# Dell PowerEdge T560

## Technical Guide

Regulatory Model: E86S Series
Regulatory Type: E86S001
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DELL Technologies

## Notes, cautions, and warnings

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

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

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

# Contents

1

# Dell PowerEdge T560 system overview

The PowerEdge T560 system is a 2-socket 4.5U tower server that supports:

- Up to two 4th Generation Intel ® Xeon Scalable processors with up to 32 cores per processor
- 16 RDIMM slots
- Two redundant AC or DC power supply units
- Up to 12 x 3.5-inch SAS/SATA HDD drives
- Up to 8 x 3.5-inch SAS/SATA HDD drives
- Up to 8 x 3.5-inch SAS/ SATA HDD + 8 x 2.5-inch NVMe SSD drives
- Up to 8 x 2.5-inch SAS/SATA HDD drives
- Up to 16 x 2.5-inch SAS/SATA HDD drives
- Up to 24 x 2.5-inch SAS/SATA HDD drives

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

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

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

### Topics:



## New technologies

**Table 1. New technologies**

| Technology | Detailed Description |
|---|---|
| 4th Generation Intel ® Xeon Scalable processors | Core count: Up to 32 core processor |
| | UPI speed: Up to 3 links per CPU, speed: 16 GT/s |
| | Maximum number of PCIe lanes per CPU: Integrated 80 PCIe 5.0 lanes @ 32GT/s PCIe Gen5 |
| | Maximum TDP: 250 W |
| 4800 MT/s DDR5 Memory | Max 8 DIMMs per processor and 16 DIMMs per system |
| | Supports DDR5 ECC RDIMM |
| Flex I/O | Onboard LOM board, 2x1Gb with BCM5720 LAN controller |
| | Rear I/O with:<br>• 1x Dedicated iDRAC (RJ45) port |

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

| Technology | | Detailed Description |
|---|---|---|
| | | • 1 x USB 3.0<br>• 1 x USB 2.0<br>• 1 x VGA port |
| | | Optional Serial Port |
| | | Optional OCP Mezz 3.0 (supported by x8 PCIe lanes) |
| | | Front I/O with:<br>• 1 x USB 2.0<br>• 1 x USB 3.0<br>• 1x iDRAC Direct (Micro-AB USB) port |
| CPLD 1-wire | | Support payload data of Front PERC, Riser, BP and Rear IO to BOSS-N1 and iDRAC |
| Dedicated PERC | | Front Storage module PERC with Front PERC11 & PERC12 |
| Software RAID | | OS RAID / S160 (NVMe only) |
| Power Supplies | 60 mm dimension PSU | Platinum 600 W AC/VDC |
| | | Titanium 700 W AC/VDC |
| | | Platinum 800 W AC/VDC |
| | | Titanium 1100 W AC/VDC |
| | | Platinum 1400 W AC/VDC |
| | | 1100 W -48 LVDC |
| | | Titanium 1800 W AC/VDC |
| | 86 mm dimension PSU | Platinum 2400 W AC/VDC |

# Key workloads

The Dell PowerEdge T560 offers powerful performance in a purpose-built, cyber resilient, mainstream server. Ideal for:

- Traditional business applications
- Virtualization
- Data analytics
- Private cloud
- Line of Business ROBO/Edge applications

# 2

# Product comparison

The following table shows the comparison between the PowerEdge T560 with the PowerEdge T550.

**Table 2. Features comparison**

| Features | PowerEdge T560 | PowerEdge T550 |
|---|---|---|
| Processors | Up to two 4th Generation Intel ® Xeon Scalable processorswith up to 32 cores per processor | Up to two 3rd Generation Intel Xeon Scalable processors with up to 32 cores |
| Memory | DIMM Speed<br>• Up to 4800 MT/s<br>Memory Type<br>• RDIMM<br>Memory module slots<br>• 16 DDR5 DIMM slots<br>• Supports registered ECC DDR5 DIMM slots only<br>Maximum RAM<br>• RDIMM 1TB | DIMM Speed<br>• Up to 3200 MT/s<br>Memory Type<br>• RDIMM<br>Memory module slots<br>• 16 DDR4 DIMM slots<br>• Supports registered ECC DDR4 DIMM slots only<br>Maximum RAM<br>• RDIMM 1TB |
| Storage Controllers | • Internal PERC: fPERC HBA355i, fPERC H755, fPERC H755N, fPERC H355, fPERC H965i<br>• Internal Boot: Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 NVMe SSDs drives, or USB<br>• External HBA (non-RAID): PERC HBA355e<br>• Software RAID: S160 (NVMe only) | • Internal controllers: PERC H345, PERC H755, H755N, HBA355i<br>• Internal Boot: Internal Dual SD Module or Boot Optimized Storage Subsystem (BOSS-S2): HWRAID 2 x M.2 SSDs or USB<br>• External Controller (RAID): PERC H840<br>• External HBAs (non-RAID): HBA355e<br>• Software RAID: S150 |
| Drive Bays | Front bays:<br>• Up to 12 x 3.5-inch SAS/SATA HDD drives, max 180 TB<br>• Up to 8 x 3.5-inch SAS/SATA HDD drives, max 120 TB<br>• Up to 8 x 3.5-inch SAS/ SATA HDD + 8 x 2.5-inch NVMe SSD drives, max 240 TB<br>• Up to 8 x 2.5-inch SAS/SATA HDD drives, max 120 TB<br>• Up to 16 x 2.5-inch SAS/SATA HDD drives, max 240 TB<br>• Up to 24 x 2.5-inch SAS/SATA HDD drives, max 360 TB | Front bays:<br>• Up to 8 x 2.5-inch SAS/SATA (hard drive) max 120 TB<br>• 16 x 2.5-inch SAS/SATA (HDD) max 240 TB<br>• 24 x 2.5-inch SAS/SATA (HDD)max 360 TB<br>• 8 x 3.5-inch SAS/SATA (HDD/SAS) max 120 TB<br>• 8 x 3.5-inch SAS/SATA (HDD) + 8 x 2.5-inch NVMe (SSD) max 240 TB |
| Power Supplies | • 600 W Platinum 100-240 VAC or 600 W 240 HVDC, hot swap redundant<br>• 800 W Platinum 100-240 VAC or 800 W 240 HVDC, hot swap redundant<br>• 1100 LVDC -48 - (-60) VDC, hot swap redundant<br>• 1400 W Platinum 100-240 VAC or 1400 W 240 HVDC, hot swap redundant<br>• 2400 W Platinum 100-240 VAC or 2400 W 240 HVDC, hot swap redundant<br>• 700 W Titanium 200-240 VAC or 700 W 240 HVDC, hot swap redundant | • 600 W Platinum AC/100 - 240 V<br>• 600 W DC/240 V<br>• 800 W Platinum AC/100 - 240 V<br>• 800 W DC/240 V<br>• 1100 W Titanium AC/100 - 240 V<br>• 1100 W DC/240 V<br>• 1100 W DC/-48 V<br>• 1400 W Platinum AC/100 - 240 V<br>• 1400 W DC/240 V<br>• 2400 W Platinum AC/100 - 240 V<br>• 2400 W DC/240 V |

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

| Features | PowerEdge T560 | PowerEdge T550 | |
|---|---|---|---|
| | • 1100 W Titanium 100-240 VAC or 1100 W 240 HVDC, hot swap redundant<br>• 1800 W Titanium 200-240 VAC or 1800 W 240 HVDC, hot swap redundant | | |
| Cooling Options | Air cooling | Air Cooling | |
| Fans | Standard (STD) fans or High performance (HPR) fans | Standard (STD) fans /High performance (HPR) silver fans | |
| | Up to eight hot swap fans | Up to eight hot swap fans | |
| Dimension | Height: 464.0 mm (18.26 inches) (with feet) | Height: 464.0 mm (18.26 inches) (with feet) | |
| | 446.0 mm (17.60 inches) (without feet) | 446.0 mm (17.60 inches) (without feet) | |
| | 508.8 mm (20.03 inches) (with caster wheels) | 508.8 mm (20.03 inches) (with caster wheels) | |
| | Width — 200.0 mm (7.87 inches) | Width — 200.0 mm (7.87 inches) | |
| | Depth — 678.2 mm (26.70 inches) (with bezel) | Depth — 678.2 mm (26.70 inches) (with bezel) | |
| | 660.6 mm (26 inches) (without bezel) | 660.6 mm (26 inches) (without bezel) | |
| Form Factor | 4.5U tower server | 4.5U tower server | |
| Embedded Management | • iDRAC9<br>• iDRAC Direct<br>• iDRAC RESTful API with Redfish<br>• iDRAC Service Module<br>• Quick Sync 2 wireless module | • iDRAC9<br>• iDRAC Direct<br>• iDRAC RESTful with Redfish<br>• iDRAC Service Manual<br>• Quick Sync 2 wireless module<br>**NOTE:** iDRAC Direct and Quick Sync 2 are available only as an upsell on T550. | |
| Bezel | Security bezel | Optional LCD bezel or security bezel | |
| OpenManage Software | • OpenManage Enterprise<br>• OpenManage Power Manager plugin<br>• OpenManage Service plugin<br>• OpenManage Update Manager plugin<br>• CloudIQ for PowerEdge plug in<br>• OpenManage Enterprise Integration for VMware vCenter<br>• OpenManage Integration for Microsoft System Center<br>• OpenManage Integration with Windows Admin Center | • OpenManage Enterprise<br>• OpenManage Power Manager plug-in<br>• OpenManage SupportAssist plug-in<br>• OpenManage Update Manager plug-in | |
| Mobility | OpenManage Mobile | OpenManage Mobile | |
| Integrations and Connections | • BMC Truesight<br>• Microsoft System Center<br>• OpenManage Integration with ServiceNow<br>• Red Hat Ansible Modules<br>• Terraform Providers<br>• VMware vCenter and vRealize Operations Manager | OpenManage Integrations<br>• BMC TrueSight<br>• Microsoft System Center<br>• Red Hat Ansible Modules<br>• VMware vCenter and vRealize Operations Manager | OpenManage Connections<br>• IBM Tivoli Netcool/ OMNIbus<br>• IBM Tivoli Network Manager IP Edition<br>• Micro Focus Operations Manager |

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

| Features | PowerEdge T560 | | PowerEdge T550 | |
|---|---|---|---|---|
| | | | | • Nagios Core<br>• Nagios XI |
| Security | • Cryptographically signed firmware<br>• Data at Rest Encryption (SEDs with local or external key mgmt)<br>• Secure Boot<br>• Secured Component Verification (Hardware integrity check)<br>• Secure Erase<br>• Silicon Root of Trust<br>• System Lockdown (requires iDRAC9 Enterprise or Datacenter)<br>• TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ | | • Cryptographically signed firmware<br>• Secure Boot<br>• Secure Erase<br>• Silicon Root of Trust<br>• System Lockdown (requires iDRAC9 Enterprise or Datacenter)<br>• TPM 1.2/2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ | |
| Embedded NIC | 2 x 1 GbE LOM | | 2 x 1 GbE LOM | |
| Networking Options | OCP x8 3.0 | | OCP x16 Mezz 3.0 | |
| GPU Options | Up to 2 x double-width 300 W or 6 x single-width 75 W accelerators | | Up to 2 x double-width 300 W, or 5 x single-width 70 W accelerators | |
| Ports | Front Ports<br>• 1 x USB 2.0<br>• 1 x USB 3.0<br>• 1 x iDRAC Direct (Micro-AB USB) port | Rear Ports<br>• 1 x USB 2.0<br>• 1 x USB 3.0<br>• 1 x Serial port (optional)<br>• 1 x Dedicated iDRAC management (RJ45) port<br>• 2 x Ethernet ports<br>• 1 x VGA port | Front Ports<br>There are 2 SKUs:<br>• Base: Status LED only<br>○ 1 x USB 2.0<br>○ 1 x USB 3.0<br>Upsell: Status LED only and Quick Sync 2<br>• 1 x USB 2.0<br>• 1 x USB 3.0<br>• 1 x iDRAC Direct (Micro-AB USB) port | Rear Ports<br>• 1 x USB 2.0<br>• 1 x iDRAC Direct ethernet port<br>• 1 x USB 3.0<br>• 1 x Serial port (optioanl)<br>• 1 x VGA |
| | Internal Port : 1 x USB 3.0 (optional) | | Internal Port: 1 x USB 3.0 | |
| PCIe | Up to six PCIe slots: 4 x PCIe Gen4 slots and 2 x PCIe Gen5 slots | | 3x PCIe Gen4 slots (all x16) + 1x PCIe Gen3 slot (x8) + Upsell: up to 2 PCIe x16 DW for GPU | |
| | Slot 1: x16 Gen5 Full height, full length | | | |
| | Slot 2: x16 Gen5 Full height, full length | | | |
| | Slot 3: x16 Gen4 Full height, half length | | | |
| | Slot 4: x16 Gen4 Full height, half length | | | |
| | Slot 5: x16 (with x8 lanes) Gen4 Full height, half length | | | |
| | Slot 6: x16 Gen4 Full height, half length | | | |
| Operating System and Hypervisors | • Canonical Ubuntu Server LTS<br>• Microsoft Windows Server with Hyper-V<br>• Red Hat Enterprise Linux<br>• SUSE Linux Enterprise Server<br>• VMware ESXi<br>For specifications and interoperability details, see Dell.com/OSsupport. | | • Canonical Ubuntu Server LTS<br>• Citrix Hypervisor<br>• Windows Server with Hyper-V<br>• Red Hat Enterprise Linux<br>• SUSE Linux Enterprise Server<br>• VMware ESXi | |

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

| Features | PowerEdge T560 | PowerEdge T550 |
|---|---|---|
| | | For specifications and interoperability details, see Dell EMC Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport. |

# 3

# Chassis views and features

**Topics:**

- Chassis views

## Chassis views

### Front view of the system

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

Figure 2. Front view of 8 x 3.5-inch drive system

Figure 3. Front view of 8 x 3.5-inch + 8 x 2.5-inch drive system

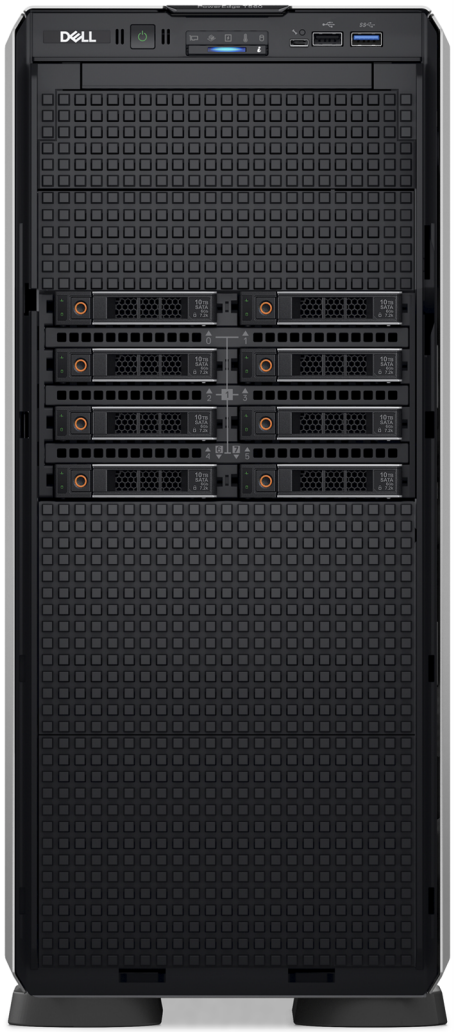

Figure 4. Front view of 8 x 2.5-inch drive system

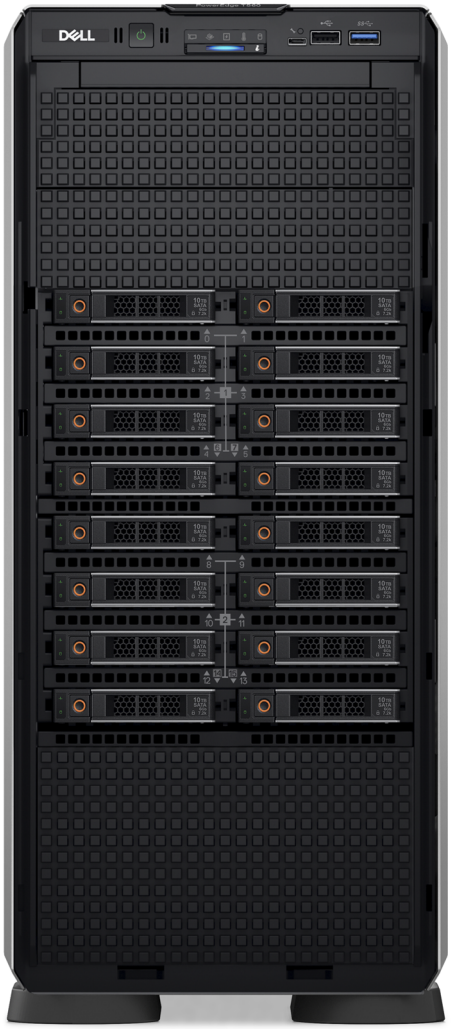

Figure 5. Front view of 16 x 2.5-inch drive system

Figure 6. Front view of 24 x 2.5-inch drive system

# Rear view of the system


**Figure 7. Rear view of the system**

# Inside the system

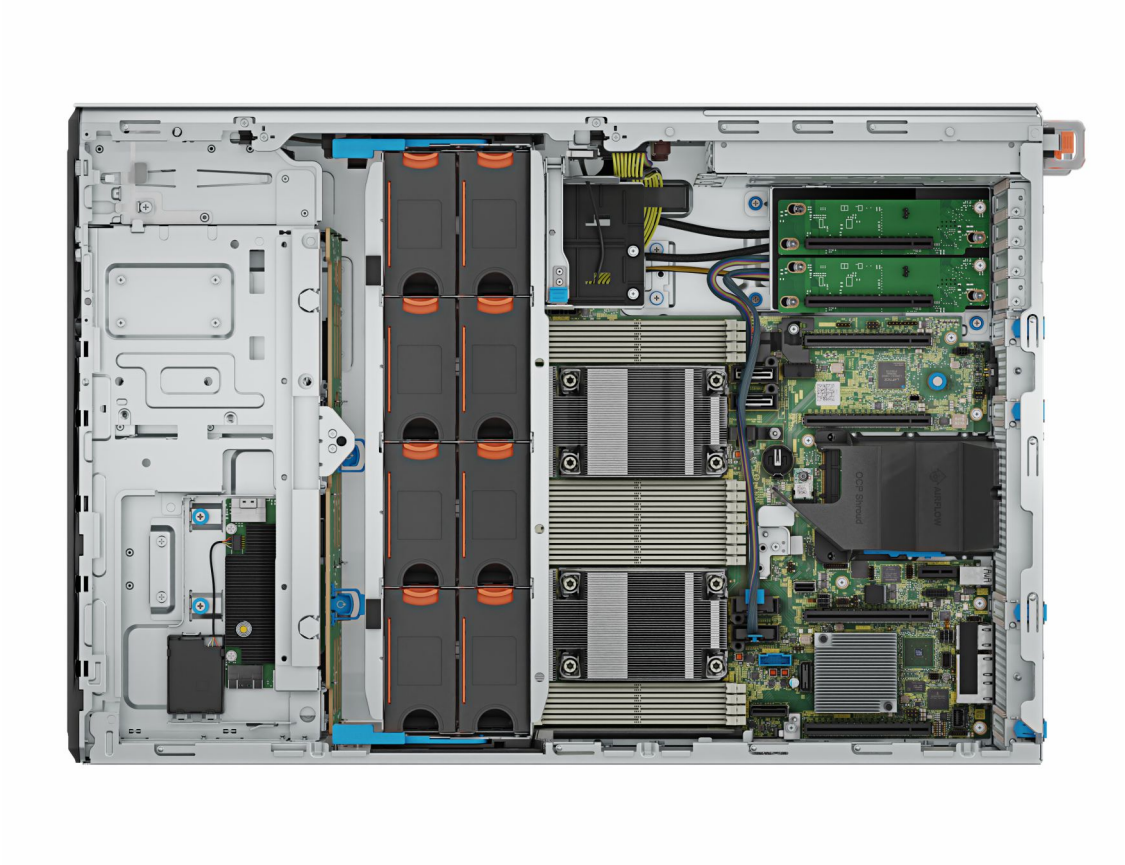

Figure 8. Inside view of the 12 x 3.5-inch configuration + PCIe Gen5 system

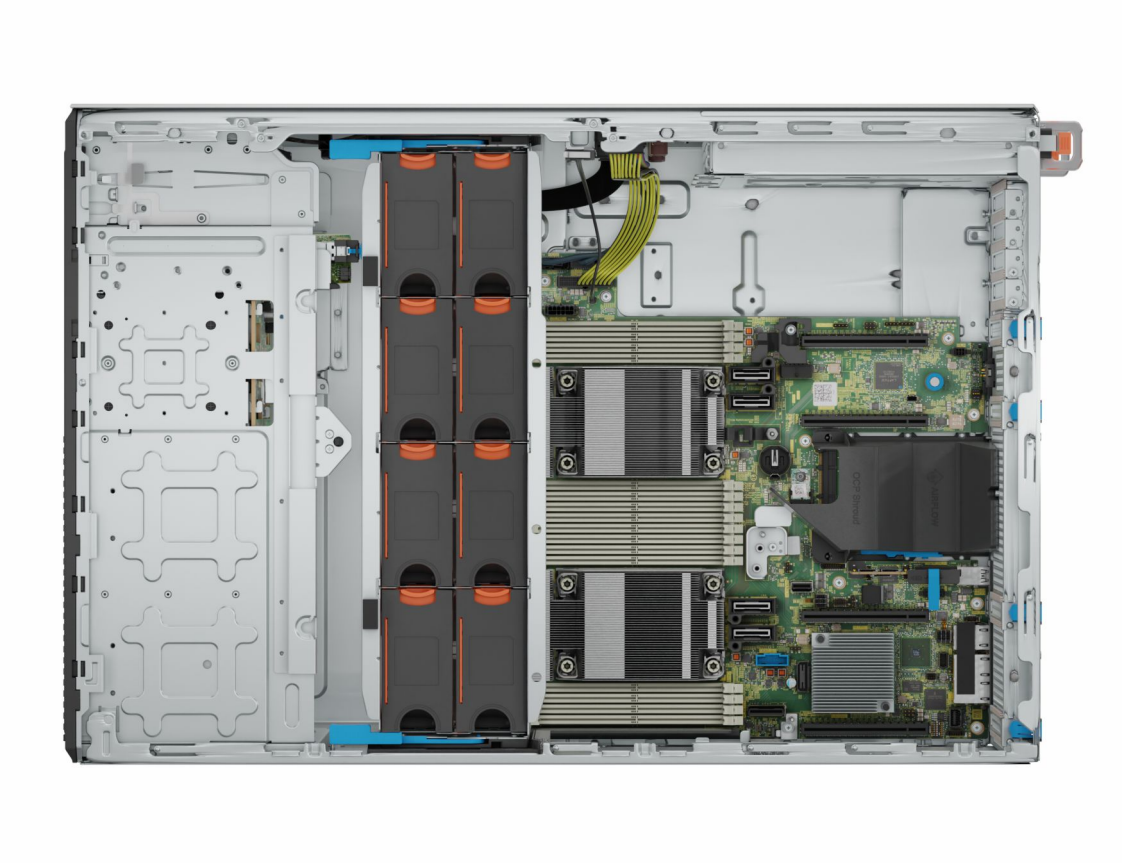

**Figure 9. Inside view of the 24 x 2.5-inch configuration system**

# Quick Resource Locator

The QRL on everything (SILs, GSG, Owner's Manual except on the EST) is a generic QRL for T560 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 T560 that is available in the other QRLs.


**Figure 10. Quick Resource Locator for PowerEdge T560 system**

# 4

# Processor

**Topics:**

- Processor features

## Processor features

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

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

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

## Supported processors

The following table shows the Intel Sapphire Rapids SKUs that are supported on the T560.

**Table 3. Supported Processors for T560**

| Processor | Clock Speed (GHz) | Cache (M) | UPI (GT/s) | Cores | Threads | Turbo | Memory Speed (MT/s) | Memory Capacity | TDP |
|---|---|---|---|---|---|---|---|---|---|
| 6448Y | 2.1 | 60 | 16 | 32 | 64 | Turbo | 4800 | 6TB | 225W |
| 6442Y | 2.6 | 60 | 16 | 24 | 48 | Turbo | 4800 | 6TB | 225W |
| 6438Y+ | 2 | 60 | 16 | 32 | 64 | Turbo | 4800 | 6TB | 205W |
| 6438M | 2.2 | 60 | 16 | 32 | 64 | Turbo | 4800 | 6TB | 205W |
| 6434 | 3.7 | 23 | 16 | 8 | 16 | Turbo | 4800 | 6TB | 205W |
| 6426Y | 2.5 | 38 | 16 | 16 | 32 | Turbo | 4800 | 6TB | 185W |
| 5420+ | 2 | 53 | 16 | 28 | 56 | Turbo | 4400 | 6TB | 205W |
| 5418Y | 2 | 45 | 16 | 24 | 48 | Turbo | 4400 | 6TB | 185W |
| 5416S | 2 | 30 | 16 | 16 | 32 | Turbo | 4400 | 6TB | 150W |
| 5415+ | 2.9 | 23 | 16 | 8 | 16 | Turbo | 4400 | 6TB | 150W |
| 5412U | 2.1 | 45 | 16 | 24 | 48 | Turbo | 4400 | 6TB | 185W |
| 4416+ | 2 | 38 | 16 | 20 | 40 | Turbo | 4000 | 6TB | 165W |
| 4410Y | 2 | 30 | 16 | 12 | 24 | Turbo | 4000 | 6TB | 150W |
| 4410T | 2.7 | 27 | 16 | 10 | 20 | Turbo | 4000 | 6TB | 150W |
| 3408U | 1.8 | 23 | 16 | 8 | 16 | No Turbo | 4000 | 6TB | 125W |

# 5

# Memory subsystem

**Topics:**

- Supported memory

## Supported memory

**Table 4. Memory technology comparison**

| Feature | PowerEdge T560 (DDR5) |
|---|---|
| DIMM type | RDIMM |
| Transfer speed | 4800 MT/s (1DPC) |
| Voltage | 1.1 V |

**Table 5. Supported DIMMs**

| Rated DIMM Speed (MT/s) | DIMM Type | DIMM Capacity (GB) | Ranks per DIMM | Data Width | DIMM Volts (V) |
|---|---|---|---|---|---|
| 4800 | RDIMM | 16 | 1 | x8 | 1.1 |
| 4800 | RDIMM | 32 | 2 | x8 | 1.1 |
| 4800 | RDIMM | 64 | 2 | x4 | 1.1 |

**Table 6. Supported memory matrix**

| DIMM type | Rank | Capacity | DIMM rated voltage and speed | Operating Speed |
|---|---|---|---|---|
| | | | | 1 DIMM per channel (DPC) |
| RDIMM | 1 R | 16 GB | DDR5 (1.1 V), 4800 MT/s | 4800 MT/s |
| | 2 R | 32 GB, 64 GB | DDR5 (1.1 V), 4800 MT/s | 4800 MT/s |

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

# 6

# Storage

**Topics:**



## Storage controllers

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

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

**Table 7. PERC Series controller offerings**

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

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

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

## Supported Drives

**Table 8. Supported Drives**

| Form Factor | Type | Speed | Rotational Speed | Capacities |
|---|---|---|---|---|
| 2.5 inches | vSAS | 12 Gb | SSD | 1.92 TB, 3.84 TB, 960 GB, 7.68 TB |

### Table 8. Supported Drives (continued)

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

# Internal storage configuration

T560 available internal storage configurations:

- 12 x 3.5-inch (SAS/SATA) drives
- 8 x 3.5-inch (SAS/SATA) drives
- 8 x 3.5-inch (SAS/SATA) + 8x2.5-inch NVMe SSD drives
- 8 x 2.5-inch (SAS/SATA) drives
- 16 x 2.5-inch (SAS/SATA) drives
- 24 x 2.5-inch (SAS/SATA) drives

# External Storage

The T560 support the external storage device types listed in the table below.

### Table 9. Support External Storage Devices

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

# 7

# Networking

**Topics:**



## Overview

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

## OCP 3.0 support

**Table 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. Supported OCP cards**

| Form factor | Vendor | Port type | Port speed | Port count |
|---|---|---|---|---|
| OCP 3.0 | Intel | V2 | 10GbE | 4 |
| | Intel | V2 | 25GbE | 4 |
| | Broadcom | BT | 10GbE | 4 |
| | Broadcom | V2 | 10GbE | 2 |
| | Intel | V2 | 10GbE | 2 |
| | Intel | V2 | 1GbE | 4 |

**Table 11. Supported OCP cards (continued)**

| Form factor | Vendor | Port type | Port speed | Port count |
|---|---|---|---|---|
| | Broadcom | V3 | 25GbE | 2 |
| | Intel | V2 | 25GbE | 2 |

# 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 x8 | See server slot priority matrix |
| Shared LOM | Yes | Yes | Yes | This is iDRAC port redirect |
| Aux Power | Yes | Yes | Yes | Used for Shared LOM |

# 8

# PCIe subsystem

**Topics:**

- PCIe risers

## PCIe risers

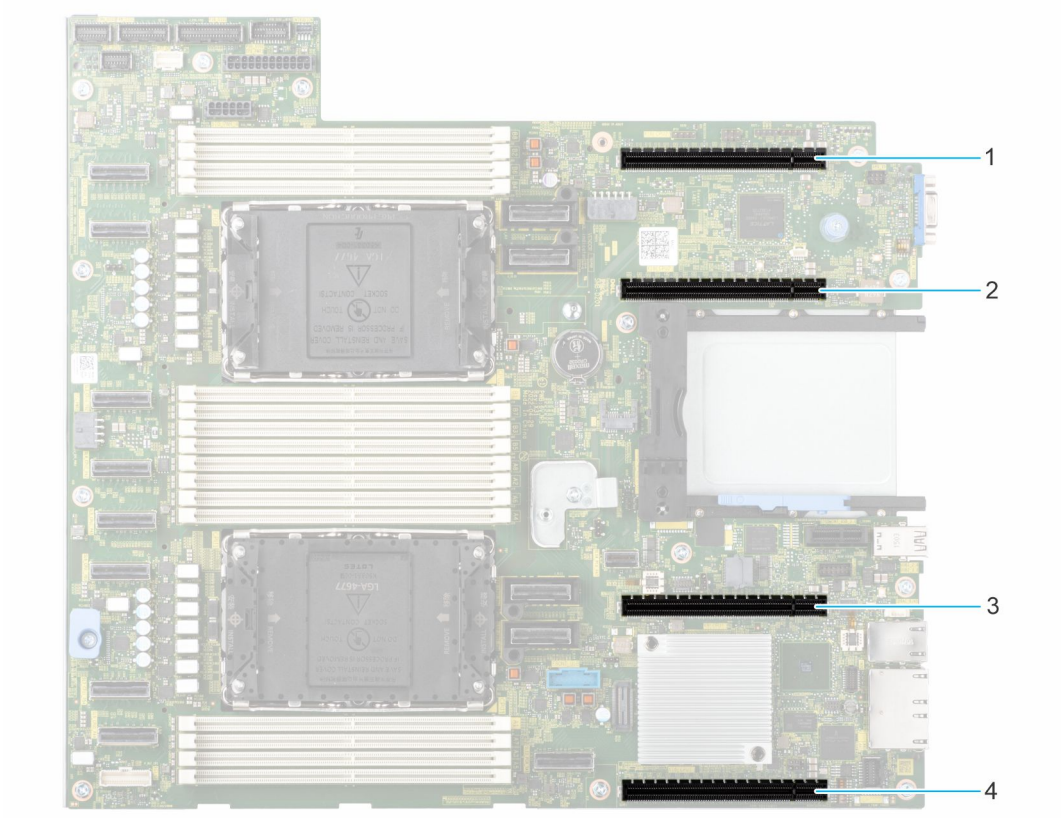


**Figure 11. Riser connector slots on system board**

1. PCIe Slot 3 (CPU 2)
2. PCIe Slot 4 (CPU 2)
3. PCIe Slot 5 (CPU 1)
4. PCIe Slot 6 (CPU 1)

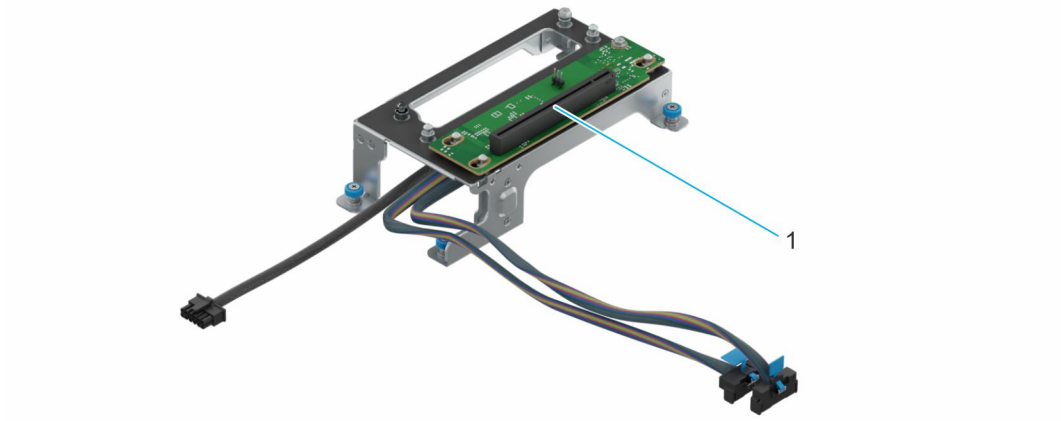


**Figure 12. GPU Riser RC1 Module**

1. Slot 2

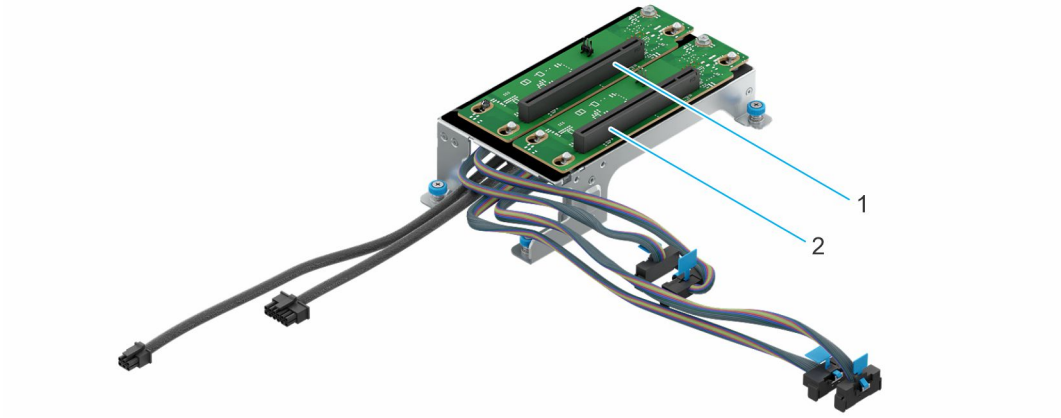


**Figure 13. GPU Riser RC2 Module**

1. Slot 1
2. Slot 2

## Table 13. PCIe Riser Configurations

| Config No. | Riser configuration | No. of Processors | PERC type supported | Rear storage possible |
|---|---|---|---|---|
| 0 | N/A | 2 | fPERC | No |
| 0-1 | N/A | 1 | fPERC | No |
| 1 | 1 x GPU Riser | 1 | fPERC | No |
| 1-1 | 1 x GPU Riser | 2 | fPERC | No |
| 2 | 2 x GPU Riser | 2 | fPERC | No |

# 9

# Power, thermal, and acoustics

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

**Topics:**



## Power

**Table 14. Power tools and technologies**

| Feature | Description |
|---|---|
| Power Supply Units(PSU) portfolio | Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section. |
| Tools for right sizing | Enterprise Infrastructure Planning Tool (EIPT) is a tool that can help you determine the most efficient configuration possible. With Dell's EIPT, you can calculate the power consumption of your hardware, power infrastructure, and storage at a given workload. Learn more at www.dell.com/calc. |
| Industry Compliance | Dell's servers are compliant with all relevant industry certifications and guide lines, including 80 PLUS, Climate Savers and ENERGY STAR. |
| Power monitoring accuracy | PSU power monitoring improvements include:<br>● Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5%<br>● More accurate reporting of power<br>● Better performance under a power cap |
| Power capping | Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping. |
| Systems Management | iDRAC Enterprise and Datacenter provides server-level management that monitors, reports and controls power consumption at the processor, memory and system level.<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>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 14. Power tools and technologies (continued)**

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

# PSU specifications

The PowerEdge T560 system supports up to two AC or DC power supply units (PSUs).

**Table 15. PSU specifications**

| PSU | Class | Heat dissipation (maximum) | Frequency | Voltage | AC | | DC | Current |
|---|---|---|---|---|---|---|---|---|
| | | | | | High line 200–240 V | Low line 100–120 V | | |
| 600 W Mixed Mode | Platinum | 2250 BTU/hr | 50/60 Hz | 100 - 240 V, autoranging | 600 W | 600 W | N/A | 7.1 A - 3.6 A |
| | N/A | 2250 BTU/hr | N/A | 240 V DC | N/A | N/A | 600 W | 2.9 A |
| 700 W Mixed Mode | Titanium | 2625 BTU/hr | 50/60 Hz | 200–240 V AC | 700 W | NA | NA | 4.1 A |
| | NA | 2625 BTU/hr | NA | 240 V DC | NA | NA | 700 W | 3.4 A |
| 800 W Mixed Mode | Platinum | 3000 BTU/hr | 50/60 Hz | 100 - 240 V, autoranging | 800 W | 800 W | N/A | 9.2 A - 4.7 A |
| | N/A | 3000 BTU/hr | N/A | 240 V DC | N/A | N/A | 800 W | 3.8 A |
| 1100 W DC | N/A | 4265 BTU/hr | N/A | -48 VDC – -60 VDC | N/A | N/A | 1100 W | 27 A |
| 1100 W Mixed Mode | Titanium | 4125 BTU/hr | 50/60 Hz | 100 - 240 V | 1100 W | 1050 W | N/A | 12 A - 6.3 A |
| | N/A | 4125 BTU/hr | N/A | 240 V DC | N/A | N/A | 1100 W | 5.2 A |
| 1400 W Mixed Mode | Platinum | 5250 BTU/hr | 50/60 Hz | 100 - 240 V | 1400 W | 1050 W | N/A | 12 A - 8 A |
| | N/A | 5250 BTU/hr | N/A | 240 V DC | N/A | N/A | 1400 W | 6.6 A |

### Table 15. PSU specifications (continued)

| PSU | Class | Heat dissipation (maximum) | Frequency | Voltage | AC | | DC | Current |
|---|---|---|---|---|---|---|---|---|
| | | | | | High line 200–240 V | Low line 100–120 V | | |
| 1800 W Mixed Mode | Titanium | 6610 BTU/hr | 50/60 Hz | 200–240 V AC | 1800 W | NA | NA | 10 A |
| | NA | 6610 BTU/hr | NA | 240 V DC | NA | NA | 1800 W | 8.2 A |
| 2400 W Mixed Mode | Platinum | 9000 BTU/hr | 50/60 Hz | 100 - 240 V, autoranging | 2400 W | 1400 W | N/A | 16 A - 13.5 A |
| | N/A | 9000 BTU/hr | N/A | 240 V DC | N/A | N/A | 2400 W | 11.2 A |

**NOTE:** This system is also designed to connect to the IT power systems with a phase-to-phase voltage not exceeding 240 V.

**NOTE:** If a system with AC 1400W/1100W PSUs operates at low line 100-120 V AC, then the power rating per PSU is derated to 1050W.

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

**NOTE:** Heat dissipation is calculated using the PSU wattage rating.

**NOTE:** When selecting or upgrading the system configuration, to ensure optimum power utilization, verify the system power consumption with the Dell Energy Smart Solution Advisor available at **Dell.com/ESSA**.


**Figure 14. PSU power cord connectors**

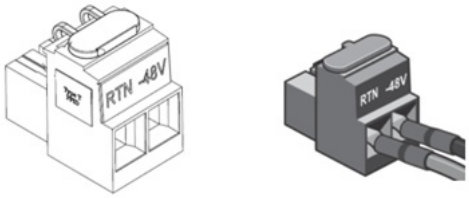


**Figure 15. Lotes DC PSU connector**

### Table 16. PSU power cords

| Form factor | Output | Power cord |
|---|---|---|
| Redundant 60 mm | 600 W AC | C13 |
| | 700 W AC | C13 |
| | 800 W AC | C13 |

**Table 16. PSU power cords (continued)**

| Form factor | Output | Power cord |
|---|---|---|
| | 1100 W AC | C13 |
| | 1100 W -48 LVDC | Lotes DC PSU connector |
| | 1400 W AC | C13 |
| | 1800 W AC | C15 |
| Redundant 86 mm | 2400 W AC | C19 |

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

# Thermal

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

## Thermal design

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

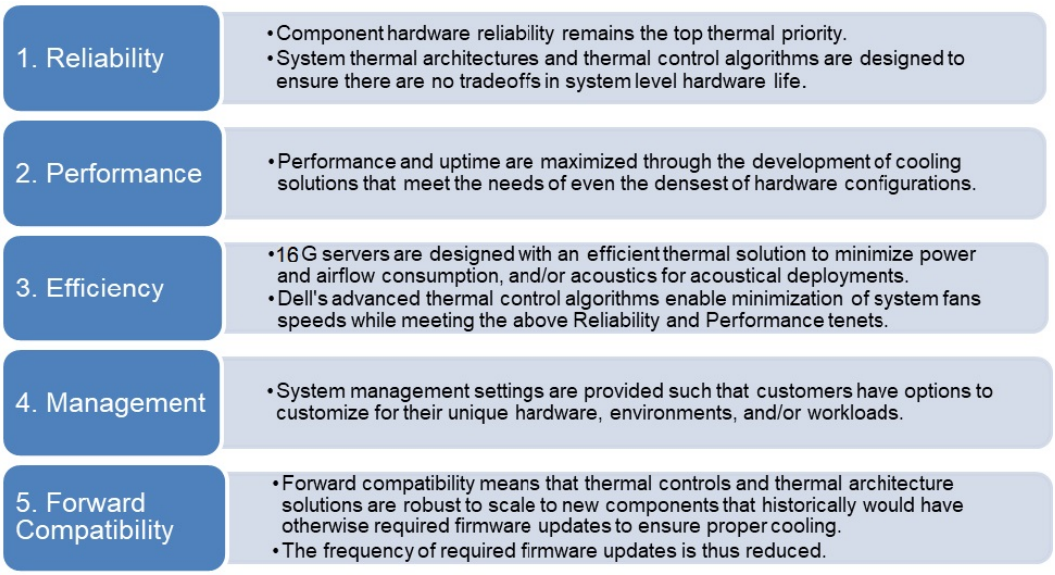


**Figure 16. Thermal design characteristics**

The thermal design of the PowerEdge T560 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 T560 Installation and Service Manual at www.dell.com/poweredgemanuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- Cooling redundancy: The T560 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.
- Environmental Specifications: The optimized thermal management makes the T560 reliable under a wide range of operating environments.

# Acoustics

## Acoustical configurations of T560

Dell PowerEdge T560 is a tower server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations.

**Table 17. Configurations tested for acoustical experience**

| Configuration | Near Desk | Typical-1, 2.5-inch | Typical-2, 3.5-inch | GPU configuration |
|---|---|---|---|---|
| CPU TDP | 125 W | 185 W | 185 W | 225 W |
| CPU Quantity | 2 | 2 | 2 | 2 |
| RDIMM Memory | 16 GB RDIMM DDR5 | 16 GB RDIMM DDR5 | 32 GB RDIMM DDR5 | 64 GB RDIMM DDR5 |
| Memory Quantity | 8 | 16 | 16 | 16 |
| Backplane Type | 16 x 2.5-inch BP | 24 x 2.5-inch exp BP | 12 x 3.5-inch BP + 2 x 2.5-inch rear BP | 24 x 2.5-inch exp BP |
| HDD Type | 2.5-inch 10K SAS | 2.5-inch 10K SAS | 3.5-inch SATA | 2.5-inch 15K SAS |
| HDD Quantity | 4 | 16 | 12 | 8 |
| Flash Drives | X | X | X | 2.5-inch NVMe |
| Flash Quantity | X | X | X | 8 |
| PSU Type | 600 W | 800 W | 1400 W | 2400 W |
| PSU Quantity | 2 | 2 | 2 | 2 |
| OCP | 2x10 Gbe | 10/25G 2-port | 10/25G 2-port | 25G 2-port |
| PCI 1 | X | 2-port 25 Gb | 2-port 25 Gb | DW GPU |
| PCI 2 | X | 2-port 25 Gb | 2-port 25 Gb | DW GPU |
| PCI 3 | X | X | X | LP 100 Gb |
| PCI 4 | X | X | X | LP 100 Gb |
| PCI 5 | X | X | X | X |
| PCI 6 | X | X | X | X |
| Front PERC | fPERC H345 | fPERC H755P | fPERC H755P | fPERC H755P |

**Table 18. Acoustical performance of T560 acoustical configurations**

| Configuration | | Minimum | Basic | Mainstream | Feature Rich | Hilltop |
|---|---|---|---|---|---|---|
| Acoustical Performance: Idle/ Operating @ 25 °C Ambient | | | | | | |
| $L_{wA,m}$ (B) | Idle | 4.3 | 4.4 | 4.8 | 4.9 | 5.7 |
| | Operating | 4.4 | 4.7 | 4.9 | 5.3 | 8.6 |
| $K_v$ (B) | Idle | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |

**Table 18. Acoustical performance of T560 acoustical configurations (continued)**

| Configuration | | Minimum | Basic | Mainstream | Feature Rich | Hilltop |
|---|---|---|---|---|---|---|
| | Operating | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| $L_{pA,m}$ (dB) | Idle | 35 | 36 | 40 | 41 | 43 |
| | Operating | 36 | 41 | 41 | 45 | 72 |
| Prominent tones | | No prominent tones in Idle and Operating | | | | |
| Acoustical Performance: Idle @ 28 °C Ambient | | | | | | |
| $L_{wA,m}$ (B) | | 5 | 5 | 5.1 | 5.3 | 6.1 |
| $K_v$ (B) | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| $L_{pA,m}$ (dB) | | 42 | 42 | 43 | 45 | 47 |
| Acoustical Performance: Max. Loading @ 35 °C Ambient | | | | | | |
| $L_{wA,m}$ (B) | | 6.2 | 6.4 | 7.4 | 6.1 | 8.6 |
| $K_v$ (B) | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| $L_{pA,m}$ (dB) | | 59 | 61 | 71 | 58 | 72 |

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

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

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

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

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

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

# PowerEdge T560 acoustical dependencies

Some product features impact acoustical server output more than others. The following features are considered strong drivers of acoustical response, thus configurations, or operating conditions that include these features may increase air mover speed and acoustical output of the server:

- Ambient temperature: Dell evaluates the acoustical performance of servers in a 23±2°C environment. Ambient temperatures more than 25°C has higher acoustical output and may experience larger fluctuations between state changes.
- Processor thermal design power (TDP): Higher wattage processors may require more airflow to cool under load and thus increase the potential acoustical output of the system.
- Storage type: NVMe SSD consumes more power than SAS/SATA drives, and will pre-heat down-stream components (for example, Processor, DIMM), and hence requires higher fan speeds and hence higher acoustical outputs.
- **System thermal profile** selection in BIOS or iDRAC GUI:
  - **Default Thermal Profile**, generally provides a lower air mover speed thus lower acoustical output than those of other thermal profiles.
  - Maximum Performance (Performance Optimized) will result in higher acoustical output.
  - Sound Cap, for products that supports the feature, will limit the maximum acoustical output of the system by sacrificing some processor performance.
- PCIe cards: When 25 Gb NIC card or GPU card ≥ 75 W is installed, the acoustical outputs are higher in both idle and operating conditions.

10

# 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.

# 11

# Dell OpenManage Systems Management

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

The OpenManage portfolio includes:

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

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

For more information about the entire OpenManage portfolio, see:

- The latest Dell Systems Management Overview Guide.

**Topics:**



# Integrated Dell Remote Access Controller (iDRAC)

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

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

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

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

iDRAC9 offers following license tiers:

### Table 19. iDRAC9 license tiers

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

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

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

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

# Systems Management software support matrix

### Table 20. 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 20. Systems Management software support matrix (continued)**

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

12

# Appendix D: Service and support

**Topics:**



## Default support levels

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

### Default deployment levels

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

## Other services and support information

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

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

### Dell deployment services

#### Dell ProDeploy Infrastructure Suite

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

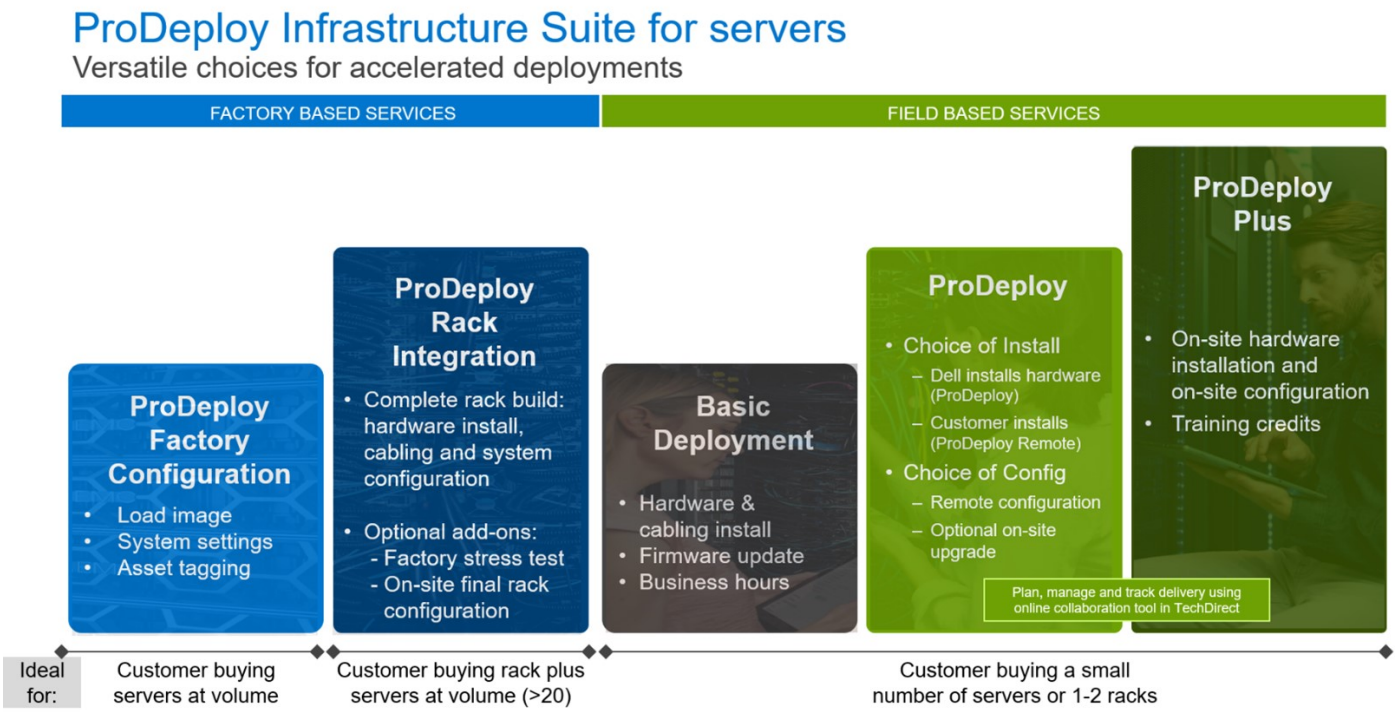


**Figure 17. ProDeploy Infrastructure Suite for servers**

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

**Factory Based Services:**

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

**Field Based Services:**

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

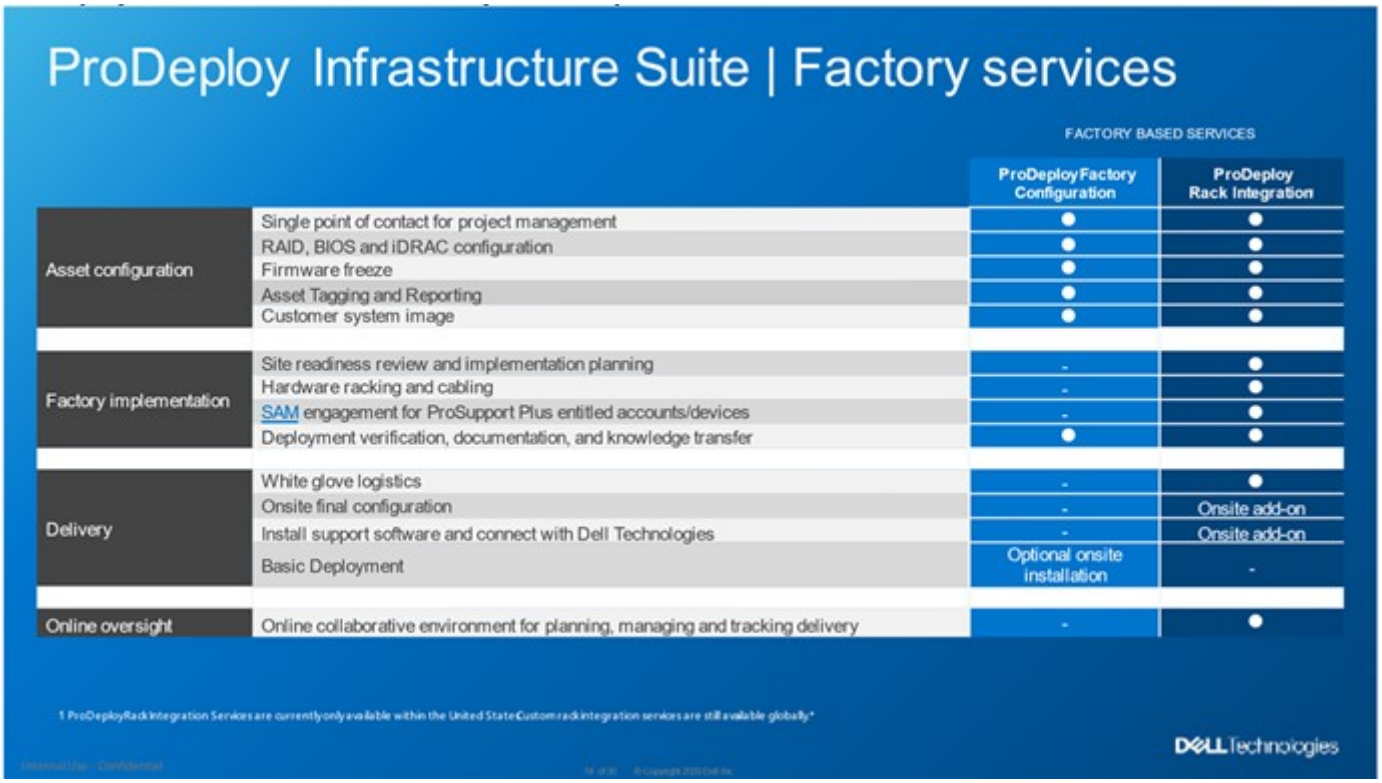


**Figure 18. ProDeploy Infrastructure Suite - Factory services**

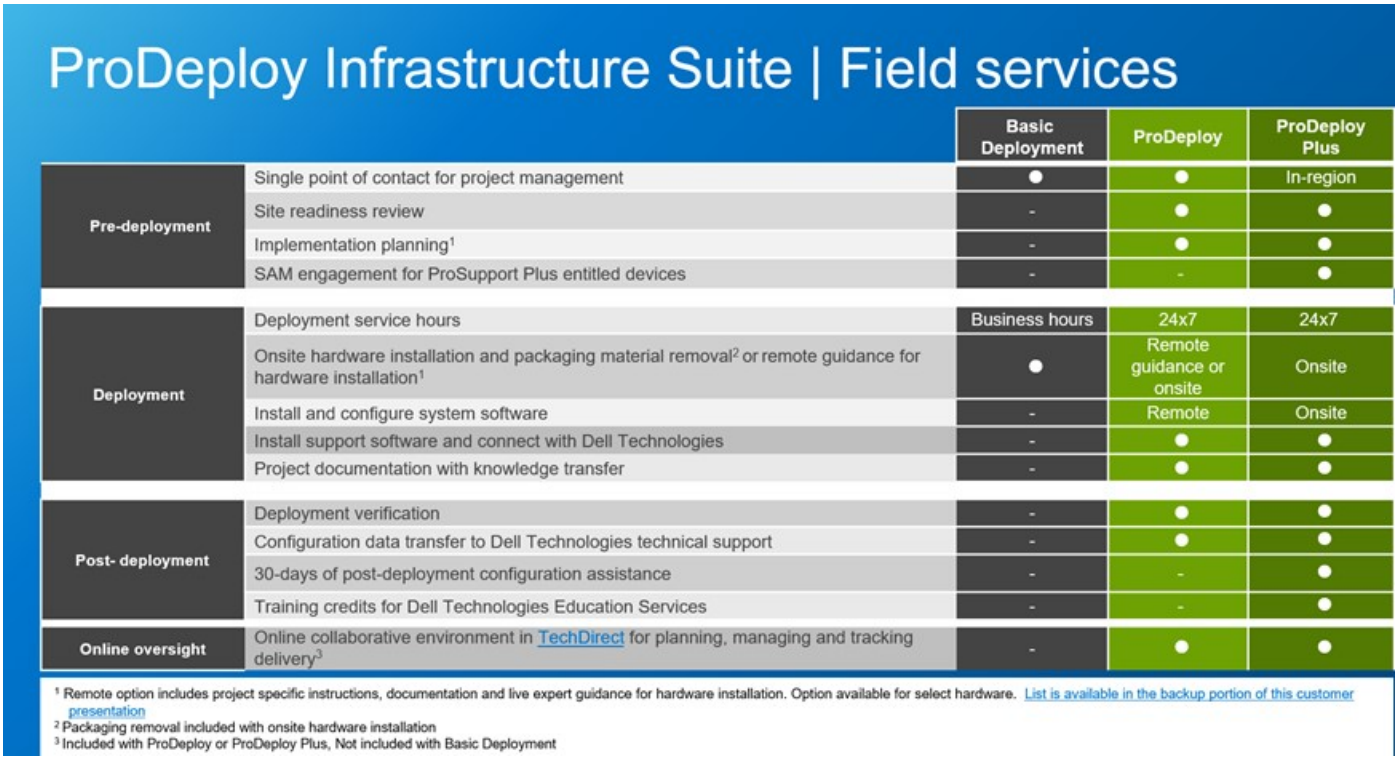


**Figure 19. ProDeploy Infrastructure Suite - Field services**

## Dell ProDeploy Plus for Infrastructure

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

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

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

## Dell ProDeploy for Infrastructure

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

## Dell Basic Deployment

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

## Additional Deployment Services

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

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

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

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

Learn more at Dell.com/HPC-Services.

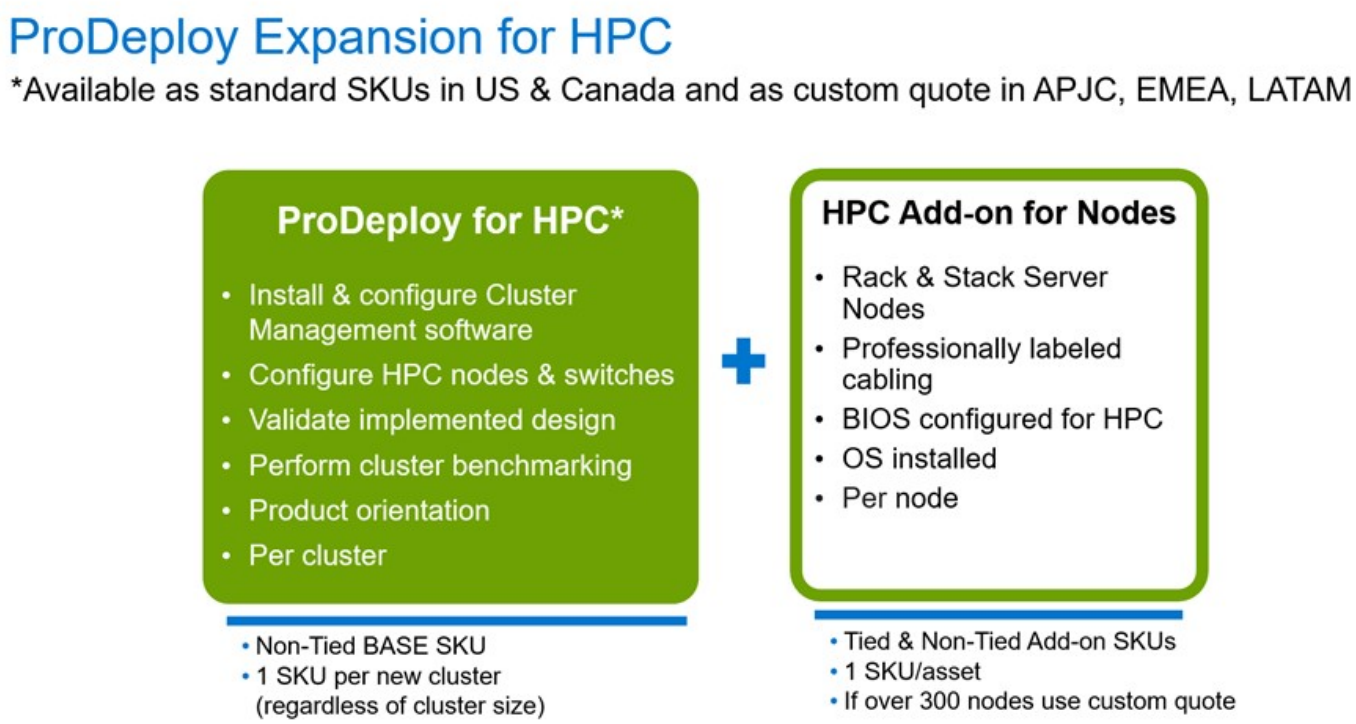


**Figure 20. ProDeploy Expansion for HPC**

## 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 21. 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

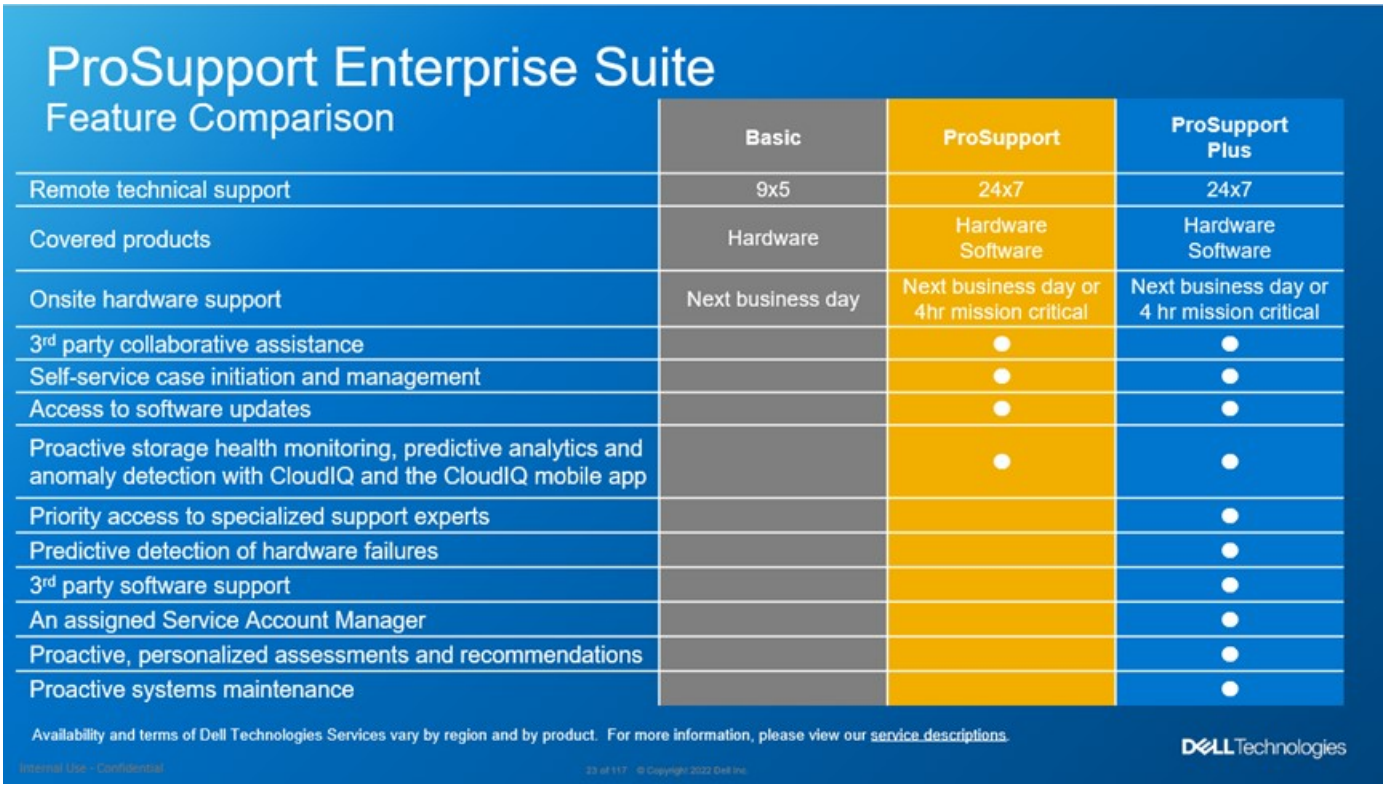


**Figure 21. ProSupport Enterprise Suite**

## Dell ProSupport One for Data Center

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

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

## Dell ProSupport Add-on for HPC

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

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

Learn more at Dell.com/HPC-Services.

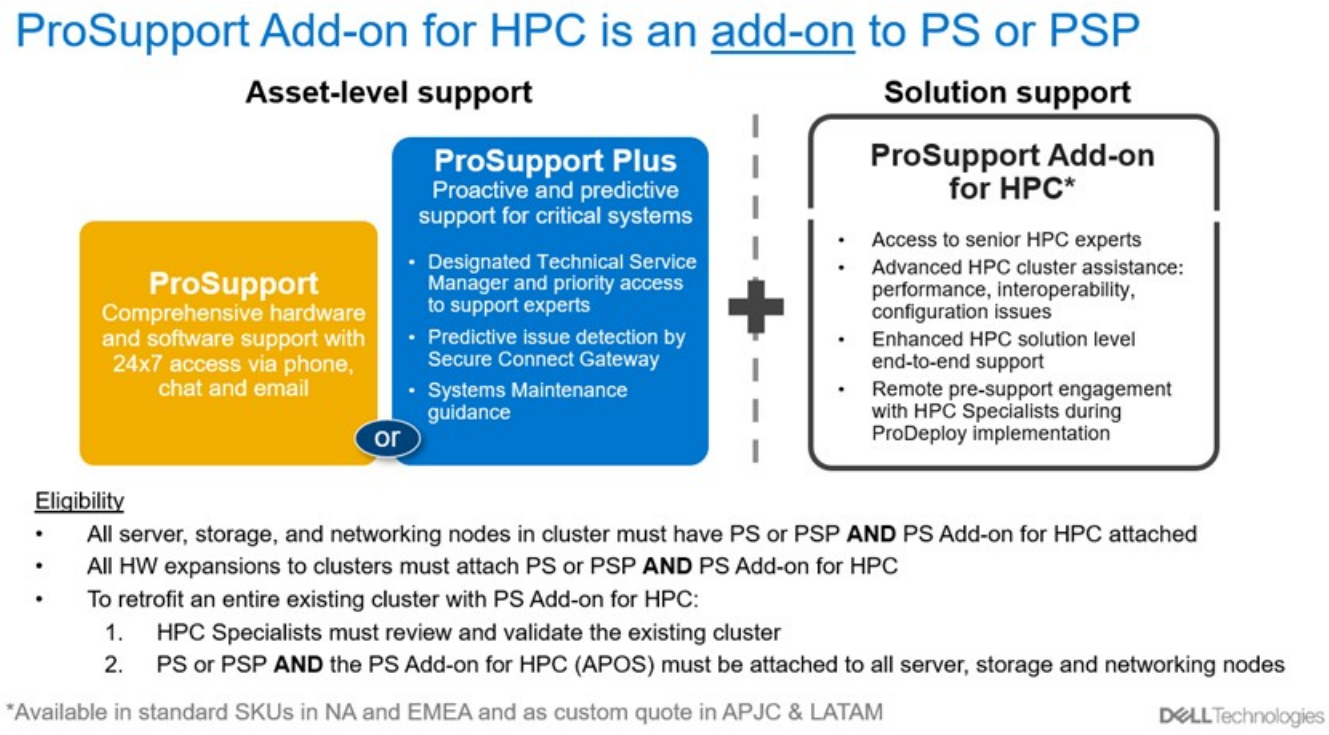


**Figure 22. ProSupport Add-on for HPC is an add-on to PS or PSP**

## 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 22. 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 22. Features enabled by connectivity (continued)**

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

Get started at DellTechnologies.com/secureconnectgateway.

# Dell TechDirect

TechDirect helps boost IT team productivity when supporting Dell systems.

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

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

Register at TechDirect.Dell.com.

# Dell Technologies Consulting Services

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

## Dell Managed Services

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


**Figure 23. 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.

13

# Appendix A: Additional specifications

**Topics:**



## Chassis dimensions

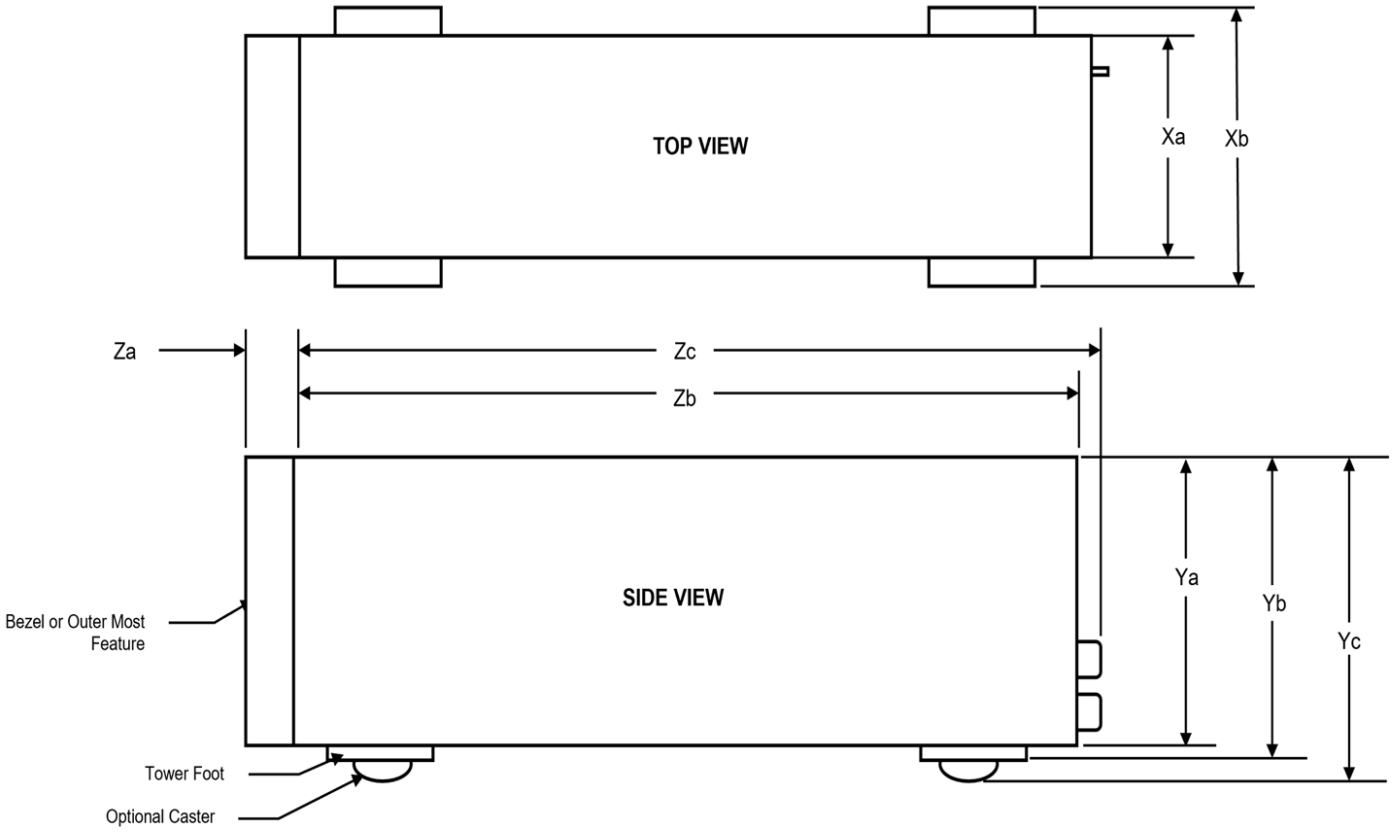


**Figure 24. Chassis dimensions**

**Table 23. Chassis dimension for the system**

| Drives | Xa | Xb | Ya | Yb | Yc | Za (with bezel) | Zb | Zc |
|---|---|---|---|---|---|---|---|---|
| 12 x 3.5-inch SAS/SATA HDD | 200.0 mm (7.87 inches) | 293.0 mm (11.53 inches) | 446.0 mm (17.55 inches) | 464.0 mm (18.26 inches) | 508.8 mm (20.03 inches) | 17.6 mm (0.69 inches) | 660.6 mm (26.00 inches) | 695.5 mm (27.38 inches) |

# System weight

### Table 24. PowerEdge T560 system weight

| System configuration | Maximum weight (with all drives/SSDs) |
|---|---|
| 12 x 3.5-inch (SAS/SATA) | 48 kg (107.32 pound) |
| 8 x 3.5-inch (SAS/SATA) | 43.16 kg (95.15 pound) |
| 8 x 3.5-inch (SAS/SATA) + 8 x 2.5-inch NVMe | 46.84 kg (103.26 pound) |
| 8 x 2.5-inch (SAS/SATA) | 39.40 kg (86.86 pound) |
| 16 x 2.5-inch (SAS/SATA) | 42.02 kg (92.63 pound) |
| 24 x 2.5-inch (SAS/SATA) | 44.64 kg (98.41 pound) |

# NIC port specifications

The PowerEdge T560 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 Open Compute Project (OCP) cards.

### Table 25. NIC port specification for the system

| Feature | Specifications |
|---|---|
| LOM on Planar | 2 x 1 GbE |
| OCP card | 1 x OCP x8 3.0 |

# Video specifications

The PowerEdge T560 system supports integrated Matrox G200 graphics controller with 16 MB of video frame buffer.

### Table 26. Supported video resolution options

| Resolution | Refresh rate (Hz) | Color depth (bits) |
|---|---|---|
| 1024 x 768 | 60 | 8, 16, 32 |
| 1280 x 800 | 60 | 8, 16, 32 |
| 1280 x 1024 | 60 | 8, 16, 32 |
| 1360 x 768 | 60 | 8, 16, 32 |
| 1440 x 900 | 60 | 8, 16, 32 |
| 1600 x 900 | 60 | 8, 16, 32 |
| 1600 x 1200 | 60 | 8, 16, 32 |
| 1680 x 1050 | 60 | 8, 16, 32 |
| 1920 x 1080 | 60 | 8, 16, 32 |
| 1920 x 1200 | 60 | 8, 16, 32 |

# USB Ports

### Table 27. PowerEdge T560 USB port specifications

| Front | | Rear | | Internal (Optional) | |
|---|---|---|---|---|---|
| **Port type** | **No. of ports** | **Port type** | **No. of ports** | **Port type** | **No. of ports** |
| 1 x USB 2.0-compliant port | One | 1 x USB 2.0-compliant port | One | Internal USB 3.0-compliant port | One |
| 1 x USB 3.0-compliant port | One | 1 x USB 3.0-compliant port | One | | |

# PSU rating

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

### Table 28. PSUs highline and lowline ratings

| — | 600 W Platinum 60 mm | 700 W Titanium 60 mm | 800 W Platinum 60 mm | 1100 W Titanium 60 mm | 1100 W DC 60 mm | 1400 W Platinum 60 mm | 1800 W Titanium 60 mm | 2400 W Platinum 86 mm |
|---|---|---|---|---|---|---|---|---|
| Max Power (AC High Line) | 600 W | 700 W | 800 W | 1100 W | NA | 1400 W | 1800 W | 2400 W |
| Max Power (AC Low Line) | 600 W | NA | 800 W | 1050 W | NA | 1050 W | NA | 1400 W |
| Max Power (DC input, 240Vdc or (-48)VDC | 600 W | 700 W | 800 W | 1100 W | 1100 W (-48) VDC | 1400 W | 1800 W | 2400 W |

The PowerEdge T560 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 29. PSU efficiency level

| **Efficiency Targets by Load** | | | | | | |
|---|---|---|---|---|---|---|
| **Form factor** | **Output** | **Class @HLAC** | **10%** | **20%** | **50%** | **100%** |
| Redundant 60 mm | 600 W | Platinum | 89.00% | 93.00% | 94.00% | 91.50% |
| | 700 W | Titanium | 90.00% | 94.00% | 96.00% | 91.50% |
| | 800 W | Platinum | 89.00% | 93.00% | 94.00% | 91.50% |
| | 1100 W | Titanium | 90.00% | 94.00% | 96.00% | 91.50% |

### Table 29. PSU efficiency level (continued)

| Efficiency Targets by Load | | | | | | |
|---|---|---|---|---|---|---|
| **Form factor** | **Output** | **Class @HLAC** | **10%** | **20%** | **50%** | **100%** |
| | 1100 W DC | NA @ (-48) VDC | 85.00% | 90.00% | 92.00% | 90.00% |
| | 1400 W | Platinum | 89.00% | 93.00% | 94.00% | 91.50% |
| | 1800 W | Titanium | 90.00% | 94.00% | 96.00% | 94.00% |
| Redundant 86 mm | 2400 W | Platinum | 89.00% | 93.00% | 94.00% | 91.50% |

# Environmental specifications

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

### Table 30. Continuous Operation Specifications for ASHRAE A2

| | **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 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 (33.8°F/984 Ft) above 900 m (2953 Ft) |

### Table 31. Continuous Operation Specifications for ASHRAE A3

| | **Allowable continuous operations** |
|---|---|
| Temperature range for altitudes <= 900 m (<= 2953 ft) | 5–40°C (41–104°F) with no direct sunlight on the equipment |
| Humidity percent range (non-condensing at all times) | 8% RH with -12°C minimum dew point to 85% RH with 24°C (75.2°F) maximum dew point |
| Operational altitude de-rating | Maximum temperature is reduced by 1°C/175 m (33.8°F/574 Ft) above 900 m (2953 Ft) |

### Table 32. Continuous Operation Specifications for ASHRAE A4

| | **Allowable continuous operations** |
|---|---|
| Temperature range for altitudes <= 900 m (<= 2953 ft) | 5–45°C (41–113°F) with no direct sunlight on the equipment |
| Humidity percent range (non-condensing at all times) | 8% RH with -12°C minimum dew point to 90% RH with 24°C (75.2°F) maximum dew point |
| Operational altitude de-rating | Maximum temperature is reduced by 1°C/125 m (33.8°F/410 Ft) above 900 m (2953 Ft) |

### Table 33. Continuous Operation Specifications for Rugged Environment

| | **Allowable continuous operations** |
|---|---|
| Temperature range for altitudes <= 900 m (<= 2953 ft) | 5–55°C (41–131°F) with no direct sunlight on the equipment |
| Humidity percent range (non-condensing at all times) | 8% RH with -12°C minimum dew point to 90% RH with 24°C (75.2°F) maximum dew point |

### Table 33. Continuous Operation Specifications for Rugged Environment (continued)

| | Allowable continuous operations |
|---|---|
| Operational altitude de-rating | Maximum temperature is reduced by 1°C/125 m (33.8°F/410 Ft) above 900 m (2953 Ft) |

### Table 34. Common Environmental Specifications for ASHRAE A2, A3, A4 and Rugged

| | 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 (41°F in 15 minutes), 5°C in an hour* (41°F in an hour) for tape<br>**NOTE:** * - Per ASHRAE thermal guidelines for tape hardware, these are not instantaneous rates of temperature change. |
| Non-operational temperature limits | -40 to 65°C (-104 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 | 3,048 meters (10,000 feet) |

### Table 35. Maximum vibration specifications

| Maximum vibration | Specifications |
|---|---|
| Operating | 0.26 $G_{rms}$ at 5 Hz to 350 Hz (all operation orientations) |
| Storage | 1.88 $G_{rms}$ at 10 Hz to 500 Hz for 15 minutes (all six sides tested) |

### Table 36. 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. |

## Thermal restriction matrix

### Table 37. Processor and heat sink matrix

| Heat sink | Processor TDP |
|---|---|
| STD HSK | ≤ 150 W |
| HPR HSK | > 150 W |

### Table 38. Label reference

| Label | Description |
|---|---|
| STD | Standard |
| HPR | High performance |
| HSK | Heat sink |

### Table 39. Thermal restriction matrix

| Drive Configuration | Processor | Fans | CPU TDP | Fan redundancy | CPU HSK | | GPU support | | TBU support | GPU riser configuration |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | TDP>150 W | TDP<=150 W | GPU<=75 W | GPU>75 W | | |
| 8 x 3.5 | 1 | STDx3 | <=185 | No | HPR HSK | STD HSK | No | No | No | Riser 0,2 |
| | 1 or 2 | STDx4 | <=185 | No | | | No | No | No | Riser 0,1,2 |
| | 1 or 2 | STDx8 | <=250 | Yes | | | No | No | No | Riser 0,1,2 |
| | 1 or 2 | HPRx4 | <=250 | No | | | Yes/No | No | No | Riser 0,1,2 |
| | 1 or 2 | *HPRx7 | <=250 | Yes | | | ***Yes/No | No | Yes | Riser 0 |
| | | | | **No | | | ** Yes /No | **Yes | Yes | Riser 1,2 |
| | 1 or 2 | HPRx8 | <=250 | Yes | | | Yes/No | Yes | No | Riser 1,2 |
| 12x3.5 & ****8x2.5 16x2.5 24x2.5 | 1 or 2 | STDx4 | <=185 | No | HPR HSK | STD HSK | No | No | No | Riser 0,1,2 |
| | 1 or 2 | STDx8 | <=250 | Yes | | | No | No | No | Riser 0,1,2 |
| | 1 or 2 | HPRx4 | <=250 | No | | | Yes/No | No | No | Riser 0,1,2 |
| | 1 or 2 | *HPRx7 | <=250 | Yes | | | ***Yes/No | No | Yes | Riser 0 |
| | | | | **No | | | ** Yes /No | ** Yes | Yes | Riser 1,2 |
| | 1 or 2 | HPRx8 | <=250 | Yes | | | Yes/No | Yes | No | Riser 1,2 |
| 8 x 3.5 + 8 x 2.5 (NVMe) | 1 or 2 | HPRx4 | <=250 | No | HPR HSK | STD HSK | Yes/No | No | No | Riser 0,1,2 |
| | 1 or 2 | *HPRx7 | <=250 | Yes | | | *** Yes/No | No | Yes | Riser 0 |
| | | | | **No | | | ** Yes /No | ** Yes | Yes | Riser 1,2 |
| | 1 or 2 | HPRx8 | <=250 | Yes | | | Yes/No | Yes | No | Riser 1,2 |

**NOTE:** *HPRx7 counts are only for with TBU configuration. System without TBU configuration does not support HPRx7 counts.

**NOTE:** **HPRx7 with TBU configuration:

- Riser 1 does not support GPU >75W. GPU <75W support Nvidia A2 and does not support Nvidia L4..
- Riser 2 GPU <75 W supports Nvidia A2 and Nvidia L4. For GPU >150 W supports Nvidia A30 (165 W) only.
- Fan redundance is not supported with riser installed.

**NOTE:** ***HPRx7 with TBU configuration supports fan redundancy when GPUs <75W are installed on PCIe slot 3,4,5,6.

**NOTE:** **** SAS4 configuration requires minimum STDx8 fans.

### Table 40. Thermal matrix for all configurations

| System Configuration | | Configuration 1: 8 x 2.5-inch, 16 x 2.5-inch and 24 x 2.5-inch SAS/SATA | | | | Configuration 2: 8x3.5-inch SAS/SATA | | | | Configuration 3: 8x3.5-inch + 8 x NVMe | | Configuration 4: 12 x 3.5-inch SAS/SATA | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fan | | STD | STD | HPR | HPR | STD | STD | HPR | HPR | HPR | HPR | STD | STD | HPR | HPR |
| Fan count | | x4 | x8 | x4 | x8 | x3, x4 | x8 | x4 | x8 | x4 | x8 | x4 | x8 | x4 | x8 |
| CPU TDP | 125 W | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK |
| | 135 W | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK |
| | 150 W | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK | STD HSK |
| | 165 W | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK |
| | 185 W | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK |
| | 205 W | Not Supported: Requires < 25°C | HPR HSK | HPR HSK | HPR HSK | Not Supported: Requires < 25°C | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | Not Supported: Requires < 25°C | HPR HSK | HPR HSK | HPR HSK |
| | | | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK |
| | 225 W | | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK |
| | 250 W | | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK | HPR HSK | HPR HSK | | HPR HSK | HPR HSK | HPR HSK |

### Table 41. GPU thermal restriction matrix

| GPU TDP | Supported GPU | Fan configuration | Maximum supported quantity | Note |
|---|---|---|---|---|
| 300 W | Nvidia A40, L40 | HPRx8 | 2 | NA |
| 165 W | Nvdia A30 | HPRx8 | 2 | NA |
| | | HPRx7 (with TBU only) | 1 | Only supported on Riser 2 and does not support fan redundancy. |
| < 75 W | Nvidia A2 | HPRx8 | 6 | NA |
| | | HPRx7 (with TBU only) | 6 | Does not support fan redundancy when installed on Riser |

**Table 41. GPU thermal restriction matrix (continued)**

| GPU TDP | Supported GPU | Fan configuration | Maximum supported quantity | Note |
|---|---|---|---|---|
| | | HPRx4 | 6 | Does not support fan redundancy |
| | Nvidia L4 | HPRx8 | 5 | NA |
| | | HPRx7 (with TBU only) | 4 | Only supported on Riser 2 and does not support fan redundancy. |
| | | HPRx4 | 4 | Does not support fan redundancy |

**NOTE:** Nvidia L4 GPU is not supported on Riser 1 in HPRx7 and HPRx4 configurations due to thermal constraint and is not supported at PCIe slot 5 as Nvidia L4 is a PCIe x16 GPU card.

# Thermal air restrictions

## Thermal air restrictions for different configurations

**Table 42. 8 x 3.5-inch drive configuration**

| Standard Operating Support (ASHRAE A2 compliant)<br>**NOTE:** All options supported unless otherwise noted. | Extended ambient 40° C Operating Support (ASHRAE A3 compliant) | Extended ambient 45° C Operating Support (ASHRAE A4 compliant) |
|---|---|---|
| • 3x or 4x STD Fan config only support CPU Base TDP<=185W<br>• 3x STD Fans config does Does not support BOSS module<br>• HPR fan is required to support 128G DDR5 DIMM<br>• With STD Fans, the following OCP3.0 & PCIe cards only support optic cable with thermal Spec 85C and power <=1.2W<br>  ○ Mellanox CX6 Lx 25GB 2P PCIe card<br>  ○ Broadcom 25GB 4P SPF 57504 PCIe card<br>  ○ Intel 25GB 4P E810-CCV PCIe card<br>  ○ Intel 25GB 2P XXV710 PCIe card<br>  ○ Intel 25GB 4P E810-XXV OCP card | • Two PSUs are required. System performance may be reduced in the event of a PSU failure<br>• Does not support 3x or 4x STD Fans configs<br>• Does not support 8x STD fans configurations with CPU Base TDP > 125W<br>• HPRx8 Fans configuration is required to support BOSS M.2 Module<br>• Does not support TBU<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required. | • Two PSUs are required. System performance may be reduced in the event of a PSU failure<br>• Does not support STD fans configs<br>• Does not support 4x HPR fans config with CPU Base TDP > 150W<br>• Does not support 8x HPR fans configs with CPU Base TDP > 225W<br>• Does not support TBU<br>• Does not support BOSS M.2 Module<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required. |

**Table 43. 8 x 2.5-inch, 16 x 2.5-inch, 24 x 2.5-inch and 12 x 3.5-inch drive configuration**

| Standard Operating Support (ASHRAE A2 compliant) | Extended ambient 40° C Operating Support (ASHRAE A3 compliant) | Extended ambient 45° C Operating Support (ASHRAE A4 compliant) |
|---|---|---|
| • 4x STD fans support only processor with TDP<=185W<br>• Could Does not support 2.5" SAS4 drives with STDx4 Fans | • Two PSUs are required. System performance may be reduced in the event of a PSU failure | • Two PSUs are required. System performance may be reduced in the event of a PSU failure |

### Table 43. 8 x 2.5-inch, 16 x 2.5-inch, 24 x 2.5-inch and 12 x 3.5-inch drive configuration

| Standard Operating Support (ASHRAE A2 compliant) | Extended ambient 40° C Operating Support (ASHRAE A3 compliant) | Extended ambient 45° C Operating Support (ASHRAE A4 compliant) |
|---|---|---|
| • With STD Fans, the following OCP3.0 & PCIe cards only support optic cable with thermal Spec 85C and power <=1.2W<br>  ○ Mellanox CX6 Lx 25GB 2P PCIe card<br>  ○ Broadcom 25GB 4P SPF 57504 PCIe card<br>  ○ Intel 25GB 4P E810-CCV PCIe card<br>  ○ Intel 25GB 2P XXV710 PCIe card<br>  ○ Intel 25GB 4P E810-XXV OCP card | • Does not support 3x or 4x STD Fans configs<br>• Does not support 8x STD fans configurations with CPU Base TDP > 125W<br>• HPRx8 Fans configuration is required to support BOSS M.2 Module<br>• Does not support TBU<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required. | • Does not support STD fans configs<br>• Does not support 4x HPR fans config with CPU Base TDP > 150W<br>• Does not support 8x HPR fans configs with CPU Base TDP > 225W<br>• Does not support TBU<br>• Does not support BOSS M.2 Module<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required. |

### Table 44. 8 x 3.5-inch + 8 x 2.5-inch NVMe drive configuration

| Standard Operating Support (ASHRAE A2 compliant) | Extended ambient 40° C Operating Support (ASHRAE A3 compliant) | Extended ambient 45° C Operating Support (ASHRAE A4 compliant) |
|---|---|---|
| HPR fans are required. | • Two PSUs are required<br>• System performance may be reduced in the event of a PSU failure<br>• Does not support TBU<br>• HPRx8 Fans configuration is required to support BOSS M.2 Module<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required | • Two PSUs are required. System performance may be reduced in the event of a PSU failure<br>• Does not support 4x HPR fans config with CPU Base TDP > 150W<br>• Does not support 8x HPR fans configs with CPU Base TDP > 225W<br>• Does not support TBU<br>• Does not support BOSS M.2 Module<br>• Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards<br>• Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card<br>• Does not support OCP transfer rate >25G or cooling tier > 10<br>• Does not support GPU card<br>• Optic Cable with spec 85C is required. |

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# Appendix A. Standards compliance

The system conforms to the following industry standards.

**Table 45. Industry standard documents**

| Standard | URL for information and specifications |
|---|---|
| **ACPI**Advance Configuration and Power Interface Specification, v2.0c | https://uefi.org/specsandtesttools |
| **Ethernet** IEEE 802.3-2005 | https://standards.ieee.org/ |
| **HDG**Hardware Design Guide Version 3.0 for Microsoft Windows Server | microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.mspx |
| **IPMI** Intelligent Platform Management Interface, v2.0 | intel.com/design/servers/ipmi |
| **DDR5 Memory** DDR5 SDRAM Specification | jedec.org/standards-documents/docs/jesd79-4.pdf |
| **PCI Express** PCI Express Base Specification Rev. 2.0 and 3.0 | pcisig.com/specifications/pciexpress |
| **PMBus** Power System Management Protocol Specification, v1.2 | http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_I_Rev_1-1_20070205.pdf |
| **SAS** Serial Attached SCSI, v1.1 | http://www.t10.org/ |
| **SATA** Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2 | sata-io.org |
| **SMBIOS** System Management BIOS Reference Specification, v2.7 | dmtf.org/standards/smbios |
| **TPM** Trusted Platform Module Specification, v1.2 and v2.0 | trustedcomputinggroup.org |
| **UEFI** Unified Extensible Firmware Interface Specification, v2.1 | uefi.org/specifications |
| **USB** Universal Serial Bus Specification, Rev. 2.7 | usb.org/developers/docs |

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# Appendix C Additional resources

**Table 46. Additional resources**

| Resource | Description of contents | Location |
|---|---|---|
| Installation and Service Manual | This manual, available in PDF format, provides the following information:<br>• Chassis features<br>• System Setup program<br>• System indicator codes<br>• System BIOS<br>• Remove and replace procedures<br>• Diagnostics<br>• Jumpers and connectors | Dell.com/Support/Manuals |
| Getting Started Guide | This guide ships with the system, and is also available in PDF format. This guide provides the following information:<br>• Initial setup steps | Dell.com/Support/Manuals |
| System Information Label | The system information label documents the system board layout and system jumper settings. Text is minimized due to space limitations and translation considerations. The label size is standardized across platforms. | Inside the system chassis cover |
| Quick Resource Locator (QRL) | This code on the chassis can be scanned by a phone application to access additional information and resources for the server, including videos, reference materials, service tag information, and Dell contact information. | Inside the system chassis cover |
| Enterprise Infrastructure Planning Tool (EIPT) | The Dell online EIPT enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use EIPT to calculate the power consumption of your hardware, power infrastructure, and storage. | Dell.com/calc |