August 2018
Rev. A00

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.

Contents

1

Setting up the ME4 Series expansion enclosure

Consider the following best practices when setting up an ME4 Series expansion enclosure.

- Before connecting any cables between the storage system and the host server or expansion enclosure, physically label each port and connector.
- Always follow proper power-up and power-down procedures when cycling power across the network. Verify that critical network components are on separate power circuits.

WARNING: If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

NOTE: This product is intended for restricted access locations, such as a dedicated equipment room or equipment closet.

Safety warnings

Electrical disconnection warning

The system may have more than one PSU cable. To reduce the risk of electrical shock, a trained service technician may need to disconnect all PSU cables before servicing the system.

CAUTION: Class I laser radiation when open, avoid exposure to beam.

WARNING: Laser radiation, avoid direct exposure to beam.

The unit is certified in the U.S. to conform to the requirements of DHHS 21 CFR, chapter 1 Subchapter J for Class I (1) laser products, and elsewhere is certified as a Class I laser product conforming to the requirements of IEC 60825-1.

Class I laser products are not considered to be hazardous. The laser system and unit are designed so there is never any human access to laser radiation above a Class I level during normal operation, user maintenance or prescribed service condition.

2

Other information you may need

To install the storage system, you may need the following additional information:

NOTE: See the *Enterprise Products Safety, Environmental, and Regulatory Information* that shipped with your storage system. Warranty information is included as a separate document.

- The *ME4 Series Storage System Deployment Guide* provides information about cabling storage system hardware components and configuring a new storage system.
- The *ME4 Series Storage System Administrator's Guide* describes how to use the ME Storage Manager to manage ME4 Series storage systems.

3

Installation safety precautions

Always follow these safety precautions to avoid injury and damage to storage system equipment.

If equipment described in this guide is used in a manner not specified by the documentation, the protection provided by the equipment could be impaired. For your safety and protection, observe the rules described in the following sections.

Follow these safety precautions:

- It is recommended that only individuals with rack-mounting experience install the system in a rack.
- Make sure the storage system is always fully grounded to prevent damage from electrostatic discharge.
- When handling the storage system hardware, use an electrostatic wrist guard (not included) or a similar form of protection.

The chassis must be mounted in a rack. The following safety requirements must be considered when the chassis is being mounted:

- The rack construction must be capable of supporting the total weight of the installed chassis. The design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- To avoid danger of the rack toppling over, slide only one chassis out of the rack at a time.
- The storage system must be operated with low-pressure rear exhaust installation (back pressure created by rack doors and obstacles not to exceed 5 Pascals [0.5 mm water gauge]).

4

NOM information

The following information is provided on the device described in this document in compliance with the requirements of the official Mexican standards (NOM):

NOM information	
Importer	Dell México, S.A. de C.V Av. Javier Barros Sierra, no 540, Piso 10, Col. Lomas de Santa Fe Delegación Álvaro Obregón, Ciudad de México C.P. 01219 R.F.C: DME9204099R6
Model numbers	E09J, E10J
Supply voltage	100–240 VAC
Frequency	50/60 Hz
Current consumption	8.0-3.0A

5

Technical specifications

AC power supply specifications	
Maximum output power	580 W
Maximum input power	687 W
Maximum input current	8.8 A
Maximum inrush current	20 A
Nominal input voltage operating range	100-240 VAC
Nominal input frequency	50/60 Hz

Physical characteristics	
Height	87.9 mm (3.46 in)
Width across mounting flange	483 mm (19.01 in)
Width across enclosure body	443 mm (14.44 in)
Depth from face of mounting flange to back of enclosure body	576.8 mm (22.71 in)
Depth from face of mounting flange to rearmost enclosure extremity	602.9 mm (23.74 in)
Depth from face of front panel to rearmost enclosure extremity	629.6 mm (24.79 in)
Approximate weight (maximum configuration)	ME412: 28 kg (62 lb); ME424: 25 kg (55 lb)
Approximate weight without drives	4.8 kg (10.56 lb)

ENERGY STAR CERTIFIED

Data Center Storage

DELL EMC - Dell EMC PowerVault ME412 : Dell EMC PowerVault ME412

Specifications

ENERGY STAR Unique ID:	2373092
ENERGY STAR Partner:	Dell Inc.
Brand Name:	DELL EMC
Model Name:	Dell EMC PowerVault ME412
Model Number:	Dell EMC PowerVault ME412
Storage Model Connectivity:	Block I/O
Product Type:	Disk Set Online 2
Storage Controller Configuration:	Scale-Up Storage
Storage Controller Advanced Data Recovery Type:	RAID
Capacity Optimized Method Available (COMs):	Thin Provisioning
Workload Optimization Type:	Streaming
Automated Storage Tiering Capable:	Yes
Automated Storage Tiering Enabled in Hardware on Shipment:	Yes
Markets:	United States
ENERGY STAR Certified:	Yes

Additional Model Information

,Dell EMC PowerVault ME4012,; ,E09J,

UPC Codes	

Captured On:
07/19/2023

DELL Technologies

Specification Sheet

DELL POWERSWITCH S4100-ON

High-performance open networking top-of-rack switches with multirate Gigabit Ethernet and unified ports

The S4100-ON 10GbE switches comprise Dell Technologies' latest disaggregated hardware and software data center networking solutions, providing state-of-the-art 100GbE uplinks and a broad range of functionality to meet the growing demands of today's data center environment. These innovative, next-generation top-of-rack open networking switches offer optimum flexibility and cost-effectiveness for the enterprise, midmarket and tier 2 cloud service providers with demanding compute and storage traffic environments.

The compact S4100-ON models provide industry-leading density with up to 48 ports of 10GbE or up to 48 ports of 10GBaseT ports, 2 ports of 40GbE and 4 ports of 100GbE in a 1RU form factor. The S4112-ON is a half-rack width model that supports up to 12 ports of 10GbE or 12 ports 10GBaseT, and 3 ports of 100GbE.

Using industry-leading hardware and a choice of Dell SmartFabric OS10 or select 3rd party network operating systems and tools, the S4100-ON Series offers flexibility by provision of configuration profiles and delivers non-blocking performance for workloads sensitive to packet loss. The compact S4100-ON models provide multirate speed, enabling denser footprints and simplifying migration to 100Gbps. Also unique to the S4100-ON series is the ability to meet the demands of converged and virtualized data centers by offering hardware support for L2 and L3 VXLAN gateway. Priority-based flow control (PFC), data center bridge exchange (DCBX) and enhanced transmission selection (ETS) make the S4100-ON ideally suited for DCB environments. Dell PowerSwitch S4100-ON switches support the open source Open Network Install Environment (ONIE) for zero touch installation of Dell SmartFabric OS10 networking operating system, as well as of alternative network operating systems.

Maximum performance and functionality

The S4100-ON series are high-performance, multifunction, 1/10/25/40/50/100 GbE top-of-rack (ToR) switches purpose-built for applications in high-performance data center, cloud and computing environments. Architectural features to optimize data center network flexibility, efficiency and availability include IO panel to PSU airflow or PSU to IO panel airflow for hot/cold aisle environments and redundant, hot-swappable power supplies and fans.

Key applications

- Organizations looking to enter the software-defined data center era with a choice of networking technologies designed to maximize flexibility
- Multi-functional 1/10/25/40/50/100 GbE switching in High Performance Computing Clusters or other business-sensitive deployments requiring the highest bandwidth. High-density 1/10 GbE ToR server access in high-performance data center environments
- iSCSI storage deployment, including DCB converged lossless transactions
- Small-scale data center fabric implementation via the S4100-ON switch in leaf and spine along with S-Series 1/10GbE ToR switches
- VXLAN layer 2/layer 3 gateway support

Key features

- 1RU high-density 10/40/100 GbE ToR switches with up to 48 10GbE (SFP+) or 10GBaseT ports, and up to 4 ports of 100GbE (QSFP28)
- The S4112 is a 1RU, half-rack width 10/100GbE ToR switch with up to 12 ports of 10GbE (SFP+) or up to 12 ports of 10GBaseT ports, and up to 3 ports of 100GbE (QSFP28)
- Multi-rate 100GbE ports support 10/25/40/50 GbE. 40GbE ports support 10GbE. 10GbE ports support 1GbE. Up to 4 different simultaneous speeds are possible in a given profile

* Not line rate

- 1.76Tbps (full-duplex) non-blocking, cut-through switching fabric delivers line-rate performance under full load on S4148F-ON and S4148T-ON
- 960Gbps (full-duplex) non-blocking, cut-through switching fabric delivers line-rate performance under full load on S4128F-ON and S4128T-ON
- 840Gbps (full-duplex) non-blocking, cut-through switching fabric delivers line-rate performance under full load on S4112F-ON and S4112T-ON
- VXLAN gateway functionality support for bridging and routing the non-virtualized and the virtualized overlay networks with line rate performance
- Converged Network support with DCB
- IO panel to PSU airflow or PSU to IO panel airflow
- Redundant, hot-swappable power supplies and fans (S4112-ON has redundant, fixed power supplies and fans)
- IEEE 1588v2 supported on 48 port models

Key Features with Dell SmartFabric OS10

- Consistent DevOps framework across compute, storage and networking elements
- Standard networking features, interfaces and scripting functions for legacy network operations integration
- Standards-based switching hardware abstraction via Switch Abstraction Interface (SAI)
- Pervasive, unrestricted developer environment via Control Plane Services (CPS)
- OS10 Enterprise Edition software enables Dell Technologies layer 2 and 3 switching and routing protocols with integrated IP services, quality of service, manageability and automation features
- OS10 supports Precision Time Protocol (PTP, IEEE 1588v2) to synchronize clocks on network devices.
- Leverage common open source tools and best practices (data models, commit rollbacks)
- Increase VM Mobility region by stretching L2 VLAN within or across two DCs with unique VLT capabilities
- Scalable L2 and L3 Ethernet Switching with QoS, ACL and a full complement of standards based IPv4 and IPv6 features including OSPF, BGP and PBR
- Enhanced mirroring capabilities including local mirroring, Remote Port Mirroring (RPM), and Encapsulated Remote Port Mirroring (ERPM)
- Converged network support for Data Center Bridging, with priority flow control (802.1Qbb), ETS (802.1Qaz), DCBx and iSCSI TLV Enhanced mirroring capabilities including local mirroring, Remote Port Mirroring (RPM), and Encapsulated Remote Port Mirroring (ERPM)
- Converged network support for Data Center Bridging, with priority flow control (802.1Qbb), ETS (802.1Qaz), DCBx and iSCSI TLV

	S4112F-ON	S4112T-ON	S4128F-ON	S4128T-ON	S4148F-ON	S4148T-ON
Ports	12xSFP+ 3xQSFP28	12x10GbT 3xQSFP28	28xSFP+ 2xQSFP28	28x10GbT 2x QSFP28	48xSFP+ 2xQSFP+ 4xQSFP28	48x10GbT 2xQSFP+ 4xQSFP28
Max 10GbE density	24 (12 SFP+ and 12 via QSFP28 breakout)	24 (12 10GbT and 12 via QSFP28 breakout)	36 (28 SFP+ and 8 via QSFP28 breakout)	36 (28 10GbT and 8 via QSFP28 breakout)	72 (48 SFP+ and 24 via QSFP28 breakout)	72 (48 10GbT and 24 via QSFP28 breakout)
Max 25GbE density	12 via QSFP28 breakout	12 via QSFP28 breakout	8 via QSFP28 breakout	8 via QSFP28 breakout	16 via QSFP28 breakout	16 via QSFP28 breakout
Max 40GbE density	3	3	2	2	6	6
Max 50GbE density	6	6	4	4	8	8
Max 100GbE density	3	3	2	2	4	4

	S4112F-ON	S4112T-ON	S4128F-ON	S4128T-ON	S4148F-ON	S4148T-ON
Switching capacity	840Gbps	840Gbps	960Gbps	960Gbps	1.76Tbps	1.76Tbps
Throughput	625Mpps	625Mpps	720Mpps	720Mpps	1320Mpps	1320Mpps
1588v2 PTP timing					●	●
Max power consumption	180W	200W	260W	300W	370W	440W
Typical operating power	90W	120W	160W	250W	200W	320W
Number of fan trays	3 (Fixed)	3 (Fixed)	4	4	4	4
Fans per fan tray	1	1	1	1	1	2
Weight	8.30 lbs (3.76 kg)	8.45 lbs (3.83 kg)	19.66 lbs (8.92 kg)	20.67 lbs (9.38 kg)	20.15 lbs (9.14 kg)	22.37 lbs (10.15 kg)
Max thermal output	614 BTU/h	682 BTU/h	886 BTU/h	1,023 BTU/h	1261 BTU/h	1,500 BTU/h

● Supported

Product	Description
S4100-ON	S4112F, 12x 10GbE SFP+, 3x 100GbE QSFP28, 2x AC Fixed PSU, 3x Fixed Fan, I/O Panel to PSU Airflow S4112F, 12x 10GbE SFP+, 3x 100GbE QSFP28, 2x AC Fixed PSU, 3x Fixed Fan, I/O PSU to I/O Panel Airflow S4112T, 12x 10GBASE-T, 3x 100GbE QSFP28, 2x AC Fixed PSU, 3x Fixed Fan, I/O Panel to PSU Airflow S4112T, 12x 10GBASE-T, 3x 100GbE QSFP28, 2x AC Fixed PSU, 3x Fixed Fan, I/O PSU to I/O Panel Airflow S4128F, 28x 10GbE SFP+, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow S4128F, 28x 10GbE SFP+, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow, TAA Certified S4128F, 28x 10GbE SFP+, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow, TAA Certified S4128F, 28x 10GbE SFP+, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow S4128T, 28x 10GBASE-T, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow S4128T, 28x 10GBASE-T, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow, TAA Certified S4128T, 28x 10GBASE-T, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module , PSU to I/O Panel Airflow, TAA Certified S4128T, 28x 10GBASE-T, 2x 100GbE QSFP28, 2x AC PSU, 4x Fan module , PSU to I/O Panel Airflow S4148F, 48x 10GbE SFP+, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow S4148F, 48x 10GbE SFP+, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow, TAA Certified S4148F, 48x 10GbE SFP+, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow S4148F, 48x 10GbE SFP+, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow, TAA Certified S4148T, 48x 10GBASE-T, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow S4148T, 48x 10GBASE-T, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, I/O Panel to PSU Airflow, TAA Certified S4148T, 48x 10GBASE-T, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow S4148T, 48x 10GBASE-T, 2x QSFP+, 4x 100GbE QSFP28, 2x AC PSU, 4x Fan module, PSU to I/O Panel Airflow, TAA Certified
Redundant power supplies (not applicable to S4112)	S4100, AC Power Supply, IO Panel to PSU Airflow S4100, AC Power Supply, PSU to IO Panel Airflow S4100, DC Power Supply, IO Panel to PSU Airflow (available as custom kit) S4100, DC Power Supply, PSU to IO Panel Airflow (available as custom kit) S4100, HV DC Power Supply, IO Panel to PSU Airflow S4100, HV DC Power Supply, PSU to IO Panel Airflow
Fans (not applicable to S4112)	S4100 fan module, IO Panel to PSU Airflow S4100 fan module, PSU to IO Panel Airflow
Optics, Cables and Cable Management	Please refer to Dell Networking Transceivers and Cables spec sheet for complete list of optics and cables. for a complete list of optics and cables.

Technical specifications

Physical

1 RJ45 console/management port with RS232 signaling
1 RJ45 micro-USB-B console port
1 RJ45 10/100/1000Base-T management Ethernet port
Size: 1 RU, 1.75”(h) x 17”(w) x 18”(d) (4.4cm (h) x 43.1cm (w) x 45.7cm (d))
S4112: 1.7”(h) x 8.28”(w) x 18”(d) (4.125cm (h) x 20.9cm (w) x 45cm (d)
Power supply: 100–240 VAC 50/60 Hz
Max. current draw per system: 6A/5A at 100/120V
AC; 3A/2.5A at 200/240V AC
S4112: 2A/1.7A at 100/120V AC; 1A/0.8A at 200/240V AC
Max. operating specifications:
Operating temperature: 41° to 104° F (5° to 40° C)
Operating humidity: 5 to 85% (RH), non-condensing
Max. non-operating specifications:
Storage temperature: -40° to 149°F (-40° C to 65° C)
Storage humidity: 5 to 95% (RH), non-condensing

Redundancy

Hot swappable redundant power (not applicable to S4112)
Hot swappable redundant fans (not applicable to S4112)
Fixed, redundant power supply and fan for S4112

Performance

Packet buffer memory: 12MB
CPU memory: 4GB
MAC addresses: 272K (in Scaled L2 mode)
PVST: 128 instances
ARP table 200K (in Scaled
L3 host mode)
IPv4 routes: 200K (in Scaled
L3 routes mode)
IPv6 hosts: 64K
IPv6 routes: 130K (in Scaled L3 routes mode)
Multicast hosts: 8K
Link aggregation: 32 links per group, 128 groups
Layer 2 VLANs: 4K
Layer3 VLANs: 500
MSTP: 32 instances
LAG load balancing: Based on layer 2, IPv4 or IPv6 headers
L2 Ingress ACL: 6K
L2 Egress ACL: 1K
IPv4 Ingress ACL: 6K
IPv4 Egress ACL: 1K
IPv6 Ingress ACL: 3K
IPv6 Egress ACL: 500
Storage performance parameters
iSCSI Sessions: 255
iSCSI Target: 16
F-Port: Max F-Port Sessions: 526
F-Port: Max members in a zone: 526

For Network Operating System (NOS) specific features, refer to Dell SmartFabric OS10 and Enterprise SONiC Distribution by Dell Technologies spec sheets.

Regulatory compliance

Safety

UL/CSA 60950-1, Second Edition
EN 60950-1, Second Edition
IEC 60950-1, Second Edition Including All National Deviations and Group Differences
EN 60825-1 Safety of Laser Products Part 1: Equipment Classification Requirements and User’s Guide
EN 60825-2 Safety of Laser Products Part 2: Safety of Optical Fibre Communication Systems
FDA Regulation 21 CFR 1040.10 and 1040.11

Emissions

Australia/New Zealand: AS/NZS CISPR 32: Class A
Canada: ICES-003, Issue-4, Class A
Europe: EN 55032: 2015+A1:2007 (CISPR 32), Class A
Japan: VCCI V3/2009 Class A
USA: FCC CFR 47 Part 15, Subpart B:2009, Class A

Immunity

EN 300 386 V1.4.1:2008 EMC for Network Equipment
EN 55024: 1998 + A1: 2001 + A2: 2003
EN 61000-3-2: Harmonic Current Emissions
EN 61000-3-3: Voltage Fluctuations and Flicker
EN 61000-4-2: ESD
EN 61000-4-3: Radiated Immunity
EN 61000-4-4: EFT
EN 61000-4-5: Surge
EN 61000-4-6: Low Frequency Conducted Immunity

RoHS

All S-Series components are EU RoHS compliant.

Certifications

Japan: VCCI V3/2009 Class A
USA: FCC CFR 47 Part 15, Subpart B:2009, Class A

Warranty

1 Year Return to Depot

IT Lifecycle Services for Networking

Experts, insights and ease
Our highly trained experts, with innovative tools and proven processes, help you transform your IT investments into strategic advantages.

Plan & Design
Let us analyze your multivendor environment and deliver a comprehensive report and action plan to build upon the existing network and improve performance.

Deploy & Integrate
Get new wired or wireless network technology installed and configured with ProDeploy. Reduce costs, save time, and get up and running fast.

Educate
Ensure your staff builds the right skills for long-term success. Get certified on Dell Networking technology and learn how to increase performance and optimize infrastructure.

Manage & Support
Gain access to technical experts and quickly resolve multivendor networking challenges with ProSupport. Spend less time resolving network issues and more time innovating.

Optimize
Maximize performance for dynamic IT environments with Dell Optimize. Benefit from in-depth predictive analysis, remote monitoring and a dedicated systems analyst for your network.

Retire
We can help you resell or retire excess hardware while meeting local regulatory guidelines and acting in an environmentally responsible way.

Learn more at DellTechnologies.com/Services

Learn more about Dell Networking solutions

Contact a Dell Technologies Expert

View more resources

Join the conversation with @DellNetworking