Dell PowerEdge R7615

Technical Guide

DELL Technologies

Notes, cautions, and warnings

(i) **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

System overview

The PowerEdge R7615 system is a 2U server that supports:

- One AMD EPYC 4th Generation 9004 series processor with up to 128 cores
- 12 DDR5 DIMM slots with up to 3 TB memory and speeds up to 4800 MT/s
- Optional Direct Liquid Cooling (DLC) for required CPUs and/or configurations
- Two redundant AC or DC power supply units
- Up to 12 x 3.5-inch, 8 x 3.5-inch, 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.
- Up to 32 x EDSFF E3.S, 16 x EDSFF E3.S, 8 x EDSFF E3.S, or 4 x EDSFF E3.S (rear) NVMe Gen5 drives.
- PCI Express® (PCIe) 5.0 enabled expansion slots
- Network interface technologies to cover Network Interface Card (NIC)

ⓘ **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 Dell Support page **> 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.

⚠ **CAUTION: Do not install GPUs, network cards, or other PCIe devices on your system that are not validated and tested by Dell. Damage caused by unauthorized and invalidated hardware installation will null and void the system warranty.**

Topics:

- Key workloads
- New technologies

Key workloads

Customers looking for accelerated compute to maximize performance in a dense, scalable server architecture to address the following applications:

- High Performance Computing
- Virtual Desktop Infrastructure (VDI)
- Virtualization

New technologies

Table 1. New technologies

Technology	Detailed Description
AMD Genoa Processor (SP5)	Core count: Up to 128 core processor
	5 nm process technology
	AMD Interchip global memory interconnect (xGMI) up to 64 lanes
	Speeds up to 4.1 GHz
	Maximum TDP: 300 W+
5600 MT/s DDR5 Memory	Up to 12 channels with 1 DPC per CPU and 12 DIMMs in total

Table 1. New technologies (continued)

Technology	Detailed Description
ⓘ **NOTE:** The speed of 5600 MT/s RDIMM will be clocked down to match the CPU MAX DDR frequency (1 DPC) at 4800 MT/s supported on the platform.	Supports DDR5 ECC RDIMM
PCIe Gen	Gen5 @32 GT/s
PCIe Slot	Up to 8 x PCIe Slots with x8 or x16 lanes
Flex I/O	LOM board, 2 x1Gb with BCM5720 LAN controller
	Rear I/O with: ● 1 GB Dedicated Management Network Port ● USB 3.0 x1 ● USB 2.0 x1 ● VGA port
	Serial Port Option with STD RIO board
	OCP Mezz 3.0 (supported by x8 PCIe lanes)
	Front I/O with: ● USB 2.0 x1 ● 1 x iDRAC Direct (Micro-AB USB) port ● VGA x 1 port
CPLD 1-wire	Support payload data of Front PERC, Riser, BOSS N1, BP, and Rear I/O to BIOS and iDRAC.
Dedicated PERC	PERC 11 ● HBA355i, H355, H755, H755N PERC 12 ● H965i ● H965e ● HBA465i ● HBA465e
Software RAID	S160
Power Supplies	The 60 mm / 86 mm dimension is the same 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
	Titanium 1400 W AC/HVDC
	Titanium 1800 W AC/HVDC
	Platinum 2400 W AC/HVDC
	1100 W -48 LVDC

System features and generational comparison

The following table shows the comparison between the PowerEdge R7615 with the PowerEdge R7515.

Table 2. Features comparison

Features	PowerEdge R7615	PowerEdge R7515
Processors	One AMD® EPYC 4th Generation Genoa (SP5) processor	One AMD® EPYC™ Generation 2 or Generation 3 processor
CPU interconnect	Interchip global memory interconnect (xGMI) 32GT/sec.	Interchip global memory interconnect (xGMI) 16GT/sec.
Memory	12 x DDR5 RDIMM (3 TB), bandwidth up to 5600 MT/S ⓘ **NOTE:** The speed of 5600 MT/s RDIMM will be clocked down to match the CPU MAX DDR frequency (1 DPC) at 4800 MT/s supported on the platform.	16 x DDR4 RDIMM (1 TB), LRDIMM (2 TB), bandwidth up to 3200 MT/S
Storage Controllers	- PERC 11: HBA355i, H355, H755, H755N - PERC 12: H965i, H965e, HBA465i, HBA465e - Software RAID: S160 - BOSS-N1	- Adapters: Mini PERC: HBA330 - PERC: H330, H730P - Software RAID: S150 - BOSS S1
Drive Bays	Front bays: - Up to 8 x 3.5-inch SAS4/SATA (HDD/SSD) max 160 TB - 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 - Up to 8 x E3.S (NVMe Gen5) max 61.44 TB - Up to 16 x E3.S (NVMe Gen5) max 122.88 TB - Up to 32 x E3.S (NVMe Gen5) max 245.76 TB Rear bays: - Up to 2 x 2.5-inch SAS4/SATA/NVMe (HDD/SSD) max 30.72 TB - Up to 4 x 2.5-inch SAS4/SATA/NVMe (HDD/SSD) max 61.44 TB - Up to 4 x E3.S (NVMe Gen5) max 30.72 TB	Front bays: 3.5 inches, 2.5 inches - 12 Gb SAS, 6 Gb SATA, NVMe HDD Rear bay: 2 x 3.5-inch SATA/SAS HDDs
Power Supplies	Hot swap PSUs with full redundancy. 700 W Titanium 200-240 VAC or 240 HVDC	AC (Platinum) 495 W,1600 W AC (Titanium) 750 W, 1600 W

Table 2. Features comparison (continued)

Features	PowerEdge R7615	PowerEdge R7515
	800 W Platinum 100-240 VAC or 240 HVDC 1100 W LVDC -48 - -60 VDC 1100 W Titanium 100-240 VAC or 240 HVDC 1400 W Titanium 100-240 VAC or 240 HVDC 1400 W Platinum 100-240 VAC or 240 HVDC 1400 W Titanium 277 VAC or 336 HVDC 1800 W Titanium 200-240 VAC or 240 HVDC 2400 W Platinum 100-240 VAC or 240 HVDC	Mix Mode (Platinum) 750 W, 1100 W
Cooling Options	- Air Cooling - Optional Direct Liquid Cooling (DLC) ⓘ **NOTE:** Required for certain CPU SKUs and/or configuration. DLC cooling is not a self-contained solution, it requires rack-level product support (see DLC 3000 or DLC 7000 products).	Air Cooling
Fans	Up to six high-performance silver grade (HPR SLVR) or high-performance gold (HPR Gold) hot plug fans	Up to six Standard (STD) / High performance (HPR) hot plug fans
Dimension	Height: 86.8 mm (3.41 inches)	Height: 86.8 mm (3.41 inches)
	Width: 482 mm (18.97 inches)	Width: 434 mm (17.09 inches)
	Depth: 772.13 mm (30.39 inches) with bezel	Depth: 647.1 mm (25.48 inches) with bezel
	Depth: 758.29 mm (29.85 inches) without bezel	Depth: 625 mm (24.6 inches) without bezel
Form Factor	2U rack server	2U rack server
Embedded Management	- iDRAC9 - iDRAC Direct - iDRAC RESTful API with Redfish - iDRAC Service Manual - Quick Sync 2 wireless module	- iDRAC9 - iDRAC Direct - iDRAC RESTful API with Redfish - iDRAC Service Manual - 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 - CloudIQ for PowerEdge plug-in - OpenManage Enterprise Integration for VMware vCenter - OpenManage Integration for Microsoft System Center - OpenManage Integration with Windows Admin Center	- OpenManage Enterprise - OpenManage Power Manager plug-in - OpenManage Services plug-in - OpenManage Update Manager plug-in
Mobility	OpenManage Mobile	OpenManage Mobile

Table 2. Features comparison (continued)

Features	PowerEdge R7615		PowerEdge R7515	
OpenManage Integrations	- BMC TrueSight - Microsoft System Center - OpenManage Integration with ServiceNow - Red Hat Ansible Modules - Terraform Providers - VMware vCenter and vRealize Operations Manager		- BMC TrueSight - Microsoft System Center - Red Hat Ansible Modules - VMware vCenter	
Security	- Cryptographically signed firmware - Secure Boot - Secure Erase - Silicon Root of Trust - System Lockdown (requires iDRAC9 Enterprise or Datacenter) - TPM 2.0 (optional), TCM 2.0 optional - AMD Secure Memory Encryption (SME) - AMD Secure Encrypted Virtualization (SEV)		- Cryptographically signed firmware - Secure Boot - Secure Erase - Silicon Root of Trust - System Lockdown (requires iDRAC9 Enterprise or Datacenter) - TPM 1.2/2.0 (optional), TCM 2.0 optional - AMD Secure Memory Encryption (SME) - AMD Secure Encrypted Virtualization (SEV)	
Embedded NIC	2 x 1 GbE LOM (optional)		2 x 1GE LOM	
Networking 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.		OCP x16 Mezz 3.0	
GPU Options	3 x 300 W (DW) or 6 x 75 W (SW)		Up to 4 x 150 W	
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)	Front Ports 1 x Dedicated iDRAC micro-USB 2 x USB 2.0 1 x VGA	Rear Ports 2 x USB 2.0 1 x iDRAC Direct/ ethernet port 2 x USB 3.0 1 x Serial port (optional) 1 x VGA
	Internal Port: 1 x USB 3.0		Internal Port: 1 x USB 3.0	
PCIe	Up to eight PCIe slots 4 x PCIe Gen5 slots 4 x PCIe Gen4 slots		Up to four PCIe slots 2 x PCIe Gen 3 slots 2 x PCIe Gen 4 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.	

Chassis views and features

Topics:

- Front view of the system
- Rear view of the system
- Inside the system

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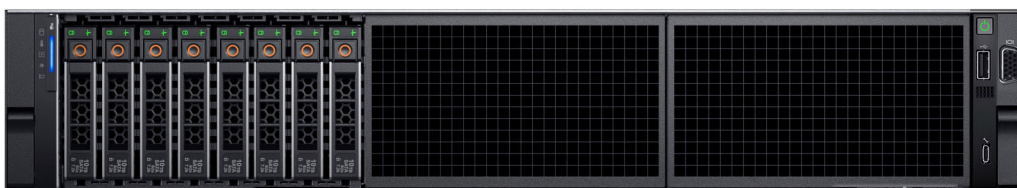
Figure 3. Front view of 8 x 2.5-inch drive system

Figure 4. Front view of 8 x 3.5-inch drive system

Figure 5. Front view of 12 x 3.5-inch drive system
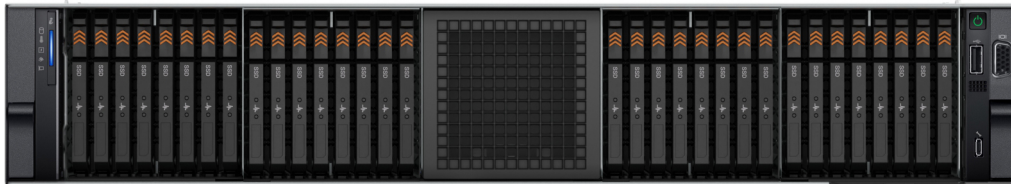
Figure 6. Front view of 32 x EDSFF E3.S

Figure 7. Front view of 16 x EDSFF E3.S
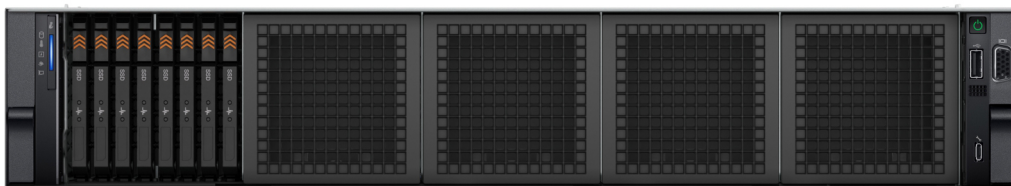
Figure 8. Front view of 8 x EDSFF E3.S

Rear view of the system

Figure 9. Rear view of the system

Figure 10. Rear view of the system with 2 x 2.5-inch rear drive module

Figure 11. Rear view of the system with 4 x 2.5-inch rear drive module
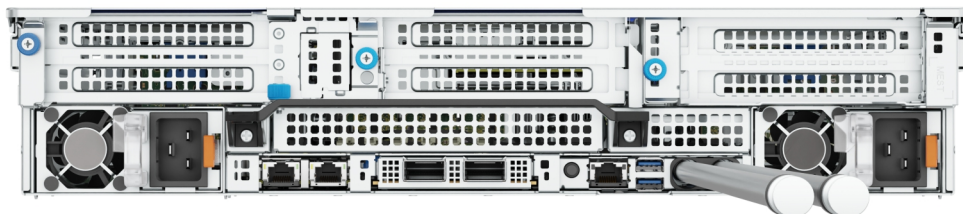
Figure 12. Rear view of system with Direct Liquid Cooling

Figure 13. Rear view of the system with 4 x EDSFF E3.S rear drive module

ⓘ **NOTE:** For more information about ports, panels, and slots, see the Technical specifications section.

Inside the system
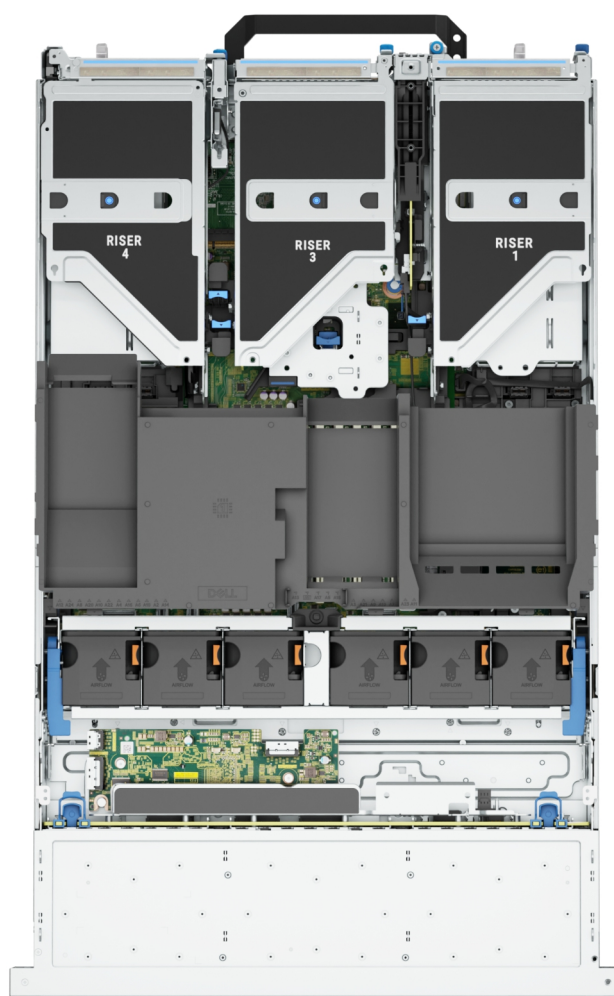
Figure 14. Inside the system
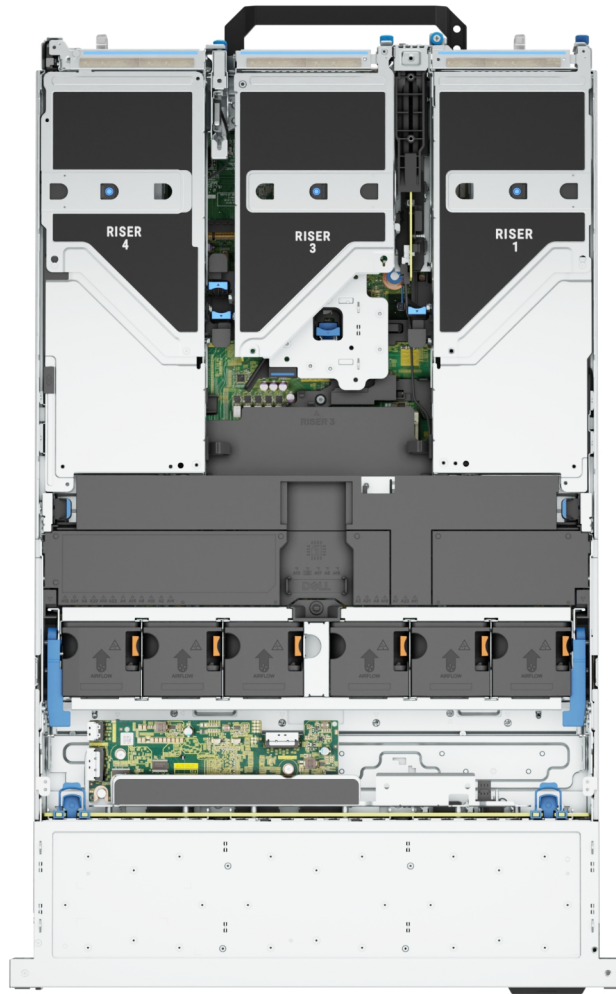
Figure 15. Inside the system with full length risers and GPU shroud
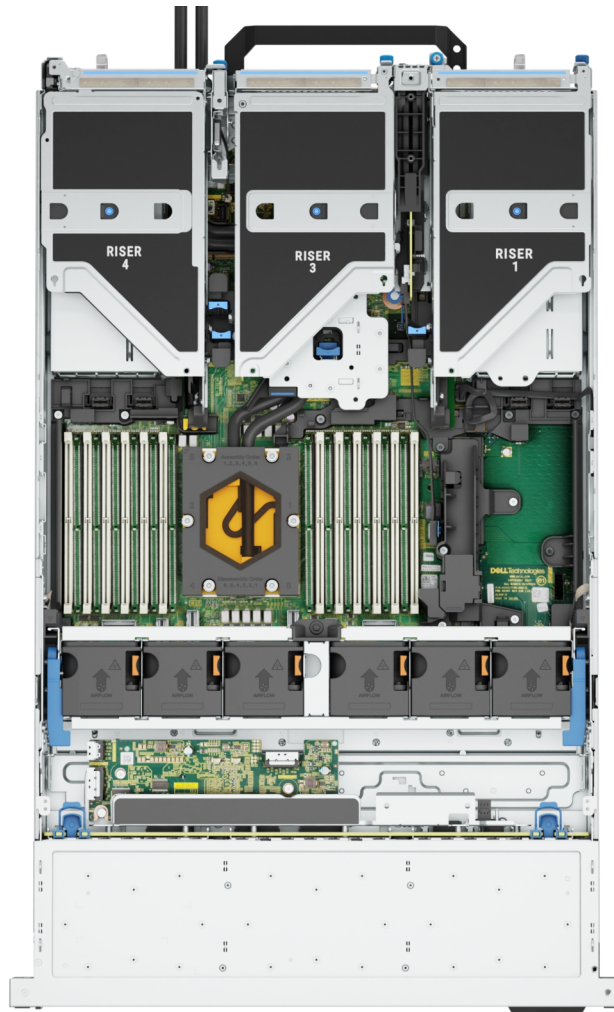
Figure 16. Inside the system with processor liquid cooling module
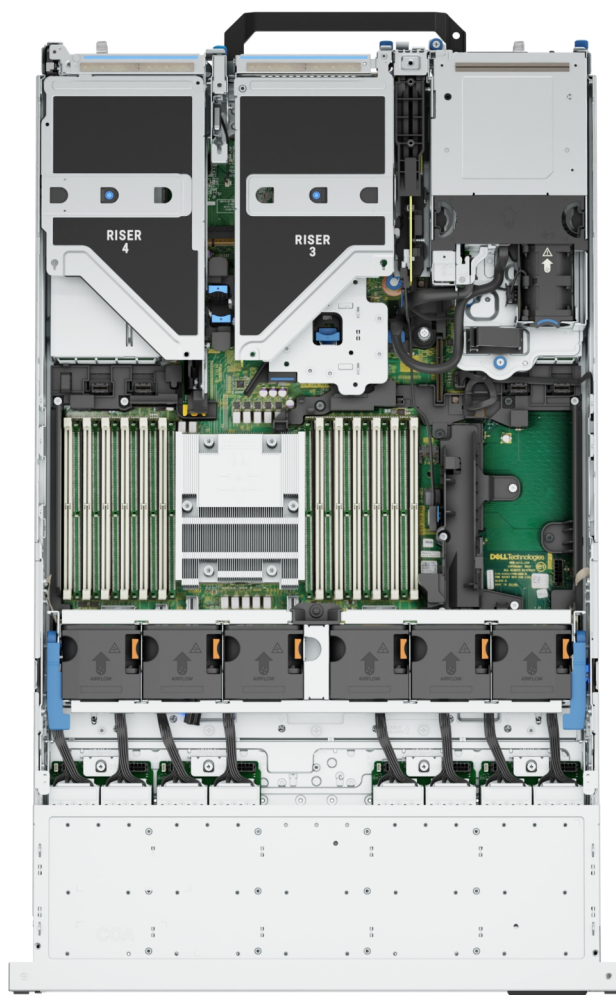
Figure 17. Inside the system with risers + rear 4 x EDSFF E3.S

Processor

Topics:

• Processor features

Processor features

AMD

The AMD EPYC™9004 Series Processor ("Genoa") is the 4th Generation AMD EPYC™ System on a chip (SOC) supporting the modern data center. The AMD EPYC™ 9004 Series Processor is based on AMD's SP5 compatible socket infrastructure with a new BIOS. AMD EPYC™9004 Series Processor is not drop-in compatible to AMD's SP3 socket infrastructure for EPYC™ Series 7002 ("Rome") and 7003 ("Milan") Processors. Based on AMD's "Zen4" and "Zen4c" cores, integrated I/O controllers, up to 32 MB of L3 cache per core, advanced security, and synchronized fabric and memory clock speeds, "Genoa" is designed for improved performance, lower TCO, and faster time to results with next gen technologies.

The following lists the features and functions included in the AMD Genoa offering:

● Supports up to 128 AMD Zen4c cores, 96 AMD Zen4 x86 cores with enhance performance with 32 MB L3 cache/core. Integrated I/O support for up to 128 lanes with PCI Express 5 on Dell platforms (AMD support up to 160 I/O lanes with 2P).
● Enhanced Memory Performance with support up to 4800 MT/s DIMMs (1 DPC), 3DS RDIMM support. Enhanced Memory Performance with: Infinity Fabric™ and Memory Clock Synchronized. Largest Available x86 L3 Cache –Up to 32 MB / core.
● Memory Capacity up to 12 channels DDR5 and up to 256 GB/channel support with 2, 4, 6, 8, 10 and 12 channel performance optimization options.
● Enhanced physical and virtual security with AMD Infinity Guard that includes silicon embedded security and virtual features (Secure Memory Encryption and Secure Encrypted Virtualization-Secure Nested Paging (SEV-SNP) to further improve platform and data security capabilities.

Supported processors

Table 3. Supported processor list for the PowerEdge R7615

| Processor model number	Base frequency (GHz)	Cores/Threads	Default TDP (W)	cTDP (W)	L3 Cache (MB)	Max DDR Freq (1 DPC)
9754	2.25	128/256	360	360-400	256	4800
9734	2.20	112/224	340	340-400	256	4800
9654	2.4	96/192	360	320-400	384	4800
9634	2.25	84/168	290	240-300	384	4800
9554	3.10	64/128	360	320-400	256	4800
9534	2.45	64/128	280	240-300	256	4800
9454	2.75	48/96	290	240-300	256	4800
9354	3.25	32/64	280	240-300	256	4800
9334	2.70	32/64	210	200-240	128	4800
9254	2.9	24/48	200	200-240	128	4800

Table 3. Supported processor list for the PowerEdge R7615 (continued)

Processor model number	Base frequency (GHz)	Cores/Threads	Default TDP (W)	cTDP (W)	L3 Cache (MB)	Max DDR Freq (1 DPC)
9224	2.5	24/48	200	200-240	384	4800
9124	3.00	16/32	200	200-240	64	4800
9474F	3.6	48/96	360	320-400	256	4800
9374F	3.85	32/64	320	320-400	256	4800
9274F	4.05	24/48	320	320-400	256	4800
9174F	4.10	16/32	320	320-400	256	4800
9654P	2.4	96/192	360	320-400	384	4800
9554P	3.1	64/128	360	320-400	256	4800
9454P	2.75	48/96	290	240-300	256	4800
9354P	3.25	32/64	280	240-300	256	4800
9684X	2.55	96/192	400	320-400	1152	4800
9384X	3.1	32/64	320	320-400	768	4800
9184X	3.55	16/32	320	320-400	768	4800

(i) **NOTE:** The processors are 12 channel and has a maximum frequency of 4800 MT/s (1DPC)

Memory subsystem

Topics:

*   Supported memory

Supported memory

The R7615 supports up to 12 DIMMs, with up to 3072 GB of memory and speeds of up to 4800 MT/s.

The R7615 supports registered (RDIMMs), allowing for the maximum platform memory capacity. Unbuffered DIMMs (UDIMMs) are not supported.

Table 4. Memory technology comparison

Feature	PowerEdge R7615 (DDR5)
DIMM type	RDIMM
Transfer speed	5600 MT/s
Voltage	1.1 V

The following table lists the supported DIMMs for the R7615. For the latest information about supported memory and memory configurations, reference the latest SDL.

Table 5. Supported DIMMs

DIMM Type	DIMM Capacity (GB)	Ranks per DIMM	Data Width	DIMM Volts (V)
DDR5 RDIMM	16	1	x8	1.1
DDR5 RDIMM	32	2	x8	1.1
DDR5 RDIMM	64	2	x4	1.1
DDR5 RDIMM	128	4	x4	1.1
DDR5 RDIMM	256	8	x4	1.1

(i) **NOTE:** The speed of 5600 MT/s RDIMM will be clocked down to match the CPU MAX DDR frequency (1 DPC) at 4800 MT/s supported on the platform.

Storage

Topics:

Storage controller specifications

The PowerEdge R7615 system supports the following controller card:

Table 6. Storage controller cards

Supported storage controller card
Software RAID ● S160
Internal controllers ● PERC H965i ● PERC H755 ● PERC H755N ● PERC H355
Internal Boot ● Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 SSDs
External controllers ● HBA355e ● PERC H965e ● HBA465e
SAS Host Bus Adapters ● HBA355i ● HBA465i

Supported Drives

The table shown below lists the internal drives that are supported by the R7615.

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

Table 7. Supported Drives (continued)

Form Factor	Type	Speed	Rotational Speed	Capacities
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
EDSFF E3.S	NVMe	Gen5	SSD	3.84 TB, 7.68 TB

Internal storage configuration

Table 8. R7615 Internal Storage Configuration Matrix

Total HDD/ SSD (not BOSS)	NVMe Enabled / Universal Slots	16G Storage Front	Rear Storage	PERC Qty (f+a)	Storage Controller(s)	Controller Form Factor
0*	0 / 0	N/A	N/A	0+0	N/A	N/A
8	0 / 0	2U 8x3.5" Passive	N/A	1+0	HBA355i / H355	N/A
12	0 / 0	2U 12x3.5" Passive v2	N/A	0+1	HBA355i / H355 / H755	PERC Adapter
14	0 / 0	2U 12x3.5" Passive v2	2U Rear 2x2.5" univ SAS4	0+1	HBA355i / H355 / H755	PERC Adapter
14	0 / 0	2U 12x3.5" Passive v2	2U Rear 2x2.5" univ SAS4	0+1	H965i	PERC Adapter
16	0 / 0	2U 12x3.5" Passive v2	2U Rear 4x2.5" univ SAS4	0+1	HBA355i / H355 / H755	PERC Adapter
16	0 / 0	2U 12x3.5" Passive v2	2U Rear 4x2.5" univ SAS4	0+1	H965i	PERC Adapter
16	4 / 0	2U 12x3.5" Passive v2	2U 4x E3 G5x2 Rear Ortho	0+1	HBA355i / H355 / H755 / S160 _NVMe	PERC Adapter
8	8 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or 16x2.5" NVME) Low-Loss PCB BP	N/A	0+0	S160 _NVMe	N/A
8	8 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or 16x2.5" NVME) Low-Loss PCB BP	N/A	1+0	H755N	Front PERC
8	8 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or 16x2.5" NVME) Low-Loss PCB BP	N/A	1+0	H965i	Front PERC
16	0 / 0	2U 8x2.5" SAS4/ SATA v2 *2	N/A	1+0	HBA355i / H355 / H755	Front PERC
16	0 / 0	2U 8x2.5" SAS4/ SATA v2 *2	N/A	1+0	H965i	Front PERC
16	16 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or	N/A	0+0	S160_NVMe	N/A

Table 8. R7615 Internal Storage Configuration Matrix (continued)

Total HDD/ SSD (not BOSS)	NVMe Enabled / Universal Slots	16G Storage Front	Rear Storage	PERC Qty (f+a)	Storage Controller(s)	Controller Form Factor
		16x2.5" NVME) Low-Loss PCB BP *2				
16	16 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or 16x2.5" NVME) Low-Loss PCB BP *2	N/A	2+0	H755N	Front PERC
16	16 / 0	2U 8x2.5" Uni (as 8x2.5" NVMe or 16x2.5" NVME) Low-Loss PCB BP *2	N/A	2+0	H965i	Front PERC
24	8 / 0	2U 8x2.5" SAS4/ SATA v2 *3	N/A	1+0	HBA355i / H355 / H755 / S160_NVMe	Front PERC
24	8 / 0	2U 8x2.5" SAS4/ SATA v2 *3	N/A	1+0	H965i / S160_NVMe	Front PERC
24	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	N/A	1+0	HBA355i / H355 / H755	Front PERC
24	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	N/A	1+0	H965i	Front PERC
24	8 / 8	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	N/A	1+0	HBA355i / H355 / H755	Front PERC
24	8 / 8	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	N/A	1+0	H965i	Front PERC
26	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 2x2.5" univ SAS4	1+0	HBA355i / H355 / H755	Front PERC
26	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 2x2.5" univ SAS4	1+0	H965i	Front PERC
26	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 2x2.5" univ SAS4	1+0	HBA355i / H355 / H755	Front PERC
26	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 2x2.5" univ SAS4	1+0	H965i	Front PERC
28	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 4x2.5" univ SAS4	1+0	HBA355i / H355 / H755	Front PERC
28	0 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U Rear 4x2.5" univ SAS4	1+0	H965i	Front PERC
28	4 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U 4x E3 G5x2 Rear Ortho	1+0	HBA355i / H355 / H755 / S160_NVMe	Front PERC

Table 8. R7615 Internal Storage Configuration Matrix (continued)

Total HDD/ SSD (not BOSS)	NVMe Enabled / Universal Slots	16G Storage Front	Rear Storage	PERC Qty (f+a)	Storage Controller(s)	Controller Form Factor
28	4 / 0	2U 24x2.5" SAS4/ SATA expander (w/ 8x universal)	2U 4x E3 G5x2 Rear Ortho	1+0	H965i / S160_NVMe	Front PERC
24	24 / 0	2U 24x2.5" NVMe Switch BP - Atlas 2 Gen5	N/A	0+0	S160_NVMe	N/A
24	24 / 0	2U 24x2.5" NVMe Switch BP - Atlas 2 Gen5	N/A	2+0	H965i	Front PERC
16	16 / 0	2U 8x E3 G5x2 G5x4 Ortho *2	N/A	2+0	H755N	Front PERC
16	16 / 0	2U 8x E3 G5x2 G5x4 Ortho *2	N/A	2+0	H965i	Front PERC
32	32 / 0	2U 8x E3 G5x2 G5x4 Ortho *4	N/A	0+0	S160_NVMe	N/A
36	36 / 0	2U 8x E3 G5x2 G5x4 Ortho *4	2U 4x E3 G5x2 Rear Ortho	0+0	S160_NVMe	N/A
8	8 / 0	2U 8x E3 G5x2 G5x4 Ortho	N/A	0+0	S160_NVMe	N/A
16	16 / 0	2U 8x E3 G5x2 G5x4 Ortho *2	N/A	0+0	S160_NVMe	N/A
20	20 / 0	2U 8x E3 G5x2 G5x4 Ortho *3	N/A	0+0	S160_NVMe	N/A

(i) **NOTE:** *BOSS/IDSDM Mandatory: All other configurations support optional BOSS/IDSDM.

External Storage

The R7615 support the external storage device types listed in the table below.

Table 9. Support for 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 ME5 series JBODs

Networking

Topics:

*   OCP 3.0 support

OCP 3.0 support

Table 10. OCP 3.0 feature list

Feature	OCP 3.0
Form factor	SFF
PCIe Gen	Gen4
Max PCIe width	x8, x16 (with OCP cable)
Max no.of ports	4
Port type	BT/SPF/SFP+/SFP28/SFP56/Q56
Max port speed	25 GbE, 100 GbE (with OCP cable)
NC-SI	Yes
SNAPI	No
WoL	Yes
Power consumption	15-35 W

Supported OCP cards

Table 11. Supported OCP cards

Form Factor	Vendor	Port type	Max Port speed	Port Count
OCP 3.0	Broadcom	Q56	100 GbE	2
	Mellanox	SFP56	100 GbE	2
	Mellanox	SFP28	25 GbE	2
	Broadcom	SFP28	25 GbE	4
	Broadcom	SFP28	25 GbE	2
	Intel	SFP28	25 GbE	2
	Intel	SFP28	25 GbE	4
	Broadcom	BT	10 GbE	4
	Intel	BT	10 GbE	2
	Broadcom	BT	10 GbE	2
	Intel	BT	10 GbE	4
	Intel	BT	1 GbE	4

Table 11. Supported OCP cards (continued)

Form Factor	Vendor	Port type	Max Port speed	Port Count
	Intel	BT	1 GbE	4
	Broadcom	BT	1 GbE	4

OCP NIC 3.0 vs. rack Network Daughter Card comparisons

Table 12. 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 is SFF (small form factor).
Max PCIe Lanes	x8	Up to x16	Up to x16	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
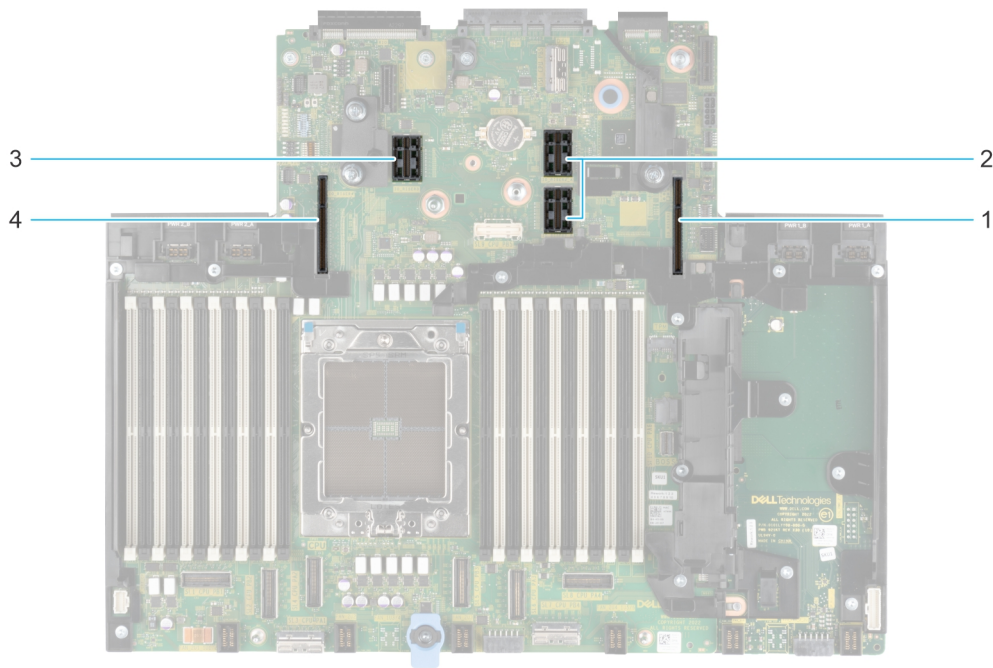
Figure 18. Expansion card riser slot connectors

1. Riser 1
2. Riser 2
3. Riser 2
4. Riser 4
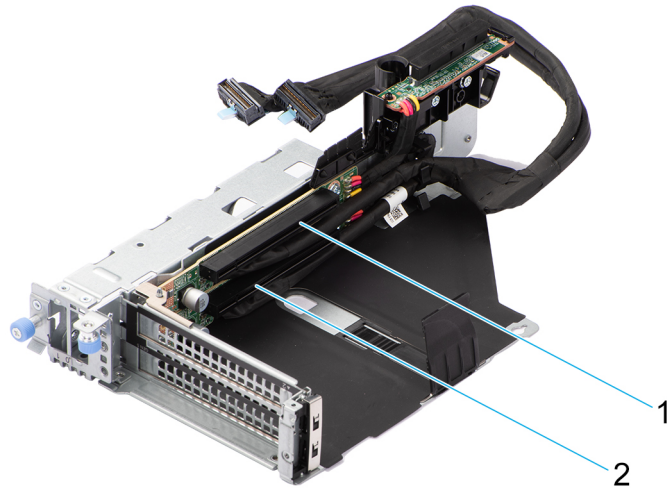
Figure 19. Riser 1U

1. Slot 1
2. Slot 2
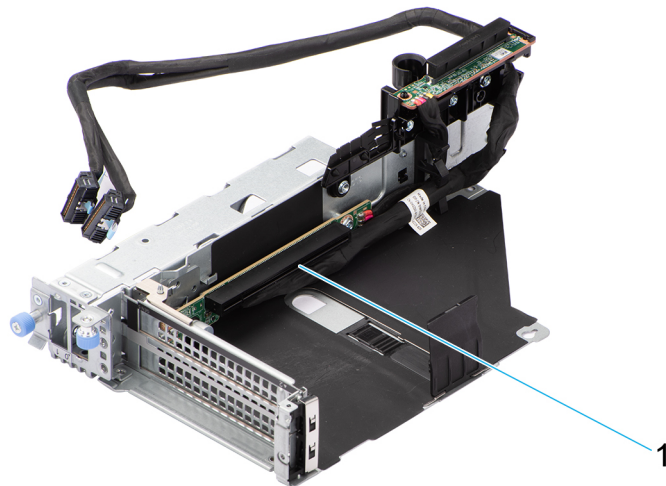
Figure 20. Riser 1T HL

1. Slot 2
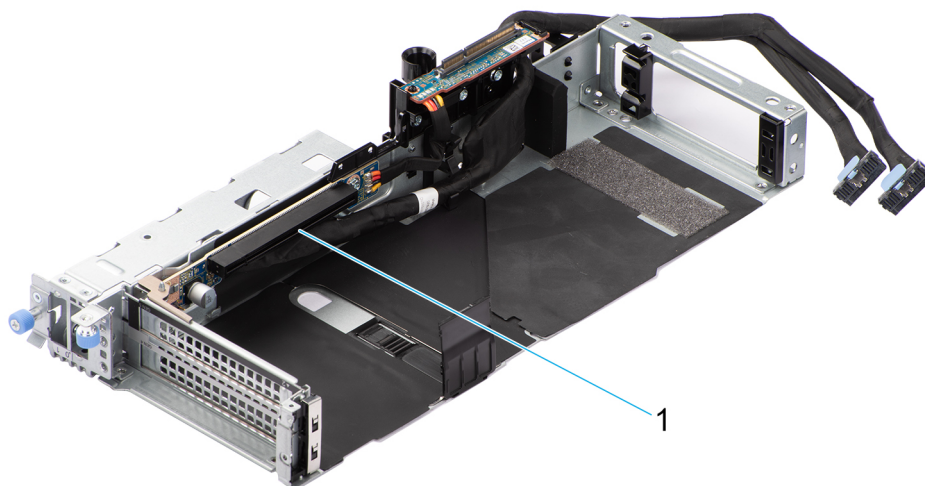
Figure 21. Riser 1T FL

1. Slot 2
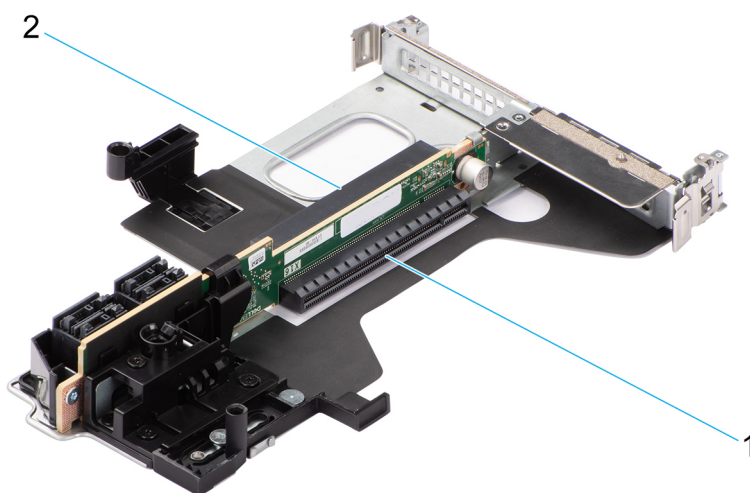
Figure 22. Riser 2A

1. Slot 3
2. Slot 6
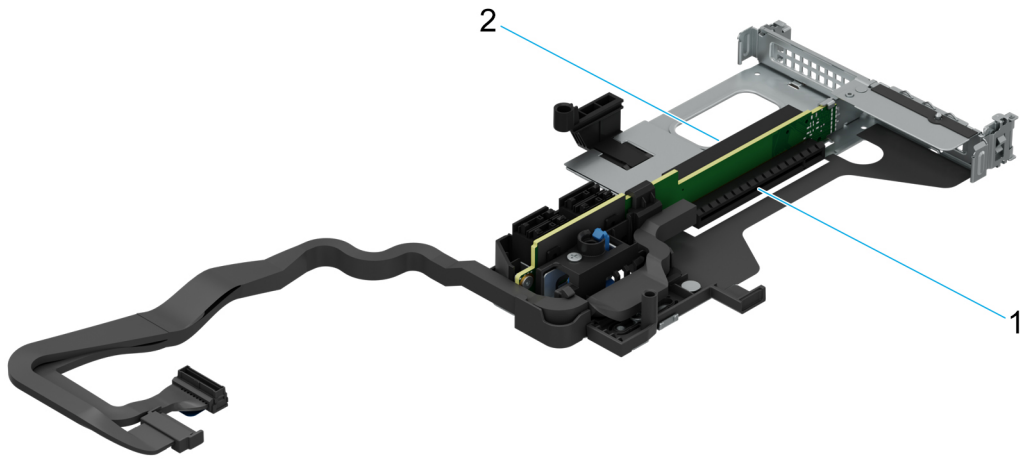
Figure 23. R2T

1. Slot 3
2. Slot 6
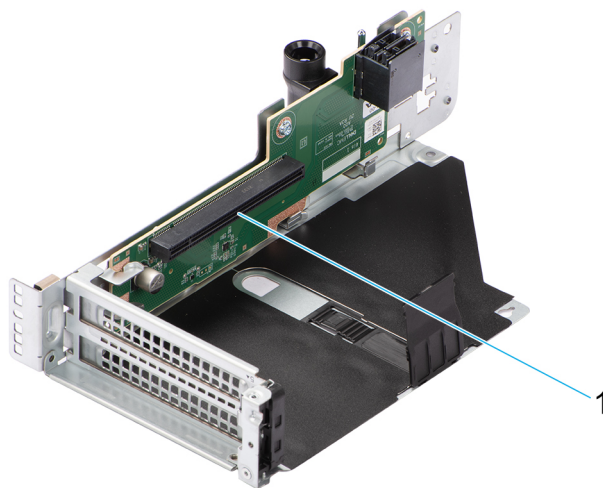
Figure 24. Riser 3A HL

1. Slot 5
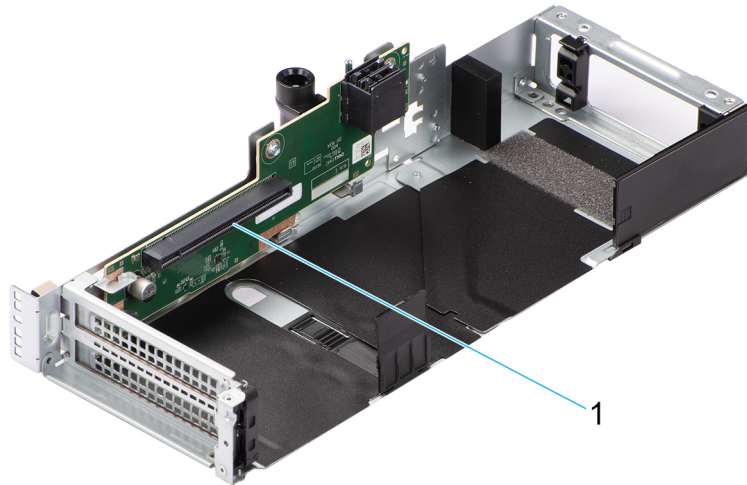
Figure 25. Riser 3A FL

1. Slot 5
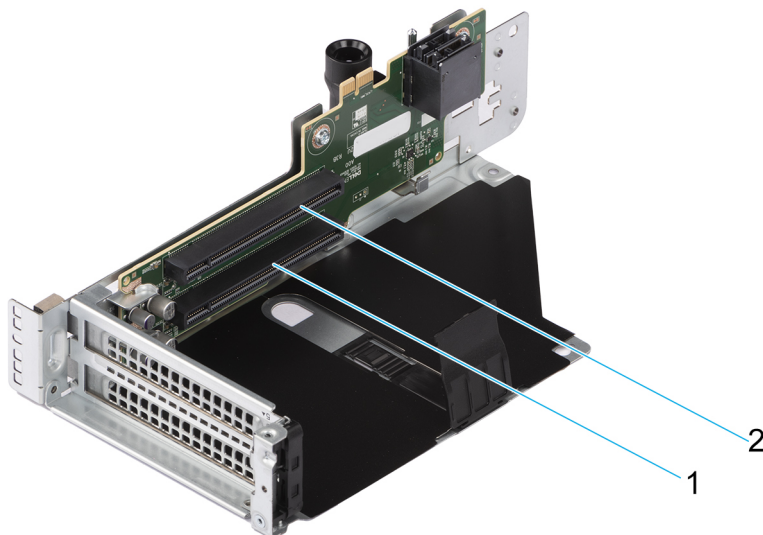
Figure 26. Riser 3B

1. Slot 4
2. Slot 5
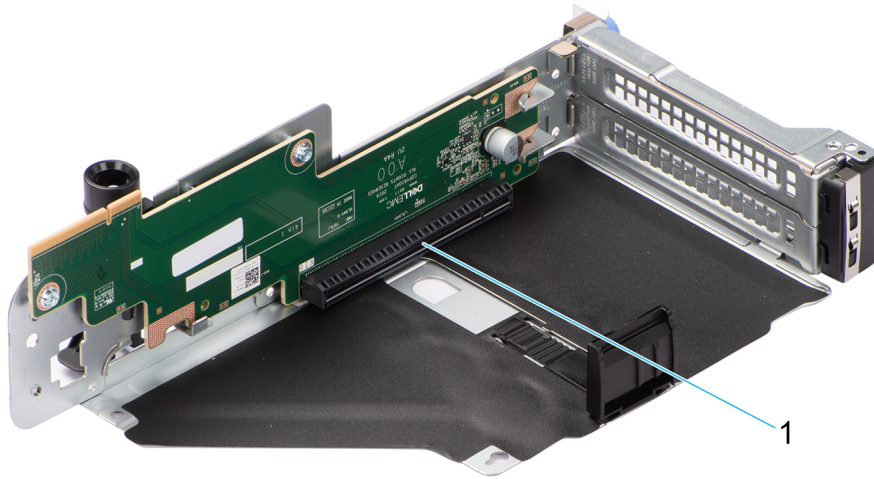
Figure 27. Riser 4A

1. Slot 7
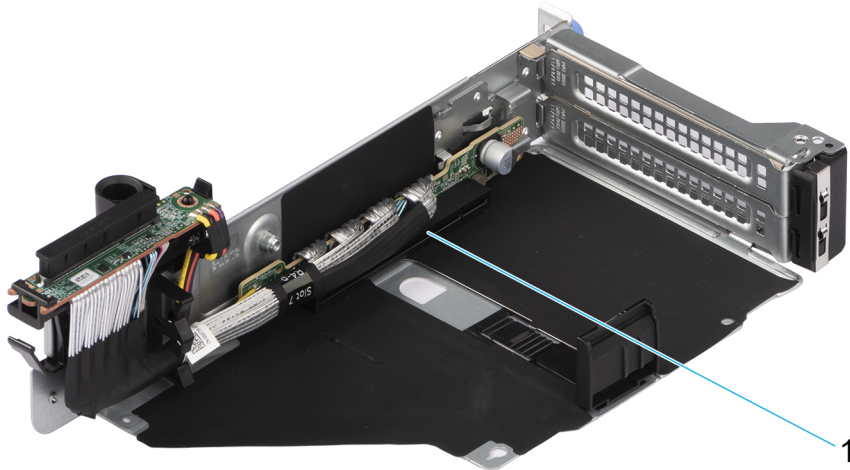
Figure 28. Riser 4P HL

1. Slot 7
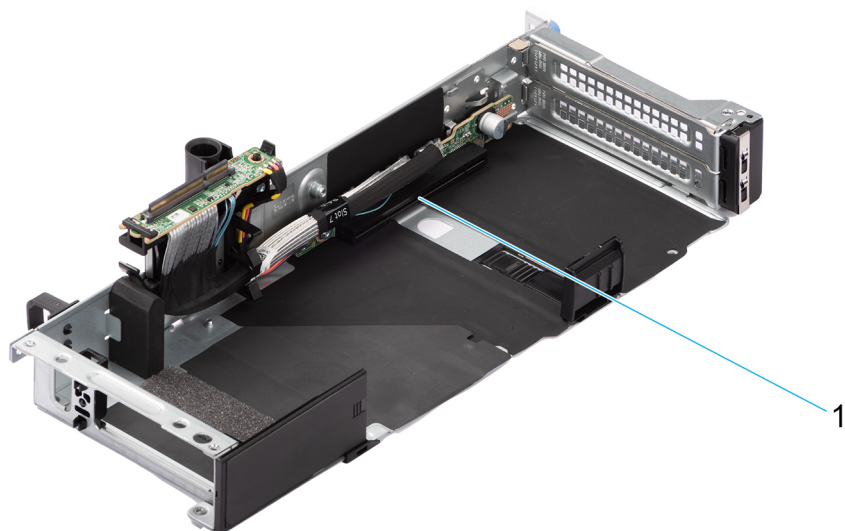
Figure 29. Riser 4P FL

1. Slot 7
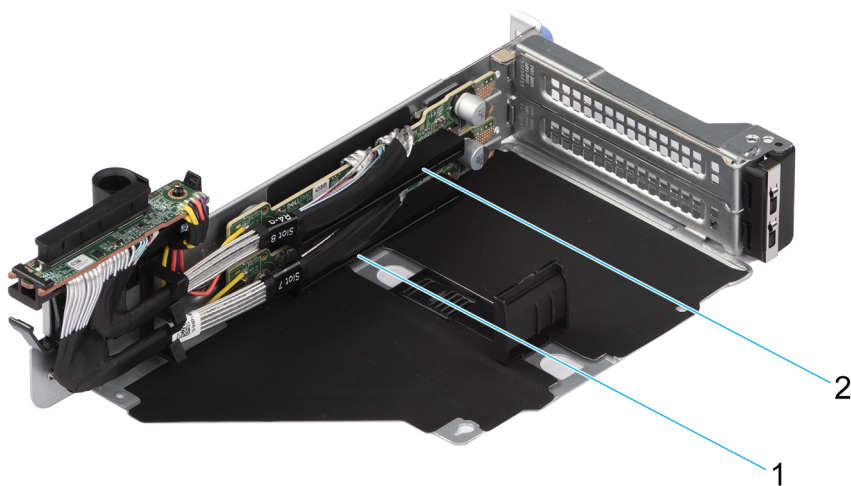
Figure 30. Riser 4Q

1. Slot 7
2. Slot 8
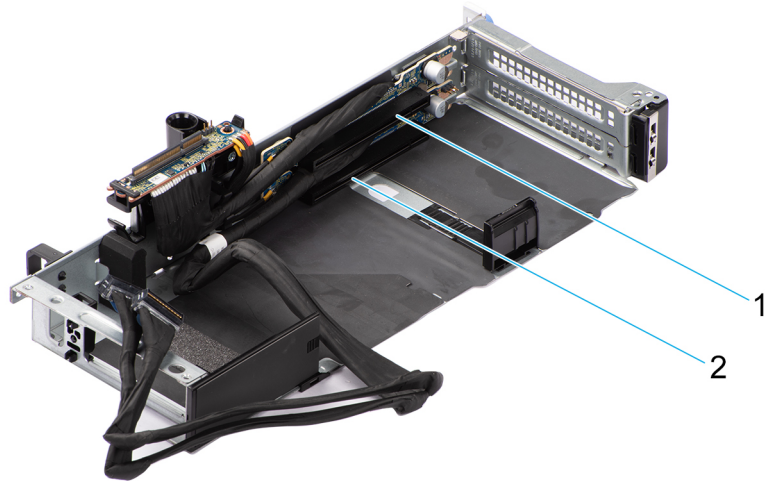
Figure 31. Riser 4S

1. Slot 7
2. Slot 8

Table 13. PCIe Riser Configurations

Configuration	RSR Configuration	# of CPUs	PERC type supported	Rear Storage Possible
0	NO RSR	1	Front PERC	No
1	R2a+R3a+4p(HL)	1	Front PERC	No
2	R1u+R2a+R3b+4q	1	Front PERC/Adapter PERC	No
3-1	R1t+R2t+R3b+4p(HL)	1	Front PERC/Adapter PERC	No
3-2	R1t+R2t+R3b+4p(FL)	1	Front PERC/Adapter PERC	No
4-1	R1t+R2t+R3a+4p(HL)	1	Front PERC	No
4-2	R1t+R2t+R3a+4p(FL)	1	Front PERC	No
5-1	R1t+R2t+R3a+4s(HL)	1	Front PERC	No
5-2	R1t+R2t+R3a+4s(FL)	1	Front PERC	No
6	R2t+R4q	1	Front PERC/Adapter PERC	Yes
7	R1u+R2t+R4q	1	Front PERC/Adapter PERC	Yes
8	R2a+R4a(HL)	1	Front PERC/Adapter PERC	No
9	R2a+R3a+4p(HL)	1	Front PERC/Adapter PERC	Yes
10	R1u+R3b+4q(HL)	1	Front PERC/Adapter PERC	Yes

Table 14. R2a+R3a+R4p (HL)

Configuration	Location	Width	Length	Height	R2a		R3a	R4q
1. R2a+R3a+ R4p (HL)	Assy DPN				3MPPM		8C52F	535MN
	PCIe Slot-3	SW	HL	LP	Gen4 x8	-	-	-
	PCIe Slot-6	SW	HL	LP	-	Gen4 x8	-	-
	PCIe Slot-5	SW	HL	FH	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	Gen5 x16

Table 15. R1u+R2a+R3b+R4q

Configuration	Location	Width	Length	Height	R1u	R2a		R3b	R4q
2. R1u+R2a+R3b+R4q	Assy DPN				92FFD	3MPPM		5W43G	26H63
	PCIe Slot-1	SW	HL	FH	Gen4 x8	-	-	-	-
	PCIe Slot-2	SW	HL	FH	Gen4 x8	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen5 x8	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen5 x8	-	-
	PCIe Slot-4	SW	HL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-5	SW	HL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-7	SW	HL	FH	-	-	-	-	Gen5 x8
	PCIe Slot-8	SW	HL	FH	-	-	-	-	Gen5 x8

Table 16. R1t+R2t+R3b+R4p(HL)

Configuration	Location	Width	Length	Height	R1t	R2t		R3b	R4p
3-1. R1t+R2t+R3b+R4p(HL)	Assy DPN				XWR65	GCDC4		5W43G	535MN
	PCIe Slot-2	SW	HL/FL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-
	PCIe Slot-4	SW	HL/FL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-5	SW	HL/FL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-7	SW	HL/FL	FH	-	-	-	-	Gen5 x16

Table 17. R1t+R2t+R3b+R4p(FL)

Configuration	Location	Width	Length	Height	R1t	R2t		R3b	R4p
3-2. R1t+R2t+R3b+R4p(FL)	Assy DPN				WJGW7	GCDC4		5W43G	5H2GJ
	PCIe Slot-2	DW	FL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-

Table 17. R1t+R2t+R3b+R4p(FL) (continued)

Configur ation	Location	Width	Length	Height	R1t	R2t		R3b	R4p
	PCIe Slot-4	SW	FL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-5	SW	FL	FH	-	-	-	Gen4 x8	-
	PCIe Slot-7	DW	FL	FH	-	-	-	-	Gen5 x16

(i) **NOTE:** Riser Configuration 3-2 requires a GPU or GPU-Ready setup.

Table 18. R1t+R2t+R3a+4p(HL)

Configur ation	Location	Width	Length	Height	R1t	R2t		R3a	R4p
4-1. R1t+R2t+ R3a+4p(H L)	Assy DPN				XWR65	GCDC4		8C52F	535MN
	PCIe Slot-2	SW	HL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-
	PCIe Slot-5	SW	HL	FH	-	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	-	Gen5 x16

Table 19. R1t+R2t+R3a+R4p(FL)

Configur ation	Location	Width	Length	Height	R1t	R2t		R3a	R4p
4-2. R1t+R2t+ R3a+R4p(FL)	Assy DPN				WJGW7	GCDC4		27XPC	5H2GJ
	PCIe Slot-2	DW	FL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-
	PCIe Slot-5	DW	FL	FH	-	-	-	Gen4 x16	-
	PCIe Slot-7	DW	FL	FH	-	-	-	-	Gen5 x16

Table 20. R1t+R2t+R3a+R4s(HL)

Configur ation	Location	Width	Length	Height	R1t	R2t		R3a	R4s
5-1. R1t+R2t+ R3a+R4s(HL)	Assy DPN				XWR65	GCDC4		8C52F	TTFX7
	PCIe Slot-2	SW	HL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-

Table 20. R1t+R2t+R3a+R4s(HL) (continued)

Configuration	Location	Width	Length	Height	R1t	R2t		R3a	R4s
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-
	PCIe Slot-5	SW	HL	FH	-	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	-	Gen5 x16
	PCIe Slot-8	SW	HL	FH	-	-	-	-	Gen5 x16

Table 21. R1t+R2t+R3a+R4s(FL)

Configuration	Location	Width	Length	Height	R1t	R2t		R3a	R4s
5-2. R1t+R2t+R3a+R4s(FL)	Assy DPN				WJGW7	GCDC4		27XPC	83X3J
	PCIe Slot-2	SW	HL	FH	Gen5 x16	-	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-	-
	PCIe Slot-6	SW	HL	LP	-	-	Gen4 x16	-	-
	PCIe Slot-5	SW	HL	FH	-	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	-	Gen5 x16
	PCIe Slot-8	SW	HL	FH	-	-	-	-	Gen5 x16

Table 22. R2t+R4q

Configuration	Location	Width	Length	Height	R2t		R4q
6. R2t+R4q	Assy DPN				GCDC4		26H63
	PCIe Slot-3	SW	HL	LP	Gen4 x16	-	-
	PCIe Slot-6	SW	HL	LP	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	Gen5 x16
	PCIe Slot-8	SW	HL	FH	-	-	Gen5 x16

Table 23. R1u+R2t+R4q

Configuration	Location	Width	Length	Height	R1u	R2t		R4q
7. R1u+R2t+R4q	Assy DPN				92FFD	GCDC4		26H63
	PCIe Slot-1	SW	HL	FH	Gen5 x8	-	-	-
	PCIe Slot-2	SW	HL	FP	Gen5 x8	-	-	-
	PCIe Slot-3	SW	HL	LP	-	Gen4 x16	-	-
	PCIe Slot-6	SW	HL	LH	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	Gen5 x8

Table 23. R1u+R2t+R4q (continued)

Configuration	Location	Width	Length	Height	R1u	R2t		R4q
	PCIe Slot-8	SW	HL	FH	-	-	-	Gen5 x8

Table 24. R1a+R4a(HL)

Configuration	Location	Width	Length	Height	R2a		R4a
8. R1a+R4a(HL)	Assy DPN				3MPPM		NJPKX
	PCIe Slot-3	SW	HL	LP	Gen4 x8	-	-
	PCIe Slot-6	SW	HL	LH	-	Gen4 x8	-
	PCIe Slot-7	SW	HL	FH	-	-	Gen4 x16

Table 25. R2a+R3a+R4p(HL)

Configuration	Location	Width	Length	Height	R2a		R3a	R4p
9. R2a+R3a+R4p(HL)	Assy DPN				3MPPM		8C52F	535MN
	PCIe Slot-3	SW	HL	LP	Gen4 x8	-	-	-
	PCIe Slot-6	SW	HL	LH	-	Gen4 x8	-	-
	PCIe Slot-5	SW	HL	FH	-	-	Gen4 x16	-
	PCIe Slot-7	SW	HL	FH	-	-	-	Gen5 x16

Table 26. R1u+R3b+R4q

Configuration	Location	Width	Length	Height	R1u	R3b	R4q
10. R1u+R3b+R4q	Assy DPN				92FFD	5W43G	26H63
	PCIe Slot-1	SW	HL	FP	Gen5 x8	-	-
	PCIe Slot-2	SW	HL	FH	Gen5 x8	-	-
	PCIe Slot-4	SW	HL	FH	-	Gen4 x8	-
	PCIe Slot-5	SW	HL	FH	-	Gen4 x8	-
	PCIe Slot-7	SW	HL	FH	-	-	Gen5 x8
	PCIe Slot-8	SW	HL	FH	-	-	Gen5 x8

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
- Thermal
- Acoustics

Power

Table 27. 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 Enterprise Infrastructure Planning Tool.
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 AMD's GUARDMI 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	AMD's GUARDMI is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of AMD's GUARDMI 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	See ASHRAE A3/A4 Thermal Restriction.

Table 27. 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: Data Center Power and Cooling Solutions.

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 R7615.

Table 28. Power Supply Unit Options

Wattage	Frequency	Voltage/Current	Class	Heat dissipation
700 W mixed mode HLAC	50/60Hz	200-240 V AC/4.1 A	Titanium	2625 BTU/hr
	800 W mixed mode	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/12-6.3 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	4265 BTU/hr
1400 W mixed mode	50/60 Hz	100–240 V AC/12-8 A	Titanium	5250 BTU/hr
	N/A	240 V DC/6.6 A	N/A	5250 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
1400 W mixed mode 277 Vac and HVDC	50/60 Hz	277 V AC/5.8 A	Titanium	5250 BTU/hr
	N/A	336 V DC/5.17 A	N/A	5250 BTU/hr
1800 W mixed mode HLAC	50/60 Hz	200-240 V AC/10 A	Titanium	6750 BTU/hr
	N/A	240 V DC/8.2 A	N/A	6750 BTU/hr
2400 W mixed mode	50/60 Hz	100–240 V AC/16-13.5 A	Platinum	9000 BTU/hr
	N/A	240 V DC/11.2 A	N/A	9000 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.

ⓘ **NOTE:** If a system with AC 2400 W PSUs operates at low line 100-120 Vac, 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, then the power rating per PSU is degraded to 1050 W.

ⓘ **NOTE:**
● HLAC stands for High-Line AC, with a range of 200 - 240 V AC.

● HVDC stands for High-Voltage DC, with 336 V DC.

Figure 32. PSU power cables
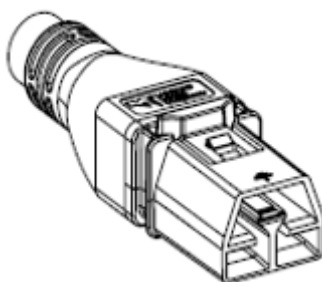
Figure 33. APP 2006G1 power cable

Table 29. PSU power cables

Form factor	Output	Power cable
Redundant 60 mm	700 W mixed mode HLAC	C13
	800 W mixed mode	C13
	1100 W mixed mode	C13
	1400 W mixed mode	C13
	1400 W mixed mode 277 Vac and HVDC	APP 2006G1
	1800 W mixed mode HLAC	C15
Redundant 86 mm	2400 W mixed mode	C19

ⓘ **NOTE:** C13 power cable combined with C14 to C15 jumper power cable 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.
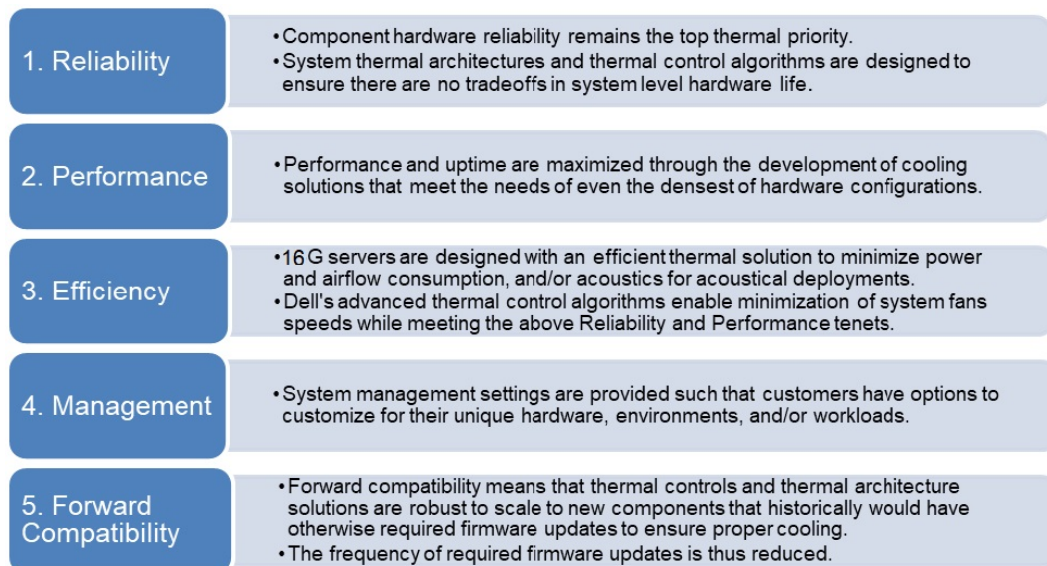
Figure 34. Thermal design characteristics

The thermal design of the PowerEdge R7615 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 R7615 Installation and Service Manual at PowerEdge Manuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- Cooling redundancy: The R7615 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.
- Environmental Specifications: The optimized thermal management makes the R7615 reliable under a wide range of operating environments.

Acoustics

Acoustical design

Dell PowerEdge delivers sound quality and smooth transient response in addition to sound power levels and sound pressure levels oriented to deployment environments.

Sound quality describes how disturbing or pleasing a person finds a sound, as a function of a variety of psycho-acoustical metrics and thresholds. Tone prominence is one such metric. Transient response refers to how sound changes with time. Sound power level, sound pressure level, and loudness refer to amplitude of sound. A reference for comparison to sound pressure levels and loudness for familiar noise sources is mentioned in the table below.

Table 30. Acoustical Reference Points and Output Comparisons

Value measured at your ears		Equivalent familiar noise experience
LpA, dBA, re 20μPa	Loudness, sones	
90	80	Loud concert

Table 30. Acoustical Reference Points and Output Comparisons (continued)

Value measured at your ears		Equivalent familiar noise experience
LpA, dBA, re 20μPa	Loudness, sones	
75	40	Data center, vacuum cleaner, voice must be elevated to be heard.
60	10	Conversation levels
45	4	Whispering, open office layout, normal living room
35	2	Quiet office
30	1	Quiet library
20	0	Recording studio

For more information about PowerEdge acoustical design and metrics, see Understanding Acoustical Data and Causes of Sound in Dell Enterprise Products.

Standby Mode

In standby mode, one of the system air movers may continue to run at a low speed in order to provide cooling to components that are powered on when the system is plugged in and you may hear this sound.

Sound Cap

Sound cap is an iDRAC system profile which provides some system performance capping to achieve reduced acoustics without sacrificing reliability. When sound cap is enabled, acoustics are reduced at the expense of system performance. Designed for scenarios in which the server is redeployed from a data center into a noise-sensitive environment, Sound Cap results in limits to acoustical output by applying a power-capping percentage to the CPU(s). The power cap reduces heat that is generated by the CPUs during high utilization, which reduces fan speed needed for CPU cooling, which in turn reduces acoustical output.

Sound Cap may be useful in the following scenarios:

● Deployment of data center rack servers to quieter environments such as lab or office areas.
● Equipment setup when hardware or software is being loaded.
● Equipment demonstrations or tours in which presenters wish to minimize fan noise from the server.
● When limiting acoustics is consciously prioritized over CPU performance.

Sound Cap applies a percentage-based power cap to the CPU(s) in the server. Sound Cap can limit acoustical output, and it does not impact system cooling performance or any component thermal reliability. It will also not impact fan speeds in moderate CPU workloads or when the system is in an idle state. Sound Cap should not be used or may be ineffective in the following scenarios:

● Benchmarking or performance-sensitive applications.
● Reducing idle fan speeds or make a quiet server even quieter.
● · Using PCIe-based or VDI workloads.

Sound Cap is enabled in System Settings of the iDRAC GUI or in iDRAC settings within the BIOS setup. Additional information about Sound Cap feature in iDRAC can be found in a white paper published online.

Tips for Acoustically Sensitive Environments

The main cause of computer noise is thermal management, which regulates air mover speeds (such as fans, blowers, etc.) to cool components within their designated limits. Since sound amplitude scales logarithmically with air movement speed, seemingly insignificant changes in speed can have surprisingly noticeable effects. For example, a 10% speed change results in an approximate 2 dB change in sound pressure level, while a 20% speed change results in an approximate 5 dB change in sound pressure level.

In light of this, Table 58 lists several typical thermal drivers and offers advice on how to deal with them in acoustically sensitive settings. It should be noted that additional components might start to make noise as the ambient temperature, component

power, and/or loading drop to the point where air movers are operating at their lowest speed. Examples include the humming of hard drives and the ringing of capacitors.

Table 31. Thermal drivers and tips to address acoustically sensitive environments

Driver	Description	Tip
GPU/FPGA /Accelerator Cards	- GPU, FPGA, or other accelerator cards often push the limits of power and cooling requirements in the PCI form factor. - They may therefore require significantly higher air mover speeds and cause the host system to be much louder. - During system bootup, air mover speeds may ramp (sometimes to full speed) to ensure that the cards comply with their thermal limits at assumed worst case thermal state before thermal telemetry feedback is established in bootup. After bootup and telemetry feedback ascertains actual thermal conditions, air mover speeds may reduce.	If deemed an acceptable compromise to accommodate the environment, uninstalling the GPU or running it at a lower loading may reduce air mover speed and acoustical amplitude.
PCI Cards	Dell works diligently with card vendors to validate and develop PCI cards to meet Dell's exacting standards for thermal performance. Although Dell's products can look up and cool appropriately for a variety of cards, some 3rd party cards may be unknown and thus air mover speed may be higher for thermal protection.	- Replace third party PCI cards with similar Dell supported temperature-controlled cards, if available. - Set target in Third party PCIe card options: Dell provides airflow customization for third-party PCIe adapters installed in PowerEdge platforms. If automatic cooling response is above desired levels (LFM) based on the card specifications, a different LFM target can be set using PCIe Airflow Settings options in the iDRAC GUI.
Storage Type	NVMe SSD consumes more power than SAS/SATA drive technologies and therefore demands more airflow to achieve system cooling targets thus higher air mover speeds.	If deemed an acceptable compromise to accommodate the environment, replacing NVMe SSD devices with SAS/SATA drives may reduce acoustical amplitude.
Thermal Design Power (TDP) System thermal profile selection in BIOS or iDRAC GUI	Higher wattage components under load may require more airflow and thus higher air mover speeds and a louder host system. *Default Thermal Profile* generally provides a lower air mover speed and thus lower acoustical output than those of other thermal profiles. *Maximum Performance (Performance Optimized)* prioritizes performance above other aspects thus will more quickly increase air mover speed and be louder. *Sound Cap*, for products that support the feature and when CPU cooling needs are dictating air mover speeds, can limit maximum acoustical output of the system by sacrificing some CPU performance.	
BOSS N1 module	If any BOSS N1 module is installed and "Maximum Performance (Performance Optimized)" is selected, air mover speed and acoustical noise may significantly increase at idle condition.	
Ambient Temperature	ISO standards, ECMA standards, and Dell specs require acoustical tests in 23±2°C ambient temperature. When ambient temperature is higher, air movers must speed up to compensate and thus generate more sound.	

PowerEdge R7615 acoustics

Dell PowerEdge R7615 is a rack-mount server for which acoustical output ranges from that appropriate for an office to that of data centers. Acoustical performance is provided in terms of one configuration: Feature Rich.

Although the R7615 is intended for data centers, certain users might want a more peaceful environment. For such a circumstance, the section on "Tips for an Acoustically Sensitive Environment" may be useful. Please be aware, however, that in the majority of situations, the system's idle air mover speed cannot be reduced without modifying the system's configuration, and in some instances, even a configuration change may not be able to do so.

Configuration details are provided in the below table for Feature Rich configuration:

Table 32. Acoustical configurations of R7615

Configuration	Minimum	Typical-1, 2.5-inch	Typical-2, 3.5-inch	GPU	Feature Rich
CPU Type	AMD	AMD	AMD	AMD	AMD
CPU TDP / Cores	200 W / 24C	200 W / 24C	200 W / 24C	260 W / 32C	320 W / 32C
CPU Quantity	1	1	1	1	1
RDIMM Memory	16GB, RDIMM	16GB, RDIMM	32GB, RDIMM	32GB, RDIMM	32GB, RDIMM
Memory Quantity	6	12	12	24	24
Backplane Type	5" x 12	5" x 8	5" x 12 + 4 x E3 Rear	5" x 24 exp BP	5" x 24 exp BP
HDD Type	5" SATA	5" SSD	5" HDD+E3	5" SSD	5" SSD
HDD Quantity	1	8	3.5-inch x 12 + E3 x 4	16	24
PSU Type	800 W	800 W	1400 W	2400 W	2400 W
PSU Quantity	2	2	2	2	2
OCP	Dual Port 10 GbE	Dual Port 25 GbE	Dual Port 25 GbE	Dual Port 25 GbE	Dual Port 25 GbE
PCI 1	-	25 Gb PCI	10 Gb PCI	GPU: Double-Wide	100 Gb PCI
PCI 2	-	25 Gb PCI	10 Gb PCI	100 Gb PCI	100 Gb PCI
PCI 3	-	-	-	100 Gb PCI	-
PCI 4	-	-	-	GPU: Double-Wide	-

Acoustical experience data for the configuration: Feature Rich is provided in the below table.

Table 33. Acoustical performance of R7615

Configuration		Feature Rich
Acoustical Performance: Idle/ Operating @ 25 °C Ambient		
$L_{wA,m}(B)$	Idle	7.3
	Operating	7.3
$K_v(B)$	Idle	0.4
	Operating	0.4
$L_{pA,m}(dB)$	Idle	57
	Operating	57
Prominent tones		Prominence ratio < 15 dB
Acoustical Performance: Idle @ 28 °C Ambient		
$L_{wA,m}(B)$		7.7

Table 33. Acoustical performance of R7615 (continued)

Configuration	Feature Rich
K_v (B)	0.4
$L_{pA,m}$ (dB)	61
Acoustical Performance: Max. Loading @ 35 °C Ambient	
$L_{wA,m}$ (B)	8.8
K_v (B)	0.4
$L_{pA,m}$ (dB)	73

- $L_{wA,m}$: The declared mean A-weighted sound power level (LwA) is calculated per section 5.2 of ISO 9296 with data collected using the methods described in ISO 7779 (2010). Engineering data presented here may not be fully compliant with ISO 7779 declaration requirements.
- $L_{pA,m}$: The declared mean A-weighted emission sound pressure level is at the bystander position per section 5.3 of ISO 9296 and measured using methods described in ISO 7779. The system is placed in a 24U rack enclosure, 25cm above a reflective floor. Engineering data presented here may not be fully compliant with ISO 7779 declaration requirements.
- **Prominent discrete tones:** Criteria of Annex D of ECMA-74 & Prominence Ratio method of ECMA-418 are followed to determine if discrete tones are prominent and to report them, if so.
- **Idle mode:** Idle mode is the steady-state condition in which the server is energized but not operating any intended function.
- **Operating mode:** Operating mode is represented by 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.

The below Category tables show the R7615 configuration tested for acoustical experience of each configuration in a 23±2°C environment.

Category 1: Table-top in Office Environment

When Dell determines that a specific Enterprise product is to be used primarily on top of the table, 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 34. 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)			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
		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	
Sound Power	LWA,m, B	≤ 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

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 Idle at 28° C & 35° C Ambient, and 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	

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 ≤ 15dB.
		• Startup behavior
		  ○ Report Startup behavior re. AC0159
		  ○ Startup must proceed smoothly, i.e., 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 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 35. 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 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 in 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 36. Dell Enterprise Category 3, "General Use Space" 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 (i.e., set fan speeds representative) for Idle at 28 & 35° C Ambient, and 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**	
Sound Power	LWA,m, B	≤ 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, %	≤ 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 ≤ 15dB. - Startup behavior - Report Startup behavior re. AC0159 - Startup must proceed smoothly, i.e., 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	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			Simulate (i.e., set fan speeds representative) for Idle at 28 & 35° C Ambient, and 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**	
	and program configuration document				

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 37. 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 Idle at 28° C & 35° C Ambient	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**		
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

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 are defined in "Configurations and 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 38. 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
	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 are defined in "Configurations and Configuration Dependencies" for each platform.				
Sound Pressure	LpA-reported, dBA, re AC0158 and	Report for all mics	Report for all mics	Report for all mics	Report for all mics	Report for all mics

Table 38. 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	
	program configuration document					

Rack, rails, and cable management

Topics:

* Rails and cable management information

Rails and cable management information

The rail offerings for the PowerEdge R7615 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 Enterprise Systems Rail Sizing and Rack Compatibility Matrix 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 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).

  (i) **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.
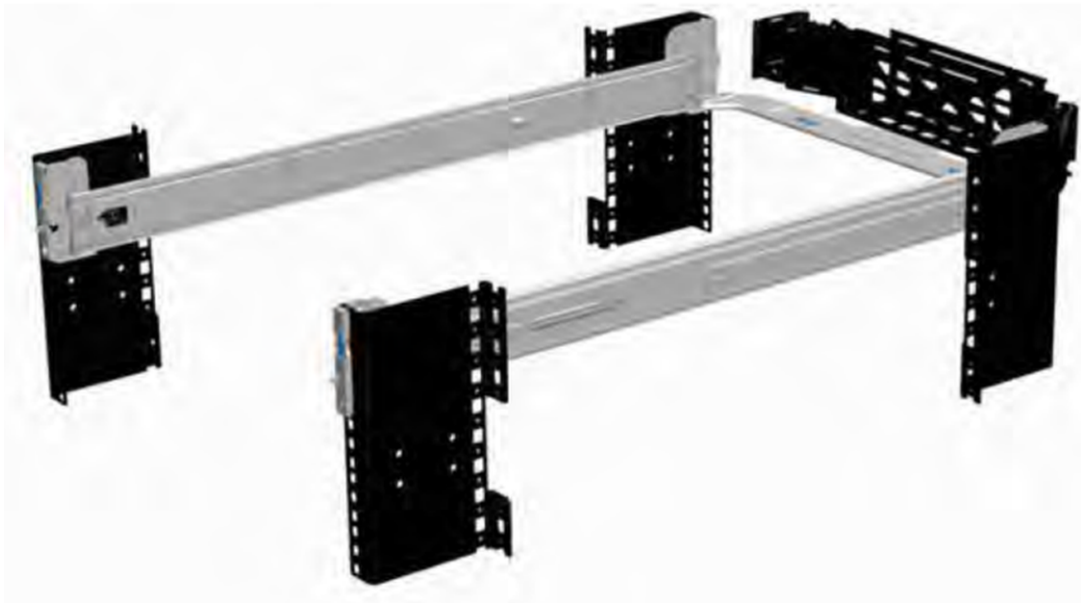
Figure 35. Sliding rails with optional CMA
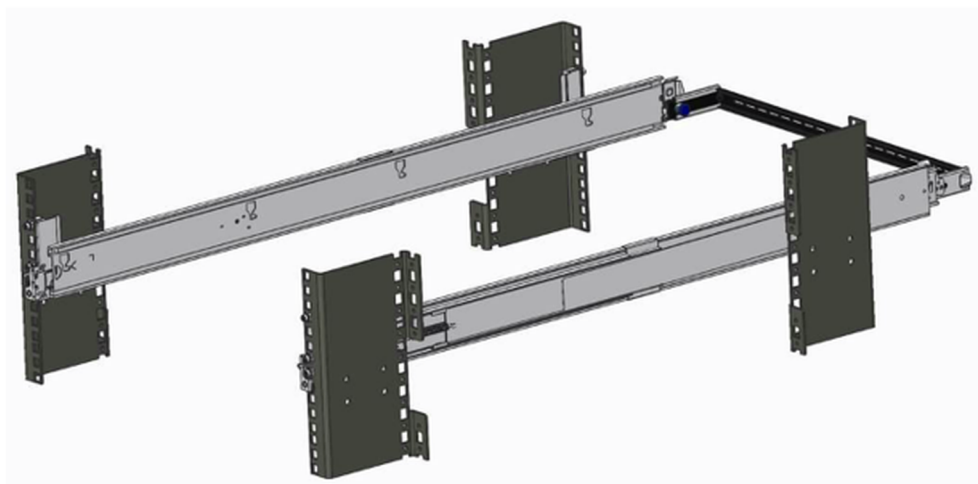
Figure 36. Sliding rails with optional SRB

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, 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.

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.
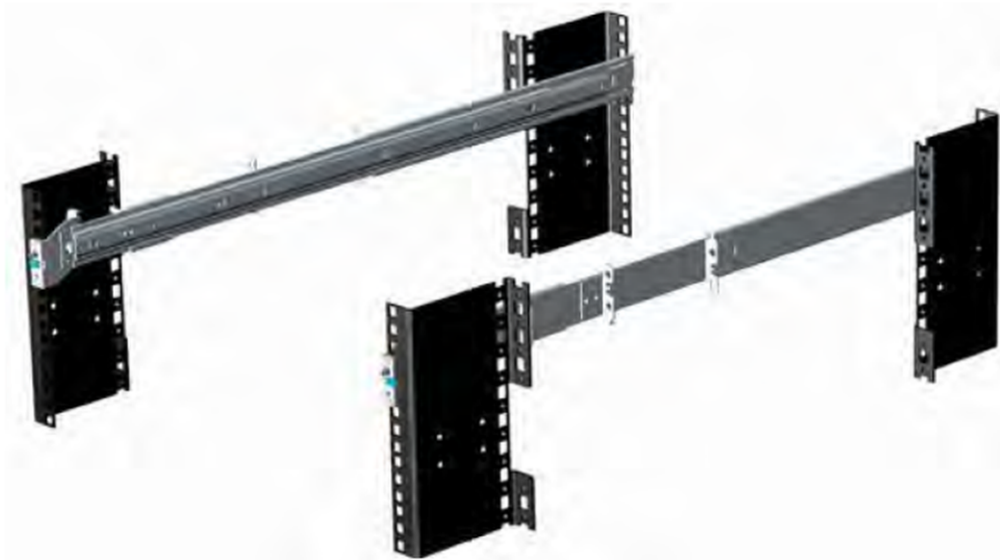
Figure 37. Static rails

Static rails features summary

Static rails for 4-post & 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 static rails (B20) must be used. Sliding rails support mounting in 4-post racks only.

Figure 38. 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.

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.
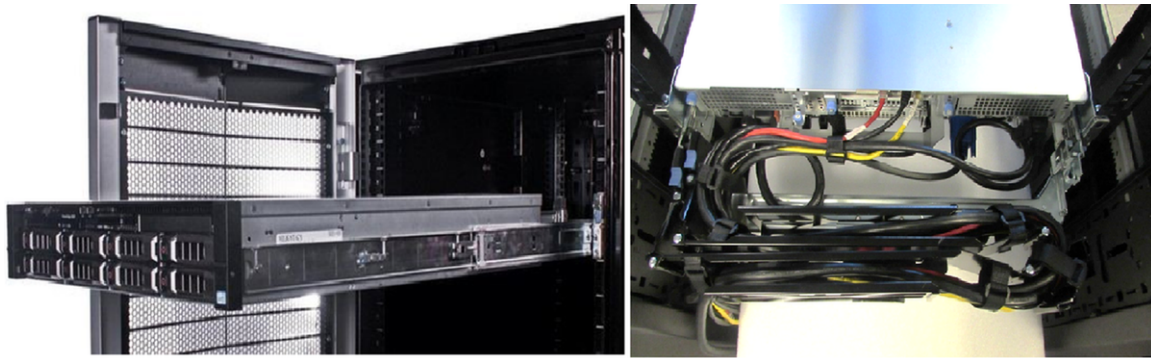
Figure 39. Sliding rails with CMA cabling

Strain Relief Bar (SRB)

The optional strain relief bar (SRB) for the PowerEdge R7615 organizes and supports cable connections at the rear end of the server to avoid damage from bending.
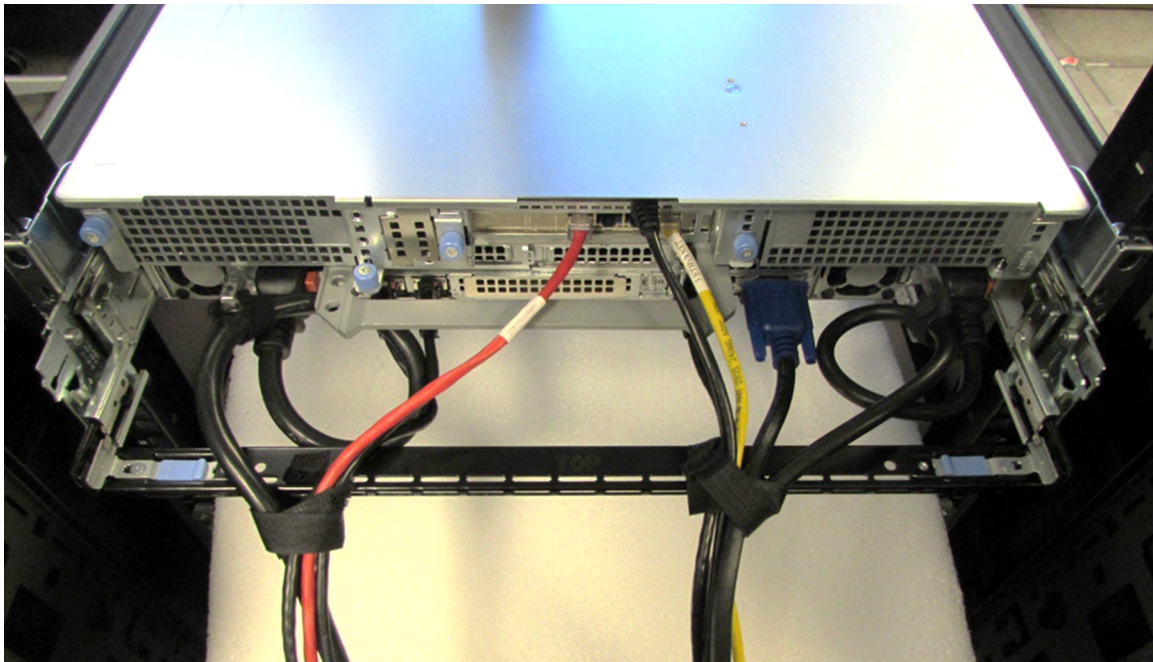
Figure 40. Cabled strain relief bar

- 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 separated 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.
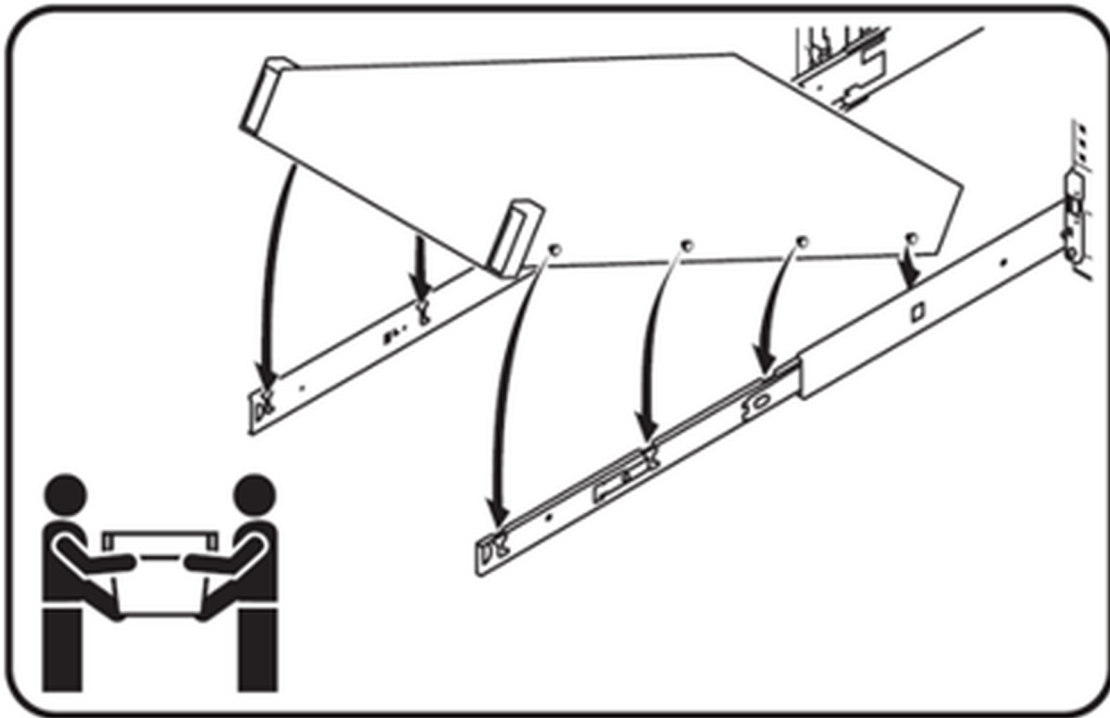
Figure 41. Installing the system in Drop-in sliding rails

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. For a 2U systems, this is a two person lift.

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

1. Pull the inner rails out of the rack until they lock into place.
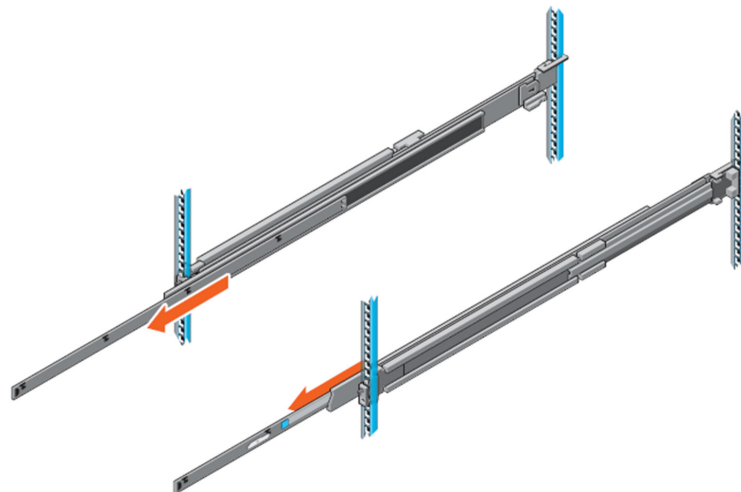
Figure 42. Pull out inner rail

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.
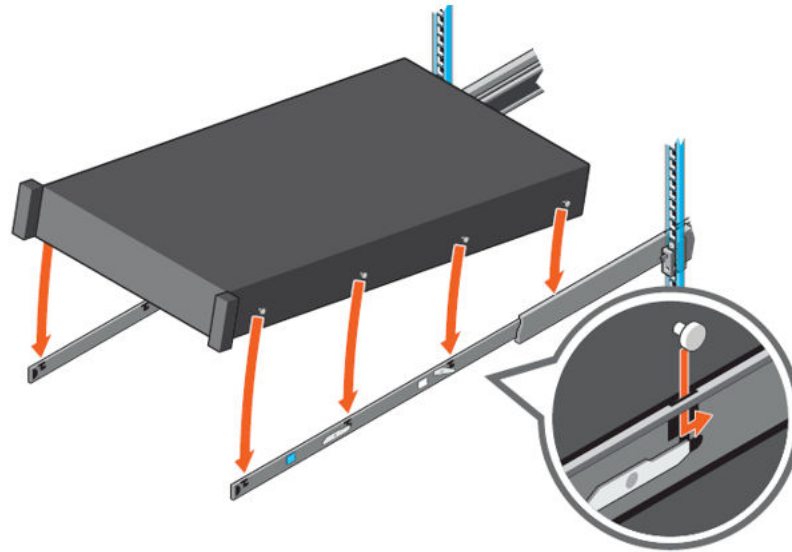
Figure 43. Rail standoffs seated in J-slots

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.
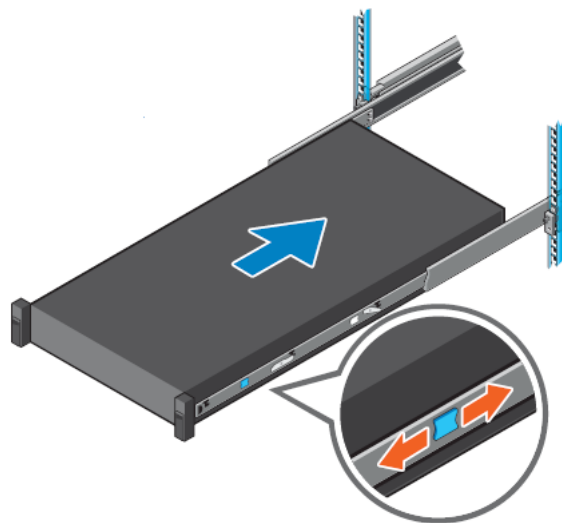
Figure 44. Slide system into the rack

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.
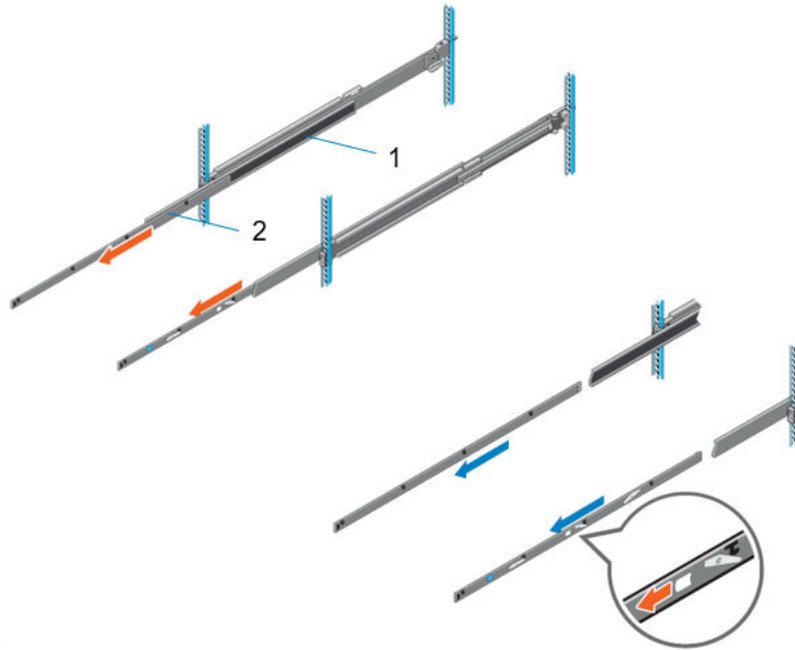
Figure 45. Pull out the intermediate rail

Table 39. 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.
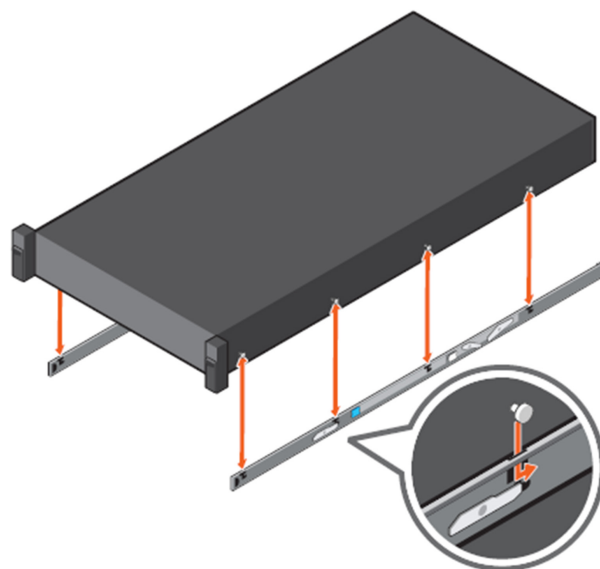
Figure 46. Attach the inner rails to the system

4. With the intermediate rails extended, install the system into the extended rails.
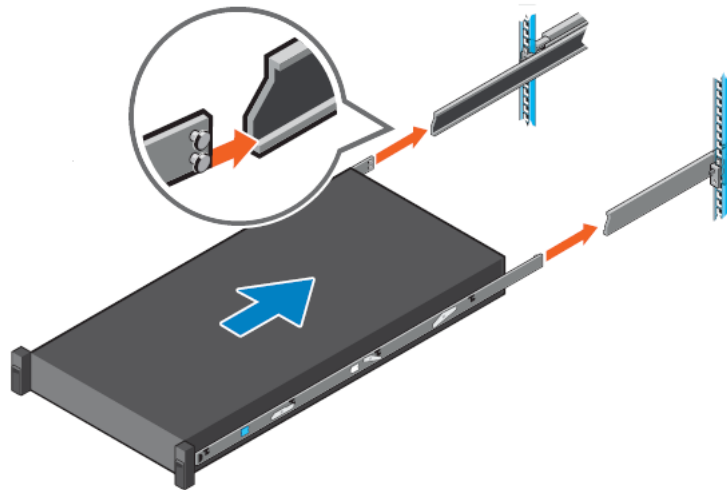
Figure 47. Install system into the extended rails

5. Pull blue slide release lock tabs forward or backward on both rails, and slide the system into the rack.
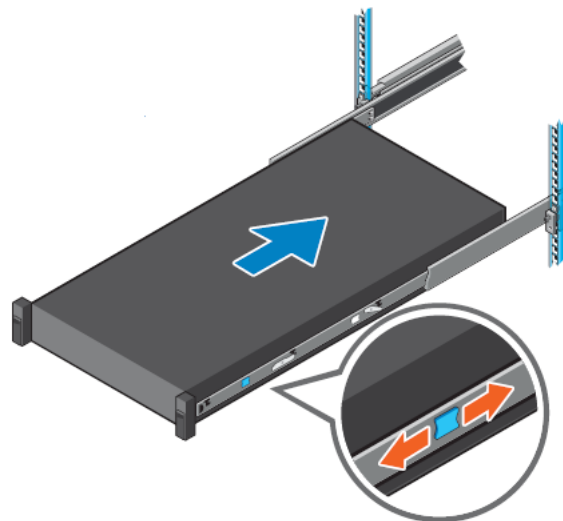
Figure 48. Slide system into the rack

Supported Operating Systems

The PowerEdge system supports the following operating system:

- Canonical Ubuntu Server LTS
- Microsoft Windows Server with Hyper-V
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- VMware vSAN/ESXi
- Citrix XenServer

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

Dell Systems Management

Dell delivers management solutions that help IT administrators effectively deploy, update, monitor, and manage IT assets. Dell 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 40. 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 41. 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 41. 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 2019 or 2022, Ubuntu, CentOS	Supported (Tier-1)

Appendix A. Additional specifications

Topics:

Chassis dimensions
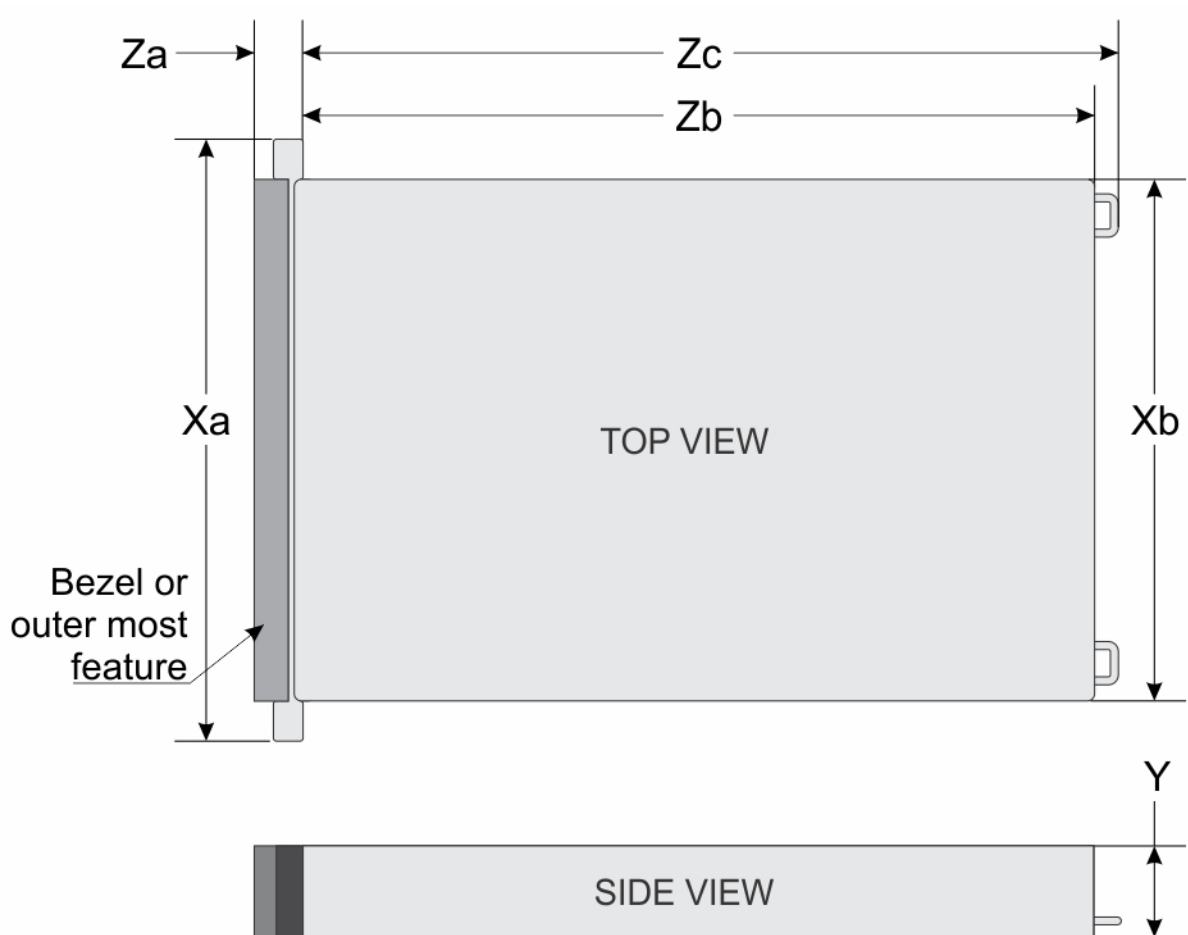
Figure 49. Chassis dimensions

Table 42. PowerEdge R7615 chassis dimensions

Xa	Xb	Y	Za	Zb	Zc
482.0 mm (18.97 inches)	434.0 mm (17.08 inches)	86.8 mm (3.41 inches)	35.84 mm (1.96 inches) With bezel 22.0 mm (0.86 inches) Without bezel	700.7 mm (27.58 inches) Ear to rear wall	736.29 mm (28.98 inches) Ear to PSU handle

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

System weight

Table 43. PowerEdge R7615 system weight

System configuration	Maximum weight (with all drives/SSDs)
A server with fully populated drives	34.5 kg (76.05 pound)
A server without drives and PSU installed	25.7 kg (56.65 pound)

NIC port specifications

The PowerEdge R7615 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 Open Compute Project (OCP) cards.

Table 44. NIC port specification for the system

Feature	Specifications
(Optional) LOM card (optional)	1 Gb x 2
(Optional) 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
Management Interface Card (MIC) to support Dell Data Processing Unit (DPU) card (optional)	25 GbE x 2 or 100 GbE x 2

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

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

(i) **NOTE:** The system allows either LOM card or MIC card to be installed in the system.

Video specifications

The PowerEdge R7615 system supports integrated Matrox G200 graphics controller with 16 MB of video frame buffer.

Table 45. Supported video resolution options

Resolution	Refresh rate (Hz)	Color depth (bits)
1024 x 768	60	8, 16, 32
1280 x 800	60	8, 16, 32
1280 x 1024	60	8, 16, 32
1360 x 768	60	8, 16, 32

Table 45. Supported video resolution options (continued)

Resolution	Refresh rate (Hz)	Color depth (bits)
1440 x 900	60	8, 16, 32
1600 x 900	60	8, 16, 32
1600 x 1200	60	8, 16, 32
1680 x 1050	60	8, 16, 32
1920 x 1080	60	8, 16, 32
1920 x 1200	60	8, 16, 32

USB ports specifications

Table 46. PowerEdge R7615 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		

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

PSU rating

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

Table 47. PSUs highline and lowline ratings

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

The PowerEdge R7615 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 the 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 48. 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%
	1400 W AC	Titanium	90.00%	94.00%	96.00%	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%

Environmental specifications

Table 49. Continuous Operation Specifications for ASHRAE A2

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

Table 50. Continuous Operation Specifications for ASHRAE A3

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

Table 51. 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
Humidity percent range (non-condensing at all times)	8% RH with -12°C 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 52. 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 (i) **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 (10,000 feet)

Table 53. 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 54. 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 55. 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

Table 55. Particulate contamination specifications (continued)

Particulate contamination	Specifications
	(i) **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. (i) **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 (i) **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 (i) **NOTE:** This condition applies to data center and non-data center environments.
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 (i) **NOTE:** In environments commonly above ISA-71 Class G1 or that may have known challenges, special filters may be required.

Table 56. 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

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

Table 57. Particulate contamination specifications

Particulate contamination	Specifications
Air filtration: Conventional Data Center only	Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit (i) **NOTE:** Filtering room air with a MERV8 filter, as specified in ANSI/ASHRAE Standard 127, is a recommended method for achieving the necessary environmental conditions. (i) **NOTE:** Air entering the data center must have MERV11 or MERV13 filtration. (i) **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.

Table 57. 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 six 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.
Conductive dust: data center and non-data center environments	Air must be free of conductive dust, zinc whiskers, or other conductive particles. ⓘ **NOTE:** Conductive dust, which can interfere with equipment operation, can originate from various sources, including manufacturing processes and zinc whiskers that may develop on the plating of raised floor tiles. ⓘ **NOTE:** This condition applies to data center and non-data center environments.
Corrosive dust: data center and non-data center environments	● 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 58. Gaseous contamination specifications

Gaseous contamination	Specifications	Notes
Copper coupon corrosion rate	ISA-71 Class G1: <300 Å/month	Per ANSI/ISA71.04
Silver coupon corrosion rate	ISA-71 Class G1: <200 Å/month	Per ANSI/ISA71.04

Thermal restriction matrix

Table 59. Air cooling: Thermal restriction matrix (non-GPU)

Configuration			No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 8 x E3	32 x E3	
Rear storage							2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan					2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan			4x Rear 2.5 w/ 3x Rear-Fan
CPU cTDP Max	CPU TDP		No Rear Drives	No Rear Drives	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	240 W	210 W	HPR Sliver Fan + 2U STD HSK			HPR Sliver Fan + 2U	HPR Sliver Fan + 2U STD HSK	HPR Sliver Fan + 2U	HPR Sliver Fan	HPR Gold Fan	HPR Sliver Fan [75%]	HPR Sliver Fan [70%]	HPR Gold Fan [70%]	HPR Gold Fan [70%] + 2U EXT HSK	HPR Sliver Fan	HPR Gold Fan	HPR Gold Fan + 2U STD HSK
		200 W															

Table 59. Air cooling: Thermal restriction matrix (non-GPU) (continued)

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 / 8 x E3	32 x E3	
Rear storage → CPU cTDP Max	CPU TDP	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
								STD HSK	+ 2U STD HSK	+ 2U STD HSK	+ 2U EXT HSK			+ 2U STD HSK		
300 W	260 W	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan + 2U EXT HSK
	290 W	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan + 2U EXT HSK
	280 W	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Sliver Fan [75%] + 2U EXT HSK	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Gold Fan [70%] + 2U EXT HSK *	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan + 2U EXT HSK
400 W	360 W	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan [75%] + 2U EXT HSK	HPR Gold Fan [75%] + 2U EXT HSK	Not supported	Not supported	Not supported	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan + 2U EXT HSK
	320 W	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Sliver Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan [75%] + 2U EXT HSK	HPR Gold Fan [75%] + 2U EXT HSK	Not supported	Not supported	Not supported	HPR Gold Fan + 2U EXT HSK	HPR Gold Fan + 2U STD HSK	HPR Gold Fan + 2U EXT HSK
Memory	16 GB RDIMM	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan [75%]	HPR Sliver Fan [75%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR Sliver Fan	HPR Gold Fan	HPR Gold Fan
	32 GB RDIMM	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan [75%]	HPR Sliver Fan [75%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR Sliver Fan	HPR Gold Fan	HPR Gold Fan
	64 GB RDIMM	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan	HPR Sliver Fan [75%]	HPR Sliver Fan [75%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR Sliver Fan	HPR Gold Fan	HPR Gold Fan
	96 GB RDIMM	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan [75%]	HPR GOLD Fan [75%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR Gold Fan	HPR Gold Fan	HPR Gold Fan
	128 GB RDIMM	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan	HPR GOLD Fan [75%]	HPR GOLD Fan [75%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR GOLD Fan [70%]	HPR Gold Fan	HPR Gold Fan	HPR Gold Fan

Table 59. Air cooling: Thermal restriction matrix (non-GPU) (continued)

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3	8 x E3	32 x E3
Rear storage																
CPU cTDP Max	CPU TDP	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
	256 GB RDIMM	HPR GOLD Fan								Supports 30°C ambient temperature	Supports 30°C ambient temperature			HPR Gold Fan	HPR Gold Fan	HPR Gold Fan

> ⓘ **NOTE:** The standard supported operating temperature is 35°C.

*Note: Supported ambient temperature is 30°C.

> ⓘ **NOTE:** Three fan modules are required for a single processor, and six fan modules are required for a dual processor system.

Table 60. Air cooling: Thermal restriction matrix (GPU Configuration)

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3	8 x E3	32 x E3
Rear storage																
CPU cTDP Max	Model	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/ 3x Rear-Fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
CPU TDP / cTDP — 240 W	9334 9224 9254 9124	Not Supported	HPR Gold Fan + 1U EXT HSK					HPR Gold Fan	HPR Gold	HPR Gold Fan [75%]	Not Supported		HPR Gold Fan	HPR Gold Fan	Not Supported	HPR Gold Fan

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3, 8 x E3	32 x E3	
Rear storage																
CPU cTDP Max	Model	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/3x Rear-Fan
300 W	9634						+ 1U EXT HSK	+ 1U EXT HSK	Fan + 1U EXT HSK	+ 1U EXT HSK				+ 1U EXT HSK		+ 1U EXT HSK
	9534															
	9454 / 9454P															
	9354 / 9354P															
400 W	9654 / 9654P		HPR Gold Fan + 1U EXT HSK	Not Supported			Not Supported	Not Supported						HPR Gold Fan + 1U EXT HSK *	Not Supported	Not Supported
	9554 / 9554P		HPR Gold Fan + 1U EXT HSK *													
	9474F															
	9374F															
	9274F		HPR Gold Fan + 1U EXT HSK											HPR Gold Fan		
	9174F															

Configuration			No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 / 8 x E3	32 x E3	
Rear storage																	
CPU cTDP Max	**Model**		No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/3x Rear-Fan
	9684X			HPR Gold Fan + 1U EXT HSK *											+ 1U EXT HSK HPR Gold Fan + 1U EXT HSK *		
	9384X														HPR Gold Fan + 1U EXT HSK		
	9184X			HPR Gold Fan + 1U EXT HSK													
Memory	16 GB RDIMM			HPR Gold Fan			HPR Gold Fan	HPR Gold Fan	HPR Gold Fan						HPR Go	HPR Gol	
	32 GB RDIMM																

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/ SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 / 8 x E3	32 x E3
Rear storage					No Rear Drives	2x Rear 2.5-inch w/ 2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2x Rear 2.5-inch w/2x Rear-Fan	4x Rear 2.5 w/3x Rear-Fan	No Rear Drives	4x Rear 2.5 w/3x Rear-Fan
CPU cTDP Max	**Model**	No Rear Drives	No Rear Drives	No Rear Drives											
GPU	64 GB RDIMM													ld Fan	d Fan
	96 GB RDIMM														
	128 GB RDIMM														
	256 GB RDIMM								HPR Gold Fan *						
	A2		HPR Gold Fan			HPR Gold Fan	HPR Gold Fan		HPR Gold Fan					HPR Gold Fan	HPR Gold Fan
	A16 64GB														
	A30 24GB														
	A40 48GB														
	A100 80GB														
	MI210 64GB														
	H100														
	L4														
	L40														

*__Note:__ Supported ambient temperature is 30°C.

ⓘ __NOTE:__ "High-Performance Gold Fan" to be supported on all GPU configs.

ⓘ __NOTE:__ GPU is not supported on 12 x 3.5-inch configs and system configs with rear module installed.

Table 61. Air cooling: Thermal Guidance (non-GPU)

Configuration			No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 8 x E3	32 x E3
Rear storage			No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch w/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch w/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
cTDP	Model	Core Count														
Shroud Type			**Regular**			**Regular**			**Regular**						**Regular**	
240W	9334	32	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C			35°C	35°C
240W	9224	24	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C			35°C	35°C
240W	9254	24	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C			35°C	35°C
240W	9124	16	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C			35°C	35°C
300W	9634	84	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	30°C			35°C	35°C
300W	9534	48	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	30°C			35°C	35°C
300W	9454 / 9454P	64	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	30°C			35°C	35°C
300W	9354 / 9354P	32	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	30°C			35°C	35°C
400W	9654 / 9654P	96	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	35°C	Not Support			35°C	35°C

Table 61. Air cooling: Thermal Guidance (non-GPU) (continued)

Configuration			No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 8 x E3	32 x E3	
Rear storage			No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch hw/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch w/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
cTDP	Model	Core Count															
Shroud Type			Regular			Regular			Regular						Regular		
400 W	9554 / 9554 P	64															
400 W	9474 F	48															
400 W	9374 F	32															
400 W	9274 F	24															
400 W	9174 F	16															
400 W	9754	128															
400 W	9734	112															
400 W	9684 X	96															
400 W	9384 X	32															
400 W	9184 X	16															
Memory	16 GB RDIMM		35°C			35°C			35°C			35°C			35°C		
	32 GB RDIMM																

Table 61. Air cooling: Thermal Guidance (non-GPU) (continued)

cTDP	Model	Core Count	No BP	8 x 2.5-inch U.2	16 x 2.5-inch U.2/ SAS	24 x 2.5-inch SAS			16 x 2.5-inch SAS + 8 x 2.5-inch U.2	24 x 2.5-inch NVMe	8 x 3.5-inch	12 x 3.5-inch			16 x E3 8 x E3	32 x E3
Rear storage			No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch hw/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	No Rear Drives	No Rear Drives	No Rear Drives	2 x Rear 2.5-inch w/ 2 x Rear fan	4 x Rear 2.5-inch w/ 3 x Rear fan	No Rear Drives	4x Rear 2.5 w/ 3x Rear-Fan
Shroud Type			Regular	Regular		Regular				Regular					Regular	
	64 GB RDIMM															
	96 GB RDIMM															
	128 GB RDIMM															
	256 GB RDIMM										30°C		30°C			

Table 62. Air cooling: Thermal Guidance (GPU configuration)

cTDP	Model	Core Count	No BP DW (A100/A40/A30/A16/MI210/H100/L40)	No BP SW A2/L4	8 x 2.5-inch U.2 DW (A100/A40/A30/A16/MI210/H100/L40)	8 x 2.5-inch U.2 SW A2/L4	16 x 2.5-inch U.2 DW (A100/A40/A30/A16/MI210/H100/L40)	16 x 2.5-inch U.2 SW A2/L4	24 x 2.5-inch DW (A100/A40/A30/A16/MI210/H100/L40)	24 x 2.5-inch SW A2/L4	8 x 3.5-inch DW (A100/A40/A30/A16/MI210/H100/L40)	8 x 3.5-inch SW A2/L4	12 x 3.5-inch DW (A100/A40/A30/A16/MI210/H100/L40)	12 x 3.5-inch SW A2/L4	16 x E3 8 x E3 DW (A100/A40/A30/A16/MI210/H100/L40)	16 x E3 8 x E3 SW A2/L4	32 x E3 DW (A100/A40/A30/A16/MI210/H100/L40)	32 x E3 SW A2/L4
GPU																		
Max Qty			x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6
Shroud Type			GPU	GPU	GPU		GPU	GPU	GPU		GPU		GPU		GPU		GPU	
CPU TDP	240 W 9334	32	Not Supported	35°C	35°C		35°C	35°C	35°C		35°C		Not Supported		35°C		Not Supp	35°C

Table 62. Air cooling: Thermal Guidance (GPU configuration) (continued)

Configuration			No BP		8 x 2.5-inch U.2		16 x 2.5-inch U.2		24 x 2.5-inch		8 x 3.5-inch		12 x 3.5-inch		16 x E3 / 8 x E3		32 x E3	
GPU			DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4
Max Qty			x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6
Shroud Type			GPU		GPU		GPU		GPU		GPU		GPU		GPU		GPU	
cTDP	Model	Core Count																
P/cTDP	9224	24													orted ed			
240W	9254	24																
240W	9124	16																
240W	9634	84																
300W	9534	48																
300W	9454 / 9454P	64																
300W	9354 / 9354P	32																

Table 62. Air cooling: Thermal Guidance (GPU configuration) (continued)

Shroud Type			No BP		8 x 2.5-inch U.2		16 x 2.5-inch U.2		24 x 2.5-inch		8 x 3.5-inch		12 x 3.5-inch		16 x E3 / 8 x E3		32 x E3	
cTDP	Model	Core Count	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4
Max Qty			x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6
			GPU		GPU		GPU		GPU		GPU		GPU		GPU		GPU	
400W	9654 / 9654P	96		30°C	30°C		Not Supported	Not Supported	Not Supported		Not Supported				30°C			Not Supported
400W	9554 / 9554P	64		30°C	30°C		Not Supported	Not Supported	Not Supported		Not Supported				30°C			Not Supported
400W	9474F	48		30°C	30°C		Not Supported	Not Supported	Not Supported		Not Supported				30°C			Not Supported
400W	9374F	32		30°C	30°C		Not Supported	Not Supported	Not Supported		Not Supported				30°C			Not Supported
400W	9274F	24		35°C	35°C		Not Supported	Not Supported	Not Supported		Not Supported				35°C			Not Supported
400W	9174F	16		35°C	35°C		Not Supported	Not Supported	Not Supported		Not Supported				35°C			Not Supported
400W	9684X	96		30°C	30°C		Not Supported	Not Supported	Not Supported		Not Supported				30°C			Not Supported

Table 62. Air cooling: Thermal Guidance (GPU configuration) (continued)

Configuration	No BP		8 x 2.5-inch U.2		16 x 2.5-inch U.2		24 x 2.5-inch		8 x 3.5-inch		12 x 3.5-inch		16 x E3 / 8 x E3		32 x E3	
GPU	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4	DW (A100/A40/A30/A16/MI210/H100/L40)	SW A2/L4
Max Qty	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6	x3	x6
Shroud Type	GPU		GPU		GPU		GPU		GPU		GPU		GPU		GPU	

cTDP	Model	Core Count							
400 W	9384X	32	35°C		35°C				35°C
400 W	9184X	16							

(i) **NOTE:** GPU is not supported on 12 x 3.5-inch configs and system configs with rear module installed.

Table 63. Liquid cooling: Thermal restriction matrix (GPU Configuration)

Configuration		No BP	8 x 2.5-inch U.2	16 x 2.5-inch	24 x 2.5-inch	16 x E3 / 8 x E3
GPU		SW A2/L4	SW A2/L4	SW A2/L4	SW A2/L4	SW A2/L4
Max Qty		x6	x6	x6	x6	x6
Shroud Type		GPU	GPU	GPU	GPU	GPU
CPU	All CPU TDP	35°C				
Memory	16 GB RDIMM	35°C				
	32 GB RDIMM					
	64 GB RDIMM					
	96 GB RDIMM					
	128 GB RDIMM					
	256 GB RDIMM					

(i) **NOTE:** The standard supported operating temperature is 35°C.

(i) **NOTE:** "High-Performance GOLD Fan" to be supported on all GPU configs.

(i) **NOTE:** GPU is not supported on 12 x 3.5-inch, 8 x 3.5-inch, 32 x E3.S configs and system configs with rear module installed.

Table 64. Label reference

Label	Description
HPR (Silver)	High performance (silver grade)
HPR (Gold)	High performance (gold grade)
HSK	Heat sink
LP	Low profile
FH	Full height

Appendix B. Standards compliance

The system conforms to the following industry standards.

Table 65. Industry standard documents

Standard	URL for information and specifications
ACPIAdvance Configuration and Power Interface Specification, v6.4	ACPI
Ethernet IEEE Std 802.3-2022	IEEE Standards
MSFT WHQL Microsoft Windows Hardware Quality Labs	Windows Hardware Compatibility Program
IPMI Intelligent Platform Management Interface, v2.0	IPMI
DDR5 Memory DDR5 SDRAM Specification	JEDEC Standards
PCI Express PCI Express Base Specification, v5.0	PCIe Specifications
PMBus Power System Management Protocol Specification, v1.2	Power System Management Protocol Specification
SAS Serial Attached SCSI, 3 (SAS-3) (T10/INCITS 519)	SCSI Storage Interfaces
SATA Serial ATA Rev. 3.3	SATA IO
SMBIOS System Management BIOS Reference Specification, v3.3.0	DMTF SMBIOS
TPM Trusted Platform Module Specification, v1.2 and v2.0	TPM Specifications
UEFI Unified Extensible Firmware Interface Specification, v2.7	UEFI Specifications
PI Platform Initialization Specification, v1.7	
USB Universal Serial Bus v2.0 and SuperSpeed v3.0 (USB 3.1 Gen1)	USB Implementers Forum, Inc. USB
NVMe Express Base Specification. Revision 2.0c	NVMe
NVMe Command Set Specifications 1. NVM Express NVM Command Set Specification. Revision 1.1c 2. NVM Express Zoned Namespaces Command Set. Revision 1.0c 3. NVM Express® Key Value Command Set. Revision 1.0c	
NVMe Transport Specifications 1. NVM Express over PCIe Transport. Revision 1.0c 2. NVM Express RDMA Transport Revision. 1.0b 3. NVM Express TCP Transport. Revision 1.0c	
NVMe NVM Express Management Interface. Revision 1.2c	
NVMe NVMe Boot Specification. Revision 1.0	

Appendix C Additional resources

Table 66. 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
QR code for system resources	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

Appendix D: Service and support

Topics:

Why attach service contracts

Dell PowerEdge servers include a standard hardware warranty that highlights our commitment to product quality by guaranteeing repair or replacement of defective components. While industry-leading, our warranties are limited to 1 or 3 years, depending on model, and do not cover software assistance. Call records show that customers are most often seeking Dell technical support for software related issues like configuration guidance, troubleshooting, upgrade assistance or performance tuning. Encourage customers to purchase ProSupport service contracts to supplement warranty coverage and ensure optimal support for both hardware and software. ProSupport provides a complete hardware guarantee beyond the original warranty period.

ProSupport Infrastructure Suite

ProSupport Infrastructure Suite is a set of support services that enable customers to build the solution that is right for their organization. It is an industry-leading, enterprise-class support that aligns with the criticality of your systems, the complexity of your environment, and the allocation of your IT resources.

Figure 50. ProSupport Enterprise Suite

	Basic Hardware Support¹	ProSupport	BEST ProSupport Plus
Outcome Assistance and Advocacy *via assigned Technical Customer Success Manager* ⓘ			
Enjoy a frictionless customer experience with cross-functional lifecycle management aligned to your goals			✓
Accelerate time-to-value through onboarding assistance, education and success planning			✓
Turn challenges into opportunities with actionable strategies powered by data and AI-driven analytics			✓
Ensure coverage continuity while preparing to scale for future success			✓
Proactive Monitoring & Actionable Insights *via Dell's connectivity solutions and tools*			
Quickly visualize performance through a current system health score		✓	✓
Cybersecurity monitoring and mitigation recommendations provide another layer of protection		✓	✓
Predictive performance and capacity analysis address bottlenecks		✓	✓
Prevent or plan for downtime with predictive hardware anomaly detection		✓	✓
Energy consumption and carbon footprint forecasting support sustainability and stewardship initiatives		✓	✓
Get ahead of problems with proactive issue detection with automated case creation	✓	✓	✓
Streamline internal IT efforts with efficient service request and escalation management tools	✓	✓	✓
Minimize disruptions by self-dispatching eligible parts	✓	✓	✓
Support Essentials			
Receive an assigned incident manager for Sev 1 issues who will work your issue through to resolution		✓	✓
Count on Mission Critical Support during Sev 1 incidents and natural disasters ⓘ			✓
Keep systems code current and performing at peak through Proactive System Maintenance			✓
Get priority access to senior technical support engineers—skip the queues and callbacks			✓
Bringing your own software? We provide limited 3rd party software support ⓘ			✓
Choose onsite parts delivery and labor response that meets your needs	Next Business Day	NBD or 4-hour	4-hour
Select product coverage that best augments your internal resources	Hardware	Hardware & Software	Hardware & Software
Have an issue? We are here for you by phone, chat and online	Local business hours	24/7/365	24/7/365

ProSupport Plus for Infrastructure

ProSupport Plus for Infrastructure is the ultimate solution for customers seeking preventative maintenance and optimal performance on their business-critical assets. The service caters to customers who require proactive, predictive, and personalized support for systems that manage critical business applications and workloads. 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, including the following "Top five reasons to buy ProSupport Plus (PSP)"

1. **Priority access to specialized support experts:** Immediate advanced troubleshooting from an engineer that understands Dell infrastructure solutions.
2. **Mission Critical Support:** When critical (Severity 1) support issues happen, the customer is assured that we do all that we can to get them back up and running as quickly as possible.
3. **Technical Customer Success Manager:** A customer's #1 support advocate, ensuring they get the best possible proactive and predictive support experience.
4. **Systems maintenance:** On a semiannual basis, we will keep a customer's ProSupport Plus system(s) up to date by installing the latest firmware, BIOS, and driver updates to improve performance and availability.
5. **Third-party software support:** Dell is a customer's single point of accountability for any eligible third-party software that is installed on their ProSupport Plus system, whether they purchased the software from us or not.

ProSupport for Infrastructure

Comprehensive 24x7 support for hardware and software – best for production, but not critical, workloads and applications. The 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
● A central point of accountability for all hardware and software issues
● Hypervisor, operating system, and application support
● Dell security advisories

- Onsite response service levels 4 hour or Next Business Day options
- Proactive issue detection with automated case creation
- Predictive hardware anomaly detection
- Incident Manager assigned for Severity 1 cases
- Collaborative third-party support
- Access to AIOps Platforms - (MyService360, TechDirect, and CloudIQ)
- Consistent experience regardless of where customers are located or what language that they speak.

Basic Hardware Support

Provides reactive hardware support during normal business hours, excluding local national holidays. No software support or software-related guidance. For improved levels of support, choose ProSupport or ProSupport Plus.

Specialty Support Services

Optional specialty support services complement the ProSupport Infrastructure Suite to provide additional proficiencies that are critical for modern data center operations.

Hardware coverage add-ons to ProSupport or ProSupport Plus

- **Keep Your Hard Drive (KYHD), Keep Your Component (KYC), or Keep Your GPU (KYGPU):**

   Normally if a device fails under warranty, Dell replaces it using a one-for-one exchange process.KYHD/KYCC/KYGPU gives you the option to retain your device. It provides full control of sensitive data and minimizes security risk by letting you retain possession of failed drives, components, or GPU when receiving replacement parts without incurring additional cost.
- **Onsite Diagnosis Service:**

   Ideal for sites with non-technical staff. Dell field technician performs initial troubleshooting diagnosis onsite and transfers to Dell remote engineers to resolve the issue.
- **ProSupport Add-on for HPC:**

   Sold as an add-on to a ProSupport service contract, the ProSupport Add-on for HPC provides solution-aware support to cover the additional requirements that are required to maintain an HPC environment such as:

   - Access to senior HPC experts
   - Advanced HPC cluster assistance: Performance, interoperability, and configuration
   - Enhanced HPC solution level end-to-end support
   - Remote pre-support engagement with HPC Specialists during ProDeploy implementation
- **ProSupport Add-on for Telco (Respond & Restore):**

   An add-on service designed for the top 31 TELCO customers globally, Respond & Restore provides direct access to Dell solution experts who specialize in TELCO carrier-grade support. This add-on also provides a hardware uptime guarantee, meaning if a system fails, Dell has it installed and operational within 4 hours for Severity 1 issues. Dell incurs penalties and fees if SLAs are not met.

Personalized Support and Supplemental Site-wide Expertise

- **Technical Account Manager:**

   Designated technology lead who monitors and manages the performance and configuration of specific technology sets.
- **Designated Remote Support:**

   Personalized support expert who manages all troubleshooting and resolution of IT assets.
- **Multivendor Support Service:**

   Support your third-party devices as one service plan for servers, storage, and networking (includes coverage for: Broadcom, Cisco, Fujitsu, HPE, Hitachi, Huawei, IBM, Lenovo, NetApp, Oracle, Quanta, SuperMicro and others).

Services for large enterprises

- **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 (combined total of server, storage, networking, so forth). This offering is built on standard ProSupport features that leverage our global scale and are tailored to specific customer needs. While not for everyone, this service option offers a truly unique solution for our largest customers with the most complex environments.

  - Team of assigned Services Account Managers with remote or onsite options
  - Assigned technical and field engineers who are trained on the customer's environment and configurations.
  - On-demand reporting and recommendations that are enabled by ProSupport AIOps tools (MyService360, TechDirect, and CloudIQ)
  - Flexible onsite support and parts options that fit their operational model
  - A tailored support plan and training for their operations staff

- **ProSupport One for Data Center – CSP (Cloud Serviced Provider) and AI Solution**

  ProSupport One for Data Center – CSP and AI Solution is a unique offer that is designed for a limited set of Dell accounts purchasing AI computing solutions greater than 1,000 servers and $250M in sales. PS1DC - CSP and AI improves the entire services experience combining support, deployment (rack integration), residency services, a designated support engineer, an onsite service engineer, and an onsite parts service as one holistic offer. Special pricing has been determined to compete effectively against competitors and provide the best customer experience. PS1DC for CSP and AI can only be sold with XE Servers and all networking platforms (Dell and NVIDIA). All other products would be eligible for the standard PS1DC, not this unique offer. More details on PS1DC for CSP and AI here.

- **Onsite Parts Service (OPS)**

  Ideal for large organizations that have their own staff to support their data center. Dell offers a service that is called Onsite Parts Service (OPS) from Dell Services. OPS manages parts inventory located at the customer's designated facility. The Logistics Online Inventory Solution (LOIS) program will use software to support the monitoring and automatic replenishment of inventory stored on the customer site. . Each replacement part would automatically initiate a replenishment of the parts inventory that is shipped the next day or delivered onsite by Dell during a regular scheduled visit (called Scheduled Onsite Service). As part of the LOIS system, customers can integrate their systems directly to Dell TechDirect using APIs to help streamline the support management process.

End-of-Life Services

- **Post Standard Support (PSS)**

  Extend service life beyond the initial seven years of ProSupport, adding up to five more additional years of hardware coverage.

- **Data Sanitization & Data Destruction**

  Renders data unrecoverable on repurposed or retired products, ensuring security of sensitive data and enabling compliance and provides NIST-compliant certification.

- **Asset Recovery Services**

  Recycle, resale, and disposal of hardware. Helps you securely and responsibly retire IT assets that are no longer needed while protecting both your business and the planet.

ProDeploy Infrastructure Suite

ProDeploy Infrastructure Suite provides various deployment offerings that satisfy a customer's unique needs. It is made up of various sub-offers: Factory Configuration Services, Rack Integration, Basic Deployment, ProDeploy, ProDeploy Plus, and optionally ProDeploy FLEX which allows for some customization of the features listed.
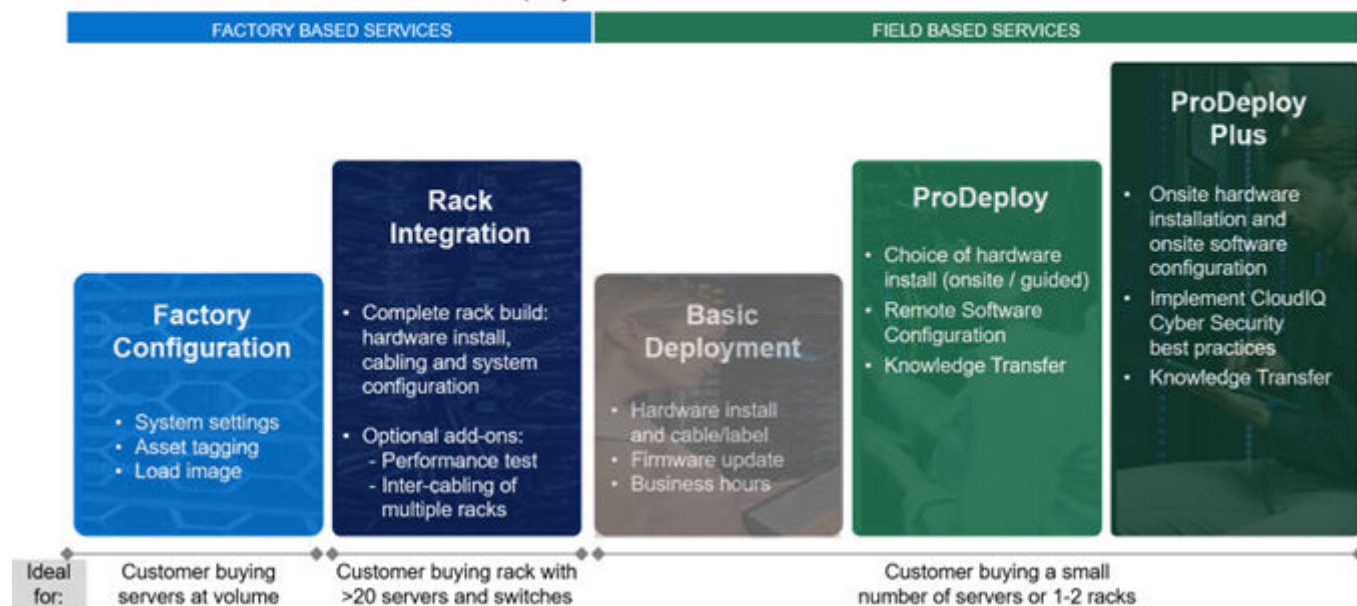
Figure 51. ProDeploy Infrastructure Suite

Factory-based Services

Pre-configured systems or complete racks, customized prior to shipping to the customer's site.

Customer Rack Integration or ProDeploy FLEX Rack Integration

Dell offers robust custom rack integration services through two main programs: Enterprise Rack Integration Services and Integrated Rack Scalable Systems (IRSS). These services are designed to streamline deployment, reduce complexity, and optimize performance for data centers, edge environments, and AI workloads. These factory services are purchased as a custom engagement or as ProDeploy Flex Rack Integration SKUs.

Figure 52. Pre-configured system

Figure 53. Pre-configured system

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, 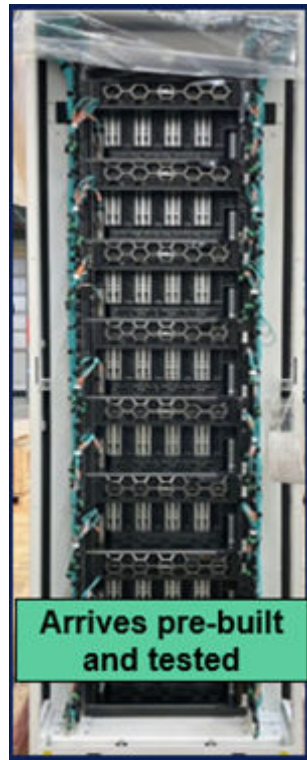servers are packaged and bundled to meet specific shipping and distribution requirements for each customer location to facilitate the rollout process. Once the server is onsite, Dell can install and configure the server to the environment using any of the field-based deployment services outlined in the next section.

Field-based services

Put PowerEdge servers to work faster with Dell field-based deployment services. Whether we are deploying one server to one thousand – we have you covered. Dell provides versatile delivery options to fit every budget and operating model.

● **ProDeploy Plus:** Elevate Infrastructure deployments with our most complete service from planning through onsite hardware installation and software configuration including the implementation of cybersecurity best practices. ProDeploy Plus provides the skill and scale that is needed to successfully execute demanding deployments in today's complex IT environments. The deployment starts with a site readiness review and implementation plan. Certified deployment experts perform the software configuration to include setup of leading operating systems and hypervisors. Dell will also configure PowerEdge software tools to include iDRAC and OpenManage system utilities as well as support AIOps platforms: MyService360, TechDirect, and

CloudIQ. Unique to ProDeploy Plus, the cybersecurity implementation helps customers understand potential security risks and make recommendations for reducing product attack surfaces. The system is tested, validated prior to completion. The customer will also receive full project documentation and knowledge transfer to complete the process.

- **ProDeploy:** ProDeploy provides remote software configuration and choice of hardware installation (onsite or guided). ProDeploy is great for customers who are price sensitive or willing to participate in some portion of the deployment to include providing remote access to their network. The ProDeploy remote software includes everything mentioned in ProDeploy Plus except it does not include the added value, cybersecurity implementation, and implementatiod best practices.
- **Basic Deployment:** Basic Deployment delivers worry-free professional installation by experienced technicians. This service is often sold to Competency Enabled Partners who will have Dell do the hardware installation while they complete the software configuration. Furthermore, Basic Deployment tends to be purchased by large enterprises who have smart technical staff. These companies just need Dell to install the hardware, and they will perform the software configuration. The last use case for Basic Deployment is when paired with Factory Configuration services. The servers are preconfigured in the factory, and the basic deployment service will install the system into the rack to finalize the deployment.

ProDeploy Infrastructure Suite | Field services

		Basic Deployment	ProDeploy	ProDeploy Plus
Pre-deployment	Single point of contact for project management	-	●	In region
	Site readiness review and implementation planning	-	●	●
Deployment	Deployment service hours	Business hours	24/7	24/7
	Hardware installation options	Onsite	Onsite or guided[1]	Onsite
	System software installation and configuration options	-	Remote	Onsite
	Install connectivity software based on Secure Connect Gateway technology[2]	-	●	●
	Implement CyberSecurity best practices and policies in APEX AIOps Infrastructure Observability	-	-	●
Post-deployment	Deployment verification, documentation and knowledge transfer	-	●	●
	Configuration data transfer to Dell technical support	-	●	●
Online collaboration	Online collaborative platform in TechDirect for planning, managing and tracking delivery	-	●	●

[1] Choose from onsite hardware installation or a guided option including project specific instructions, documentation and live expert guidance
[2] Post deployment use for intelligent, automated support & insights

Figure 54. ProDeploy Infrastructure Suite - Field services

Supplemental Deployment Services

Additional ways to expand scope or deploy for unique scenarios.

Two Host Adder (requires PD/PDP)

Deploying new storage, compute, or networking devices may require interconnection to other servers (also called hosts). The Dell delivery team will set up four hosts per device as part of every ProDeploy service. For example, if the customer is buying two storage arrays the ProDeploy service will automatically include connectivity of four hosts each (4x2=8 total hosts per project since there are two devices). This supplemental "Two Host Adder" service provides for the configuration of additional hosts above what is already provided as part of the ProDeploy service. In many cases, customers can work with us while we set up the included hosts, so they may understand how to do the rest themselves. Always ask the customer how many hosts are being connected and sell the host adder depending on the customer's technology skillset. Note that this service applies to the connectivity of Dell devices not 3rd party devices.

Additional Deployment Services (ADT) – sold with or without PD/PDP

You can expand the scope of a ProDeploy engagement leveraging Additional Deployment Time (ADT). ADT covers additional tasks above the normal deliverables of the ProDeploy offers. ADT can also be used as a standalone service without ProDeploy.

SKUs are available for both Project Management and Technical Resource Expertise. SKUs are sold as blocks of four hours remote or eight hours onsite. The delivery team can help in scoping the number of hours required for additional tasks.

Data Migration Services

Migrating data sets is no easy task. Our experts use proven tools and process to streamline data migrations and avoid compromising data. A customer project manager works with our experienced team of experts to create a migration plan. Data migration is part of every technology upgrade, platform change, and shift to the cloud. You can rely on Dell data migration services to perform a seamless transition.

Residency Services

Certified technical professionals act like an extension of your IT staff to enhance internal capabilities and resources and help you realize faster adoption and maximized ROI of new technology. Residency Services help customers transition to new capabilities quickly by leveraging specific technology skill sets. 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.

- Global experts available to serve in-person (onsite) or virtual (remote)
- Engagements starting at 2 weeks with flexibility to adjust
- Residency is available for project management needs, and many different technology skills sets such as: Server, storage, Gen AI, networking, security, multi-cloud, data mgmt., and modern workforce application residents

Unique Deployment Scenarios

Custom Deployment Services

When a deployment is beyond the scope of the ProDeploy Infrastructure Suite, you can turn to the custom deployment services team to address complex implementation scenarios and customer unique requirements. The Dell custom deployment team is staffed with solution architects who will assist with customer scoping calls to define the project and develop the statement of work. Custom services can handle a wide range of deployments that can be performed in the factory or onsite. All custom engagement services are requested through SFDC.

Deployment of AI or HPC using Cluster Build Services

Once the integrated rack arrives the data center or is built onsite, Dell can also convert the racks into a large computing cluster. Dell provides several deploy options for Artificial Intelligence (AI) or High-Performance Computing (HPC) implementations. These complex environments require specialists that understand advanced feature sets to create a unified computing cluster for the most demanding workloads. Choose one of the cluster build add-ons below.

Increase Time to Value and with ProDeploy Flex and Cluster Builds

ProDeploy Flex Rack Integration or ProDeploy Flex Onsite + **Cluster Build Add-ons** Select one or more add-ons below

Sell as Custom Quote or Standard SKUs
Add-ons 1 & 2 arriving as standard SKUs in Sept.

Ideal for

1 Physical Configuration of Cluster
- Onsite Infrastructure Assessment
- Installation of switches[1]
- Inter-rack cabling and labeling
- Liquid connectivity and leak test[2]

Customers needing help with installing the network, inter-rack cabling, and fabric testing

2 Logical Configuration of Cluster
- Review system design and plan
- Configure switches & mgmt nodes
- Validation and acceptance testing

Customers requiring cluster configuration and essential testing of the solution

3 AI Network Design Services
- 2-week intensive consultation that accelerates AI network performance and maximizes operational efficiency[3]

Customers seeking foundational design strategy to achieve optimal performance

When the environment is demanding, your configuration can't be average ★★★★★

Key Benefits:
- Factory rack integration enables faster time to value and reliability
- Reduce onsite setup time and fast track to production
- Fine-tuned system performance based on workload types
- Services aligned with enterprise-grade security standards
- Final testing and customer handoff lessen amount of support calls

1 – Network switches to be installed in factory or onsite depending on requirements. Choose options: ProDeploy Flex Rack Integration or ProDeploy Flex Onsite combined with PD Flex Cluster Add-ons
2 – If applicable. Leak test performed in factory and again onsite which is limited to in-rack CDU. Secondary Fluid Network (SFN) design and deployment quoted separately by Vertiv or Motivair
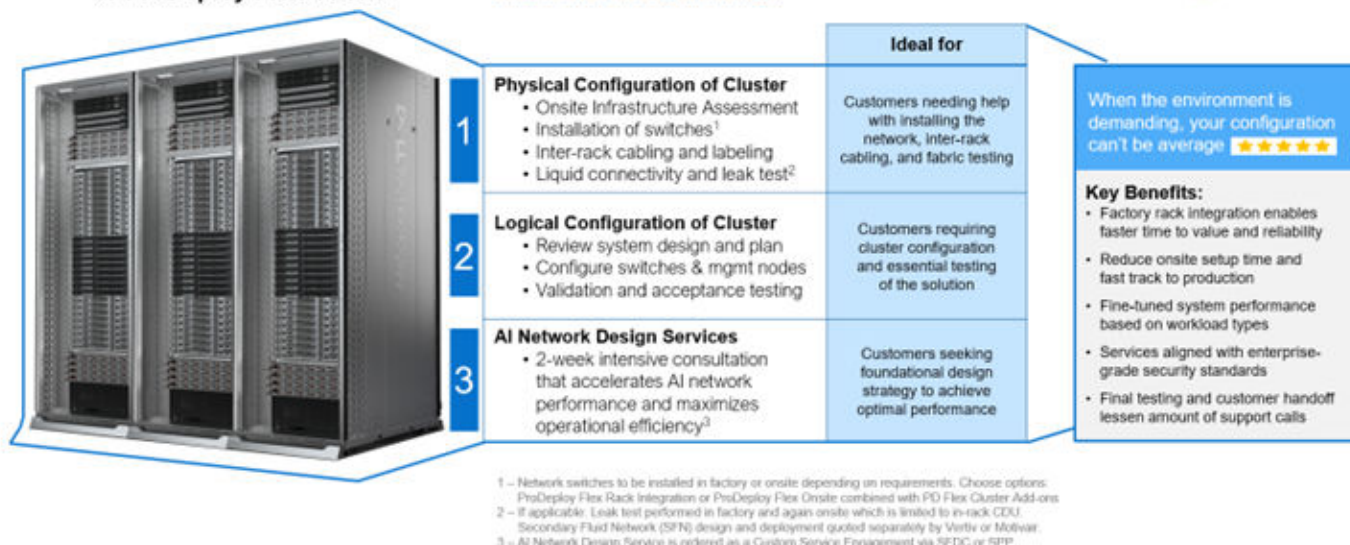3 – AI Network Design Service is ordered as a Custom Service Engagement via SFDC or SPP

Figure 55. Deployment choices for cluster implementation

DAY 2 – Automation Services with Ansible

Dell solutions are built as "automation ready" with integrated APIs (Application Programming Interfaces) to allow customers to programmatically call actions on the product through code. Although Dell has published Anisble automation use cases, some customers need additional assistance with GitOps. By the end of the service, the customer will have the foundational components required to accelerate automation and understand how the programming works together: Day 1 and Day 2 use case automation scripts (ansible modules), CI/CD tool (Jenkins), and Version control (Git).

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 the portfolio and partner ecosystem of Dell Technologies to help achieve real business outcomes. From multicloud, 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 that are 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 56. Dell Managed Services

Cyber-Security Services

Managed Detection and Response (MDR)

Dell Managed Detection and Response Pro Plus is our fully-managed, 360⁰ security operations solution comprised of our most cutting-edge, preventive and responsive cybersecurity services. MDR Pro Plus was designed with your top security concerns in mind, allowing you to focus on your core business goals while Dell handles your security operations. First, we have Vulnerability Management. With this service, we'll do ongoing scanning of the customer's environment looking for software that needs to be patched. Next is Pen Testing and Attack Simulation Management. This service will continuously validate security controls and policies with automated Breach and Attack Simulation (BAS), because a misconfiguration can lead to an exposure which an attacker can exploit. The service also includes an annual penetration test to determine if a skilled threat actor could exploit pathways leading to critical assets or data. Third, Managed Security Awareness Training. This service will educate the customer's end users so that they don't inadvertently put the customer at risk. If you think about our annual compliance training modules, there is always a security module. This is the same type of thing, but rather than once a year, it will be smaller, bite-size pieces of content delivered throughout the year.Fourth is our Managed Detection and Response service which provides 24x7 threat detection and investigation, analysis of end-to-end activity by threat actors, threat hunting, and quick initiation of cyber incident response when needed. Customers can choose between Secureworks Taegis XDR, CrowdStrike Falcon XDR or Microsoft Defender XDR as the security analytics platform our analysts will use to monitor their environment. All four of these services are delivered by experienced, certified Dell security experts using advanced technology such as the Secureworks Taegis XDR, CrowdStrike Falcon XDR or Microsoft Defender XDR security platforms.

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 that is 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.

Resources

Service for powerEdge