

# Dell PowerEdge R760xd2

## Technical Guide

## Notes, cautions, and warnings

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

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

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

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# System overview

The Dell PowerEdge R760xd2 is Dell's latest 2-socket storage-optimized rack server that is designed to run complex workloads using highly scalable memory, I/O, and network options.

The system features:

- Up to two 4<sup>th</sup> Generation Intel Xeon Scalable Processors and optional Intel ® QuickAssist Technology
- Up to 16 DDR5 DIMM slots
- Two redundant AC or DC power supply units
- PCI Express® (PCIe) 4.0 enabled expansion slots
- Up to 24 x 3.5-inch SAS/SATA + 4 x 3.5-inch SAS/SATA or 4 x 2.5-inch PCIe NVMe with 3.5-inch carrier adapter or 2 x 2.5-inch NVMe SSD
- Network interface technologies to cover Network Interface Card (NIC)

## Topics:

- [Key workloads](#)
- [New technologies](#)

## Key workloads

Target workloads are:

- File and object storage
- Video capturing & surveillance
- Video streaming

R760xd2 meets dynamic performance and capacity requirements with flexible storage options.

## New technologies

**Table 1. New technologies**

| Technology   | Detailed Description  |
|--|---|
| Intel Sapphire Rapids Processor (Socket E, LGA-4677) | Core count: Up to 32 core processor   |
|  | 3 x Intel® Ultra Path Interconnect (UPI) at 16 GT/s   |
|  | Maximum number of PCIe lanes: Integrated 80 PCIe lanes @ 16 GT/s PCIe Gen4  |
|  | Maximum TDP: 185 W  |
| 4800 MT/s DD5 Memory                                 | Maximum 8 DIMM slots per processor and 16 slots per system  |
|  | Supports DDR5 ECC RDIMM up to 4800 MT/s   |
| Flex I/O   | LOM board, 2x 1 GB with BCM5720 LAN controller  |
|  | Rear I/O with: <ul style="list-style-type: none"> <li>• 1 GB Dedicated Management Network Port</li> <li>• USB 3.0 x1</li> <li>• USB 2.0 x1</li> <li>• VGA port</li> </ul> |
|  | OCP 3.0 Mezz (supported by x8 PCIe Gen4 lanes)  |

**Table 1. New technologies (continued)**

| <b>Technology</b> | <b>Detailed Description</b>  |
|-------------------|--|
|                   | Front I/O with: <ul style="list-style-type: none"><li data-bbox="804 300 963 329">• USB 2.0 x1</li><li data-bbox="804 331 1267 360">• Dedicated iDRAC Direct micro-USB x 1</li></ul> |
| CPLD 1-wire       | Support payload data of Riser, BOSS-N1, BP, and Rear I/O to BIOS and iDRAC   |
| Dedicated PERC    | PERC 11 and PERC 12  |
| Power Supplies    | 60 mm dimension is the new PSU form factor design.   |
|                   | 700 W AC/DC HLAC Titanium  |
|                   | 1100 W AC/DC Titanium  |
|                   | 1400 W AC/DC Platinum  |
|                   | 1800 W AC/DC HLAC Titanium   |
|                   | 1100 W DC (-48 V)  |

## System features and generational comparison

The following table shows the comparison between the PowerEdge R760xd2 with the PowerEdge R740xd2.

**Table 2. Features comparison**

| Features            | PowerEdge R760xd2  | PowerEdge R740xd2  |
|---------------------|--|--|
| Processors          | Up to two 4 <sup>th</sup> Generation Intel® Xeon® Scalable processors with up to 32 cores per processor. Support for up to 2 x 185W processors   | Up to two 2 <sup>nd</sup> Generation Intel® Xeon® Scalable processors with up to 22 cores per processor. Support for up to 2 x 140W processors |
| CPU interconnect    | Intel® Ultra Path Interconnect (UPI) @ 16 GT/s   | Intel® Ultra Path Interconnect (UPI) @ 10.4 GT/s   |
| Memory              | Up to 16 x DDR5 RDIMMs DIMM Speed: Up to 4800 MT/s   | Up to 16 x DDR4 RDIMMs DIMM Speed: Up to 3200 MT/s   |
| Storage Controllers | PERC 12: H965i<br>PERC 11: HBA355i, H755, H355<br>External PERC: HBA355e   | PERC H740P or HBA330   |
| Drive Bays          | Front: Up to 12 x 3.5 inch SAS/SATA<br>Middle: Up to 12 x 3.5 inch SAS/SATA<br>Rear: Up to 4 x 3.5 inch Universal or Up to 2 x 2.5 inch U.2 NVMe   | Front: Up to 24 x 3.5 inch SAS/SATA<br>Rear: Up to 2 x 3.5 inch SAS/SATA 3.5 inch or SSD   |
| Power Supplies      | 15G/16G 60mm PSUs 48Vdc/1100W, 700W, 1100W, 1400W, 1800W   | 750W, 1100W  |
| Cooling Options     | Air cooled   | Air cooled   |
| Fans                | Up to 6 STD fans   | Up to 6 HPR fans   |
| Dimension           | H x W x D: 2U x 481.6 mm x 837 mm  | H x W x D: 2U x 482 mm x 810.26 mm   |
| Form Factor         | 2U   | 2U   |
| Embedded Management | iDRAC9 Enterprise, Datacenter license options; OpenManage Enterprise and Plugins   | iDRAC9 Enterprise, Datacenter license options; OpenManage Enterprise and Plugins   |
| OpenManage Software | <ul style="list-style-type: none"> <li>• OpenManage Enterprise</li> <li>• OpenManage Power Manager plugin</li> <li>• OpenManage Service plugin</li> <li>• OpenManage Update Manager plugin</li> <li>• CloudIQ for PowerEdge plug in</li> <li>• OpenManage Enterprise Integration for VMware vCenter</li> <li>• OpenManage Integration for Microsoft System Center</li> <li>• OpenManage Integration with Windows Admin Center</li> </ul> | <ul style="list-style-type: none"> <li>• OpenManage Enterprise</li> <li>• OpenManage Power Center</li> <li>• OpenManage Mobile</li> </ul>      |
| Mobility            | OpenManage Mobile  | OpenManage Mobile  |

**Table 2. Features comparison (continued)**

| Features                         | PowerEdge R760xd2   | PowerEdge R740xd2   |  |
|----------------------------------|---|---|--|
| Integrations and Connections     | OpenManage Integrations <ul style="list-style-type: none"> <li>• BMC Truesight</li> <li>• Microsoft System Center</li> <li>• OpenManage Integration with ServiceNow</li> <li>• Red Hat Ansible Modules</li> <li>• Terraform Providers</li> <li>• VMware vCenter and vRealize Operations Manager</li> </ul>  | Integrations: <ul style="list-style-type: none"> <li>• Microsoft® System Center</li> <li>• VMware® vCenter™</li> <li>• BMC Truesight</li> <li>• Red Hat Ansible Modules</li> </ul>  | Connections: <ul style="list-style-type: none"> <li>• Nagios Core &amp; Nagios XI</li> <li>• Micro Focus Operations Manager i (OMi)</li> <li>• IBM Tivoli Netcool/OMNibus</li> <li>• IBM Tivoli® Network Manager IP Edition</li> </ul> |
| Security                         | <ul style="list-style-type: none"> <li>• Cryptographically signed firmware</li> <li>• Data at Rest Encryption (SEDs with local or external key mgmt)</li> <li>• Secure Boot</li> <li>• Secured Component Verification (Hardware integrity check)</li> <li>• Secure Erase</li> <li>• Silicon Root of Trust</li> <li>• System Lockdown (requires iDRAC9 Enterprise or Datacenter)</li> <li>• TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ</li> </ul> | <ul style="list-style-type: none"> <li>• TPM 1.2/2.0, TCM 2.0 optional</li> <li>• Cryptographically signed firmware</li> <li>• Silicon Root of Trust</li> <li>• Secure Boot</li> <li>• System Lockdown (requires iDRAC Enterprise or Datacenter)</li> </ul>   |  |
| Embedded NIC                     | 2 x 1 GbE LOM   | 2 x 1 GbE LOM   |  |
| Networking Options               | OCP 3.0 x8 (Optional)   | OCP (Optional)  |  |
| GPU Options                      | Up to 2 x 75 W SW , 1 x 75 W SW + 1 x 150 W SW or 1 x180 W DW   | None  |  |
| Ports                            | Front:1 x USB 2.0, 1x iDRAC Direct (Micro-USB)<br><br>Rear: 1 x VGA, 1 x USB2.0 + 1 x USB3.0<br><br>Internal : USB3.0 ( Optional )  | Front: 2 x USB 2.0, 1 managed (micro USB) + front VGA<br>Rear: 1 x Gen2 + 1 x Gen3 USB Optional Internal USB  |  |
| PCIe                             | Up to 5 x PCIe Slots Gen4 (mix of LP, HL, FL, DW)   | Up to 2 x PCIe Slots Gen3   |  |
| Operating System and Hypervisors | <ul style="list-style-type: none"> <li>• Canonical Ubuntu Server LTS</li> <li>• Microsoft Windows Server with Hyper-V</li> <li>• Red Hat Enterprise Linux</li> <li>• SUSE Linux Enterprise Server</li> <li>• VMware ESXi</li> </ul> For specifications and interoperability details, see <a href="http://Dell.com/OSsupport">Dell.com/OSsupport</a> .   | <ul style="list-style-type: none"> <li>• Canonical® Ubuntu® LTS</li> <li>• Citrix® Hypervisor</li> <li>• Microsoft® Windows Server® LTSC with Hyper-V</li> <li>• Oracle® Linux</li> <li>• Red Hat® Enterprise Linux</li> <li>• SUSE® Linux Enterprise Server</li> <li>• VMware® ESXi</li> </ul> For specifications and interoperability details, see <a href="http://Dell.com/OSsupport">Dell.com/OSsupport</a> . |  |

## Chassis views and features

### Topics:

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

### Front view of the system



Figure 1. Front view of 12 x 3.5-inch drive system



Figure 2. Front view of 24 x 3.5-inch drive system

## Rear view of the system



Figure 3. 3 x PCIe Low-Profile Slots with 4 x 3.5-inch SAS/SATA or 4 x 2.5-inch NVMe Drives



Figure 4. 2 x PCIe Low-Profile Slots + 4 x 3.5-inch SAS/SATA Drives with 1 CPU



Figure 5. 5 x PCIe Low-Profile Slots



Figure 6. 3 x PCIe Low-Profile Slots with 1 CPU



Figure 7. 5 x PCIe Low-Profile Slots + 2 x 2.5-inch NVMe Drives



Figure 8. 3 x PCIe Low-Profile Slots + 2 x 2.5-inch NVMe Drives with 1 CPU

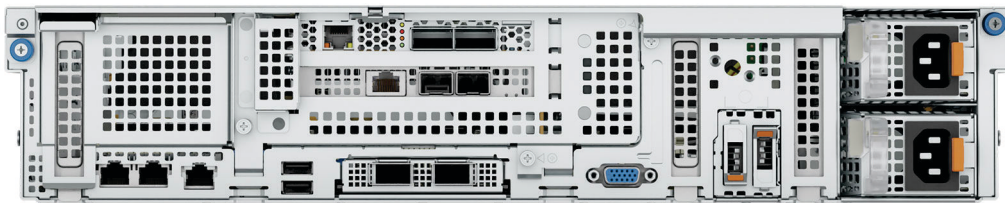


Figure 9. 3 x PCIe Low-Profile Slots + 2 x PCIe FH/FL Slots



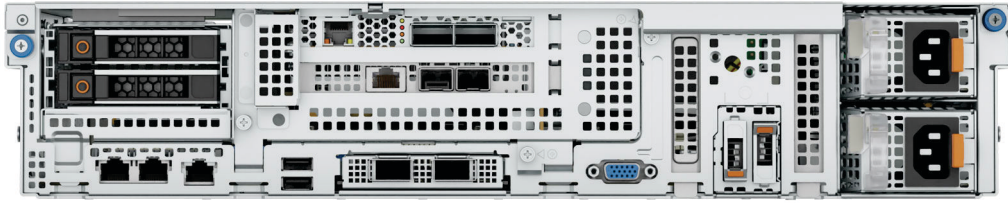


Figure 10. 2 x PCIe Low-Profile Slots + 2 x PCIe x16 FH/FL Slots + 2 x 2.5-inch NVMe Drives

## Inside the system

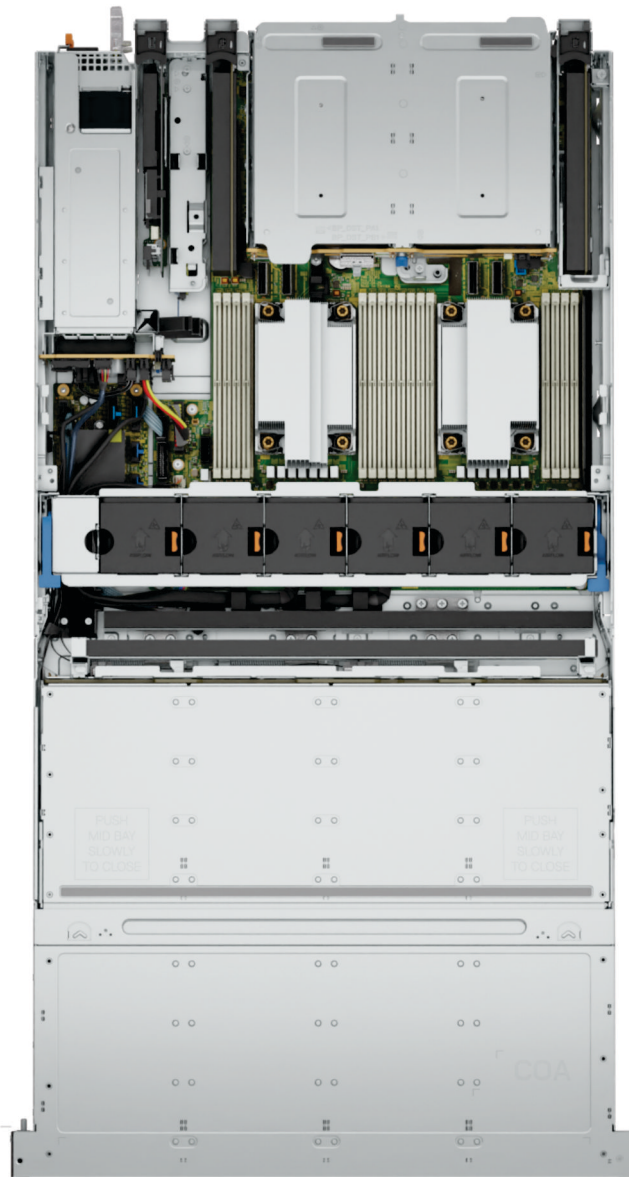


Figure 11. 3 x PCIe Low-Profile Slots with 4 x 3.5-inch SAS/SATA or 4 x 2.5-inch NVMe Drives



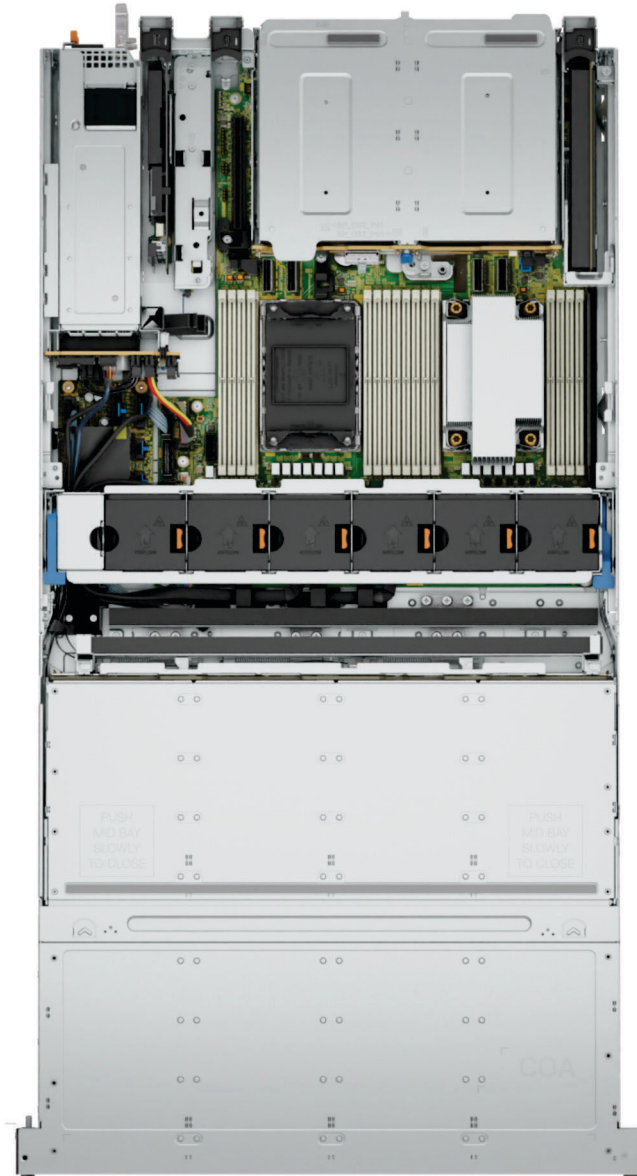


Figure 12. 2 x PCIe Low-Profile Slots + 4 x 3.5-inch SAS/SATA Drives with 1 CPU

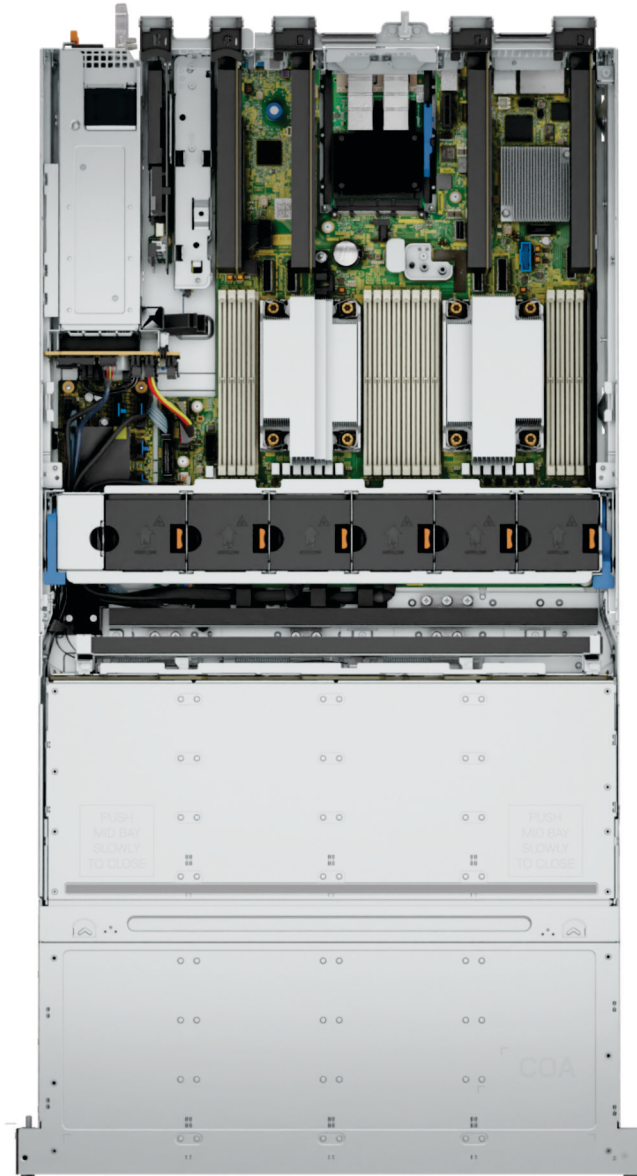


Figure 13. 5 x PCIe Low-Profile Slots

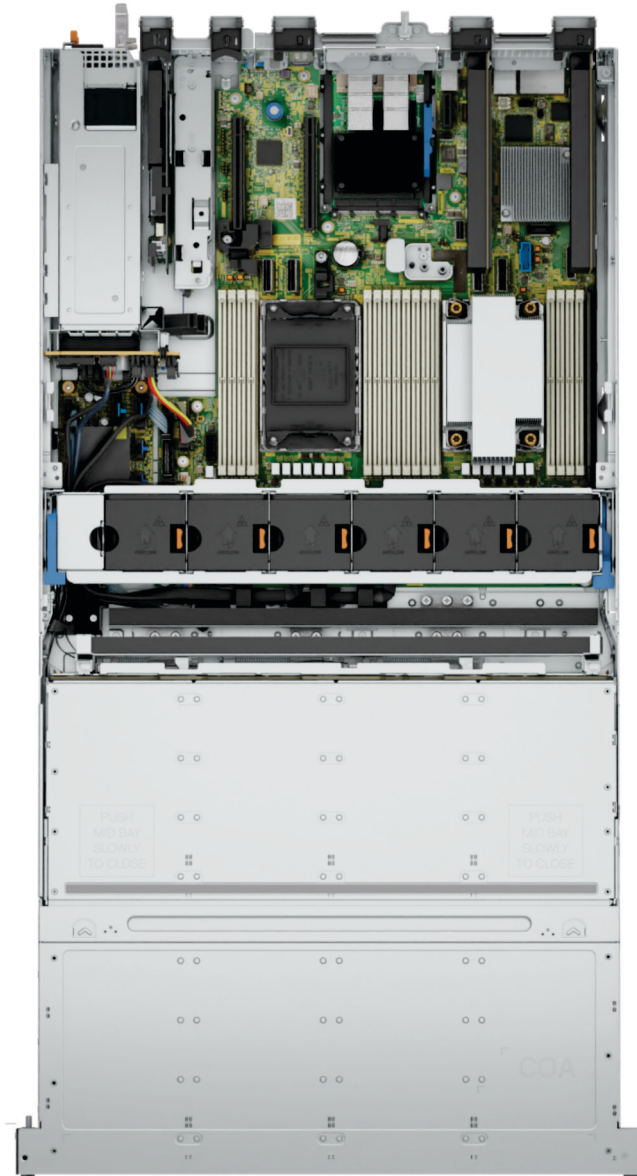


Figure 14. 3 x PCIe Low-Profile Slots with 1 CPU



Figure 15. 5 x PCIe Low-Profile Slots + 2 x 2.5-inch NVMe Drives

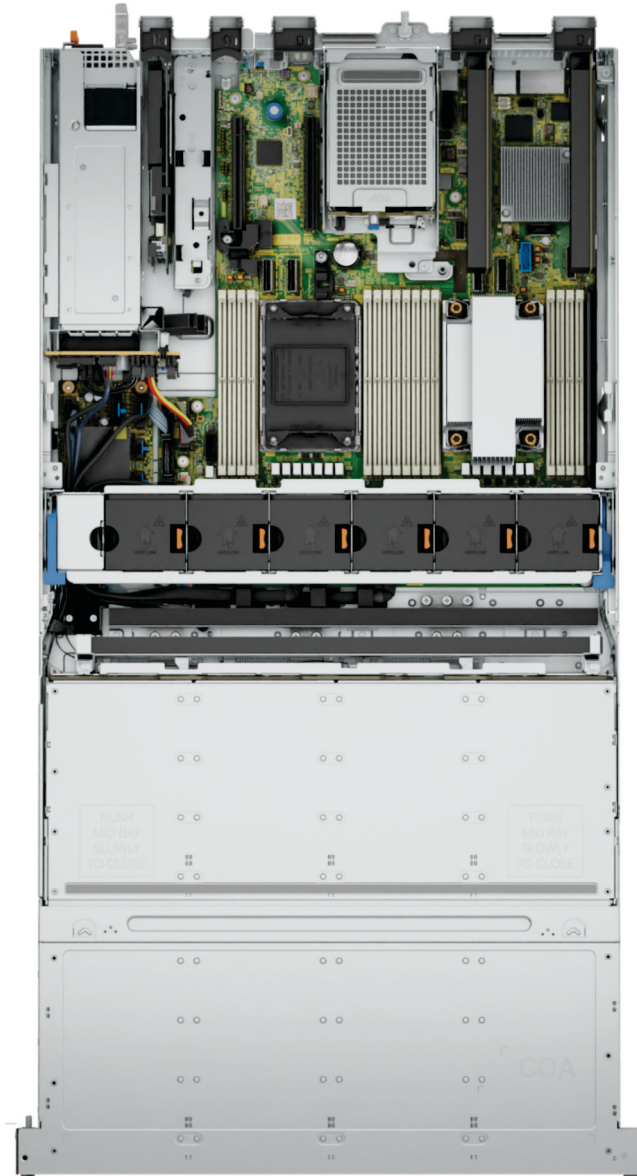


Figure 16. 3 x PCIe Low-Profile Slots + 2 x 2.5-inch NVMe Drives with 1 CPU



Figure 17. 3 x PCIe Low-Profile Slots + 2 x PCIe FH/FL Slots





**Figure 18. 2 x PCIe Low-Profile Slots + 2 x PCIe x16 FH/FL Slots + 2 x 2.5-inch NVMe Drives**

## Quick Resource Locator

The QRL on everything (SILs, GSG, Owner's Manual except on the EST) is a generic QRL for R760xd2 that leads to a webpage for that product. That webpage has links for things like setup and service videos, iDRAC manual, and other things that apply to the platform. The QRL on the EST is unique and specific to that service tag and will contain the Service Tag number and the iDRAC password. The label and the QRL code within it are printed on demand at the L10 factories. This QRL links to a webpage that shows the exact configuration as built for that customer, and the specific warranty purchased. It is one click away from the same content of generic information that applies to R760xd2 that is available in the other QRLs.



**Figure 19. Quick Resource Locator for PowerEdgeR760xd2system**

# Processor

## Topics:

- [Processor features](#)

## Processor features

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

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

- Faster UPI with up to three Intel Ultra Path Interconnect (Intel UPI) at up to 16 GT/s, increasing multisocket bandwidth.
- More, faster I/O with PCI Express Gen4 and up to 80 lanes (per socket)
- Enhanced Memory Performance with DDR5 support and memory speed up to 4800 MT/s in one DIMM per channel (1DPC).
- New built-in accelerators for data analytics, networking, storage, crypto, and data compression

## Supported processors

**Table 3. Supported processors for R760xd2**

| Processor | Clock Speed (GHz) | Cache (M) | UPI (GT/s) | Cores | Threads | Turbo    | Memory Speed (MT/s) | Memory Capacity | TDP   |
|-----------|-------------------|-----------|------------|-------|---------|----------|---------------------|-----------------|-------|
| 6428N     | 1.8               | 60        | 16         | 32    | 64      | Turbo    | 4800                | 6TB             | 185 W |
| 6426Y     | 2.6               | 38        | 16         | 16    | 32      | Turbo    | 4800                | 6TB             | 185 W |
| 5418Y     | 2                 | 45        | 16         | 24    | 48      | Turbo    | 4400                | 6TB             | 185 W |
| 5418N     | 1.8               | 45        | 16         | 24    | 48      | Turbo    | 4400                | 6TB             | 165 W |
| 5416S     | 2                 | 30        | 16         | 16    | 32      | Turbo    | 4400                | 6TB             | 150 W |
| 5415+     | 2.9               | 23        | 16         | 8     | 16      | Turbo    | 4400                | 6TB             | 150 W |
| 5412U     | 2.1               | 45        | 16         | 24    | 48      | Turbo    | 4400                | 6TB             | 185 W |
| 5411N     | 1.9               | 45        | 16         | 24    | 48      | Turbo    | 4400                | 6TB             | 165 W |
| 4416+     | 2                 | 38        | 16         | 20    | 40      | Turbo    | 4000                | 6TB             | 165 W |
| 4410Y     | 2                 | 30        | 16         | 12    | 24      | Turbo    | 4000                | 6TB             | 150 W |
| 3408U     | 1.8               | 23        | 16         | 8     | 16      | No Turbo | 4000                | 6TB             | 125 W |



# Memory subsystem

## Topics:

- [Supported memory](#)

## Supported memory

**Table 4. Memory technology**

| Feature        | PowerEdge R760xd2 (DDR5) |
|----------------|--------------------------|
| DIMM type      | RDIMM                    |
| Transfer speed | 4800 MT/s                |
| Voltage        | 1.1 V                    |

The following table lists the supported DIMMs for R760xd2. For the latest information on supported memory and memory configurations reference the latest SDL.

**Table 5. Supported DIMMs**

| Rated DIMM Speed (MT/s) | DIMM Type | DIMM Capacity (GB) | Ranks per DIMM | Data Width | DIMM Volts |
|-------------------------|-----------|--------------------|----------------|------------|------------|
| 4800                    | RDIMM     | 16                 | 1              | 8          | 1.1        |
| 4800                    | RDIMM     | 32                 | 2              | 8          | 1.1        |
| 4800                    | RDIMM     | 64                 | 2              | 4          | 1.1        |

# Storage

## Topics:

- Storage controllers
- Supported Drives
- Internal storage configuration
- External Storage

## Storage controllers

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

**Table 6. PERC Series controller offerings**

| Performance Level    | Controller and Description                |
|----------------------|---|
| Entry                | NA  |
| Value                | HBA355i Adapter (Internal)                |
| Value Performance    | H755 Adapter, H355 Adapter, H965i Adapter |
| External Controllers | HBA355e                                   |

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

**NOTE:** From December 2021, H355 will replace H345 as the entry raid controller. H345 will be deprecated in January 2022.

## Storage controller feature matrix

**Table 7. Storage controller feature matrix**

| Model & Form Factors  | Interface Support   | PCI Support | SAS Connection                | Cache Memory Size | Write Back Cache   | RAID Levels      | Max Drive Support | RAID Support |
|---|---|-------------|-------------------------------|-------------------|--------------------|------------------|-------------------|--------------|
| PowerEdge Server-Storage Controllers (PERC) Series 12           |   |             |                               |                   |                    |                  |                   |              |
| H965i Adapter   | 24Gb/s SAS<br>6Gb/s SAS/SATA<br>Gen3 (8 GT/s) NVMe<br>Gen4 (16 GT/s) NVMe | PCIe Gen 4  | 16 ports/lanes - 2x8 Internal | 8GB NV            | Flash Backed Cache | 0,1,5,6,10,50,60 | 16                | Hardware     |
| PowerEdge Server-Storage Controllers (PERC & SAS HBA) Series 11 |   |             |                               |                   |                    |                  |                   |              |

**Table 7. Storage controller feature matrix (continued)**

| Model & Form Factors | Interface Support   | PCI Support | SAS Connection         | Cache Memory Size | Write Back Cache   | RAID Levels      | Max Drive Support                      | RAID Support |
|----------------------|---|-------------|------------------------|-------------------|--------------------|------------------|--|--------------|
| H755 Adapter         | 12Gb/s SAS<br>6Gb/s SAS/SATA<br>3Gb/s SAS/SATA<br>Gen3 (8 GT/s) NVMe<br>Gen4 (16 GT/s) NVMe | PCIe Gen 4  | 16 ports- 2x8 Internal | 8GB NV            | Flash Backed Cache | 0,1,5,6,10,50,60 | 16/ controller<br>50 with SAS Expander | Hardware     |
| HBA355i Adapter      | 12Gb/s SAS<br>6Gb/s SAS/SATA<br>3Gb/s SAS/SATA  | PCIe Gen 4  | 16 ports- 2x8 Internal | N/A               | N/A                | N/A              | 16/ controller<br>50 with SAS Expander | N/A          |
| HBA355e Adapter      | 12Gb/s SAS<br>6Gb/s SAS/SATA<br>3Gb/s SAS/SATA  | PCIe Gen 4  | 16 ports- 4x4 external | N/A               | N/A                | N/A              | 240                                    | N/A          |
| H355 Adapter         | 12Gb/s SAS<br>6Gb/s SAS/SATA  | PCIe Gen 4  | 16 ports- 2x8 Internal | No Cache          | No Cache           | 0,1, 10          | Up to 32 RAID, or 32 Non- RAID         | Hardware     |

**NOTE:**

1. RAID 5/50 removed from entry RAID card
2. SWRAID support for Linux provides a pre-boot configuration utility to configure MDRAID and degraded boot capability.
3. For information, post-RTS, see the Storage controller documentation at [www.dell.com/stroagecontrollermanuals](http://www.dell.com/stroagecontrollermanuals).

This document is updated as changes happen, so for the latest version be sure to bookmark it rather than downloading an offline copy or refer to the [Storage Controller Matrix](#) on sales portal.

## Supported Drives

The table shown below lists the internal drives supported by the R760xd2. Refer to Agile for the latest SDL.

**Table 8. Supported Drives**

| Form Factor | Type    | Speed | Rotational Speed | Capacities  |
|-------------|---------|-------|------------------|---|
| 2.5 inches  | NVMe    | Gen4  | SSD              | 1.6 TB, 1.92 TB, 3.2 TB, 3.84 TB, 6.4 TB, 7.68 TB, 15.36 TB |
|             | DC NVMe | Gen4  | SSD              | 960 GB, 3.84 TB   |
|             | vSAS    | 12 Gb | SSD              | 960 Gb, 1.92 TB, 3.84 TB, 7.68 TB                           |
|             | SAS     | 24 Gb | SSD              | 800 Gb, 1.6 TB, 1.92 TB, 3.84 TB, 7.68 TB                   |
|             | SATA    | 6 Gb  | SSD              | 480 Gb, 960 Gb, 1.6 TB, 1.92 TB, 3.84 TB, 7.68 TB           |
|             | SAS     | 12 Gb | 10 K             | 600 GB, 1.2 TB, 2.4 TB                                      |
| 3.5 inches  | SAS     | 12 Gb | 7.2 K            | 2 TB, 4 TB, 8 TB, 12 TB, 16 TB, 20 TB, 22 TB                |
|             | SATA    | 6 Gb  | 7.2 K            | 2 TB, 4 TB, 8 TB, 12 TB, 16 TB, 20 TB, 22 TB                |

# Internal storage configuration

R760xd2 supports the following internal storage configurations:

- 2 x 12 x 3.5 inch SAS/SATA RAID
- 2 x 12 x 3.5 inch SAS/SATA RAID with rear 4 x 3.5 inch SAS/SATA
- 2 x 12 x 3.5 inch SAS/SATA RAID with rear 4 x 2.5 inch NVMe
- 2 x 12 x 3.5 inch SAS/SATA RAID with rear 2 x U.2 NVMe

# External Storage

The R760xd2 support the external storage device types listed in the table below.

**Table 9. Supported External Storage Devices**

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

# Networking

## Topics:

- [Overview](#)
- [OCP 3.0 support](#)

## Overview

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

## OCP 3.0 support

**Table 10. OCP 3.0 feature list**

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

## Supported OCP cards

**Table 11. The below table lists the supported OCP in R760xd2**

| Form factor | Vendor   | Port type | Port speed | Port count |
|-------------|----------|-----------|------------|------------|
| OCP 3.0     | Broadcom | BT        | 1 GbE      | 4 Port     |
|             | Broadcom | BT        | 1 GbE      | 4 Port     |
|             | Intel    | BT        | 1 GbE      | 4 Port     |
|             | Broadcom | BT        | 10 GbE     | 2 Port     |
|             | Broadcom | BT        | 10 GbE     | 4 Port     |
|             | Intel    | BT        | 10 GbE     | 2 Port     |

**Table 11. The below table lists the supported OCP in R760xd2 (continued)**

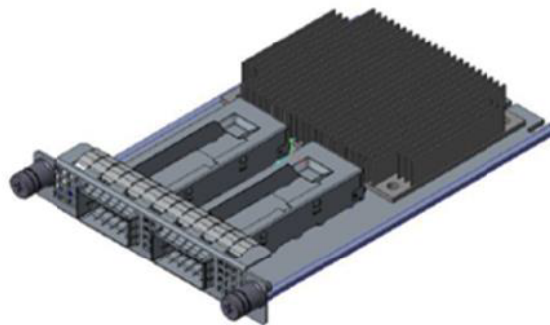
| Form factor | Vendor   | Port type | Port speed | Port count |
|-------------|----------|-----------|------------|------------|
|             | Intel    | BT        | 10 GbE     | 4 Port     |
|             | Intel    | BT        | 10 GbE     | 4 Port     |
|             | Mellanox | SFP28     | 25 GbE     | 2 Port     |
|             | Broadcom | SFP28     | 25 GbE     | 2 Port     |
|             | Broadcom | SFP28     | 25 GbE     | 4 Port     |
|             | Intel    | SFP28     | 25 GbE     | 2 Port     |
|             | Intel    | SFP28     | 25 GbE     | 4 Port     |

## 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 are 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                        |

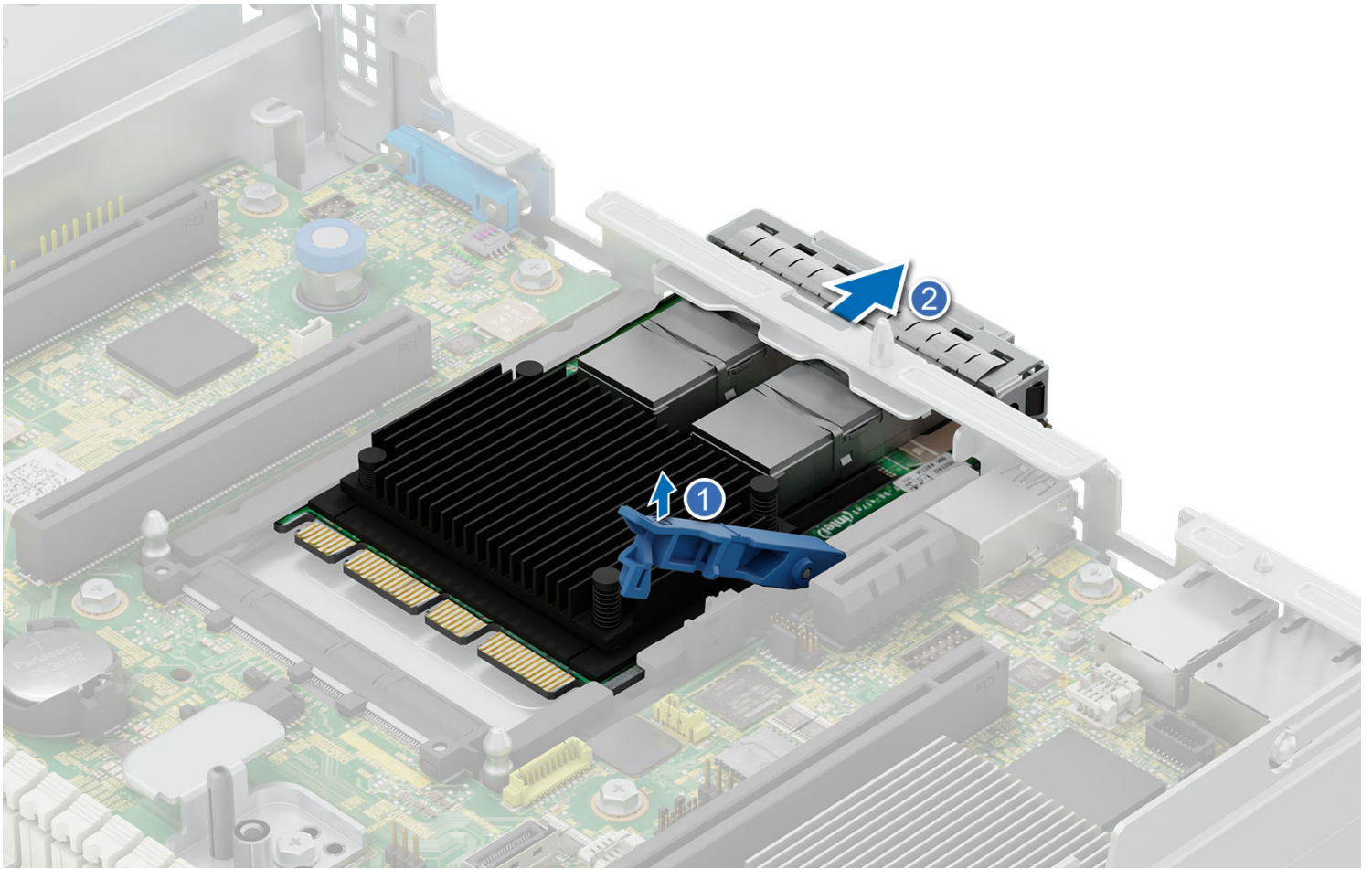
## OCP form factors



**Figure 20. OCP 3.0 Small Card Form Factor (LS)**

The process of removing the OCP card in R760xd2 system:

1. Open the blue latch to unlock the OCP card.
2. Push the OCP card towards the rear end of the system to disconnect from the connector on the system board.
3. Slide the OCP card out of the slot on the system.



**Figure 21. Removing the OCP Card in R760xd2**

The process of installing the OCP card in R760xd2 system:

1. Open the blue latch on the system board.
2. Slide the OCP card into the slot in the system.
3. Push until the OCP card is connected to the connector on the system board.
4. Close the latch to lock the OCP card to the system.

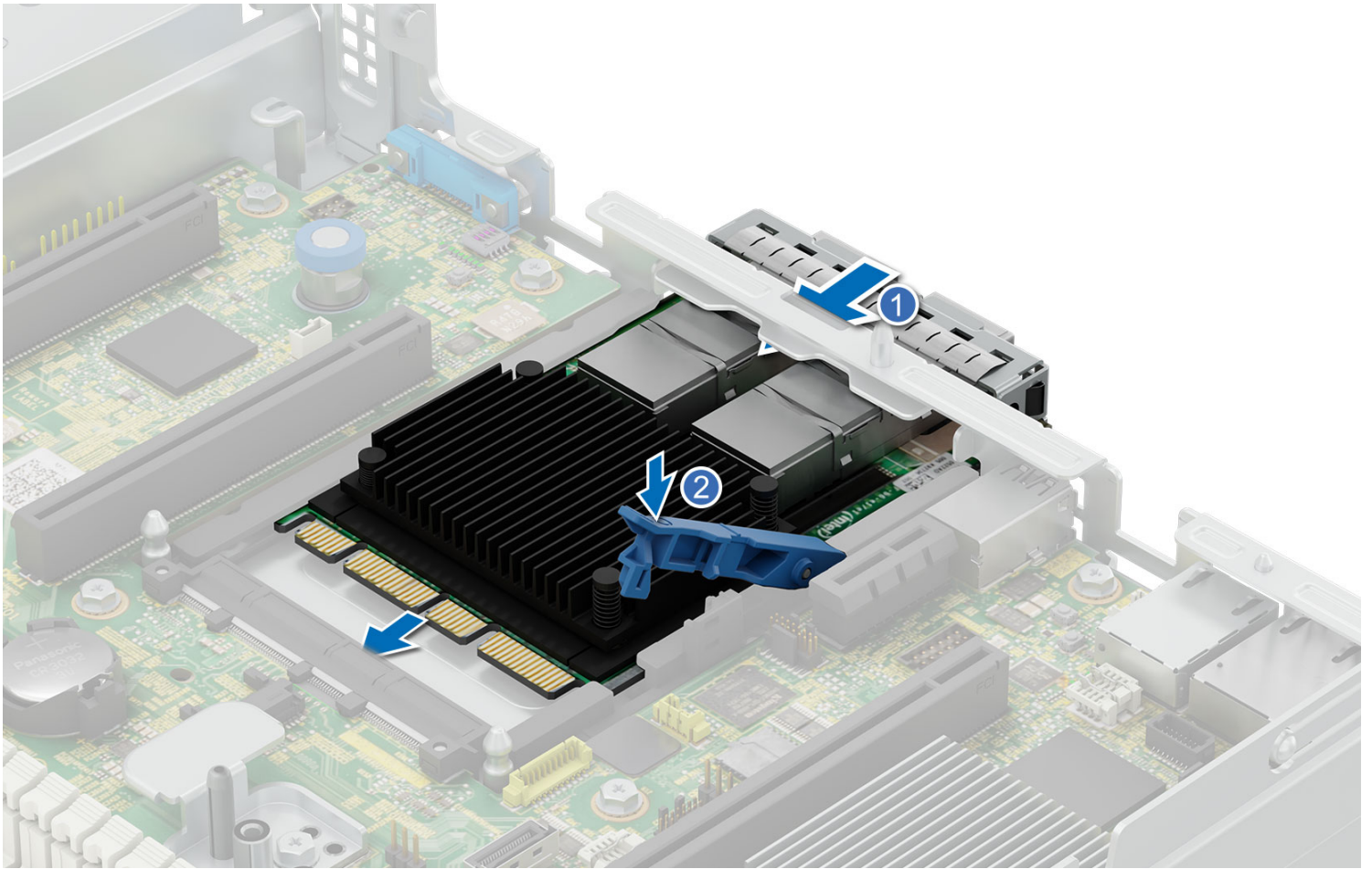


Figure 22. Installing the OCP Card in R760xd2



# PCIe subsystem

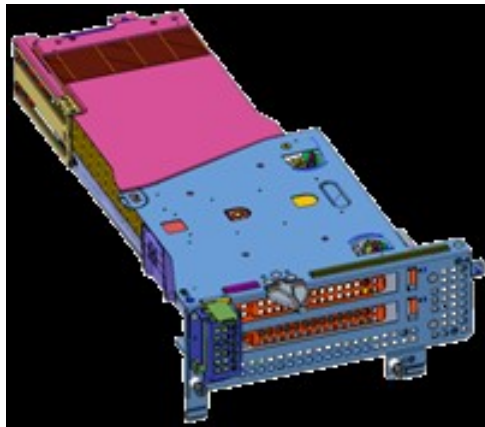
## Topics:

- PCIe risers

## PCIe risers

Shown below are the riser offerings for the platform. For a full list of supported cards and Slot priority, please see the Slot Priority Matrix - found in the Agile tool (P/N:R20W5)

**Figure 23. Riser Offerings**



**Figure 24. Config 3 FH FL Riser**



**Figure 25. Config 3 FH HL Riser**

## Power, thermal, and acoustics

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

### Topics:

- [Power](#)
- [Thermal](#)
- [Acoustics](#)

## Power

**Table 13. Power tools and technologies**

| Feature                           | Description   |
|-----------------------------------|---|
| Power Supply Units(PSU) portfolio | Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.  |
| Tools for right sizing            | Enterprise Infrastructure Planning Tool (EIPT) is a tool that can help you determine the most efficient configuration possible. With Dell's EIPT, you can calculate the power consumption of your hardware, power infrastructure, and storage at a given workload. Learn more at <a href="http://www.dell.com/calc">www.dell.com/calc</a> .   |
| 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: <ul style="list-style-type: none"> <li>• Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5%</li> <li>• More accurate reporting of power</li> <li>• Better performance under a power cap</li> </ul>  |
| Power capping                     | Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping.  |
| Systems Management                | iDRAC Enterprise and Datacenter provides server-level management that monitors, reports and controls power consumption at the processor, memory and system level.<br><br>Dell OpenManage Power Center delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.  |
| Active power management           | Intel Node Manager is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC9 Datacenter and OpenManage Power Center that allows policy-based management of power and thermal at the individual server, rack, and data center level. Hot spare reduces power consumption of redundant power supplies. Thermal control off a speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption.<br><br>Idle power enables Dell servers to run as efficiently when idle as when at full workload. |
| Rack infrastructure               | Dell offers some of the industry's highest-efficiency power infrastructure solutions, including:  |

**Table 13. Power tools and technologies (continued)**

| Feature | Description  |
|---------|--|
|         | <ul style="list-style-type: none"> <li>• <a href="#">Power distribution units (PDUs)</a></li> <li>• <a href="#">Uninterruptible power supplies (UPSs)</a></li> <li>• <a href="#">Energy Smart containment rack enclosures</a></li> </ul> Find additional information at: <a href="https://www.delltechnologies.com/en-us/servers/power-and-cooling.htm">https://www.delltechnologies.com/en-us/servers/power-and-cooling.htm</a> . |

## 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 R760xd2.

**Table 14. Power Supply Unit Options**

| Wattage   | Frequency | Voltage/Current         | Class    | Heat dissipation |
|-----------|-----------|-------------------------|----------|------------------|
| 700 W     | 50/60 Hz  | 200-240 Vac/4.1 A       | Titanium | 2625 BTU/hr      |
|           | NA        | 240 Vdc/3.4 A           | NA       |                  |
| 1100 W    | 50/60 Hz  | 100-240 Vac/12-3.6 A    | Titanium | 4125 BTU/hr      |
|           | NA        | 240 Vdc/5.2 A           | NA       |                  |
| 1400 W    | 50/60 Hz  | 100-240 Vac/12-8 A      | Platinum | 5250 BTU/hr      |
|           | NA        | 240 Vdc/6.6 A           | NA       |                  |
| 1800 W    | 50/60 Hz  | 200-240 Vac/10 A        | Titanium | 6610 BTU/hr      |
|           | NA        | 240 Vdc/8.2 A           | NA       |                  |
| 1100 W DC | NA        | (-48) — (-60) Vdc/ 27 A | NA       | 4265 BTU/hr      |

**NOTE:** If a system with AC 1100W or 1400W PSUs operate at low line 100 ~ 120 Vac, then the power rating per PSU is de-rated to 1050W.

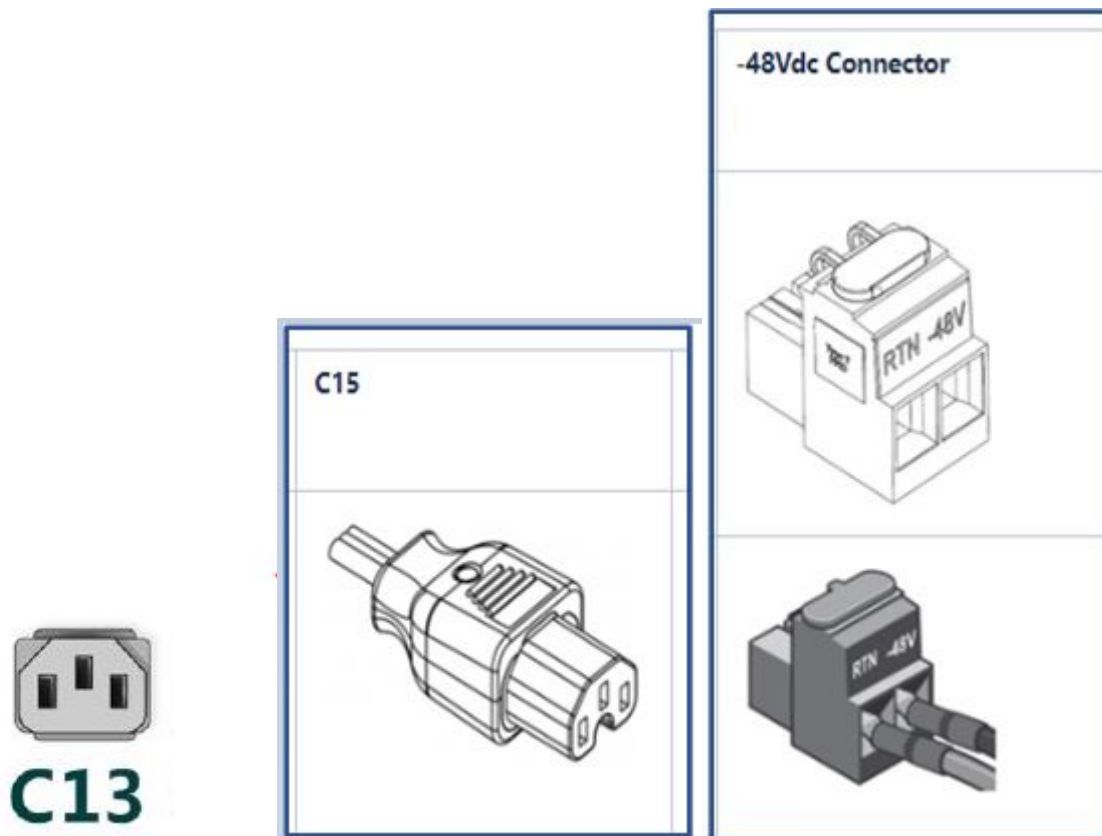


Figure 26. PSU power cord

Table 15. PSU power cords

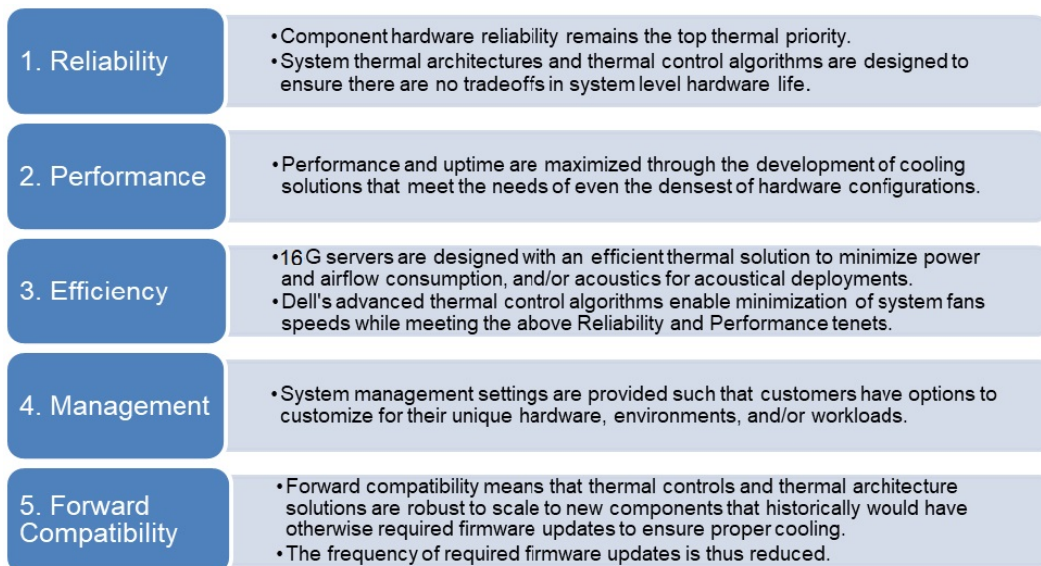
| Form factor     | Output    | Power cord        |
|-----------------|-----------|-------------------|
| Redundant 60 mm | 700 W     | C13               |
|                 | 1100 W    |                   |
|                 | 1400 W    |                   |
|                 | 1100 W DC | -48Vdc connector. |
|                 | 1800 W    | C15               |

## 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 27. Thermal design characteristics**

The thermal design of the PowerEdge R760xd2 reflects the following:

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

## Acoustics

### Acoustical performance

Dell EMC PowerEdge R760xd2 is a rack server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

**Table 16. Hardware and software configurations for lower acoustical output**

| Configuration      | Quietest                      | Quietest GPU                  | Hadoop                        | SDS typical                   | SDS + acceleration            |
|--------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Processor Type     | Intel Xeon Scalable processor | Intel Xeon Scalable processor | Intel Xeon Scalable processor | Intel Xeon Scalable processor | Intel Xeon Scalable processor |
| Processor TDP      | 185 W                         | 185 W                         | 185 W                         | 150 W                         | 185 W                         |
| Processor Quantity | 1                             | 2                             | 2                             | 2                             | 2                             |
| RDIMM Memory       | 16 GB DDR5                    | 16 GB DDR5                    | 16 GB DDR5                    | 8 GB DDR5                     | 16 GB DDR5                    |

**Table 16. Hardware and software configurations for lower acoustical output (continued)**

| Configuration   | Quietest          | Quietest GPU      | Hadoop  | SDS typical                                       | SDS + acceleration            |
|-----------------|-------------------|-------------------|---|---|-------------------------------|
| Memory Quantity | 2                 | 2                 | 16  | 8   | 16                            |
| Backplane Type  | 12 x 3.5-inch BP  | 12 x 3.5-inch BP  | 12 x 3.5-inch + 12 x 3.5-inch + Rear SSD x 2    | 12 x 3.5-inch + 12 x 3.5-inch + Rear 4 x 3.5 inch | 12 x 3.5-inch + 12 x 3.5-inch |
| HDD Type        | 12 x 3.5 inch 8TB | 12 x 3.5 inch 8TB | 14 x 3.5 inch front 8 TB, 2 x 2.5 inch rear SSD | 28 x 3.5 inch front 16 TB                         | 24 x 3.5 inch 8 TB            |
| HDD Quantity    | 12                | 12                | 14 + 2  | 28  | 24                            |
| Flash Drives    | N/A               | N/A               | PCIe SSD  | N/A   | N/A                           |
| Flash Quantity  | N/A               | N/A               | 2   | N/A   | N/A                           |
| PSU Type        | 1100 W            | 1100 W            | 1100 W  | 1100 W  | 1100 W                        |
| PSU Quantity    | 2                 | 2                 | 2   | 2   | 2                             |
| OCP             | N/A               | N/A               | Dual Port 10/25GbE                              | Dual Port 10/25GbE                                | Dual Port 10/25GbE            |
| PCI 1           | Intel 10 GbE      | Intel 10 GbE      | Intel 25 GbE                                    | Intel 10 GbE                                      | Intel 25 GbE                  |
| PCI 2           | N/A               | N/A               | N/A   | N/A   | N/A                           |
| PCI 3           | N/A               | A30 GPU           | N/A   | H755  | A30 GPU                       |
| PCI 4           | N/A               | HBA 355           | HBA 355   | HBA 355   | PERC 965                      |
| PCI 5           | HBA 355           | N/A               | N/A   | N/A   | N/A                           |

**Table 17. Acoustical performance of R760xd2 acoustical configurations**

| Configuration   | Quietest                                 | Quietest GPU | Hadoop | SDS typical | SDS + acceleration |     |
|---|--|--------------|--------|-------------|--------------------|-----|
| Acoustical Performance: Idle/ Operating @ 25 °C Ambient |  |              |        |             |                    |     |
| L <sub>wA,m</sub> (B)                                   | Idle                                     | 5.0          | 6.9    | 6.6         | 6.6                | 7.1 |
|   | Operating                                | 5.2          | 7.3    | 6.6         | 6.6                | 7.5 |
| K <sub>v</sub> (B)                                      | Idle                                     | 0.4          | 0.4    | 0.4         | 0.4                | 0.4 |
|   | Operating                                | 0.4          | 0.4    | 0.4         | 0.4                | 0.4 |
| L <sub>pA,m</sub> (dB)                                  | Idle                                     | 35           | 54     | 51          | 51                 | 56  |
|   | Operating                                | 37           | 58     | 51          | 51                 | 60  |
| Prominent tones   | No prominent tones in Idle and Operating |              |        |             |                    |     |
| Acoustical Performance: Idle @ 28 °C Ambient            |  |              |        |             |                    |     |
| L <sub>wA,m</sub> (B)                                   | 5.8                                      | 7.2          | 7.0    | 7.0         | 7.4                |     |
| K <sub>v</sub> (B)                                      | 0.4                                      | 0.4          | 0.4    | 0.4         | 0.4                |     |
| L <sub>pA,m</sub> (dB)                                  | 42                                       | 58           | 54     | 55          | 59                 |     |
| Acoustical Performance: Max. Loading @ 35 °C Ambient    |  |              |        |             |                    |     |
| L <sub>wA,m</sub> (B)                                   | 7.7                                      | 8.1          | 7.6    | 8.1         | 8.1                |     |
| K <sub>v</sub> (B)                                      | 0.4                                      | 0.4          | 0.4    | 0.4         | 0.4                |     |
| L <sub>pA,m</sub> (dB)                                  | 60                                       | 66           | 60     | 66          | 66                 |     |

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

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

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: 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.

Customer Usage Operating mode: The operating mode is represented by the maximum of the steady state acoustical output at 0%~40% of CPU TDP, 5%~50% IOPs load, 0%~20% Memory load, and 10 0% GPU load as the components showed in the above configurations

## PowerEdge acoustical specifications

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

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

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

### Category 1: Floor-standing in Office Environment

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

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

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

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

| Measurement Position re AC0158 | Metric, re AC0159   | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)  |                         |   |   |
|--------------------------------|---|---|-------------------------|---|---|
|                                |   | Standby in 23±2° C Ambient  | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient |
|                                | LpA-single point, dBA   | Report  | Report                  | Report  | Report  |
| Front Binaural HEAD            | Transients  | <ul style="list-style-type: none"> <li>Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria:                             <ul style="list-style-type: none"> <li>Max. {ΔLpA} &lt; 3.0 dB</li> <li>Event count &lt; 3 for “1.5 dB &lt; ΔLpA &lt; 3.0 dB”</li> <li>Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB.</li> </ul> </li> <li>Startup behavior                             <ul style="list-style-type: none"> <li>Report Startup behavior re. AC0159</li> <li>Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum</li> </ul> </li> <li>Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”</li> </ul> |                         |   | N/A   |
| Any                            | Other   | <p>No rattles, squeaks, or unexpected noises</p> <p>Sound should be “even” around the EUT (one side should not be dramatically louder than another)</p> <p>Unless otherwise specified, the “default” thermal-related settings shall be selected for BIOS and iDRAC.</p> <p>Specific operating conditions will be defined in “Configurations &amp; Configuration Dependencies” for each platform.</p>  |                         |   |   |
| Sound Pressure                 | LpA-reported, dBA, re AC0158 and program configuration document | Report for all mics   | Report for all mics     | Report for all mics   | Report for all mics   |

## Category 2: Floor-standing in Office Environment

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



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

| Measurement Position re AC0158   | Metric, re AC0159   | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)  |                         |   |   |
|--|---|---|-------------------------|---|---|
|  |   | Standby in 23±2° C Ambient  | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient |
| Sound Power  | LWA,m, 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  | <ul style="list-style-type: none"> <li>● Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: <ul style="list-style-type: none"> <li>○ Max. {ΔLpA} &lt; 3.0 dB</li> <li>○ Event count &lt; 3 for “1.5 dB &lt; ΔLpA &lt; 3.0 dB”</li> </ul> </li> <li>● Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB.</li> <li>● Startup behavior <ul style="list-style-type: none"> <li>○ Report Startup behavior re. AC0159</li> <li>○ Startup must proceed smoothly, that is, no sudden or large jumps, and fan speed during startup must not exceed 50% of its maximum</li> </ul> </li> <li>● Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”</li> </ul> |                         |   | N/A   |
| Any  | Other   | <ul style="list-style-type: none"> <li>● No rattles, squeaks, or unexpected noises</li> <li>● Sound should be “even” around the EUT (one side should not be dramatically louder than another)</li> <li>● Unless otherwise specified, the “default” thermal-related settings shall be selected for BIOS and iDRAC.</li> <li>● Specific operating conditions are defined in “Configurations and Configuration Dependencies” for each platform.</li> </ul>   |                         |   |   |
| 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 of the table below applies. These products could be found in laboratories, schools, restaurants, open office space layouts, small ventilated closets, etc., though not in close proximity to any particular person nor in quantities greater than a few in any location. People within proximity of a few of these products should not experience any impact to speech intelligibility or annoyance from the noise of the product. A rack product sitting on a table in a common area is an example.

**Table 20. Dell Enterprise Category 3, “General Use” acoustical specification category**

| Measurement Position re AC0158   | Metric, re AC0159     | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)   |                         |   |  |
|--|-----------------------|--|-------------------------|---|--|
|  |                       | Standby in 23±2° C Ambient   | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient and for 100% loading and maximum configuration, at 35° C Ambient |
| Sound Power  | LWA,m, 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, %    | ≤ 40   | ≤ 40                    | ≤ 40  | Report   |
|  | Loudness, sones       | Report   | Report                  | Report  | Report   |
|  | LpA-single point, dBA | Report   | Report                  | Report  | Report   |
| Front Binaural HEAD  | Transients            | <ul style="list-style-type: none"> <li>● Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria: <ul style="list-style-type: none"> <li>○ Max. {ΔLpA} &lt; 3.0 dB</li> <li>○ Event count &lt; 3 for “1.5 dB &lt; ΔLpA &lt; 3.0 dB”</li> </ul> </li> <li>● Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15dB.</li> <li>● Startup behavior <ul style="list-style-type: none"> <li>○ Report Startup behavior re. AC0159</li> <li>○ Startup must proceed smoothly, that is, no sudden or large jumps, and air mover speed during startup must not exceed 50% of its maximum</li> </ul> </li> <li>● Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”</li> </ul> |                         |   | N/A  |
| Any  | Other                 | <p>No rattles, squeaks, or unexpected noises</p> <p>Sound should be “even” around the EUT (one side should not be dramatically louder than another)</p> <p>Unless otherwise specified, the “default” thermal-related settings shall be selected for BIOS and iDRAC.</p>  |                         |   |  |

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

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

### Category 4: Attended Data Center

When Dell determines that a specific Enterprise product is to be predominantly used in an attended data center, then the acoustical specification of the table applies. The phrase “attended data center” is used to mean a space in which many (from tens to 1000s) of Enterprise products are deployed in proximity (that is, in the same room) to personnel whose speech (perhaps with raised voices) is expected to be intelligible over the data center noise. Hearing protection or hearing monitoring programs are not expected in these areas. Examples in this category include monolithic rack products. 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 21. Dell Enterprise Category 4, “Attended Data Center” acoustical specification category.**

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

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

| Measurement Position re AC0158 | Metric, re AC0159     | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)  |                         |   |   | Simulate (that is, set fan speeds representative) for 100% loading and maximum configuration, at 35° C Ambient |
|--------------------------------|-----------------------|---|-------------------------|---|---|--|
|                                |                       | Standby in 23±2° C Ambient  | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient |  |
|                                | LpA-single point, dBA | Report  | Report                  | Report  | Report  | Report   |
|                                | Transients            | <ul style="list-style-type: none"> <li>● Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria:                             <ul style="list-style-type: none"> <li>○ Max. {ΔLpA} &lt; 3.0 dB</li> <li>○ Event count &lt; 3 for “1.5 dB &lt; ΔLpA &lt; 3.0 dB”</li> <li>○ Acoustical Jump (see AC0159), during air mover speed transition from Idle to Operating Mode must be ≤ 15 dB.</li> <li>○ Startup behavior                                     <ul style="list-style-type: none"> <li>■ Report Startup behavior re. AC0159</li> <li>■ Startup must proceed smoothly, that is, no sudden or large jumps.</li> </ul> </li> </ul> </li> <li>∞ Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”</li> </ul> |                         |   | N/A   |  |
| Any                            | Other                 | <p>No rattles, squeaks, or unexpected noises</p> <p>Sound should be “even” around the EUT (one side should not be dramatically louder than another)</p> <p>Unless otherwise specified, the “default” thermal-related settings shall be selected for BIOS and iDRAC.</p> <p>Specific operating conditions will be defined in “Configurations &amp; Configuration Dependencies” for each platform.</p>  |                         |   |   |  |
| Sound Pressure                 | LpA-reported, dBA     | Report for all mics   | Report for all mics     | Report for all mics   | Report for all mics   | Report for all mics  |

### Category 5: Unattended Data Center

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

**Table 22. Dell Enterprise Category 5, “Unattended Data Center” acoustical specification category**

| Measurement Position re AC0158 | Metric, re AC0159     | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)  |                         |   |   | Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient |
|--------------------------------|-----------------------|---|-------------------------|---|---|--|
|                                |                       | Standby in 23±2° C Ambient  | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient |  |
| Sound Power                    | LWA,m, B              | Report  | ≤ 7.5                   | ≤ 7.7   | Report  | Report   |
| Front Binaural HEAD            | Tones, Hz, dB         | Report  | < 15 dB                 | < 15 dB   | Report  | Report   |
|                                | 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            | <ul style="list-style-type: none"> <li>Oscillation (see AC0159), if observed, during 20-minute steady-state observation, must adhere to the following two criteria:                             <ul style="list-style-type: none"> <li>Max. {ΔLpA} &lt; 3.0 dB</li> <li>Event count &lt; 3 for “1.5 dB &lt; ΔLpA &lt; 3.0 dB”</li> </ul> </li> <li>Report Acoustical Jump (see AC0159) during air mover speed transition from Idle to Operating Mode.</li> <li>Startup behavior                             <ul style="list-style-type: none"> <li>Report Startup behavior re. AC0159</li> <li>Startup must proceed smoothly, that is, no sudden or large jumps.</li> </ul> </li> <li>Transient inputs: Report time-history sound pressure levels re AC0159 “Train of Step Functions on Processor”</li> </ul> |                         |   | N/A   |  |
| Any                            | Other                 | <p>No rattles, squeaks, or unexpected noises</p> <p>Sound should be “even” around the EUT (one side should not be dramatically louder than another)</p> <p>Unless otherwise specified, the “default” thermal-related settings shall be selected for BIOS and iDRAC.</p> <p>Specific operating conditions will be defined in “Configurations &amp; Configuration Dependencies” for each platform.</p>  |                         |   |   |  |
| Sound Pressure                 | LpA-reported, dBA, re | Report for all mics   | Report for all mics     | Report for all mics   | Report for all mics   | Report for all mics  |

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

| Measurement Position re AC0158 | Metric, re AC0159                         | Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below) |                         |   |   | Simulate (that is, set air mover speeds representative) for 100% loading and maximum configuration, at 35° C Ambient |
|--------------------------------|---|--|-------------------------|---|---|--|
|                                |   | Standby in 23±2° C Ambient   | Idle in 23±2° C Ambient | Operating in 23±2° C Ambient – if not otherwise specified in the program’s configuration document, then processor and hard drive operating modes are required | Simulate (that is, set air mover speeds representative) for Idle at 28° C & 35° C Ambient |  |
|                                | AC0158 and 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 R760xd2 consist of general type: Stab-in sliding. The cable management offerings consist of an optional cable management arm (CMA) and an optional strain relief bar (SRB).

See the *Enterprise Systems Rail Sizing and Rack Compatibility Matrix* available at [https://i.dell.com/sites/csdocuments/Business\\_solutions\\_engineering-Docs\\_Documents/en/rail-rack-matrix.pdf](https://i.dell.com/sites/csdocuments/Business_solutions_engineering-Docs_Documents/en/rail-rack-matrix.pdf) for information regarding:

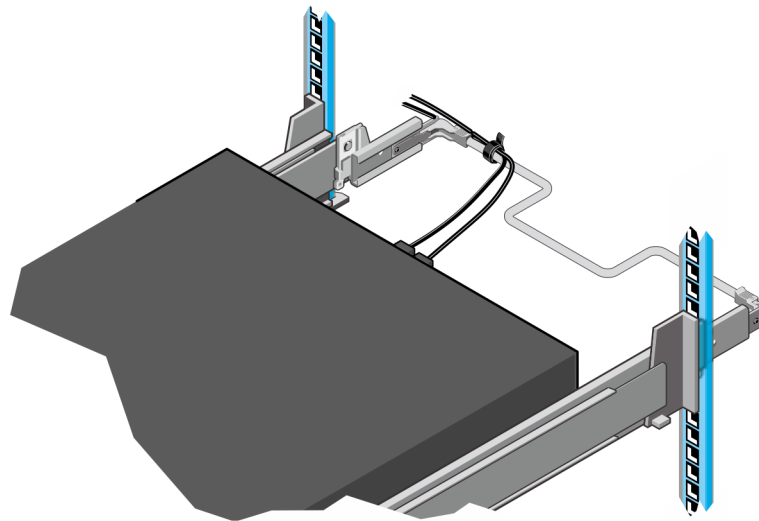
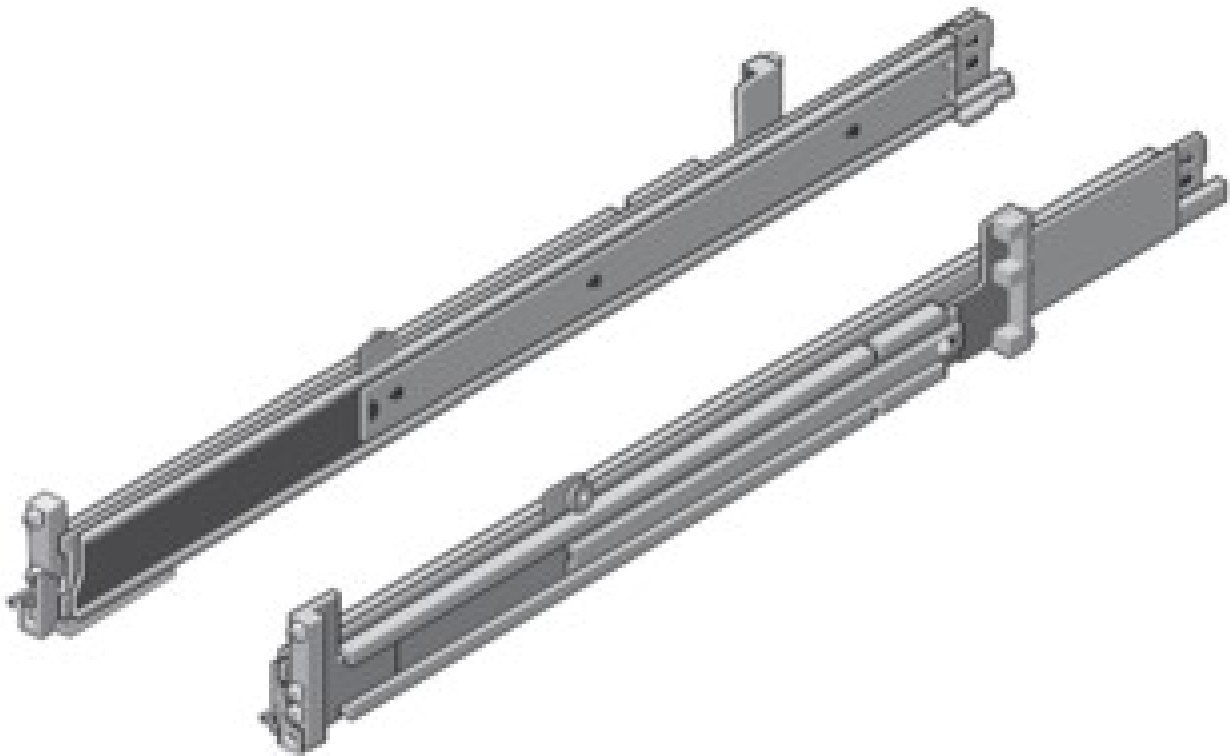
- Specific details about rail types.
- Rail adjustability ranges for various rack mounting flange types.
- Rail depth with and without cable management accessories.
- Rack types that are supported for various rack mounting flange types.

Key factors governing proper rail selection include the following:

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

## Stab-in sliding rails features summary

The stab-in sliding rails allow the system to be partially extended out of the rack for service. The R760xd2 supports Stab-in sliding rails. The stab-in sliding rails are available with or without the optional cable management arm (CMA) or strain relief bar (SRB).



**Figure 28. Stab-in sliding rails with optional SRB**

### **B22 Stab-in sliding rails for 4-post racks**

- Supports stab-in installation of the chassis to the rails.
- Support for tool-less installation in 19" EIA-310-E compliant square, unthreaded round hole racks including all generations of the Dell racks. Also supports tool-less installation in threaded round hole 4-post racks.
- Support for tool-less installation in Dell Titan or Titan-D racks.
- Support partial 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).

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



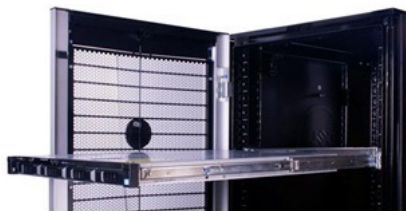
## Cable management arm (CMA)

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

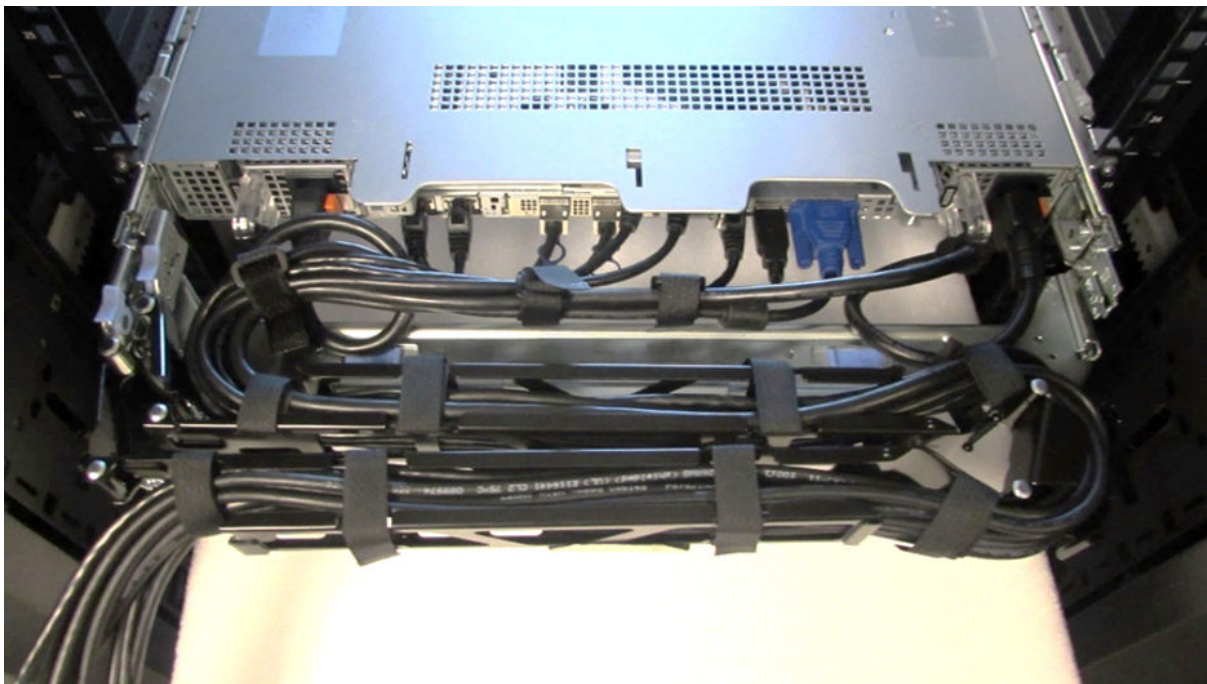
- Large U-shaped baskets to support dense cable loads.
- Open vent pattern for optimal airflow.
- Ability to mount on either side by swinging the spring-loaded brackets from one side to the other.
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during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

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

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



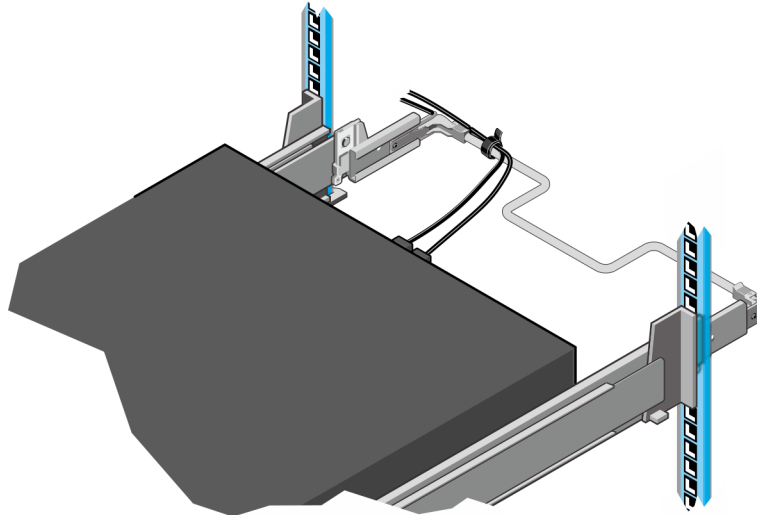
**Figure 29. Sliding rails with CMA**



**Figure 30. CMA Cabling**

## Strain Relief Bar (SRB)

The optional strain relief bar (SRB) for the PowerEdge R760xd2 organizes and supports cable connections at the rear end of the server to avoid damage from bending.



**Figure 31. Cabled strain relief bar**

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

## Rack Installation

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

### Installing the system into the rack : 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.

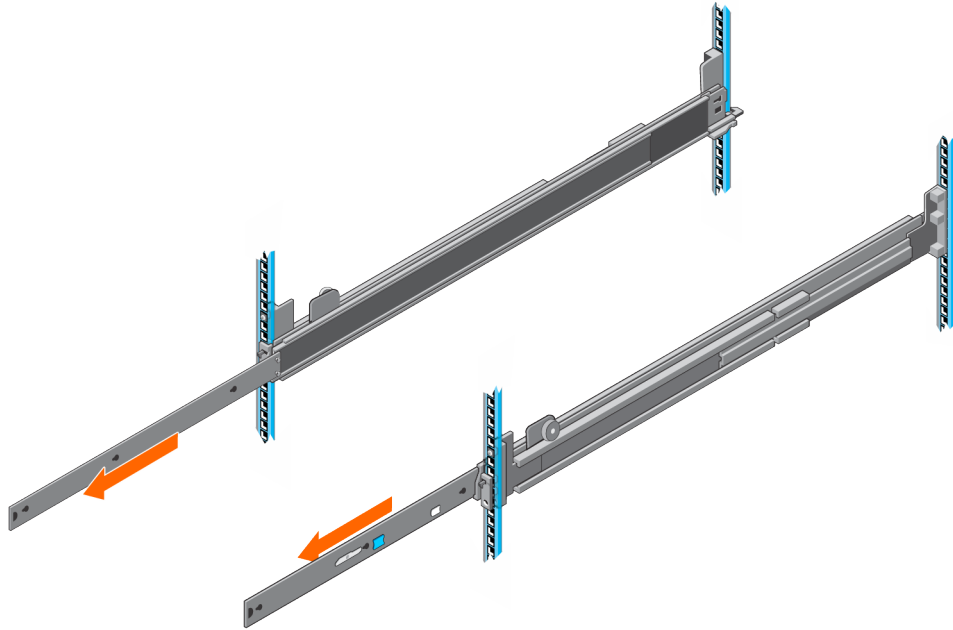


Figure 32. Pull out the intermediate rail

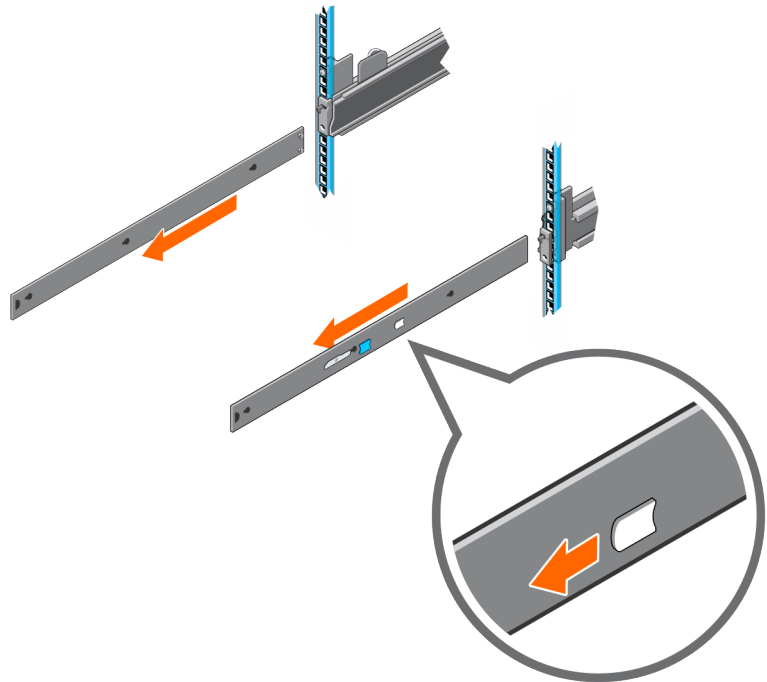
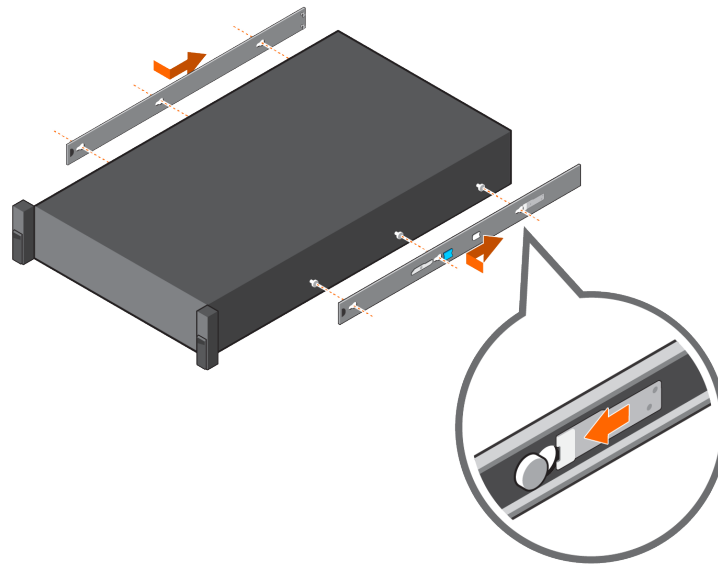


Table 23. Rail component label

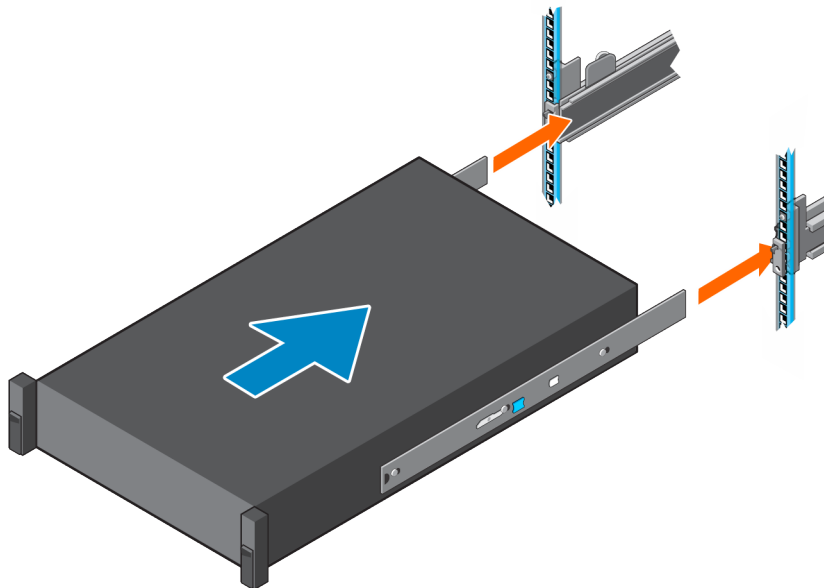
| Number | Component         |
|--------|-------------------|
| 1      | Intermediate rail |
| 2      | Inner rail        |

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



**Figure 33. Attach the inner rails to the system**

4. Install the system into the extended rails.



**Figure 34. 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.

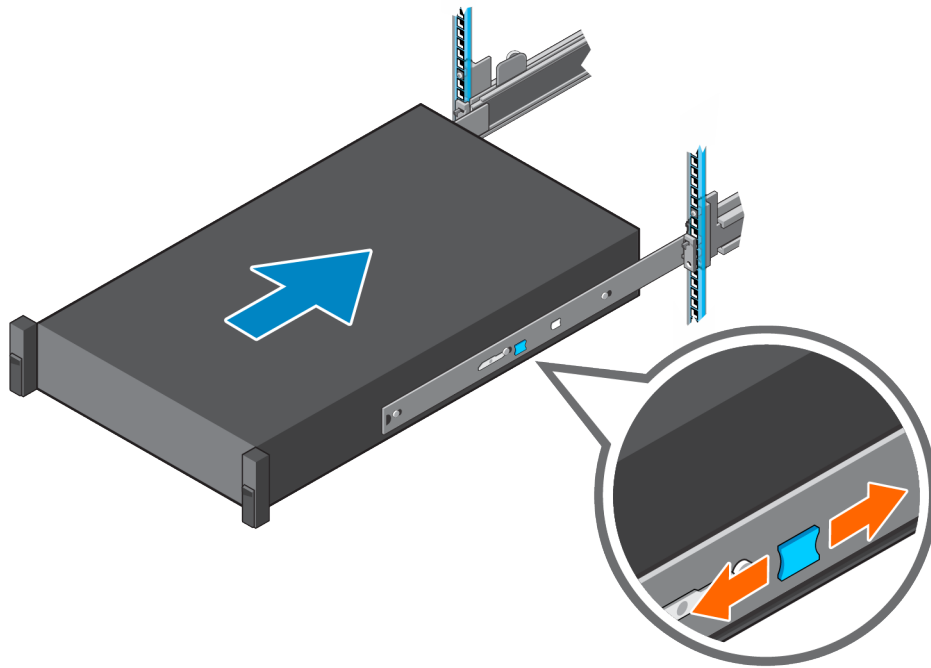


Figure 35. Slide system into the rack

# Operating Systems and Virtualization

## Topics:

- [Supported Operating Systems](#)

## Supported Operating Systems

The PowerEdge system supports the following operating systems:

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

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

# Dell OpenManage Systems Management

Dell delivers management solutions that help IT administrators effectively deploy, update, monitor, and manage IT assets. OpenManage solutions and tools enable you to quickly respond to problems by helping them to manage Dell servers efficiently; in physical, virtual, local, and remote environments; all without the need to install an agent in the operating system.

The OpenManage portfolio includes:

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

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

For more information about the entire OpenManage portfolio, see:

- The latest [Dell Systems Management Overview Guide](#).

## Topics:

- [Integrated Dell Remote Access Controller \(iDRAC\)](#)
- [Systems Management software support matrix](#)

## Integrated Dell Remote Access Controller (iDRAC)

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

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

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

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

iDRAC9 offers following license tiers:

**Table 24. iDRAC9 license tiers**

| License           | Description  |
|-------------------|--|
| iDRAC9 Basic      | <ul style="list-style-type: none"> <li>• Available only on 100-500 series rack/tower</li> <li>• Basic instrumentation with iDRAC web UI</li> <li>• For cost conscious customers that see limited value in management</li> </ul>  |
| iDRAC9 Express    | <ul style="list-style-type: none"> <li>• Default on 600+ series rack/tower, modular, and XR series</li> <li>• Includes all features of Basic</li> <li>• Expanded remote management and server life-cycle features</li> </ul>   |
| iDRAC9 Enterprise | <ul style="list-style-type: none"> <li>• Available as an upsell on all servers</li> <li>• Includes all features of Basic and Express. Includes key features such as virtual console, AD/LDAP support, and more</li> <li>• Remote presence features with advanced, Enterprise-class, management capabilities</li> </ul>   |
| iDRAC9 Datacenter | <ul style="list-style-type: none"> <li>• Available as an upsell on all servers</li> <li>• Includes all features of Basic, Express, and Enterprise. Includes key features such as telemetry streaming, Thermal Manage, automated certificate management, and more</li> <li>• Extended remote insight into server details, focused on high end server options, granular power, and thermal management</li> </ul> |

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

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

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

## Systems Management software support matrix

**Table 25. Systems Management software support matrix**

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



**Table 25. Systems Management software support matrix (continued)**

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

# Appendix D: Service and support

## Topics:

- [Default support levels](#)
- [Other services and support information](#)

## Default support levels

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

## Default deployment levels

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

## Other services and support information

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

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

## Dell deployment services

### [Dell ProDeploy Infrastructure Suite](#)

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

# ProDeploy Infrastructure Suite for servers

## Versatile choices for accelerated deployments

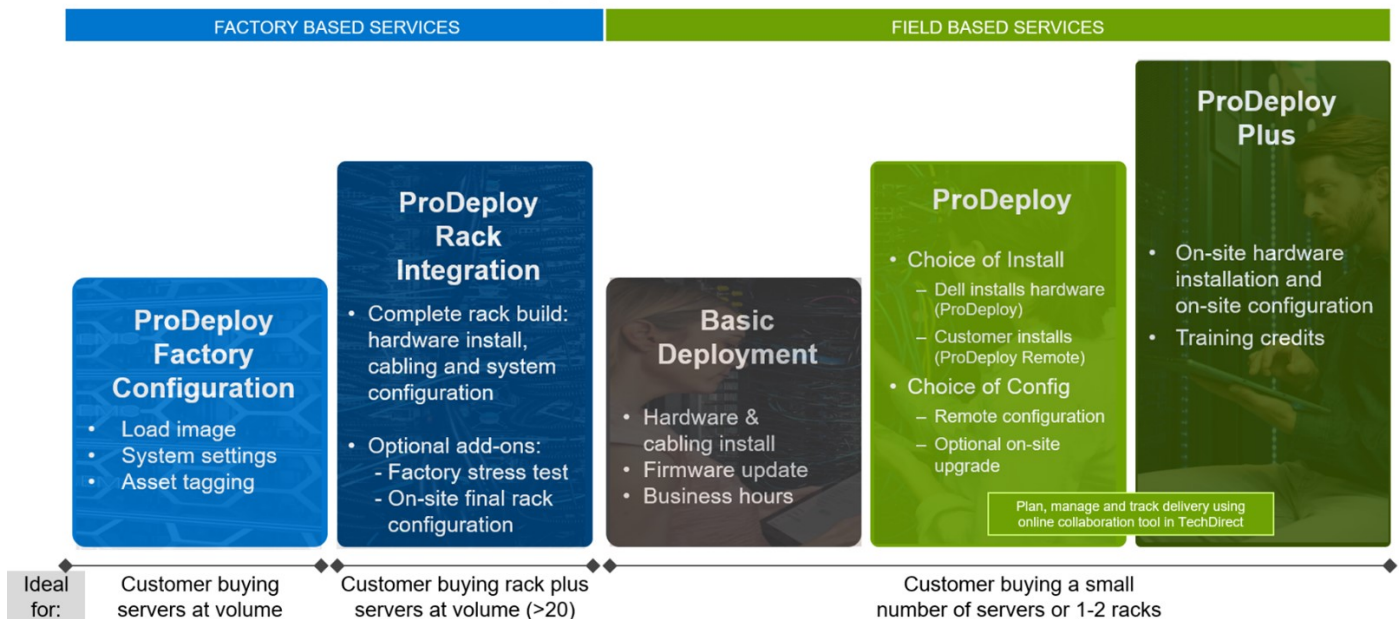


Figure 36. ProDeploy Infrastructure Suite for servers

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

### Factory Based Services:

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

### Field Based Services:

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

# ProDeploy Infrastructure Suite | Factory services

## FACTORY BASED SERVICES

|                        |   | ProDeploy Factory Configuration | ProDeploy Rack Integration |
|------------------------|---|---------------------------------|----------------------------|
| Asset configuration    | Single point of contact for project management                                | ●                               | ●                          |
|                        | RAID, BIOS and iDRAC configuration  | ●                               | ●                          |
|                        | Firmware freeze   | ●                               | ●                          |
|                        | Asset Tagging and Reporting   | ●                               | ●                          |
|                        | Customer system image   | ●                               | ●                          |
| Factory implementation | Site readiness review and implementation planning                             | -                               | ●                          |
|                        | Hardware racking and cabling  | -                               | ●                          |
|                        | SAM engagement for ProSupport Plus entitled accounts/devices                  | -                               | ●                          |
|                        | Deployment verification, documentation, and knowledge transfer                | ●                               | ●                          |
| Delivery               | White glove logistics   | -                               | ●                          |
|                        | Onsite final configuration  | -                               | Onsite add-on              |
|                        | Install support software and connect with Dell Technologies                   | -                               | Onsite add-on              |
|                        | Basic Deployment  | Optional onsite installation    | -                          |
| Online oversight       | Online collaborative environment for planning, managing and tracking delivery | -                               | ●                          |

<sup>1</sup> ProDeploy Rack Integration Services are currently only available within the United States. Custom rack integration services are still available globally.\*

Dell Technologies

Figure 37. ProDeploy Infrastructure Suite - Factory services

# ProDeploy Infrastructure Suite | Field services

|                  |  | Basic Deployment | ProDeploy                 | ProDeploy Plus |
|------------------|--|------------------|---------------------------|----------------|
| Pre-deployment   | Single point of contact for project management   | ●                | ●                         | In-region      |
|                  | Site readiness review  | -                | ●                         | ●              |
|                  | Implementation planning <sup>1</sup>   | -                | ●                         | ●              |
|                  | SAM engagement for ProSupport Plus entitled devices  | -                | -                         | ●              |
| Deployment       | Deployment service hours   | Business hours   | 24x7                      | 24x7           |
|                  | Onsite hardware installation and packaging material removal <sup>2</sup> or remote guidance for hardware installation <sup>1</sup> | ●                | Remote guidance or onsite | Onsite         |
|                  | Install and configure system software  | -                | Remote                    | Onsite         |
|                  | Install support software and connect with Dell Technologies  | -                | ●                         | ●              |
|                  | Project documentation with knowledge transfer  | -                | ●                         | ●              |
| Post-deployment  | Deployment verification  | -                | ●                         | ●              |
|                  | Configuration data transfer to Dell Technologies technical support   | -                | ●                         | ●              |
|                  | 30-days of post-deployment configuration assistance  | -                | -                         | ●              |
|                  | Training credits for Dell Technologies Education Services  | -                | -                         | ●              |
| Online oversight | Online collaborative environment in <a href="#">TechDirect</a> for planning, managing and tracking delivery <sup>3</sup>           | -                | ●                         | ●              |

<sup>1</sup> Remote option includes project specific instructions, documentation and live expert guidance for hardware installation. Option available for select hardware. [List is available in the backup portion of this customer presentation](#)

<sup>2</sup> Packaging removal included with onsite hardware installation

<sup>3</sup> Included with ProDeploy or ProDeploy Plus, Not included with Basic Deployment

Figure 38. ProDeploy Infrastructure Suite - Field services

## Dell ProDeploy Plus for Infrastructure

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

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

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

## Dell ProDeploy for Infrastructure

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

## Dell Basic Deployment

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

## Additional Deployment Services

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

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

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

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

Learn more at [Dell.com/HPC-Services](https://Dell.com/HPC-Services).

# ProDeploy Expansion for HPC

\*Available as standard SKUs in US & Canada and as custom quote in APJC, EMEA, LATAM

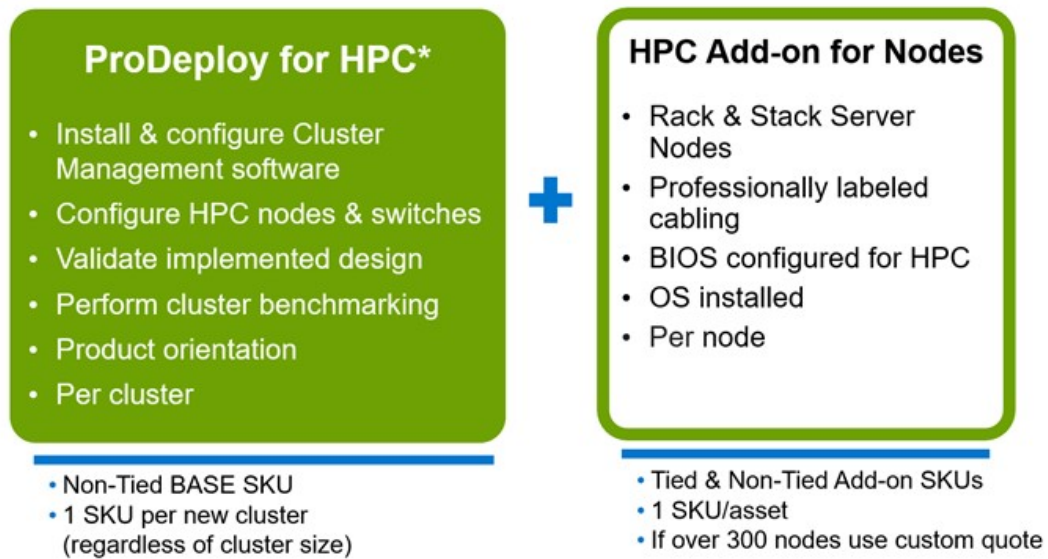


Figure 39. ProDeploy Expansion for HPC

## Dell custom deployment Services

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

For more information, see [Server Configuration Services](#).

## Dell Residency Services

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

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

## Dell Data Migration Services

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

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



# Dell Enterprise Support Services

## Dell ProSupport Enterprise Suite

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

**Table 26. ProSupport Enterprise Suite**

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

## Dell ProSupport Plus for Enterprise


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

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

## Dell ProSupport for Enterprise

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

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

 **NOTE:** Subject to service offer country or region availability.

- Optional onsite parts and labor response options including next business day or four-hour mission critical

## ProSupport Enterprise Suite Feature Comparison

|   | Basic             | ProSupport                                   | ProSupport Plus                               |
|---|-------------------|--|---|
| Remote technical support  | 9x5               | 24x7   | 24x7  |
| Covered products  | Hardware          | Hardware<br>Software                         | Hardware<br>Software                          |
| Onsite hardware support   | Next business day | Next business day or<br>4hr mission critical | Next business day or<br>4 hr mission critical |
| 3 <sup>rd</sup> party collaborative assistance  |                   | ●  | ●   |
| Self-service case initiation and management   |                   | ●  | ●   |
| Access to software updates  |                   | ●  | ●   |
| Proactive storage health monitoring, predictive analytics and anomaly detection with CloudIQ and the CloudIQ mobile app |                   | ●  | ●   |
| Priority access to specialized support experts  |                   |  | ●   |
| Predictive detection of hardware failures   |                   |  | ●   |
| 3 <sup>rd</sup> party software support  |                   |  | ●   |
| An assigned Service Account Manager   |                   |  | ●   |
| Proactive, personalized assessments and recommendations   |                   |  | ●   |
| Proactive systems maintenance   |                   |  | ●   |

Availability and terms of Dell Technologies Services vary by region and by product. For more information, please view our [service descriptions](#).

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**Figure 40. ProSupport Enterprise Suite**

## Dell ProSupport One for Data Center

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

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

## Dell ProSupport Add-on for HPC

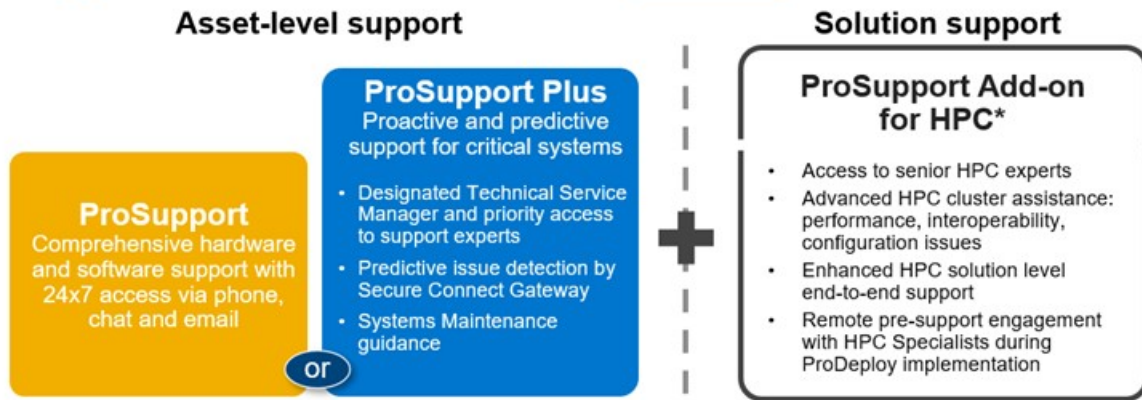
The ProSupport Add-on for HPC provides solution-aware support including:

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

Learn more at [Dell.com/HPC-Services](https://Dell.com/HPC-Services).



# ProSupport Add-on for HPC is an add-on to PS or PSP



### Eligibility

- All server, storage, and networking nodes in cluster must have PS or PSP **AND** PS Add-on for HPC attached
- All HW expansions to clusters must attach PS or PSP **AND** PS Add-on for HPC
- To retrofit an entire existing cluster with PS Add-on for HPC:
  1. HPC Specialists must review and validate the existing cluster
  2. PS or PSP **AND** the PS Add-on for HPC (APOS) must be attached to all server, storage and networking nodes

\*Available in standard SKUs in NA and EMEA and as custom quote in APJC & LATAM

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Figure 41. ProSupport Add-on for HPC is an add-on to PS or PSP

## Support Technologies

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

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

## Enterprise connectivity

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

Benefits include:

- Value: Our connectivity solutions are available to all customers at no additional charge
- Improve productivity: Replace manual, high-effort routines with automated support
- Accelerate time to resolution: Receive issue alerts, automatic case creation, and proactive contact from Dell experts
- Gain insight and control: Optimize enterprise devices with insights in portals reporting like TechDirect, and get predictive issue detection before the problem starts

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

Table 27. Features enabled by connectivity

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

**Table 27. Features enabled by connectivity (continued)**

|   | <b>Basic hardware warranty</b> | <b>ProSupport</b> | <b>ProSupport Plus</b> |
|---|--------------------------------|-------------------|------------------------|
| Predictive issue detection for failure prevention | Not supported                  | Not supported     | Supported              |

Get started at [DellTechnologies.com/secureconnectgateway](https://DellTechnologies.com/secureconnectgateway).

## Dell TechDirect

TechDirect helps boost IT team productivity when supporting Dell systems.

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

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


Register at [TechDirect.Dell.com](https://TechDirect.Dell.com).

## Dell Technologies Consulting Services

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

## Dell Managed Services

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

| <b>Managed</b><br>Outsourcing or CAPEX model  |  | <b>APEX</b><br>as-a-Service or OPEX model  |
|---|---|--|
| <p>We manage your technology using our people and tools.<sup>1</sup></p> <ul style="list-style-type: none"> <li>• Managed detection and response*</li> <li>• Technology Infrastructure</li> <li>• End-user (PC/desktop)</li> <li>• Service desk operations</li> <li>• Cloud Managed (Pub/Private)</li> <li>• Office365 or Microsoft Endpoint</li> </ul> |   | <p>We own all technology so you can off-load all IT decisions.</p> <ul style="list-style-type: none"> <li>• APEX Cloud Services</li> <li>• APEX Flex on Demand elastic capacity</li> <li>• APEX Data Center Utility pay-per-use model</li> </ul> |

1 – Some minimum device counts may apply. Order via: [ClientManagedServices.sales@dell.com](mailto:ClientManagedServices.sales@dell.com)

\* Managed detection and response covers the security monitoring of laptops, servers, & virtual servers. Min. 50 devices combined. No Networking or Storage-only systems [SAN/NAS]. Available in 32 countries. [Details here](#)

**Figure 42. Dell Managed Services**

## Dell Technologies Education Services

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

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

To learn more or register for a class today, see [Education.Dell.com](http://Education.Dell.com).

## Appendix A: Additional specifications

### Topics:

- Chassis dimensions
- Chassis weight
- NIC port specifications
- Video specifications
- USB Ports
- PSU rating
- Environmental specifications

### Chassis dimensions

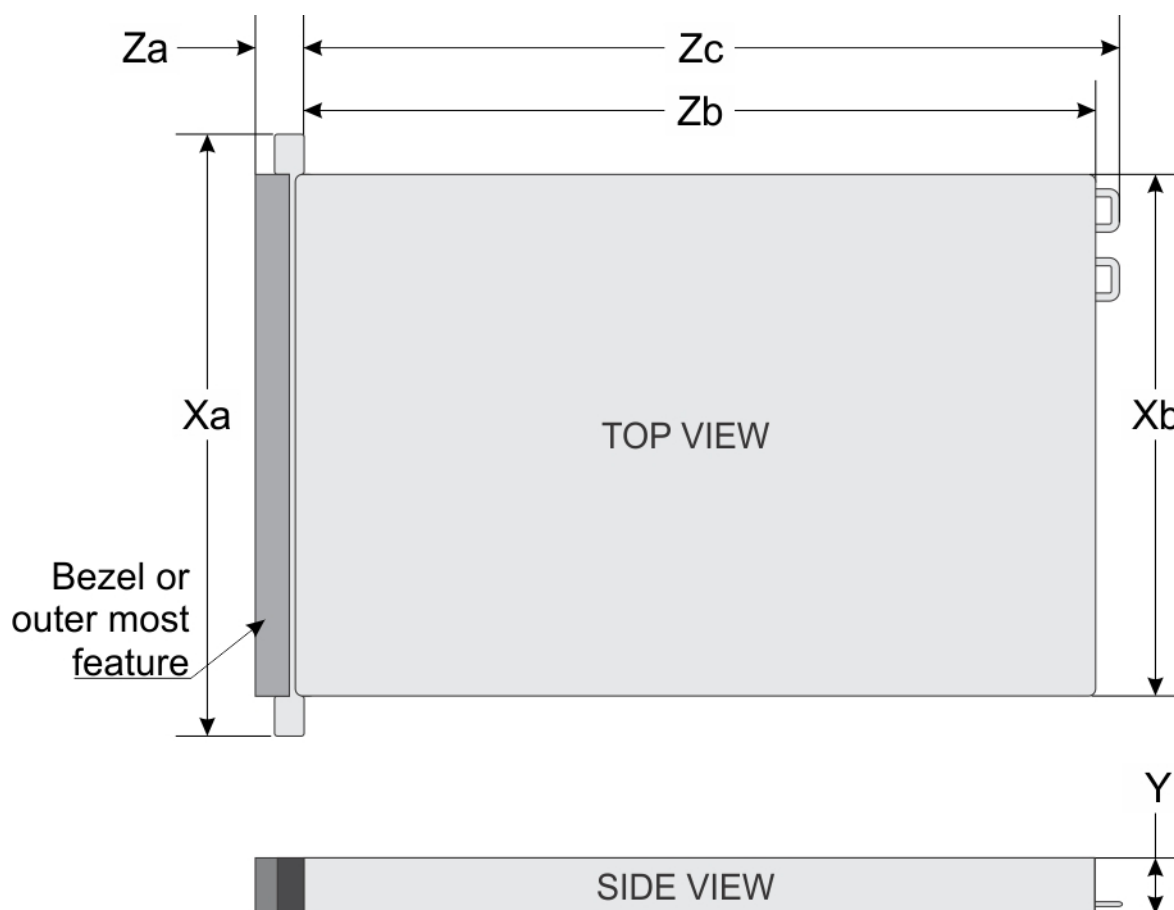


Figure 43. Chassis dimensions

Table 28. PowerEdge R760xd2 chassis dimensions

| Drives    | Xa                       | Xb                       | Y                      | Za                   | Zb                       | Zc                       |
|-----------|--------------------------|--------------------------|------------------------|----------------------|--------------------------|--------------------------|
| 12 drives | 481.6 mm (18.960 inches) | 448.0 mm (17.637 inches) | 86.8 mm (3.417 inches) | 35 mm (1.378 inches) | 837.0 mm (32.952 inches) | 872.74 mm (34.36 inches) |

**Table 28. PowerEdge R760xd2 chassis dimensions**

| Drives | Xa | Xb                             | Y | Za | Zb                    | Zc                   |
|--------|----|--------------------------------|---|----|-----------------------|----------------------|
|        |    | CC: 434.0 mm<br>(17.08 inches) |   |    | Ear to PSU<br>Surface | Ear to PSU<br>handle |

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

**NOTE:** Xb is unique to this system and has two values for the Storage module (SM) and the Compute Module (CC) .

## Chassis weight

**Table 29. PowerEdge R760xd2system weight**

| System configuration                      | Maximum weight (with all drives/SSDs) |
|---|---------------------------------------|
| A server with fully populated drives      | 46.3 kg (102.07 pounds)               |
| A server without drives and PSU installed | 23.72 kg (52.29 pounds)               |

## NIC port specifications

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

**Table 30. NIC port specification for the system**

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

## Video specifications

The platform supports the following video resolution and refresh rates:

**Table 31. Video specifications for R760xd2**

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

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

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

## USB Ports

Insert images (right control panel, rear and internal) with labeling of USB Port Locations

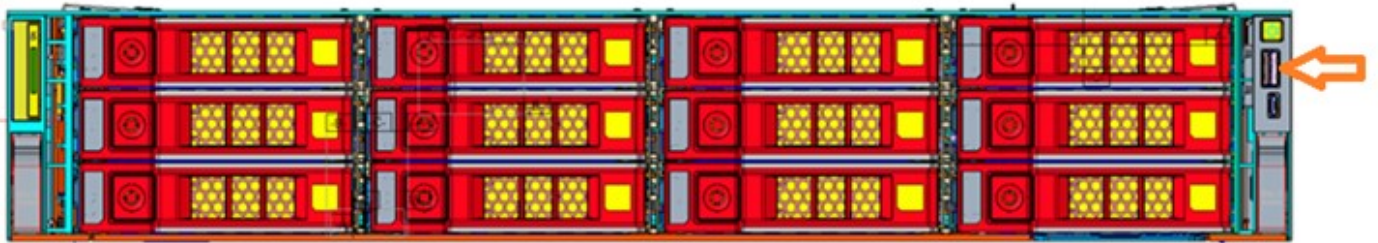


Figure 44. Front USB

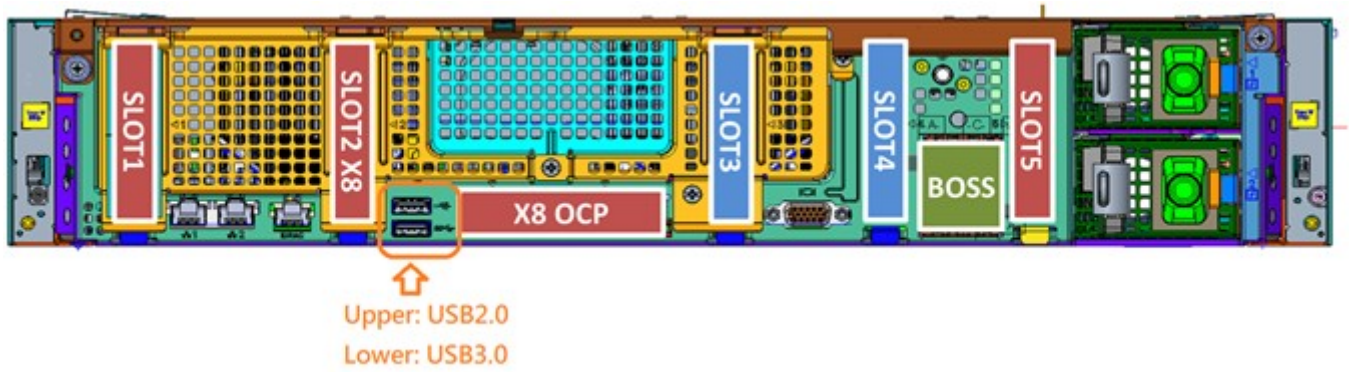


Figure 45. Rear USB

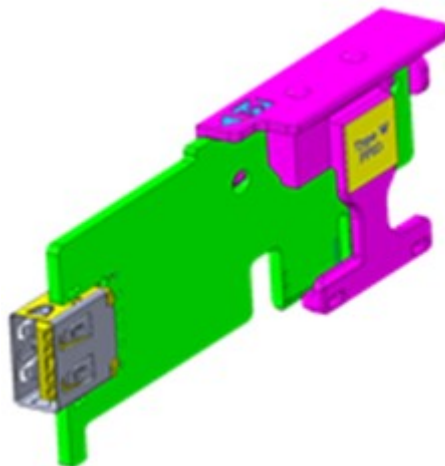
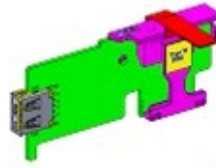


Figure 46. Internal USB



Internal USB3.0

SD Card



or

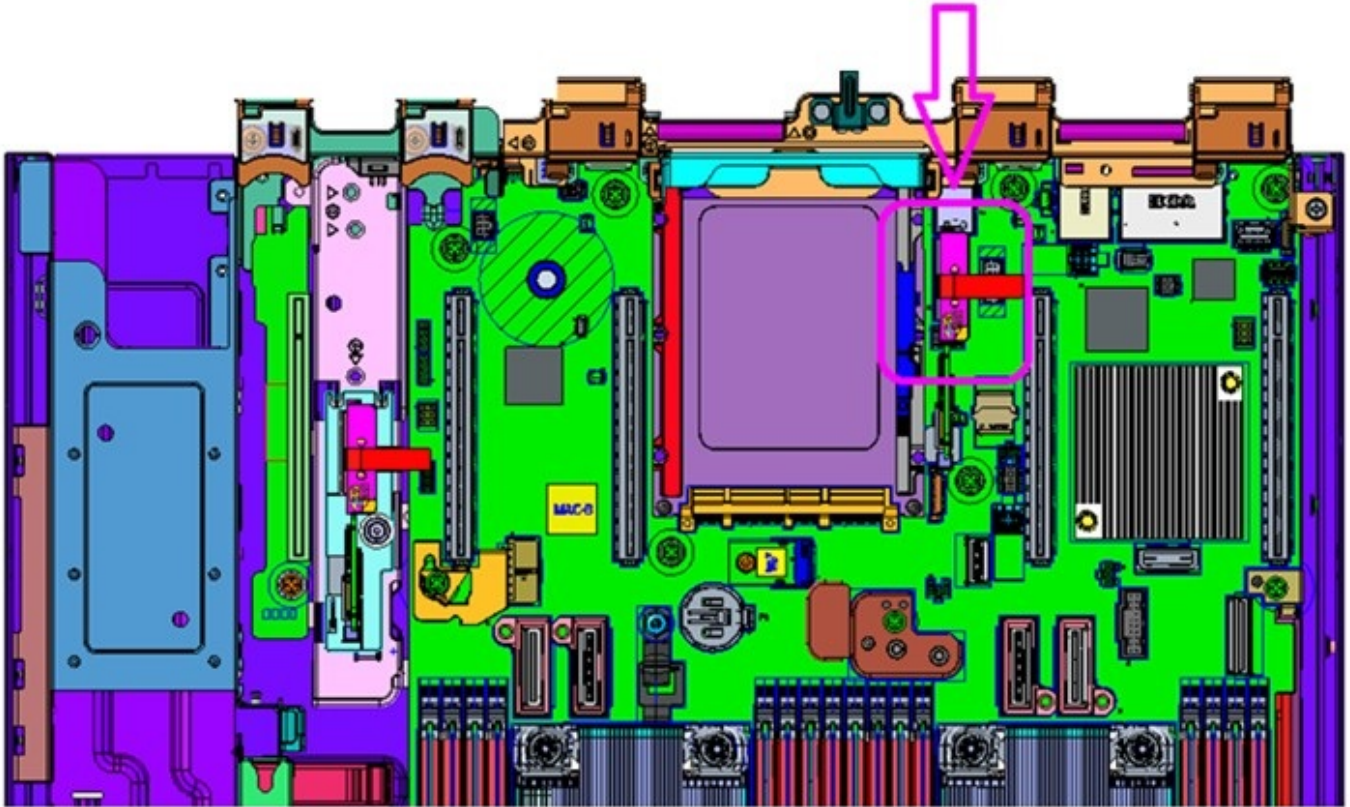
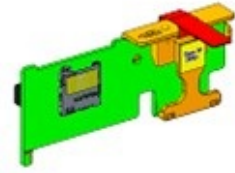
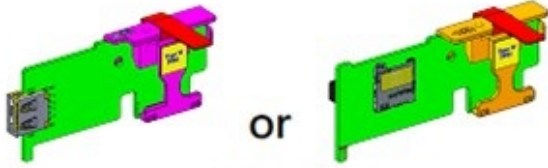


Figure 47. Internal USB Port for Configuration 2A,2B and 2C

Internal USB3.0

SD Card



or

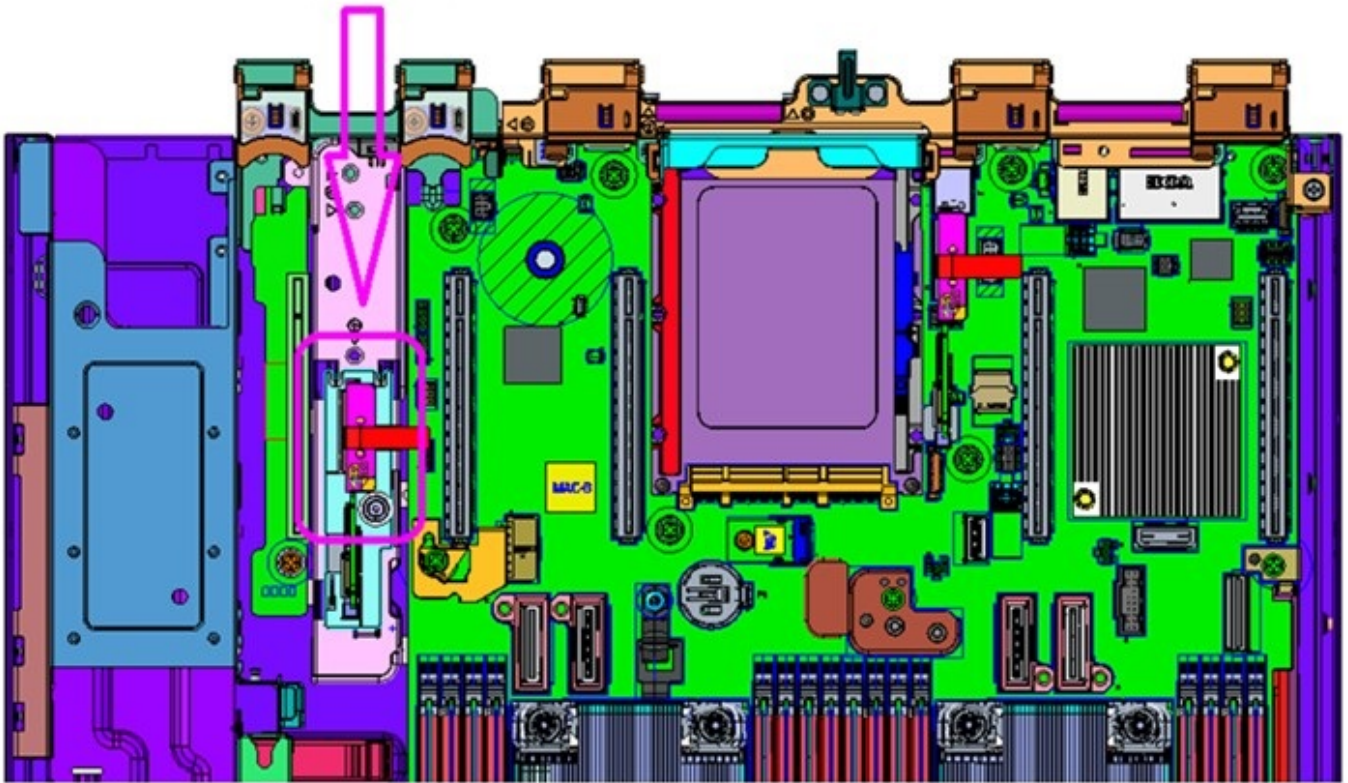


Figure 48. Internal USB Port for Configuration 1-SAS/SATA, 1-NVMe 3A,3B and 3C

Table 32. Systems USB Specifications

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



## Internal USB

The size of the internal USB card dongle is 40 x 16 x 8 mm (L x W x H).

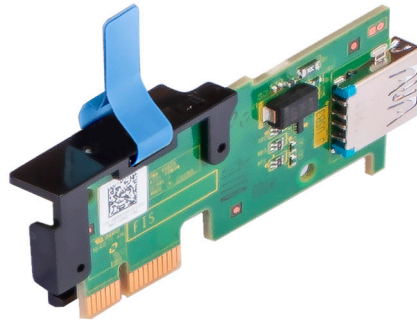


Figure 49. Internal USB

## PSU rating

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

Table 33. PSUs highline and lowline ratings

| —                             | 700 W Titanium | 1100 W Titanium | 1400 W Platinum | 1800 W Titanium | 1100 W VDC |
|-------------------------------|----------------|-----------------|-----------------|-----------------|------------|
| Peak Power (Highline/-72 VDC) | 700 W          | 1100 W          | 1400 W          | 1800 W          | 1100 W     |
| Lowline/-40 VDC               | NA             | 1050 W          | 1050 W          | NA              | 1100 W     |
| Highline 240 VDC              | 700 W          | 1100 W          | 1400 W          | 1800 W          | NA         |
| Highline 200 ~ 380VDC         | NA             | NA              | NA              | NA              | NA         |
| DC-48-60 V                    | NA             | NA              | NA              | NA              | 1100 W     |

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

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

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

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

Table 34. PSU efficiency level

| Efficiency Targets by Load |            |          |        |        |        |        |
|----------------------------|------------|----------|--------|--------|--------|--------|
| Form factor                | Output     | Class    | 10%    | 20%    | 50%    | 100%   |
| Redundant 60 mm            | 700 W AC   | Titanium | 90.00% | 94.00% | 96.00% | 91.50% |
|                            | 1100 W AC  | Titanium | 90.00% | 94.00% | 96.00% | 91.50% |
|                            | 1100 W VDC | (-48Vdc) | 85.00% | 90.00% | 92.00% | 90.00% |
|                            | 1400 W AC  | Platinum | 89.00% | 93.00% | 94.00% | 91.50% |

**Table 34. PSU efficiency level (continued)**

| Efficiency Targets by Load |           |          |        |        |        |        |
|----------------------------|-----------|----------|--------|--------|--------|--------|
| Form factor                | Output    | Class    | 10%    | 20%    | 50%    | 100%   |
|                            | 1800 W AC | Titanium | 90.00% | 94.00% | 96.00% | 94.00% |

## Environmental specifications

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

**Table 35. Continuous Operation Specifications for ASHRAE A2**

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

**Table 36. Continuous Operation Specifications for ASHRAE A3**

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

**Table 37. Continuous Operation Specifications for ASHRAE A4**

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

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

| Temperature  | Specifications  |
|--|---|
| Allowable continuous operations  |   |
| Maximum temperature gradient (applies to both operation and non-operation) | 20°C in an hour* (36°F in an hour) and 5°C in 15 minutes (9°F in 15 minutes), 5°C in an hour* (9°F in an hour) for tape hardware<br><i>i</i> <b>NOTE:</b> * - Per ASHRAE thermal guidelines for tape hardware, these are not instantaneous rates of temperature change. |
| Non-operational temperature limits   | -40 to 65°C (-40 to 149°F)  |
| Non-operational humidity limits  | 5% to 95% RH with 27°C (80.6°F) maximum dew point   |
| Maximum non-operational altitude   | 12,000 meters (39,370 feet)   |
| Maximum operational altitude   | 3,050 meters (10,006 feet)  |

**Table 39. Maximum vibration specifications**

| Maximum vibration | Specifications  |
|-------------------|---|
| Operating         | 0.21 G <sub>rms</sub> at 5 Hz to 500 Hz for 10 minutes (all operation orientations) |
| Storage           | 1.88 G <sub>rms</sub> at 10 Hz to 500 Hz for 15 minutes (all six sides tested)      |

**Table 40. Maximum shock pulse specifications**

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

## Particulate and gaseous contamination specifications

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

**Table 41. Particulate contamination specifications**

| Particulate contamination | Specifications  |
|---------------------------|---|
| Air filtration            | Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit<br><i>i</i> <b>NOTE:</b> 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.<br><i>i</i> <b>NOTE:</b> 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<br><i>i</i> <b>NOTE:</b> This condition applies to data center and non-data center environments.  |
| Corrosive dust            | <ul style="list-style-type: none"> <li>• Air must be free of corrosive dust</li> <li>• Residual dust present in the air must have a deliquescent point less than 60% relative humidity</li> </ul>   |

**Table 41. Particulate contamination specifications (continued)**

| Particulate contamination   | Specifications   |
|---|--|
|   | <p><b>i</b> NOTE: This condition applies to data center and non-data center environments.</p>  |
| Walk-Up Edge Data Center or Cabinet (sealed, closed loop environment) | <p>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</p> <p><b>i</b> NOTE: In environments commonly above ISA-71 Class G1 or that may have known challenges, special filters may be required.</p> |

**Table 42. Gaseous contamination specifications**

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

## Thermal restriction matrix

**Table 43. Processor and heat sink matrix**

| Heat sink | Configuration No                                     |
|-----------|--|
| 2U HSK    | Configuration 1, Configuration 2 and Configuration 3 |

**i** NOTE: All GPU/FGPA cards require 2U L-type HSK and GPU shroud.

**Table 44. Label reference**

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

**Table 45. Thermal restriction matrix**

| Configuration    |       | Configuration 1<br>24 x 3.5 inch SAS/SATA |                                      | Configuration 2<br>24 x 3.5 inch SAS/SATA | Configuration 3<br>24 x 3.5 inch SAS/SATA | Ambient temperature |
|------------------|-------|---|--------------------------------------|---|---|---------------------|
| Rear storage     |       | 4 x 3.5 inch SAS/SATA                     | 4 x 2.5 inch NVMe in Carrier Adapter | 2 x 2.5 inch                              | 2 x 2.5 inch                              |                     |
| CPU TDP/<br>cTDP | 125 W | STD Fan<br>2U STD HSK                     | STD Fan<br>2U STD HSK                | STD Fan<br>2U STD HSK                     | STD Fan<br>2U STD HSK                     | 35°C (95°F)         |
|                  | 150 W | STD Fan<br>2U STD HSK                     | STD Fan<br>2U STD HSK                | STD Fan<br>2U STD HSK                     | STD Fan<br>2U STD HSK                     | 35°C (95°F)         |
|                  | 165 W | NA  | NA                                   | STD Fan                                   | STD Fan                                   | 35°C (95°F)         |

**Table 45. Thermal restriction matrix (continued)**

| Configuration |       | Configuration 1<br>24 x 3.5 inch SAS/SATA |                                      | Configuration 2<br>24 x 3.5 inch SAS/SATA | Configuration 3<br>24 x 3.5 inch SAS/SATA | Ambient temperature |
|---------------|-------|---|--------------------------------------|---|---|---------------------|
| Rear storage  |       | 4 x 3.5 inch SAS/SATA                     | 4 x 2.5 inch NVMe in Carrier Adapter | 2 x 2.5 inch                              | 2 x 2.5 inch                              |                     |
|               |       |   |                                      | 2U STD HSK                                | 2U STD HSK                                |                     |
|               | 185 W | NA  | NA                                   | STD Fan<br>2U STD HSK                     | STD Fan<br>2U STD HSK                     | 35°C (95°F)         |

- NOTE:** DDR5 DIMM blank is required for Configuration 3.
- NOTE:** HDD blank is required for all Configurations.
- NOTE:** Restrict HDD capacity up to 7.68TB of 2 x 2.5 inch and 4 x 2.5 inch rear storage.
- NOTE:** System cannot support same type of 2.5 inch drive in front and rear storage (4 x 2.5 inch) when using 2.5 inch HDD adapter in Configuration 1
- NOTE:** System can support PCIe card with cooling Tier equal or lower than Tier 5 (300LFM at 55°C) requirement .
- NOTE:** Need optical transceiver with higher temperature spec (>85°C) supporting in rear OCP.
- NOTE:** Need 30C ambient restriction for 960G BOSS module (21GXV, PRV6C, 7MTJ8, KG8M4, and HN8H6) in Configuration 2 and Configuration 3.
- NOTE:** Single CPU support is there only for configuration 1, configuration 2A and configuration 2B

**Table 46. GPU/FPGA thermal restriction matrix**

| Configuration    |       | Configuration 1<br>24 x 3.5 inch SAS/SATA |                                      | Configuration 2<br>24 x 3.5 inch SAS/SATA | Configuration 3<br>24 x 3.5 inch SAS/SATA | Ambient temperature |
|------------------|-------|---|--------------------------------------|---|---|---------------------|
| Rear storage     |       | 4 x 3.5 inch SAS/SATA                     | 4 x 2.5 inch NVMe in Carrier Adapter | 2 x 2.5 inch                              | 2 x 2.5 inch                              |                     |
| CPU TDP/<br>cTDP | 125 W | NA  | NA                                   | NA  | STD Fan<br>2U STD HSK                     | 30°C (86°F)         |
|                  | 150 W | NA  | NA                                   | NA  | STD Fan<br>2U STD HSK                     | 30°C (86°F)         |
|                  | 165 W | NA  | NA                                   | NA  | STD Fan<br>2U STD HSK                     | 30°C (86°F)         |
|                  | 185 W | NA  | NA                                   | NA  | STD Fan<br>2U STD HSK                     | 30°C (86°F)         |

- NOTE:** Can support GPU in Configuration 3 Only .
- NOTE:** Support LP A2 GPU up to 30°C (86°F) ambient.

**NOTE:** DDR5 DIMM blank is required for Configuration 3.

**NOTE:** HDD blank is required for all Configurations.

**NOTE:** Restrict HDD capacity up to 7.68TB of 2 x 2.5 inch and 4 x 2.5 inch rear storage

**NOTE:** System cannot support same type of 2.5 inch drive in front and rear storage (4 x 2.5 inch) when using 2.5 inch HDD adapter in Configuration 1

**NOTE:** Need 30C ambient restriction for 960G BOSS module (21GXV, PRV6C, 7MTJ8, KG8M4 and HN8H6) in Configuration 2 and Configuration 3.

**NOTE:** Single CPU support is there only for configuration 1, configuration 2A and configuration 2B

## Thermal air restrictions

### Fresh air environment

- Two PSUs are required in redundant mode. Single PSU failure is not supported.
- BOSS-N1 (M.2) module is not supported.
- GPU and FPGA are not supported.
- Rear storage module is not supported.
- Non-Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- OCP card with transmission rate higher than 25G is not supported.
- OCP transceiver spec less than or equal to 70°C ( 158°F) is not supported.

### ASHRAE A3 environment

- Two PSUs are required in redundant mode. Single PSU failure is not supported.
- BOSS-N1 (M.2) module is not supported.
- GPU and FPGA are not supported.
- Rear storage module is not supported.
- Non-Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- OCP card with transmission rate higher than 25G is not supported.
- OCP transceiver spec less than or equal to 70°C ( 158°F) is not supported.

### ASHRAE A4 environment

- Two PSUs are required in redundant mode. Single PSU failure is not supported.
- BOSS-N1 (M.2) module is not supported.
- GPU and FPGA are not supported.
- CPU TDP equal or greater than 185 W are not supported.
- Rear storage module is not supported.
- OCP card with transmission rate higher than 25G is not supported.
- OCP transceiver spec less than or equal to 70°C ( 158°F) is not supported.
- Non-Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.

## Appendix A. Standards compliance

The system conforms to the following industry standards.

**Table 47. Industry standard documents**

| Standard   | URL for information and specifications  |
|--|---|
| <b>ACPI</b> Advance Configuration and Power Interface Specification, v2.0c | <a href="https://uefi.org/specsandtesttools">https://uefi.org/specsandtesttools</a>   |
| <b>Ethernet</b> IEEE 802.3-2005  | <a href="https://standards.ieee.org/">https://standards.ieee.org/</a>   |
| <b>HDG</b> Hardware Design Guide Version 3.0 for Microsoft Windows Server  | <a href="https://microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.msp">microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.msp</a>                             |
| <b>IPMI</b> Intelligent Platform Management Interface, v2.0                | <a href="https://intel.com/design/servers/ipmi">intel.com/design/servers/ipmi</a>   |
| <b>DDR5 Memory</b> DDR5 SDRAM Specification                                | <a href="https://jedec.org/standards-documents/docs/jesd79-4.pdf">jedec.org/standards-documents/docs/jesd79-4.pdf</a>   |
| <b>PCI Express</b> PCI Express Base Specification Rev. 2.0 and 3.0         | <a href="https://pcisig.com/specifications/pciexpress">pcisig.com/specifications/pciexpress</a>   |
| <b>PMBus</b> Power System Management Protocol Specification, v1.2          | <a href="http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_1_Rev_1-1_20070205.pdf">http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_1_Rev_1-1_20070205.pdf</a> |
| <b>SAS</b> Serial Attached SCSI, v1.1                                      | <a href="http://www.t10.org/">http://www.t10.org/</a>   |
| <b>SATA</b> Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2   | <a href="https://sata-io.org">sata-io.org</a>   |
| <b>SMBIOS</b> System Management BIOS Reference Specification, v2.7         | <a href="https://dmtf.org/standards/smbios">dmtf.org/standards/smbios</a>   |
| <b>TPM</b> Trusted Platform Module Specification, v1.2 and v2.0            | <a href="https://trustedcomputinggroup.org">trustedcomputinggroup.org</a>   |
| <b>UEFI</b> Unified Extensible Firmware Interface Specification, v2.1      | <a href="https://uefi.org/specifications">uefi.org/specifications</a>   |
| <b>USB</b> Universal Serial Bus Specification, Rev. 2.7                    | <a href="https://usb.org/developers/docs">usb.org/developers/docs</a>   |

## Appendix C Additional resources

**Table 48. Additional resources**

| Resource                                       | Description of contents  | Location  |
|--|--|---|
| Installation and Service Manual                | <p>This manual, available in PDF format, provides the following information:</p> <ul style="list-style-type: none"> <li>• Chassis features</li> <li>• System Setup program</li> <li>• System indicator codes</li> <li>• System BIOS</li> <li>• Remove and replace procedures</li> <li>• Diagnostics</li> <li>• Jumpers and connectors</li> </ul> | <a href="https://Dell.com/Support/Manuals">Dell.com/Support/Manuals</a> |
| Getting Started Guide                          | <p>This guide ships with the system, and is also available in PDF format. This guide provides the following information:</p> <ul style="list-style-type: none"> <li>• Initial setup steps</li> </ul>   | <a href="https://Dell.com/Support/Manuals">Dell.com/Support/Manuals</a> |
| Rack Installation Guide                        | <p>This document ships with the rack kits, and provides instructions for installing a server in a rack.</p>  | <a href="https://Dell.com/Support/Manuals">Dell.com/Support/Manuals</a> |
| System Information Label                       | <p>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.</p>  | Inside the system chassis cover   |
| Quick Resource Locator (QRL)                   | <p>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.</p>   | Inside the system chassis cover   |
| Enterprise Infrastructure Planning Tool (EIPT) | <p>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.</p>   | <a href="https://Dell.com/calc">Dell.com/calc</a>                       |