

Dell PowerEdge T560

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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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
- Up to two 5th Generation Intel® Xeon® Scalable Processors with up to 28 cores
- 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](#)
- [Key workloads](#)

New technologies

Table 1. New technologies

Technology	Detailed Description
Two 4 th Gen 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
Two 5 th Gen Intel® Xeon® Scalable Processors	Core count: Up to 28 core processor
	UPI speed: Up to 3 links per CPU, speed: 20 GT/s
	Maximum number of PCIe lanes per CPU: Integrated 80 PCIe 5.0 lanes @ 32GT/s PCIe Gen5

Table 1. New technologies (continued)

Technology		Detailed Description
		Maximum TDP: 250 W
5200 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: <ul style="list-style-type: none"> • 1x Dedicated iDRAC (RJ45) port • 1 x USB 3.0 • 1 x USB 2.0 • 1 x VGA port
		Optional Serial Port
		Optional OCP Mezz 3.0 (supported by x8 PCIe lanes)
		Front I/O with: <ul style="list-style-type: none"> • 1 x USB 2.0 • 1 x USB 3.0 • 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 mixed mode
		Titanium 700 W mixed mode HLAC
		Platinum 800 W mixed mode
		Titanium 1100 W mixed mode
		Platinum 1400 W mixed mode
		Titanium 1400 W 277 Vac and HVDC
		1100 W -48 V DC
		Titanium 1800 W mixed mode HLAC
	86 mm dimension PSU	Platinum 2400 W mixed mode
		Titanium 2800 W mixed mode

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

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	<ul style="list-style-type: none"> Up to two 4th Generation Intel Xeon Scalable processors with up to 32 cores per processor Up to two 5th Generation Intel Xeon Scalable processors with up to 28 cores per processor 	Up to two 3 rd Generation Intel Xeon Scalable processors with up to 32 cores
Memory	DIMM Speed <ul style="list-style-type: none"> Up to 4800 MT/s on the 4th Generation Intel® Xeon Scalable processors Up to 5200 MT/s on the 5th Generation Intel® Xeon Scalable processors Memory Type <ul style="list-style-type: none"> RDIMM Memory module slots <ul style="list-style-type: none"> 16 DDR5 DIMM slots Supports registered ECC DDR5 DIMM slots only Maximum RAM <ul style="list-style-type: none"> RDIMM 1TB 	DIMM Speed <ul style="list-style-type: none"> Up to 3200 MT/s Memory Type <ul style="list-style-type: none"> RDIMM Memory module slots <ul style="list-style-type: none"> 16 DDR4 DIMM slots Supports registered ECC DDR4 DIMM slots only Maximum RAM <ul style="list-style-type: none"> RDIMM 1TB
Storage Controllers	<ul style="list-style-type: none"> Internal PERC: fPERC HBA355i, fPERC H755, fPERC H755N, fPERC H355, fPERC H965i Internal Boot: Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 NVMe SSDs drives, or USB External HBA (non-RAID): PERC HBA355e Software RAID: S160 (NVMe only) 	<ul style="list-style-type: none"> Internal controllers: PERC H345, PERC H755, H755N, HBA355i Internal Boot: Internal Dual SD Module or Boot Optimized Storage Subsystem (BOSS-S2): HWRAID 2 x M.2 SSDs or USB External Controller (RAID): PERC H840 External HBAs (non-RAID): HBA355e Software RAID: S150
Drive Bays	Front bays: <ul style="list-style-type: none"> Up to 12 x 3.5-inch SAS/SATA HDD drives, max 180 TB Up to 8 x 3.5-inch SAS/SATA HDD drives, max 120 TB Up to 8 x 3.5-inch SAS/ SATA HDD + 8 x 2.5-inch NVMe SSD drives, max 240 TB Up to 8 x 2.5-inch SAS/SATA HDD drives, max 120 TB Up to 16 x 2.5-inch SAS/SATA HDD drives, max 240 TB Up to 24 x 2.5-inch SAS/SATA HDD drives, max 360 TB 	Front bays: <ul style="list-style-type: none"> Up to 8 x 2.5-inch SAS/SATA (hard drive) max 120 TB 16 x 2.5-inch SAS/SATA (HDD) max 240 TB 24 x 2.5-inch SAS/SATA (HDD)max 360 TB 8 x 3.5-inch SAS/SATA (HDD/SAS) max 120 TB 8 x 3.5-inch SAS/SATA (HDD) + 8 x 2.5-inch NVMe (SSD) max 240 TB
Power Supplies	<ul style="list-style-type: none"> 600 W Platinum 100-240 V AC or 600 W 240 V DC Mixed Mode, hot swap redundant 800 W Platinum 100-240 V AC or 800 W 240 V DC Mixed Mode, hot swap redundant 1100 LVDC -48 - (-60) VDC, hot swap redundant 1400 W Platinum 100-240 V AC or 1400 W 240 V DC Mixed Mode, hot swap redundant 	<ul style="list-style-type: none"> 600 W Platinum AC/100 - 240 V 600 W DC/240 V 800 W Platinum AC/100 - 240 V 800 W DC/240 V 1100 W Titanium AC/100 - 240 V 1100 W DC/240 V 1100 W DC/-48 V

Table 2. Features comparison (continued)

Features	PowerEdge T560	PowerEdge T550				
	<ul style="list-style-type: none"> • 1400 W Titanium 277 V AC or 1400 W 336 V DC Mixed Mode, hot swap redundant • 2400 W Platinum 100-240 V AC or 2400 W 240 V DC Mixed Mode, hot swap redundant • 700 W Titanium 200-240 V AC or 700 W 240 V DC Mixed Mode, hot swap redundant • 1100 W Titanium 100-240 V AC or 1100 W 240 V DC Mixed Mode, hot swap redundant • 1800 W Titanium 200-240 V AC or 1800 W 240 V DC Mixed Mode, hot swap redundant • 2800 W Titanium 200-240 V AC or 2800 W 240 V DC Mixed Mode, hot swap redundant 	<ul style="list-style-type: none"> • 1400 W Platinum AC/100 - 240 V • 1400 W DC/240 V • 2400 W Platinum AC/100 - 240 V • 2400 W DC/240 V 				
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	<ul style="list-style-type: none"> • iDRAC9 • iDRAC Direct • iDRAC RESTful API with Redfish • iDRAC Service Module • Quick Sync 2 wireless module 	<ul style="list-style-type: none"> • iDRAC9 • iDRAC Direct • iDRAC RESTful with Redfish • iDRAC Service Manual • Quick Sync 2 wireless module <p>i NOTE: iDRAC Direct and Quick Sync 2 are available only as an upsell on T550.</p>				
Bezel	Security bezel	Optional LCD bezel or security bezel				
OpenManage Software	<ul style="list-style-type: none"> • OpenManage Enterprise • OpenManage Power Manager plugin • OpenManage Service plugin • OpenManage Update Manager plugin • CloudIQ for PowerEdge plug in • OpenManage Enterprise Integration for VMware vCenter • OpenManage Integration for Microsoft System Center • OpenManage Integration with Windows Admin Center 	<ul style="list-style-type: none"> • OpenManage Enterprise • OpenManage Power Manager plug-in • OpenManage SupportAssist plug-in • OpenManage Update Manager plug-in 				
Mobility	OpenManage Mobile	OpenManage Mobile				
Integrations and Connections	<ul style="list-style-type: none"> • BMC Truesight • Microsoft System Center • OpenManage Integration with ServiceNow 	<table border="0"> <tr> <td>OpenManage Integrations</td> <td>OpenManage Connections</td> </tr> <tr> <td> <ul style="list-style-type: none"> • BMC TrueSight </td> <td></td> </tr> </table>	OpenManage Integrations	OpenManage Connections	<ul style="list-style-type: none"> • BMC TrueSight 	
OpenManage Integrations	OpenManage Connections					
<ul style="list-style-type: none"> • BMC TrueSight 						

Table 2. Features comparison (continued)

Features	PowerEdge T560		PowerEdge T550	
	<ul style="list-style-type: none"> Red Hat Ansible Modules Terraform Providers VMware vCenter and vRealize Operations Manager 		<ul style="list-style-type: none"> Microsoft System Center Red Hat Ansible Modules VMware vCenter and vRealize Operations Manager IBM Tivoli Netcool/OMNibus IBM Tivoli Network Manager IP Edition Micro Focus Operations Manager Nagios Core Nagios XI 	
Security	<ul style="list-style-type: none"> Cryptographically signed firmware Data at Rest Encryption (SEDs with local or external key mgmt) Secure Boot Secured Component Verification (Hardware integrity check) Secure Erase Silicon Root of Trust System Lockdown (requires iDRAC9 Enterprise or Datacenter) TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ 		<ul style="list-style-type: none"> Cryptographically signed firmware Secure Boot Secure Erase Silicon Root of Trust System Lockdown (requires iDRAC9 Enterprise or Datacenter) TPM 1.2/2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ 	
Embedded NIC	2 x 1 GbE LOM		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 <ul style="list-style-type: none"> 1 x USB 2.0 1 x USB 3.0 1 x iDRAC Direct (Micro-AB USB) port 	Rear Ports <ul style="list-style-type: none"> 1 x USB 2.0 1 x USB 3.0 1 x Serial port (optional) 1 x Dedicated iDRAC management (RJ45) port 2 x Ethernet ports 1 x VGA port 	Front Ports There are 2 SKUs: <ul style="list-style-type: none"> Base: Status LED only <ul style="list-style-type: none"> 1 x USB 2.0 1 x USB 3.0 Upsell: Status LED only and Quick Sync 2 <ul style="list-style-type: none"> 1 x USB 2.0 1 x USB 3.0 1 x iDRAC Direct (Micro-AB USB) port 	Rear Ports <ul style="list-style-type: none"> 1 x USB 2.0 1 x iDRAC Direct ethernet port 1 x USB 3.0 1 x Serial port (optional) 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 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		3x PCIe Gen4 slots (all x16) + 1x PCIe Gen3 slot (x8) + Upsell: up to 2 PCIe x16 DW for GPU	

Table 2. Features comparison (continued)

Features	PowerEdge T560	PowerEdge T550
	Slot 5: x16 (with x8 lanes) Gen4 Full height, half length	
Operating System and Hypervisors	<ul style="list-style-type: none"> ● Canonical Ubuntu Server LTS ● Microsoft Windows Server with Hyper-V ● Red Hat Enterprise Linux ● SUSE Linux Enterprise Server ● VMware ESXi <p>For specifications and interoperability details, see Dell.com/OSsupport.</p>	<ul style="list-style-type: none"> ● Canonical Ubuntu Server LTS ● Citrix Hypervisor ● Windows Server with Hyper-V ● Red Hat Enterprise Linux ● SUSE Linux Enterprise Server ● VMware ESXi <p>For specifications and interoperability details, see Dell EMC Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.</p>

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

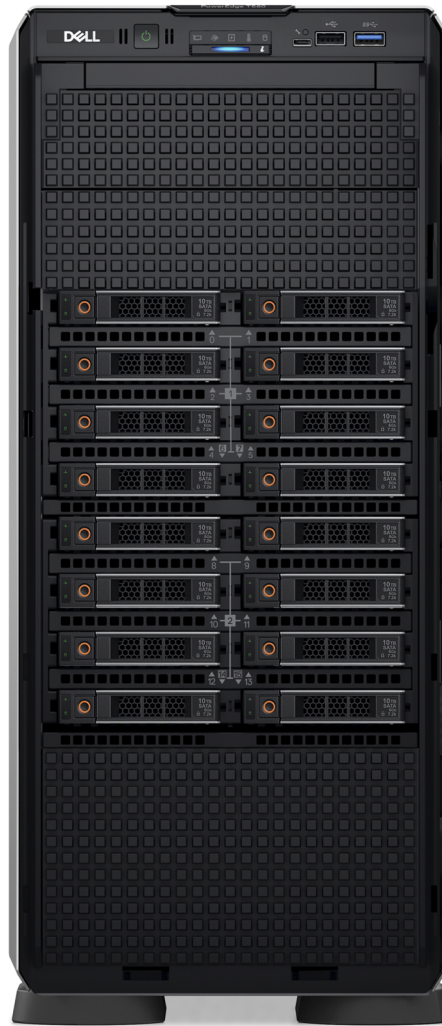


Figure 5. Front view of 16 x 2.5-inch drive system

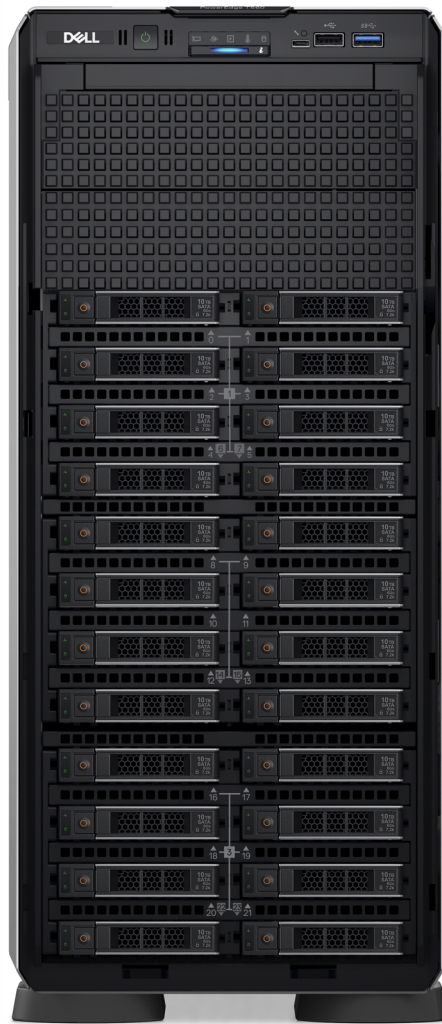


Figure 6. Front view of 24 x 2.5-inch drive system

Rear view of the system

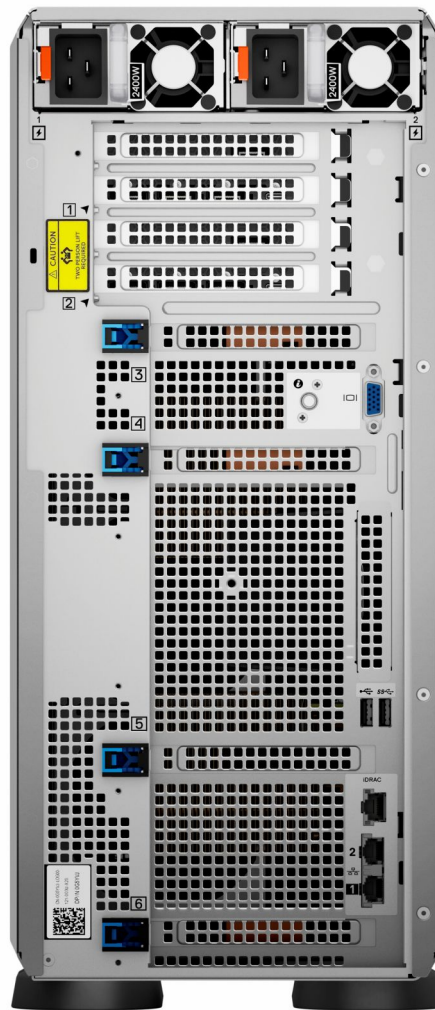


Figure 7. Rear view of the system

Inside the system

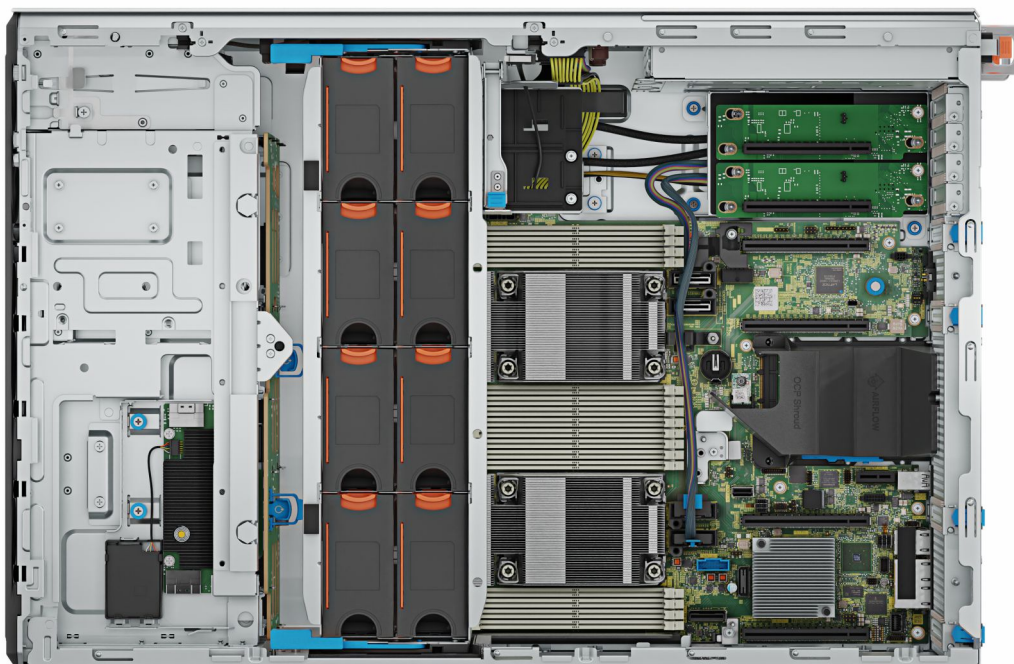


Figure 8. Inside view of the 12 x 3.5-inch configuration + PCIe Gen5 system

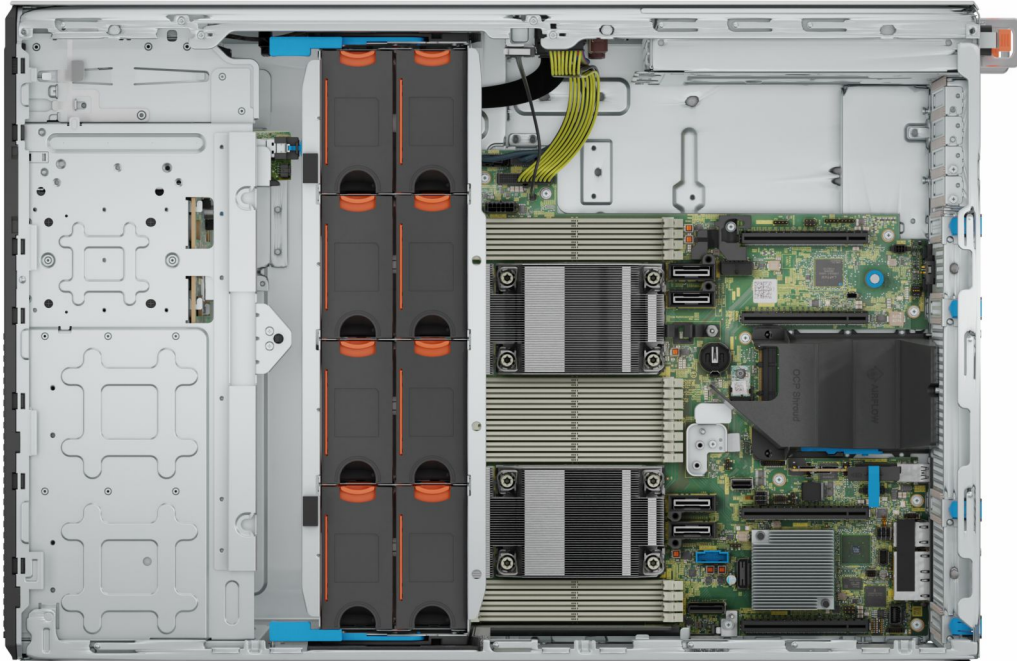


Figure 9. Inside view of the 24 x 2.5-inch configuration system

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

Processor

Topics:

- [Processor features](#)

Processor features

The Intel 4th and 5th 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 and Emerald Rapids accelerate customer usages with unique workload optimizations.

The following lists the features and functions that are in the upcoming 5th Generation Intel® Xeon Scalable Processor offering:

- Faster UPI with up to three Intel Ultra Path Interconnect (Intel UPI) at up to 20 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 5200 MT/s in one DIMM per channel (1DPC)
- New built-in accelerators for data analytics, networking, storage, crypto, and data compression
- Enhanced security for virtualized environments with Intel Trust Domain Extensions (Intel® TDX) for confidential computing

Supported processors

The following table shows the 4th and 5thGen Intel® Xeon® Scalable processors supported on the PowerEdge T560.

Table 3. 4th Gen Intel® Xeon® Scalable processor supported on the PowerEdge 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

Table 4. 5th Gen Intel® Xeon® Scalable processor supported on the PowerEdge T560

Processor	Clock Speed (GHz)	Cache (M)	UPI (GT/s)	Cores	Threads	Turbo	Memory Speed (MT/s)	Memory Capacity	TDP
6534	3.9	22.5	20	8	16	Turbo	4800	4TB	195W
6526Y	2.8	37.5	20	16	32	Turbo	5200	4TB	195W
5512U	2.1	52.5	N/A	28	56	Turbo	4800	4TB	185W
4514Y	2.0	30	16	16	32	Turbo	4400	4TB	150W
4510	2.4	30	16	12	24	Turbo	4400	4TB	150W
4509Y	2.6	23	16	8	16	Turbo	4400	4TB	125W

Memory subsystem

Topics:

- Supported memory

Supported memory

Table 5. Memory technology comparison

Feature	PowerEdge T560 (DDR5)
DIMM type	RDIMM
Transfer speed	5200 MT/s (1DPC)
Voltage	1.1 V

Table 6. 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
5600	RDIMM	16	1	x8	1.1
5600	RDIMM	32,64, 96	2	x4	1.1

Table 7. 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 DDR5 (1.1 V), 5600 MT/s	Up to 4800 MT/s Up to 5200 MT/s
	2 R	32 GB, 64 GB, 96 GB	DDR5 (1.1 V), 4800 MT/s DDR5 (1.1 V), 5600 MT/s	Up to 4800 MT/s Up to 5200 MT/s

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

NOTE: 5600 MT/s RDIMMs are applicable for 5th Gen Intel® Xeon® Scalable Processors

Storage

Topics:

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

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 8. 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, Avenger 1 Memory: 8GB DDR4 NV cache 72-bit memory 2133 MHz Low profile form factors Dual A15 1.2 GHz CPU X8PCIe 3.0, x8 12Gb SAS

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

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

Supported Drives

Table 9. 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 9. 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 10. 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

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 11. OCP 3.0 feature list

Feature	OCP 3.0
Form factor	SFF
PCIe Gen	Gen4
Max PCIe width	x8, x16 (with OCP cable)
Max number of ports	4
Port type	BT/SFP/SFP+/SFP28/QSFP56
Max port speed	25 GbE, 100 GbE (with OCP cable)
NC-SI	Yes
SNAPI	Yes
WoL	Yes
Power consumption	15 W–35 W

Supported OCP cards

Table 12. 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 12. 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 13. 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

PCIe subsystem

Topics:

- PCIe risers

PCIe risers

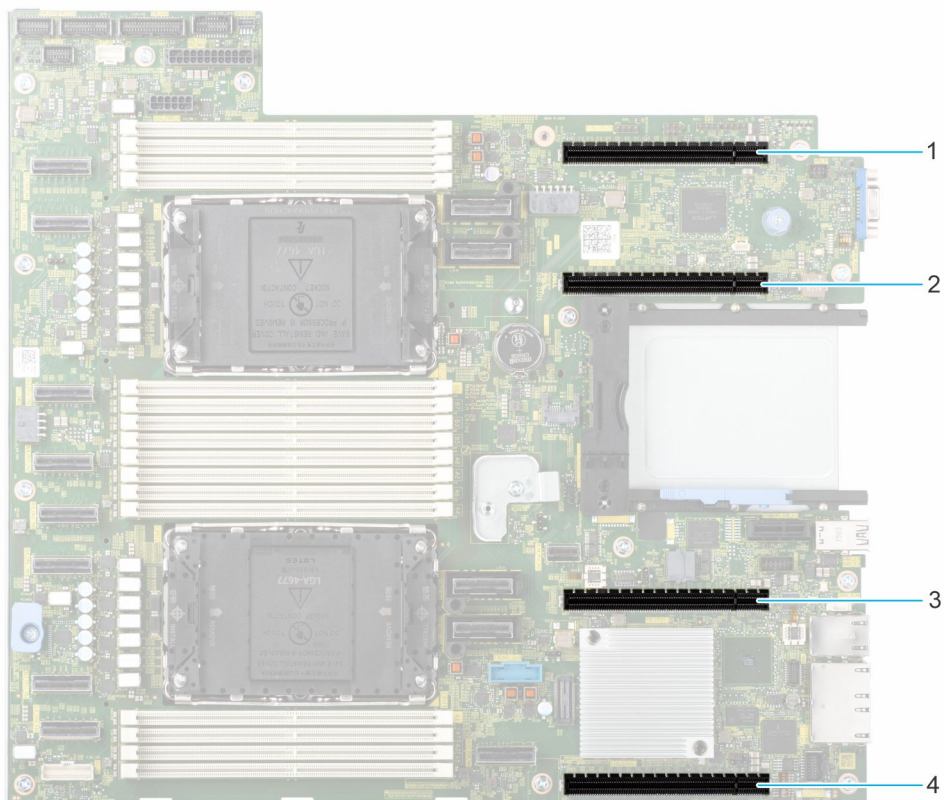


Figure 11. Riser connector slots on system board

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

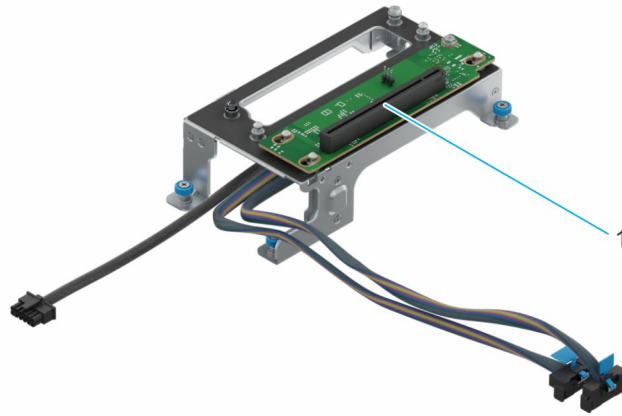


Figure 12. GPU Riser RC1 Module

- 1. Slot 2

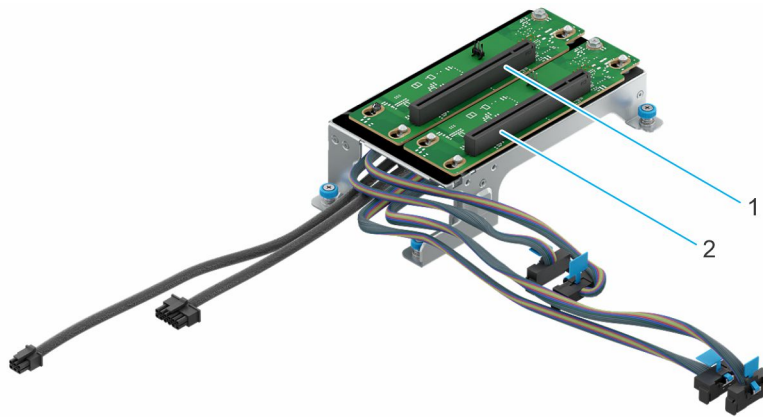


Figure 13. GPU Riser RC2 Module

- 1. Slot 1
- 2. Slot 2

Table 14. 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

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 15. 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: <ul style="list-style-type: none"> • Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit-breaker fast capping.
Systems Management	iDRAC Enterprise and Datacenter provides server-level management that monitors, reports and controls power consumption at the processor, memory and system level. Dell OpenManage Power Center delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.
Active power management	Intel Node Manager is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC9 Datacenter and OpenManage Power Center that allows policy-based management of power and thermal at the individual server, rack, and data center level. Hot spare reduces power consumption of redundant power supplies. Thermal control off a speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption. Idle power enables Dell servers to run as efficiently when idle as when at full workload.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including:

Table 15. Power tools and technologies (continued)

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

PSU specifications

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

Table 16. PSU specifications

PSU	Class	Heat dissipation (maximum) (BTU/hr)	Frequency (Hz)	AC Voltage			DC Voltage			Current (A)
				100–120 V	200–240 V	277 V	240 V	336 V	-48—(-60) V	
600 W mixed mode	Platinum	2250	50/60	600 W	600 W	N/A	N/A	N/A	N/A	7.1 - 3.6
	N/A		N/A	N/A	N/A	N/A	600 W	N/A	N/A	2.9
700 W mixed mode HLAC	Titanium	2625	50/60	N/A	700 W	N/A	N/A	N/A	N/A	4.1
	N/A		N/A	N/A	N/A	N/A	700 W	N/A	N/A	3.4
800 W mixed mode	Platinum	3000	50/60	800 W	800 W	N/A	N/A	N/A	N/A	9.2 - 4.7
	N/A		N/A	N/A	N/A	N/A	800 W	N/A	N/A	3.8
1100 W -48 V DC	N/A	4265	N/A	N/A	N/A	N/A	N/A	N/A	1100 W	27.0
1100 W mixed mode	Titanium	4125	50/60	1050 W	1100 W	N/A	N/A	N/A	N/A	12 - 6.3
	N/A		N/A	N/A	N/A	N/A	1100 W	N/A	N/A	5.2
1400 W mixed mode	Platinum	5250	50/60	1050 W	1400 W	N/A	N/A	N/A	N/A	12 - 8
	N/A		N/A	N/A	N/A	N/A	1400 W	N/A	N/A	6.6
1400 W 277 Vac and HVDC	Titanium	5250	50/60	N/A	N/A	1400 W	N/A	N/A	N/A	5.8
		5250	N/A	N/A	N/A	N/A	N/A	1400 W	N/A	5.17
1800 W mixed mode HLAC	Titanium	6610	50/60	N/A	1800 W	N/A	N/A	N/A	N/A	10.0
	N/A		N/A	N/A	N/A	N/A	1800 W	N/A	N/A	8.2
2400 W mixed mode	Platinum	9000	50/60	1400 W	2400 W	N/A	N/A	N/A	N/A	16 - 13.5
	N/A		N/A	N/A	N/A	N/A	2400 W	N/A	N/A	11.2
2800 W mixed mode HLAC	Titanium	10500	50/60	N/A	2800 W	N/A	N/A	N/A	N/A	15.6
			N/A	N/A	N/A	N/A	N/A	2800 W	N/A	N/A

- i** **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 1050 W.
- i** **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 1400 W.
- i** **NOTE:** Heat dissipation is calculated using the PSU wattage rating.
- i** **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**.
- i** **NOTE:** The input voltage for the 1400 W mixed mode PSU is 277 V AC (249 V AC - 305 V AC) and 336 V DC (260 V DC - 400 V DC).

Figure 14. PSU power cord connectors

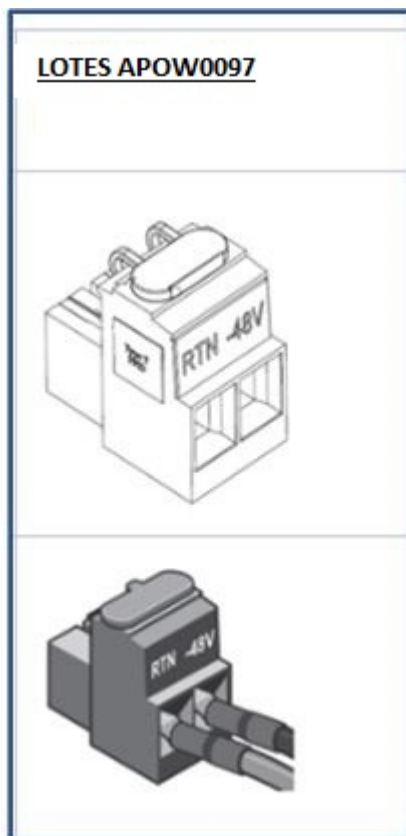




Figure 15. Types of PSU power cords

Table 17. PSU power cables

Form factor	Output	Power cord
Redundant 60 mm	600 W mixed mode	C13
	700 W mixed mode HLAC	
	800 W mixed mode	
	1100 W mixed mode	
	1400 W mixed mode	
	1100 W -48 V DC	LOTES APOW0097
	1400W 277Vac and HVDC	APP 2006G1
Redundant 86 mm	1800 W mixed mode HLAC	C15
	2400 W mixed mode	C19
	2800 W mixed mode HLAC	C21

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

Thermal

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

Thermal design

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

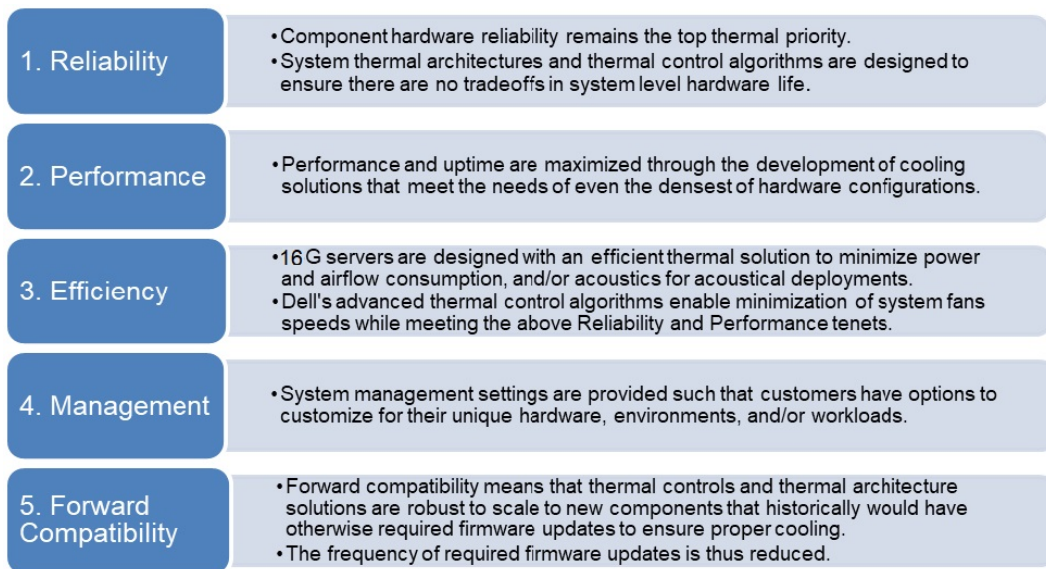


Figure 16. Thermal design characteristics

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 18. 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

Table 18. Configurations tested for acoustical experience (continued)

Configuration	Near Desk	Typical-1, 2.5-inch	Typical-2, 3.5-inch	GPU configuration
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 19. 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
	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⁾L_{WA,m}: The declared mean A-weighted sound power level (L_{WA}) 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 $23\pm 2^{\circ}\text{C}$ 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.

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 20. iDRAC9 license tiers

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

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

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

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

Systems Management software support matrix

Table 21. 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 21. Systems Management software support matrix (continued)

Categories	Features	PE mainstream
	ServiceNow	Supported
	Ansible	Supported
	Third-party Connectors (Nagios, Tivoli, Microfocus)	Supported
Security	Secure Enterprise Key Management	Supported
	Secure Component Verification	Supported
Standard operating system	Red Hat Enterprise Linux, SUSE, Windows Server 2019 or 2022, Ubuntu, CentOS	Supported (Tier-1)

Appendix D: Services

Topics:

- Default service levels
- ProDeploy Infrastructure Suite
- Supplemental Deployment Services
- Unique Deployment Scenarios
- DAY 2 - Automation Services with Ansible
- ProSupport Infrastructure Suite
- Specialty Support Services
- Consulting Services
- Resources

Default service levels

Dell sales tools like DSA, OSC, Guided Journey, DellStar, and others are defaulted with standard configurations to make quoting easier. The system defaults for services for all T-Series platforms are listed below:

1. **Support default:** 3 years, ProSupport Next BusinessDay (NBD) Onsite service which includes comprehensive 24x7 predictive and reactive support for hardware and software.
2. **Deployment default:** ProDeploy for T-Series Compute Sled which includes onsite hardware installation and remote software configuration.

ProDeploy Infrastructure Suite

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

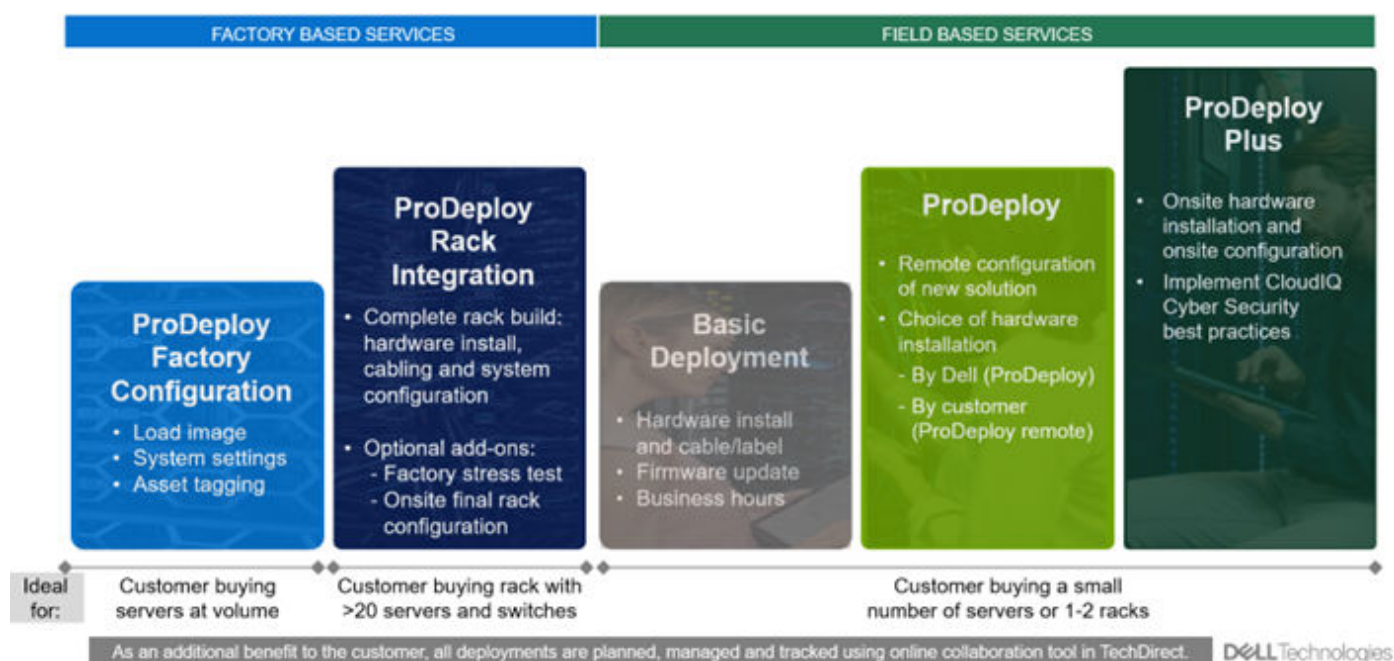


Figure 17. ProDeploy Infrastructure Suite

Factory Based Services

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

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

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 an optional on-site final rack configuration to complete the rack installation.

- STANDARD SKUs for Rack Integration is available in the USA only and requires:
 - 20 or more devices (R and C series servers, VxRail, and all Dell or non-Dell switches)
 - Use Informational SKUs for Dell switches or 3rd party products.
 - Shipping to contiguous USA
- USE CUSTOM QUOTE for Rack Integration scenarios that require:
 - Shipment to any country or region outside USA or shipping outside contiguous USA
 - Shipping to multiple locations
 - Racks containing less than 20 servers
 - Any rack that includes Storage

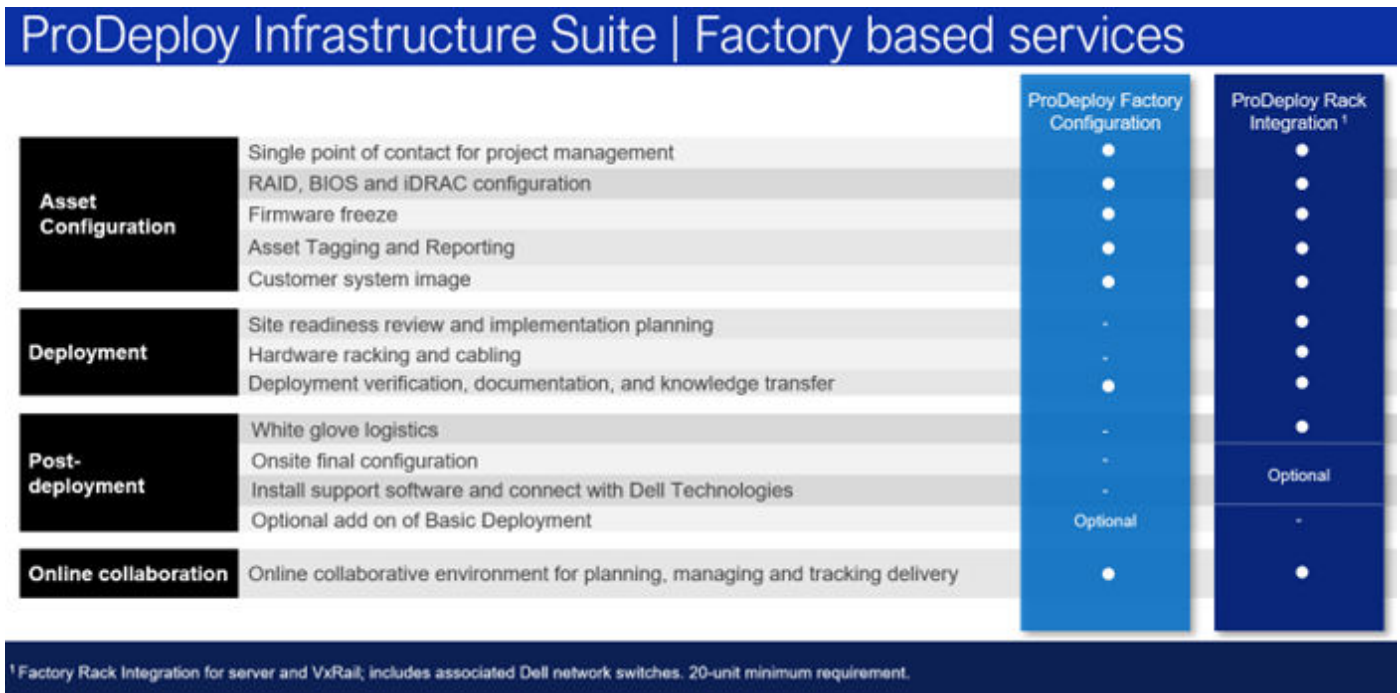


Figure 18. ProDeploy Infrastructure Suite - Factory services

Field-based Services

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

ProDeploy Plus

Elevate Infrastructure deployments with our most complete service from planning through onsite hardware installation and software configuration including the implementation of cybersecurity best practices. ProDeploy Plus provides the skill and scale needed to successfully execute demanding deployments in today's complex IT . The deployment starts with a site readiness review and implementation plan. Certified deployment experts perform the software configuration to include set up of leading operating systems and hypervisors. Dell will also configure PowerEdge software tools to include iDRAC and OpenManage system utilities as well as support AIOps platforms: MenvironmentsyService360, TechDirect, and CloudIQ. Unique to ProDeploy Plus, the cybersecurity implementation helps customers understand potential security risks and make recommendations for reducing product attack surfaces. The system is tested, validated prior to completion. The customer will also receive full project documentation and knowledge transfer to complete the process.

ProDeploy

ProDeploy provides remote software configuration and choice of hardware installation (onsite or guided). ProDeploy is great for customers who are price sensitive or willing to participate in some portion of the deployment to include providing remote access to their network. The ProDeploy remote software implementation includes everything mentioned in ProDeploy Plus except it does not include the added value, cybersecurity implementation and best practices.

Basic Deployment

Basic Deployment delivers worry-free professional installation by experienced technicians. This service is often sold to Competency Enabled Partners who will have Dell do the hardware installation while they complete the software configuration. Furthermore, Basic Deployment tends to be purchased by large enterprises who have smart technical staff. These companies just need Dell to install the hardware and they will perform the software configuration. The last use case for Basic Deployment is when paired with Factory Configuration services. The servers are pre-configured in the factory and the basic deployment service will install the system into the rack to finalize the deployment.

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

¹ Choose from onsite hardware installation or a guided option including project specific instructions, documentation and live expert guidance

² Post deployment use for intelligent, automated support & insights

Figure 19. ProDeploy Infrastructure Suite - Field services

Supplemental Deployment Services

Additional ways to expand scope or deploy for unique scenarios.

Table 22. Expand scope and transition

Expand scope and transition	Unique deployment scenarios
Two Host Adder (requires PD/PDP)	"Custom" Service Engagement
Additional Deployment Time (ADT) (Sold with or without PD/PDP)	ProDeploy Add-on for HPC
Data Migration	ProDeploy Plus for Direct Liquid Cooling (DLC 3000)
Residency Services (onsite or remote)	ProDeploy for TELCO
-	ProDeploy FLEX

Two Host Adder (requires PD/PDP)

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

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

You can expand the scope of a ProDeploy engagement leveraging Additional Deployment Time (ADT). ADT will cover additional tasks above the normal deliverables of the ProDeploy offers. ADT can also be used as a standalone service without ProDeploy. SKUs are available for both Project Management and Technical Resource Expertise. SKUs are sold as blocks of four hours remote or eight hours onsite. The delivery team can assist in scoping the number of hours required for additional tasks.

Data Migration Services

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

Residency Services

Certified technical professionals act like an extension of your IT staff to enhance internal capabilities and resources and help you realize faster adoption and maximized ROI of new technology. Residency Services help customers transition to new capabilities quickly by leveraging specific technology skill sets. Residency experts can provide post implementation management and knowledge transfer that is related to a new technology acquisition or day-to-day operational management of the IT infrastructure.

- Global experts available to serve in-person (onsite) or virtual (remote)
- Engagements starting at 2 weeks with flexibility to adjust

Unique Deployment Scenarios

Custom Deployment Services

When a deployment is beyond the scope of the ProDeploy Infrastructure Suite, you can turn to the custom deployment services team to address complex implementation scenarios and unique customer requirements. The Dell custom deployment team is staffed with solution architects who assist with customer scoping calls to define the project and develop the statement of

work. Custom services can handle a wide range of deployments that can be performed in the factory or onsite. All custom engagement services are requested through SFDC.

ProDeploy FLEX

ProDeploy Flex is a new service and a powerful tool for you to attach more services and improve revenue and margins. The ProDeploy Flex modular offer allows sales teams to build and better tailor services by mixing factory and field delivery options. You can also select special deployment scenarios without going to the custom order desk. FLEX is ideal for unique deployments where ProDeploy or ProDeploy Plus are not an adequate answer to the customer needs.

Key features of ProDeploy FLEX

- Build deployment quotes using modular, selectable features for both hardware and software.
- The system automatically scales pricing based on volume.
- Ideal for customers who require NativeEdge Orchestrator or edge deployments
- Ability to add deployment services to third-party networking devices

Deployment of HPC

High-Performance Computing (HPC) implementations require specialists that understand advanced feature sets. Dell deploys the world's fastest systems and understands the nuances that make them perform. HPC deployments are most often scoped as custom service engagements, however we can do smaller HPC clusters under 300 nodes using a standard ProDeploy SKU. Any standard SKU for HPC deployment will be sold as one base SKU per cluster (ProDeploy for HPC Base) along with one ProDeploy for HPC Add-on for each device in the cluster (server nodes and switches).

- Scope of ProDeploy for HPC: *Available as standard SKUs in the US and Canada. Custom Service would be required for all other regions.

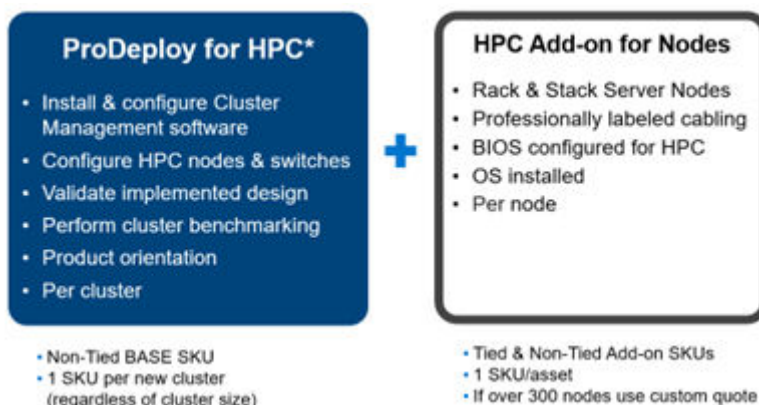


Figure 20. Standard deliverables of ProDeploy for HPC

Build HPC solutions for your unique requirements

Choose ProDeploy for HPC or Custom deploy

ProDeploy service includes configuration of most OS, cluster mgmt., networking and benchmarking



Figure 21. Visual view of HPC deployment options to include hardware and software

DAY 2 - Automation Services with Ansible

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

ProSupport Infrastructure Suite

ProSupport Infrastructure Suite is a set of support services that enable customers to build the solution that is right for their organization. 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, customers can 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.

ProSupport Plus for Infrastructure

Service that caters to customers who require proactive, predictive, and personalized support for systems that manage critical business applications and workloads. When customers purchase PowerEdge server, we recommend ProSupport Plus, our proactive and preventative support service for business-critical systems. ProSupport Plus provides all the benefits of ProSupport, including the following "Top five reasons to buy PSP".

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

ProSupport for Infrastructure

Comprehensive 24x7 support for hardware and software - best for production, but not critical, workloads and applications. The ProSupport service offers highly trained experts around the clock and around the globe to address IT needs. We help minimize disruptions and maximize availability of PowerEdge server workloads with:

- 24x7 support through phone, chat and online
- A central point of accountability for all hardware and software issues
- Hypervisor, operating system and application support
- Dell security advisories
- Onsite response service levels 4 hour or Next Business Day options
- Proactive issue detection with automated case creation
- Predictive hardware anomaly detection
- Incident Manager assigned for Severity 1 cases
- Collaborative third-party support
- Access to AIOps Platforms - (MyService360, TechDirect, and CloudIQ)
- Consistent experience regardless of where customers are located or what language they speak.

Basic Hardware Support

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

ProSupport Infrastructure Suite Enhanced value across all offers!				
	Basic Hardware Support	ProSupport for Infrastructure	ProSupport Plus for Infrastructure	Changes with August 2023 release
Technical support availability and response objective	9/5, immediate	24/7, immediate	24/7, immediate	No change
Covered products	Hardware	Hardware & Software	Hardware & Software	No change
Onsite response service level	NBD	NBD or 4-hour	4-hour	ProSupport Plus NBD is retired
ProSupport AIOps platforms	•	•	•	MyService360 and TechDirect (all offers) CloudIQ (ProSupport & ProSupport Plus)
Dell Security Advisories	•	•	•	Available on additional products
Proactive issue detection with automated case creation	•	•	•	New to Basic
Predictive hardware anomaly detection		•	•	New to ProSupport
Access to software updates		•	•	No change
CloudIQ health and cybersecurity monitoring & analytics		•	•	Enhanced features
Incident Manager for Severity 1 cases		•	•	No change
Mission Critical support			•	Enhanced features
Priority access to remote senior support engineers ¹			•	No change
Service Account Manager			•	No change
Proactive system maintenance			•	No change
Limited 3 rd party software support ²			•	No change

¹Based on availability
²Software license can be purchased through Dell or BYOL - see Service Descriptions for details.

DELL Technologies

Figure 22. ProSupport Enterprise Suite

Specialty Support Services

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

Hardware coverage add-ons to ProSupport

- **Keep Your Hard Drive (KYHD) and Keep Your Component (KYC):** Normally if a device fails under warranty, Dell replaces it using a one-for-one exchange process. KYHD / KYC gives you the option to retain your device. It provides full control of sensitive data and minimizes security risk by letting you retain possession of failed drives / components when receiving replacement parts without incurring additional cost.
- **Onsite Diagnosis Service:** Ideal for sites with non-technical staff. Dell field technician performs initial troubleshooting diagnosis onsite and transfers to Dell remote engineers to resolve the issue.
- **ProSupport Add-on for HPC:** Sold as an add-on to a ProSupport service contract, the ProSupport Add-on for HPC provides solution-aware support to cover the additional requirements that are required to maintain an HPC environment such as:
 - Access to senior HPC experts
 - Advanced HPC cluster assistance: performance, interoperability, and configuration
 - Enhanced HPC solution level end-to-end support
 - Remote pre-support engagement with HPC Specialists during ProDeploy implementation
- **ProSupport Add-on for Telco (Respond & Restore):** An add-on service designed for the top 31 TELCO customers globally, Respond & Restore provides direct access to Dell solution experts who specialize in TELCO carrier-grade support. This add-on also provides a hardware uptime guarantee, meaning if a system fails, Dell will have it installed and operational within 4 hours for Severity 1 issues. Dell incurs penalties and fees if SLAs are not met.

Supplemental Site-wide Expertise

- **Multivendor Support Service:** Support your 3rd party devices as one service plan for servers, storage and networking (includes coverage for: Broadcom, Cisco, Fujitsu, HPE, Hitachi, Huawei, IBM, Lenovo, NetApp, Oracle, Quanta, SuperMicro & others).
- **Technical Account Manager:** Designated technology lead who monitors and manages performance and configuration of specific technology sets.
- **Designated Remote Support:** Personalized support expert who manages all troubleshooting and resolution of IT assets

Services for large enterprises

- **ProSupport One for Data Center:** ProSupport One for Data Center offers flexible site-wide support for large and distributed data centers with more than 1,000 assets (combined total of server, storage, networking, etc.). This offering is built on standard ProSupport features that leverage our global scale and are tailored to specific customer needs. While not for everyone, this service option offers a truly unique solution for our largest customers with the most complex environments.
 - Team of assigned Services Account Managers with remote or onsite options
 - Assigned technical and field engineers who are trained on the customer's environment and configurations
 - On-demand reporting and recommendations enabled by ProSupport AIOps tools (MyService360, TechDirect & CloudIQ)
 - Flexible onsite support and parts options that fit their operational model
 - A tailored support plan and training for their operations staff
- **Logistics Online Inventory Solution (LOIS):** Ideal for large organizations that have their own staff to support their data center. Dell offers a service called Logistics Online Inventory Solution which is an onsite parts locker that provides self-maintainers with a local inventory of common replacement components. Having access to these parts lockers allows the self-maintainer to replace a failed component immediately without delay. Each replacement part would automatically initiate a replenishment of the parts inventory that is shipped next day or delivered onsite by Dell during a regular scheduled visit (called Scheduled Onsite Service). As part of the LOIS system, customers can integrate their systems directly to Dell TechDirect using APIs to help streamline the support management process.

End-of-Life Services

- **Post Standard Support (PSS):** Extend service life beyond the initial seven years of ProSupport, adding up to five more additional years of hardware coverage
- **Data Sanitization & Data Destruction:** Renders data unrecoverable on repurposed or retired products, ensuring security of sensitive data and enabling compliance and provides NIST compliant certification.
- **Asset Recovery Services:** Recycle, resale, and disposal of hardware. Helps you securely and responsibly retire IT assets that are no longer needed while protecting both your business and the planet.

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. We are here to help guide your next transformation that could address multi-cloud environments, business applications, DevOps, business resiliency, data center modernization, analytics, workforce collaboration, and user experiences.

Managed Services

Some customers prefer Dell to manage the complexity and risk of daily IT operations. Dell Managed Services utilizes proactive, artificial intelligence to improve operations and modern automation. This helps customers realize desired business outcomes from their infrastructure investments. With these technologies, our experts run, update, and fine-tune customer environments. You decide the service level requirements and we provide oversight of the environment. There are two types of managed service offers. First the outsourcing model, or CAPEX model, where Dell manages customer owned assets using our people and tools. The second is the "as-a-Service" model, or OPEX model, which we call 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.

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

1 – Some minimum device counts may apply. Order via: 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 23. Dell Managed Services

- **Managed Detection and Response (MDR):** Dell Technologies Managed Detection and Response (MDR) is powered by Secureworks Taegis XDR software platform. MDR is a managed service that secures the customer's IT environment against malicious actors and provides remediation if and when a threat is identified. When a customer purchases MDR, they will receive the following features from our team:
 - Dell badge resources
 - Agent rollout assistance to help deploy the Secureworks Endpoint Agent.
 - 24x7 threat detection and investigation
 - Up to 40 hrs per quarter of response and active remediation activities
 - If the customer experiences a breach, we will provide up to 40 hrs per year of Cyber incident response initiation.
 - Quarterly reviews with the customer to review the data

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](https://www.dell.com/education)

Resources

[Services for PowerEdge.](#)

Appendix A: Additional specifications

Topics:

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

Chassis dimensions

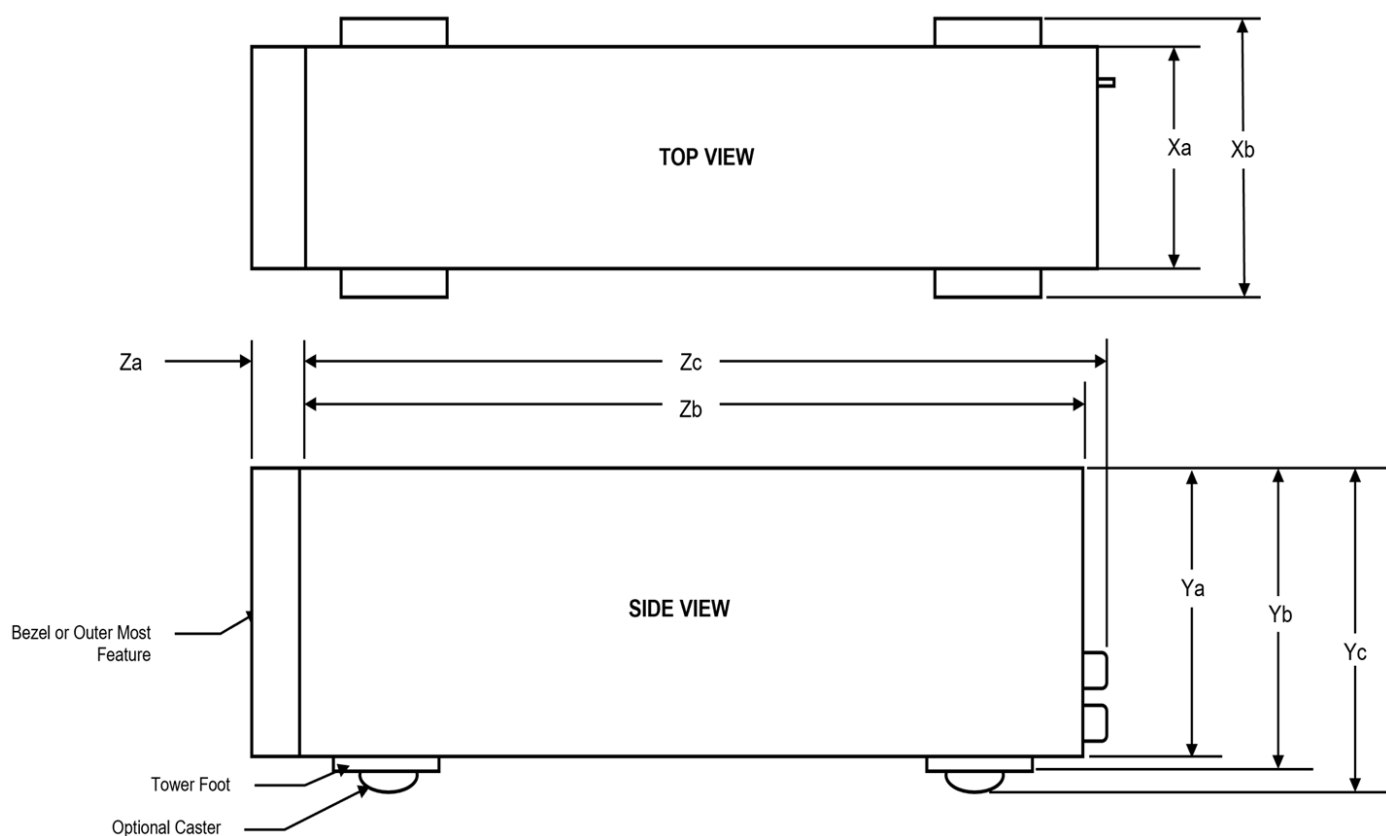


Figure 24. Chassis dimensions

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	10%	20%	50%	100%
Redundant 60 mm	600 W	Platinum	-	92.00%	94.00%	90.00%
	700 W	Titanium	90.00%	94.00%	96.00%	91.00%
	800 W	Platinum	-	92.00%	94.00%	90.00%
	1100 W	Titanium	90.00%	94.00%	96.00%	91.00%
	1100 W DC	NA	85.00%	90.00%	92.00%	90.00%

Table 29. PSU efficiency level (continued)

Efficiency Targets by Load						
Form factor	Output	Class	10%	20%	50%	100%
	1400 W	Platinum	-	92.00%	94.00%	90.00%
	1400 W 277 VAC	Titanium	90.00%	94.00%	96.00%	91.00%
	1800 W	Titanium	90.00%	94.00%	96.00%	91.00%
Redundant 86 mm	2400 W	Platinum	-	92.00%	94.00%	90.00%
	2800 W	Titanium	90.00%	94.00%	96.00%	91.00%

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.

Table 30. Continuous Operation Specifications for ASHRAE A2

Description	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

Description	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

Description	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

Description	Allowable continuous operations
Temperature range for altitudes <= 900 m (<= 2953 ft)	5–55°C (41–131°F) with no direct sunlight on the equipment

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

Description	Allowable continuous operations
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 34. Common Environmental Specifications for ASHRAE A2, A3, A4 and Rugged

Description	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 <i>i</i> NOTE: * - Per ASHRAE thermal guidelines for tape hardware, these are not instantaneous rates of temperature change.
Non-operational temperature limits	-40 to 65°C (-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: STD and HPR fans support DIMM capacity of less than or equal to 64 GB. Memory capacity of greater than/equal to 96 GB or less than/equal to 128 GB is supported by HPR fan only.

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 redundancy 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	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						
	225 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	
250 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		

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	Nvidia 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

Table 41. GPU thermal restriction matrix (continued)

GPU TDP	Supported GPU	Fan configuration	Maximum supported quantity	Note
		HPRx7 (with TBU only)	6	Does not support fan redundancy when installed on Riser
		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)	Extended ambient 40° C Operating Support (ASHRAE A3 compliant)	Extended ambient 45° C Operating Support (ASHRAE A4 compliant)
<p>NOTE: All options supported unless otherwise noted.</p> <ul style="list-style-type: none"> 3x or 4x STD Fan config only support CPU Base TDP<=185W 3x STD Fans config does not support BOSS module HPR fan is required to support 96GB <= DDR5 DIMM <= 128GB With STD Fans, the following OCP3.0 & PCIe cards only support optic cable with thermal Spec 85C and power <=1.2W <ul style="list-style-type: none"> Mellanox CX6 Lx 25GB 2P PCIe card Broadcom 25GB 4P SPF 57504 PCIe card Intel 25GB 4P E810-CCV PCIe card Intel 25GB 2P XXV710 PCIe card Intel 25GB 4P E810-XXV OCP card 	<ul style="list-style-type: none"> Two PSUs are required. System performance may be reduced in the event of a PSU failure Does not support 3x or 4x STD Fans configs Does not support 8x STD fans configurations with CPU Base TDP > 125W HPRx8 Fans configuration is required to support BOSS M.2 Module Does not support TBU Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card Does not support OCP transfer rate >25G or cooling tier > 10 Does not support GPU card Optic Cable with spec 85C is required. 	<ul style="list-style-type: none"> Two PSUs are required. System performance may be reduced in the event of a PSU failure Does not support STD fans configs Does not support 4x HPR fans config with CPU Base TDP > 150W Does not support 8x HPR fans configs with CPU Base TDP > 225W Does not support TBU Does not support BOSS M.2 Module Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card Does not support OCP transfer rate >25G or cooling tier > 10 Does not support GPU card 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)
<ul style="list-style-type: none"> ● 4x STD fans support only processor with TDP<=185W ● Does not support 2.5" SAS4 drives with STDx4 Fans ● With STD Fans, the following OCP3.0 & PCIe cards only support optic cable with thermal Spec 85C and power <=1.2W <ul style="list-style-type: none"> ○ Mellanox CX6 Lx 25GB 2P PCIe card ○ Broadcom 25GB 4P SPF 57504 PCIe card ○ Intel 25GB 4P E810-CCV PCIe card ○ Intel 25GB 2P XXV710 PCIe card ○ Intel 25GB 4P E810-XXV OCP card ○ HPR fan is required to support 96GB <= DDR5 DIMM <= 128GB 	<ul style="list-style-type: none"> ● Two PSUs are required. System performance may be reduced in the event of a PSU failure ● Does not support 3x or 4x STD Fans configs ● Does not support 8x STD fans configurations with CPU Base TDP > 125W ● HPRx8 Fans configuration is required to support BOSS M.2 Module ● Does not support TBU ● Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards ● Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card ● Does not support OCP transfer rate >25G or cooling tier > 10 ● Does not support GPU card ● Optic Cable with spec 85C is required. 	<ul style="list-style-type: none"> ● Two PSUs are required. System performance may be reduced in the event of a PSU failure ● Does not support STD fans configs ● Does not support 4x HPR fans config with CPU Base TDP > 150W ● Does not support 8x HPR fans configs with CPU Base TDP > 225W ● Does not support TBU ● Does not support BOSS M.2 Module ● Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards ● Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card ● Does not support OCP transfer rate >25G or cooling tier > 10 ● Does not support GPU card ● 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)
<p>HPR fans are required.</p>	<ul style="list-style-type: none"> ● Two PSUs are required ● System performance may be reduced in the event of a PSU failure ● Does not support TBU ● HPRx8 Fans configuration is required to support BOSS M.2 Module ● Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards ● Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card ● Does not support OCP transfer rate >25G or cooling tier > 10 ● Does not support GPU card ● Optic Cable with spec 85C is required 	<ul style="list-style-type: none"> ● Two PSUs are required. System performance may be reduced in the event of a PSU failure ● Does not support 4x HPR fans config with CPU Base TDP > 150W ● Does not support 8x HPR fans configs with CPU Base TDP > 225W ● Does not support TBU ● Does not support BOSS M.2 Module ● Does not support Non-Dell qualified peripheral cards and Channel devices (FW) cards ● Does not support PCIe card consuming power >= 25W and Mellanox CX6 Lx 25GB 2P PCIe card ● Does not support OCP transfer rate >25G or cooling tier > 10 ● Does not support GPU card ● Optic Cable with spec 85C is required.

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.msp
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_1_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

Appendix C Additional resources

Table 46. 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"> • Chassis features • System Setup program • System indicator codes • System BIOS • Remove and replace procedures • Diagnostics • Jumpers and connectors 	Dell.com/Support/Manuals
Getting Started Guide	<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"> • 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