Dell PowerEdge T160

Technical Guide

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DELL Technologies

Notes, cautions, and warnings

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

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

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

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Contents

Chapter 1: Dell PowerEdge T160 system overview 5
New technologies 5
Key workloads 6

Chapter 2: Product comparison 7

Chapter 3: Chassis views and features 10
Front view of the system 10
Rear view of the system 12
Inside the system 14
Quick Resource Locator 14

Chapter 4: Processor 16
Processor features 16
Supported processors 16

Chapter 5: Memory subsystem 17
Supported memory 17

Chapter 6: Storage 18
Storage controllers 18
Supported Drives 18
Internal storage configuration 19
External Storage 19

Chapter 7: Networking 20
Overview 20
Supported network cards 20

Chapter 8: PCIe subsystem 21
PCIe risers 21

Chapter 9: Power, thermal, and acoustics 23
Power 23
Power Supply Units 23
Thermal 24
Thermal design 24
Acoustics 25
PowerEdge acoustical specifications 25
Acoustical configurations of T160 32

Chapter 10: Operating Systems and Virtualization 34
Supported Operating Systems 34

Chapter 11: Dell OpenManage Systems Management..... 35
Integrated Dell Remote Access Controller (iDRAC)..... 35
Systems Management software support matrix..... 36

Chapter 12: Appendix D: Services..... 38
Why attach service contracts..... 38
ProSupport Infrastructure Suite..... 38
Specialty Support Services..... 40
ProDeploy Infrastructure Suite..... 41
Supplemental Deployment Services..... 43
Unique Deployment Scenarios..... 44
DAY 2 - Automation Services with Ansible..... 45
Consulting Services..... 46
Resources..... 47

Chapter 13: Appendix A: Additional specifications..... 48
Chassis dimensions..... 48
System weight..... 49
NIC port specifications..... 49
Video specifications..... 49
Ports specifications..... 50
PSU rating..... 50
Environmental specifications..... 51
Thermal air restrictions..... 52
Thermal restriction matrix..... 52

Chapter 14: Appendix A. Standards compliance..... 54

Chapter 15: Appendix C Additional resources..... 55

1

Dell PowerEdge T160 system overview

The PowerEdge T160 system is a single-socket 3U tower server that supports:

- One Intel® Xeon®-E series processor or one Intel® Pentium® processor
- Four DDR5 UDIMM slots
- One Cabled AC power supply unit
- PCI Express® (PCIe) 4.0 enabled expansion slots
- Up to 3 x 3.5 inch SATA/SAS HDD/SSD
- Up to 3 x 3.5 inch + 2 x 2.5 inch SATA/SAS HDD/SSD
- Onboard LAN ports

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

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

Topics:

- New technologies
- Key workloads

New technologies

Table 1. New technologies

Technology	Detailed Description
Intel® Xeon® E-2400 series processor	Core count: Up to eight core processor
	Maximum number of PCIe lanes: Integrated 16 PCIe Gen5 lanes @ 32 GT/s, 4 PCIe Gen4 lanes @ 16 GT/s
	Maximum TDP: 95 W
Intel® Pentium® G7400/G7400T processor	Core count: Up to two core processor
	Maximum number of PCIe lanes: Integrated 16 PCIe Gen5 lanes @ 32 GT/s, 4 PCIe Gen4 lanes @ 16 GT/s
	Maximum TDP: 46 W
5600 MT/s DDR5 Memory	Maximum 4 DIMM slots per system
	Supports DDR5 ECC UDIMM up to 4400 MT/s **NOTE:** Operating speed of the DIMM is limited due to the processor.
Flex I/O	LOM, 2 x 1Gb with BCM5720 LAN controller
	Rear I/O with: • 1 x Dedicated iDRAC Ethernet port • 3 x USB 3.2 Gen1 • 3 x USB 2.0 • 1 x VGA port

Table 1. New technologies (continued)

Technology		Detailed Description
		Serial Port
		Front I/O with: ● 1 x USB 3.2 Gen1 ● 1 x iDRAC Direct (Micro-AB USB) port
CPLD 1-wire		Support payload data of PERC, and Rear I/O to BOSS-N1 and iDRAC.
Dedicated PERC		PERC adapters with PERC11
Software RAID		Operating system RAID/S160
Power Supplies	120 mm dimension PSU	Bronze 300 W AC
		Platinum 500 W AC

Key workloads

- Mailing and Message
- Data analytics
- Traditional Business Applications

2

Product comparison

The following table shows the comparison between the PowerEdge T160 with the PowerEdge T150.

Table 2. Features comparison

Features	PowerEdge T160	PowerEdge T150
Processor	One Intel® Xeon® E-2400 series processor with up to eight cores or one Intel® Pentium processor with up to two cores	One Intel® Xeon® E-2300 series processor with up to eight cores, or Intel® Pentium processors with up to two cores
Memory	DIMM Speed • Up to 4400 MT/s Memory Type • UDIMM Memory module slots • Four DDR5 DIMM slots • Supports unregistered ECC DDR5 DIMM slots only Maximum RAM • UDIMM 128 GB	DIMM Speed • Up to 3200 MT/s Memory Type • UDIMM Memory module slots • Four DDR4 DIMM slots • Supports unregistered ECC DDR4 DIMM slots only Maximum RAM • UDIMM 128 GB
Storage Controllers	• Internal controllers: PERC H355 Adapter, HBA355i Adapter, PERC H755 Adapter • Internal Boot: Boot Optimized Storage Subsystem (BOSS-N1): HWRAID 2 x M.2 SSDs or USB • External HBA (non-RAID): HBA355e Adapter • Software RAID: S160	• Internal controllers: PERC H345, PERC H355, HBA355i, PERC H755 • Internal Boot: Boot Optimized Storage Subsystem (BOSS-S2): HWRAID 2 x M.2 SSDs • External HBA (non-RAID): HBA355e • Software RAID: S150
Drive Bays	Front bays: • Up to 3 x 3.5-inch cable SATA HDD/SSD from chipset, max 48 TB • Up to 3 x 3.5-inch cable SAS/SATA HDD/SSD from PERC, max 48 TB • Up to 3 x 3.5-inch + 2 x 2.5-inch cable SATA HDD/SSD from chipset, max 63.36 TB • Up to 3 x 3.5-inch + 2 x 2.5-inch cable SAS/SATA HDD/SSD drives from PERC, max 63.36 TB	Front bays: • Up to 4 x 3.5-inch SAS/SATA HDD/SSD • Maximum 80 TB on four HDD configuration
Power Supplies	• 300 W Bronze 100—240 V AC, cabled • 500 W Platinum 100—240 V AC, cabled	• 300 W Bronze 100—240 V AC, cabled • 400 W Platinum 100—240 V AC, cabled
Cooling Options	Air cooling	Air Cooling
Fans	One Standard (STD) fan and one optional High Performance (HPR) fan/PCIe **NOTE:** All fans are cabled.	One Standard (STD) fan and one optional High performance (HPR) silver fan **NOTE:** All fans are cabled.
Dimension	Height—332.5 mm (13.09 inches) (with feet)	Height— 362.9 mm (14.28 inches)
	329.5 mm (12.97 inches)(without feet)	360 mm (14.17 inches) (without feet)
	Width— 132.52 mm (5.21 inches)	Width—175.0 mm (6.88 inches)

Table 2. Features comparison (continued)

Features	PowerEdge T160		PowerEdge T150	
	Depth— 408.8 mm (16.09 inches) (with bezel)		Depth— 453.75 mm (17.86 inches) (with bezel)	
	403.8 mm (15.89 inches) (without bezel)		428.75 mm(16.87 inches) (without bezel)	
Form Factor	3U tower server		4U tower server	
Embedded Management	• iDRAC9 • iDRAC Direct • iDRAC RESTful API with Redfish • iDRAC Service Module		• iDRAC9 • iDRAC Direct • iDRAC RESTful API with Redfish • iDRAC Service Module	
Bezel	Filter bezel (pRTS)		Optional LCD bezel or security bezel	
OpenManage Software	• OpenManage Enterprise • OpenManage Power Manager plugin • OpenManage Service plugin • OpenManage Update Manager plugin • CloudIQ for PowerEdge plug in • OpenManage Enterprise Integration for VMware vCenter • OpenManage Integration for Microsoft System Center • OpenManage Integration with Windows Admin Center		• OpenManage Enterprise • OpenManage Power Manager plug-in • OpenManage SupportAssist plug-in • OpenManage Update Manager plug-in	
Mobility	OpenManage Mobile		OpenManage Mobile	
Integrations and Connections	• BMC Truesight • Microsoft System Center • OpenManage Integration with ServiceNow • Red Hat Ansible Modules • Terraform Providers • VMware vCenter and vRealize Operations Manager		OpenManage Integrations • BMC Truesight • Microsoft System Center • Red Hat Ansible Modules • VMware vCenter and vRealize Operations Manager	OpenManage Connections • IBM Tivoli Netcool/ OMNIbus • IBM Tivoli Network Manager IP Edition • Micro Focus Operations Manager • Nagios Core • Nagios XI
Security	• Cryptographically signed firmware • Data at Rest Encryption (SEDs with local or external key mgmt) • Secure Boot • Secured Component Verification (Hardware integrity check) • Secure Erase • Secured-core server • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ		• Cryptographically signed firmware • Secure Boot • Secure Erase • Silicon Root of Trust • System Lockdown (requires iDRAC9 Enterprise or Datacenter) • TPM 1.2/2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ	
Embedded NIC	2 x 1GbE LOM		2 x 1 GbE LOM	
Networking Options	Optional Network Card		Optional Network Card	
GPU Options	Not supported		Not supported	
Ports	Front Ports	Rear Ports	Front Ports	Rear Ports

Table 2. Features comparison (continued)

Features	PowerEdge T160		PowerEdge T150	
	• 1 x USB 3.2 Gen1 • 1 x iDRAC Direct (Micro-AB USB) port	• 3 x USB 2.0 • 3 x USB 3.2 Gen1 • 1 x Serial port • 1 x Dedicated iDRAC Ethernet port • 2 x Ethernet port • 1 x VGA port	• 1 x iDRAC Direct (Micro-AB USB) port • 1 x USB 3.0	• 5 x USB 2.0 • 1 x iDRAC ethernet port • 1 x USB 3.0 • 1 x VGA • 1 x Serial
	Internal Port : • 1 x USB 3.2 Gen1		Internal Port : • 1 x USB 3.0 (Optional)	
PCIe	Slot 1: 1 x8 slot with x4 bandwidth, Half Height, Half Length		Slot 1: x8 Gen4 Full height, half length	
	Slot 2: 1 x16 slot with x16 bandwidth, Half Height, Half Length		Slot 2: x16 Gen4 Full height, half length	
			Slot 3: x1 Gen3 Full height, half length	
			Slot 4: x8 Gen3 Full height, half length	
Operating System and Hypervisors	• Canonical Ubuntu Server LTS • Microsoft Windows Server with Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi For specifications and interoperability details, see Dell.com/OSsupport.		• Canonical Ubuntu Server LTS • VMware ESXi • Microsoft Windows Server with Hyper-V • SUSE Linux Enterprise Server • Red Hat Enterprise Linux For specifications and interoperability details, see Dell EMC Enterprise Operating Systems on Servers, Storage, and Networking page at Dell.com/OSsupport.	

3

Chassis views and features

Topics:

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

Front view of the system

Figure 1. Front view of the system

Table 3. Features available on the front of the system

Item	Ports, panels, and slots	Icon	Description
1	Power button		Indicates if the system is powered on or off. Press the power button to manually power on or off the system.
2	Status LED indicators		Indicates the status of the system. For more information, see the Status LED indicators section.
3	USB 3.2 port		Supports USB 3.2 compliant devices.
4	iDRAC Direct (Micro-AB USB) port		The iDRAC Direct (Micro-AB USB) port enables you to access the iDRAC direct Micro-AB USB features. For more information, see the *Integrated Dell Remote Access Controller User's Guide* at PowerEdge Manuals.
5	Express Service Tag	N/A	A slide-out label panel that contains the Express Service Tag that has system information such as Service Tag, NIC, MAC address, and so on. If you have opted for the secure default access to iDRAC, the Information tag will also contain the iDRAC secure default password.
6	Rubber feet	N/A	Rubber feet

Rear view of the system

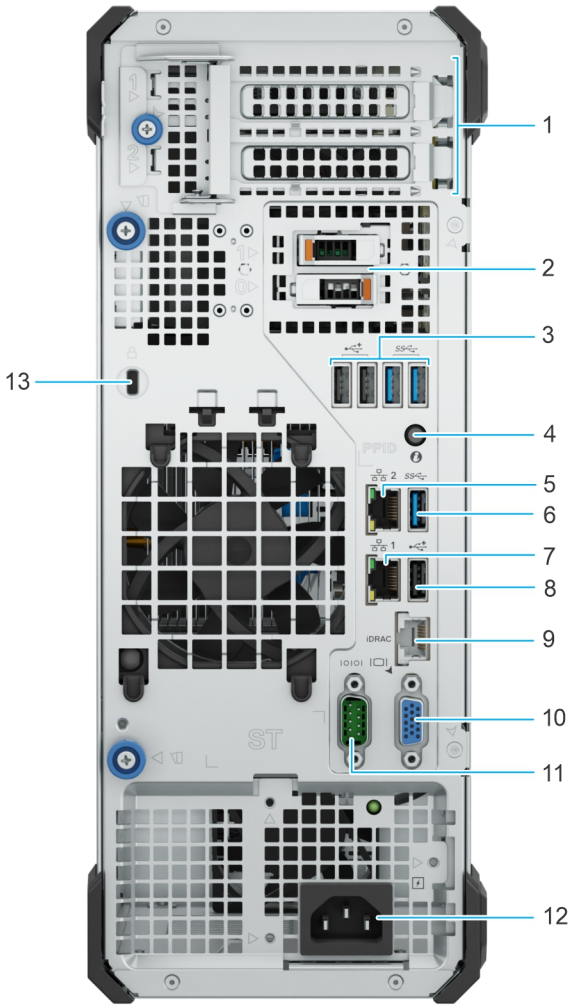

Figure 2. Rear view of the system

Table 4. Features available at the rear of the system

Item	Ports, panels, or slots	Icon	Description
1	PCIe expansion card slots	N/A	Enables you to connect PCI express expansion cards.
2	BOSS-N1 (optional)	N/A	BOSS-N1 (optional) for internal system boot.
3	2 x USB 2.0 + 2 x USB 3.2 ports		Supports USB 2.0 and USB 3.2 compliant devices.
4	System Identification (ID) button		The System Identification (ID) button is available at the rear of the system. Press the button to identify a system by turning on the system ID button. You can also use the system ID button to reset iDRAC and to access the BIOS using the step-through

Table 4. Features available at the rear of the system (continued)

Item	Ports, panels, or slots	Icon	Description
			mode. When pressed, the system ID LED in the back panel blinks until either the front or rear button is pressed again. Press the button to toggle between on or off mode.
5	NIC port (2)		The NIC ports that are integrated on the LOM card provide network connectivity which is connected to the system board.
6	USB 3.2 port		Supports USB 3.2 compliant devices.
7	NIC port (1)		The NIC ports that are integrated on the LOM card provide network connectivity which is connected to the system board.
8	USB 2.0 port		Supports USB 2.0 compliant devices.
9	Dedicated iDRAC Ethernet port	iDRAC	Enables you to remotely access iDRAC. For more information, see the Integrated Dell Remote Access Controller User's Guide at PowerEdge Manuals.
10	VGA port		Enables you to connect a display device to the system.
11	Serial port		Enables you to connect a serial device to the system.
12	Cabled power supply unit		Enables you to connect to AC power source.
13	Kensington lock slot	N/A	Enables you to connect security cable to prevent unauthorized movement of your system.

Inside the system

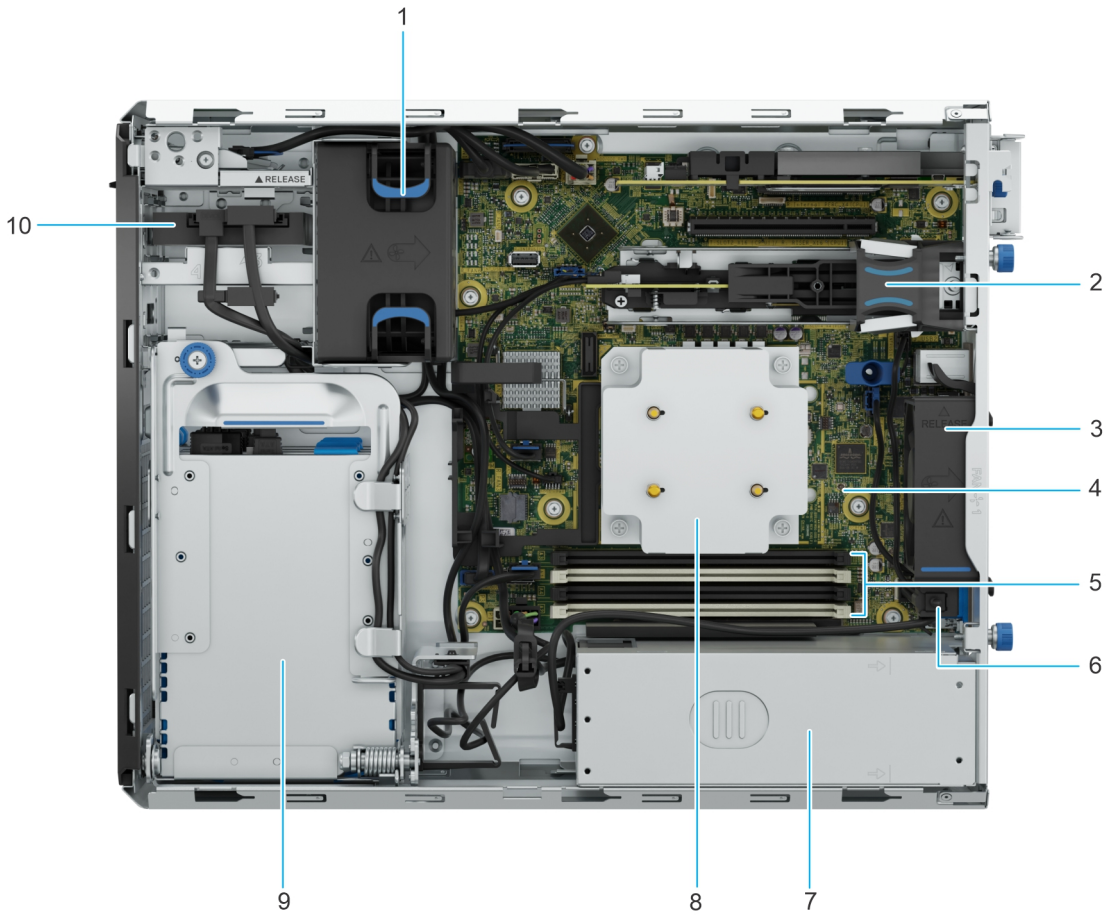

Figure 3. Inside view of the system

1. High Performance (HPR) fan - Optional
2. BOSS N1 module
3. Cooling fan
4. System board
5. Memory module sockets
6. Intrusion switch
7. Cabled PSU
8. Heat sink
9. 3.5-inch drive cage
10. 2.5-inch drive cage

Quick Resource Locator

The QRL on everything (SILs, GSG, Owner's Manual except on the EST) is a generic QRL for T160 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 T160 that is available in the other QRLs.

Figure 4. Quick Resource Locator for PowerEdge T160 system

4

Processor

Topics:

- Processor features

Processor features

The following lists the features and functions that are in the upcoming Intel® Xeon® E-2400 series processor offering:

- For small businesses, Xeon® E provides a reliable solution with business-ready servers to support business-critical services and customer data needs.
- For cloud services, Xeon® E is the perfect option for Bare Metal Instances & Code/Data Security, with a cost-effective solution for essential performance to support entry-level bare metal services.

Key updates for the E-2400 series include increased performance with a new processor core architecture:

- 4, 6, and 8 core option
- Up to 95 W TDP
- Up to 128 GB memory
- DDR5 up to 4400 MT/s

Supported processors

The following table shows the processors that are supported on the T160.

Table 5. Supported processors for T160

Processor	Clock Speed (GHz)	Cache (M)	Cores	Threads	Turbo*	Memory Speed (MT/s)	Memory Capacity	TDP
E-2488	3.2	24	8	16	Turbo	4800	128 GB	95 W
E-2486	3.5	18	6	12	Turbo	4800	128 GB	95 W
E-2478	2.8	24	8	16	Turbo	4800	128 GB	80 W
E-2468	2.6	24	8	16	Turbo	4800	128 GB	65 W
E-2456	3.3	18	6	12	Turbo	4800	128 GB	80 W
E-2436	2.9	18	6	12	Turbo	4800	128 GB	65 W
E-2434	3.4	12	4	8	Turbo	4800	128 GB	55 W
E-2414	2.6	12	4	4	Turbo	4800	128 GB	55 W
G7400	3.7	6	2	4	No Turbo	4800	128 GB	46 W
G7400T	3.1	6	2	4	No Turbo	4800	128 GB	35 W

NOTE: * Intel® E-2400 Series processors under turbo mode will not be able to meet max frequency due to processor TDP thermal limitations.

5

Memory subsystem

Topics:

- Supported memory

Supported memory

Table 6. Memory technology

DIMM type	Rank	Capacity	DIMM rated voltage and speed	Operating Speed	
				1 DIMM per channel (DPC)	2 DIMM per channel (DPC)
ECC UDIMM	1 R	16 GB	DDR5 (1.1 V), 5600 MT/s	4400 MT/s	4000 MT/s
	2 R	32 GB	DDR5 (1.1 V), 5600 MT/s	4400 MT/s	3600 MT/s

Table 7. Supported DIMMs

Rated DIMM Speed (MT/s)	DIMM Type	DIMM Capacity (GB)	Ranks per DIMM	Data Width	DIMM Volts
5600	UDIMM	16	1	8	1.1
5600	UDIMM	32	2	8	1.1

6

Storage

Topics:

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

Storage controllers

- PowerEdge Hardware RAID controllers (PERC) series 11 is designed for:
  - Enhanced performance
  - Fault tolerance
  - Simplified management of RAID array drives
- PowerEdge controller series 11 supports older legacy SAS and SATA drive interfaces.
- Dell S160 is a software RAID solution for PowerEdge systems.

Table 8. PERC Series controller offerings

Performance Level	Controller and Description
Entry	S160 (Software RAID: SATA)
Value	H355, HBA355 (internal/external)
Performance	H755

NOTE: For more information about the features of the Dell PowerEdge RAID controllers (PERC), Software RAID controllers, or BOSS cards, and on deploying the cards, see the storage controller documentation at Storage Controller Manuals.

NOTE: H355 replaces H345 as the entry raid controller.

Supported Drives

Table 9. Supported Drives

Form Factor	Type	Speed	Rotational Speed	Capacities
2.5 inches	SAS	12 Gbps	10 K	600 GB, 1.2 TB, 2.4 TB
	SAS	24 Gbps	SSD	800 GB, 1.6 TB, 1.92 TB, 3.84 TB, 7.68 TB
	SATA	6 Gbps	SSD	480 GB, 960 GB, 1.92 TB, 3.84 TB
3.5 inches	SAS	12 Gbps	7.2 K	2 TB, 4 TB, 8 TB, 12 TB, 16 TB
	SATA	6 Gbps	7.2 K	2 TB, 4 TB, 8 TB, 12 TB, 16 TB

Internal storage configuration

T160 supports the following internal storage configurations:

- 3 x 3.5-inch SATA HDD from chipset
- 3 x 3.5-inch + 2 x 2.5-inch SATA HDD from chipset

External Storage

The T160 supports 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

7

Networking

Topics:

- Overview
- Supported network cards

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.

Supported network cards

Table 11. Supported network cards

Vendor	Port type	Port speed	Port count
Intel	BT	10 GbE	2
Broadcom	BT	10 GbE	3
Broadcom	BT	10 GbE	4
Intel	F1	1 GbE	4

8

PCIe subsystem

Topics:

- PCIe risers

PCIe risers

The T160 has a no riser option. Shown below are the PCIe slot offerings for the platform.

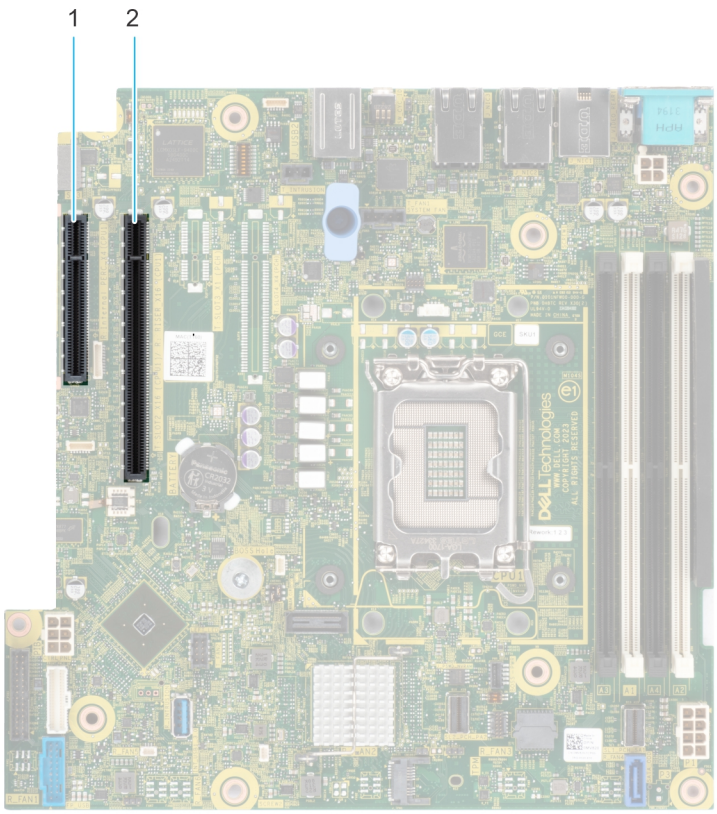

Figure 5. Riser connector slots on system board

1. PCIe Slot 1 (CPU 1)
2. PCIe Slot 2 (CPU 1)

Table 12. PCIe Riser Configurations

Config No.	Riser configuration	No. of Processors	PERC type supported	Rear storage possible
0	N/A	1	Adapter	No

NOTE: The expansion-card slots are not hot-swappable.

The following table provides guidelines for installing expansion cards to ensure proper cooling and mechanical fit. The expansion cards with the highest priority should be installed first using the slot priority indicated. All the other expansion cards should be installed in the card priority and slot priority order.

Table 13. Configuration : No Riser

Card type	Slot priority	Maximum number of cards
FOXCONN (aPERC 11)	2,1	1
FOXCONN (aPERC HBA11)	2,1	2
FOXCONN (External Adapter)	2,1	2
Intel (NIC:10Gb)	2,1	2
Broadcom (NIC:10Gb)	2,1	2
Intel (NIC:1Gb)	2,1	2
FOXCONN (BOSS-N1)	INT	1

9

Power, thermal, and acoustics

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

Topics:

- Power
- Thermal
- Acoustics

Power

Table 14. Power tools and technologies

Feature	Description
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 Dell EIPT.
Industry Compliance	Dell's servers are compliant with all relevant industry certifications and guide lines, including 80 PLUS, Climate Savers and ENERGY STAR.
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.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including: ● Power distribution units (PDUs) ● Uninterruptible power supplies (UPSs) ● Energy Smart containment rack enclosures Find additional information at: Power and Cooling.

Power Supply Units

The PowerEdge T160 system supports one AC cabled power supply unit (PSU).

The table below shows the power supply unit options that are available for the PowerEdge T160.

Table 15. Power Supply Unit Options

Wattage	Frequency	Voltage/Current	Class	Heat dissipation
300 W	50/60 Hz	100-240 Vac/4.6 - 2.3 A	Bronze	1250 BTU/hr
500 W	50/60 Hz	100-240 Vac/7.0 - 3.5 A	Platinum	1920 BTU/hr

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

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

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

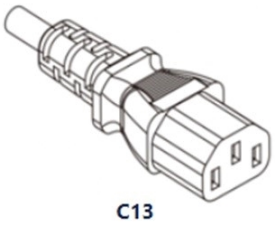

Figure 6. PSU power cord

Table 16. PSU power cords

Form factor	Output	Power cord
Cable PSU 120 mm	300 W AC	C13/C14
	500 W AC	

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.

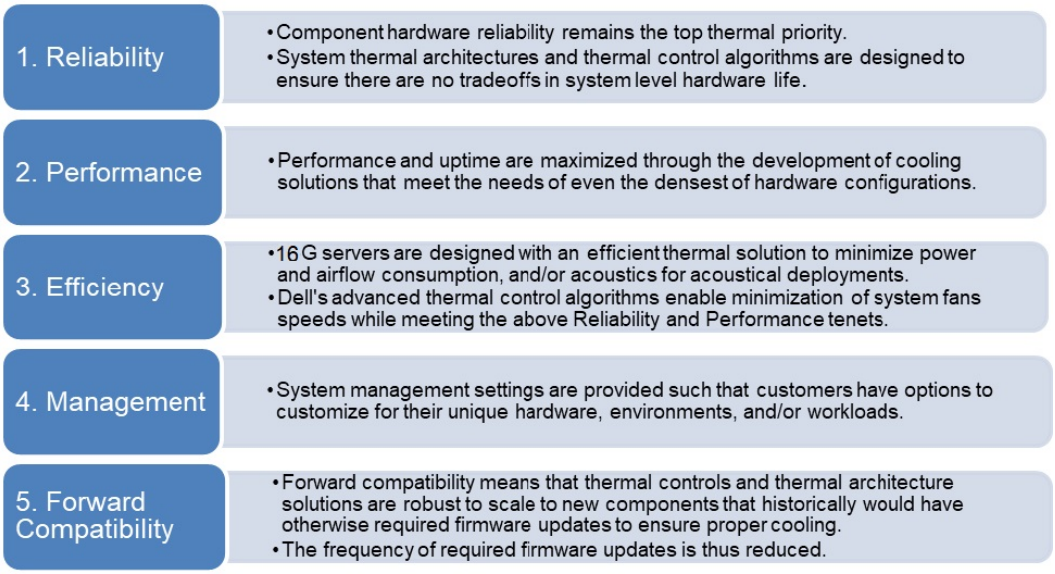

Figure 7. Thermal design characteristics

The thermal design of the PowerEdge T160 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, and hard disk drives.
- 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 T160 Installation and Service Manual at PowerEdge Manuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com.
- Environmental Specifications: The optimized thermal management makes the T160 reliable under a wide range of operating environments.

Acoustics

PowerEdge acoustical specifications

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

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

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

Category 1: Table-top in Office Environment

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

Table 17. Dell Enterprise Category 1, "Table-top in Office Environment" acoustical specification category.

Measurement Position re AC0158	Metric, re AC0159	Test Modes, re AC0159 (note must be in steady state, see AC0159, except where noted below)			
		Standby in 23±2° C Ambient	Idle in 23±2° C Ambient	Operating in 23±2° C Ambient – if not otherwise specified in the program's configuration document, then processor and hard drive operating modes are required	Simulate (that is, set fan speeds representative) for Idle at 28° C & 35° C Ambient, and for 100% loading and maximum configuration, at 35° C Ambient
Sound Power	LwA-m, bels	≤ 4.2	≤ 4.7	≤ 5.0	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 35	≤ 35	≤ 35	Report

Table 17. Dell Enterprise Category 1, "Table-top in Office Environment" acoustical specification category. (continued)

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

Category 2: Floor-standing in Office Environment

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

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

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

Category 3: General Use Space

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

Table 19. Dell Enterprise Category 3, "General Use" acoustical specification category

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

Table 19. Dell Enterprise Category 3, "General Use" acoustical specification category (continued)

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

Category 4: Attended Data Center

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

Table 20. Dell Enterprise Category 4, "Attended Data Center" acoustical specification category.

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

Table 20. Dell Enterprise Category 4, "Attended Data Center" acoustical specification category. (continued)

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

Category 5: Unattended Data Center

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

Table 21. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category

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

Table 21. Dell Enterprise Category 5, "Unattended Data Center" acoustical specification category (continued)

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

Acoustical configurations of T160

Dell PowerEdge T160 is a tower server appropriate for a quiet office environment. The acoustical output is not noticeable in a typical office environment.

Table 22. Configurations tested for acoustical experience

Configuration	Economy	Volume with BOSS	Volume Max Storage
Processor	Intel Raptor Lake, 70W	Intel Raptor Lake, 80W	Intel Raptor Lake, 80W
Processor Quantity	1	1	1
Memory	16GB UDIMM	32GB UDIMM	32GB UDIMM
Memory Quantity	2	2	2
Storage	3.5" SATA 2-TB HDD	2.5" 600G SAS HDD	2.5" 600G SAS HDD
Storage Quantity	1	5	5
Backplane	3x 3.5" Cabled, 2x 2.5" Cabled	3x 3.5" Cabled, 2x 2.5" Cabled	3x 3.5" Cabled, 2x 2.5" Cabled
Power Supply Unit	300 W	300 W	300 W
Power Supply Quantity	1	1	1
PCI 1	N/A	PERC H355i	PERC H355i
BOSS	N/A	Yes	N/A
Other	N/A	N/A	N/A

Table 23. Acoustical performance of T160 acoustical configurations

Configuration	Economy	Volume with BOSS	Volume Max Storage
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			

Table 23. Acoustical performance of T160 acoustical configurations (continued)

Configuration		Economy	Volume with BOSS	Volume Max Storage
$L_{wA,m}$ (B)	Idle	4.0	4.1	4.1
	Operating	4.0	4.1	4.1
K_v (B)	Idle	0.4	0.4	0.4
	Operating	0.4	0.4	0.4
$L_{pA,m}$ (dB)	Idle	28	29	29
	Operating	28	29	29
Prominent tones		No prominent tones in Idle and Operating		
Acoustical Performance: Idle @ 28 °C Ambient				
$L_{wA,m}$ (B)		4.0	4.1	4.1
K_v (B)		0.4	0.4	0.4
$L_{pA,m}$ (dB)		28	29	29
Acoustical Performance: Max. Loading @ 35 °C Ambient				
$L_{wA,m}$ (B)		5.2	6.3	6.3
K_v (B)		0.4	0.4	0.4
$L_{pA,m}$ (dB)		41	52	52

(1)LwA, m: The declared mean A-weighted sound power level (LwA) is calculated per section 5.2 of ISO 9296 (2017) with data collected using the methods that are described in ISO 7779 (2010). Data presented here may not be fully compliant with the 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 on a standard table, 75 cm above a reflective floor. Data presented here may not be fully compliant with the ISO 7779 declaration requirement.

(3)Prominent tones: Criteria of D.6 and D.11 of ECMA-74 (17th ed., December 2019) 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 per C.9.3.2 in ECMA-74 (17th ed., December 2019).

10

Operating Systems and Virtualization

Topics:

- Supported Operating Systems

Supported Operating Systems

The PowerEdge system supports the following operating systems:

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

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

11

Dell OpenManage Systems Management

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

The OpenManage portfolio includes:

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

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

For more information about the entire OpenManage portfolio, see:

- The latest Dell Systems Management Overview Guide.

Topics:

- Integrated Dell Remote Access Controller (iDRAC)
- Systems Management software support matrix

Integrated Dell Remote Access Controller (iDRAC)

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

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

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

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

iDRAC9 offers following license tiers:

Table 24. iDRAC9 license tiers

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

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

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

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

Systems Management software support matrix

Table 25. Systems Management software support matrix

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

Table 25. Systems Management software support matrix (continued)

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

12

Appendix D: Services

Topics:

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

Why attach service contracts

Dell PowerEdge servers include a standard hardware warranty that highlights our commitment to product quality by guaranteeing repair or replacement of defective components. While industry-leading, our warranties are limited to 1 or 3 years, depending on model, and do not cover software assistance. Call records show that failure rates for servers are roughly 1% and more commonly, customers seek Dell technical support for software related issues like configuration guidance, troubleshooting, upgrade assistance or performance tuning. Encourage customers to purchase ProSupport service contracts to supplement warranty coverage and ensure optimal support for both hardware and software. ProSupport provides a complete hardware guarantee beyond the original warranty period (up to 12 years: including seven years standard support and an additional five years of Post-Standard Support). Details of the ProSupport Suite and benefits are listed below.

ProSupport Infrastructure Suite

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

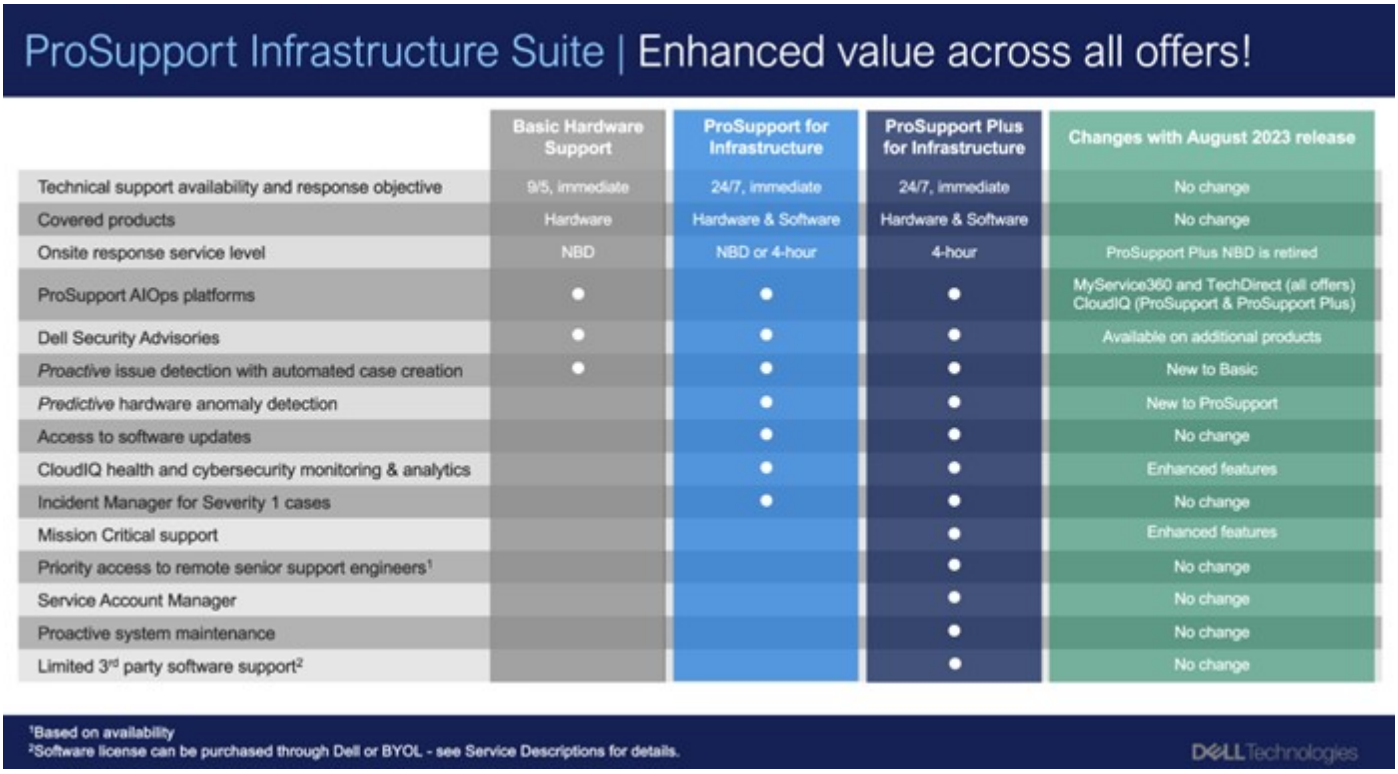

Figure 8. ProSupport Enterprise Suite

ProSupport Plus for Infrastructure

ProSupport Plus for Infrastructure is the ultimate solution for customers seeking preventative maintenance and optimal performance on their business-critical assets. The service caters to customers who require proactive, predictive, and personalized support for systems that manage critical business applications and workloads. When customers purchase PowerEdge server, we recommend ProSupport Plus, our proactive and preventative support service for business-critical systems. ProSupport Plus provides all the benefits of ProSupport, including the following "Top five reasons to buy 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.

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.

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**.

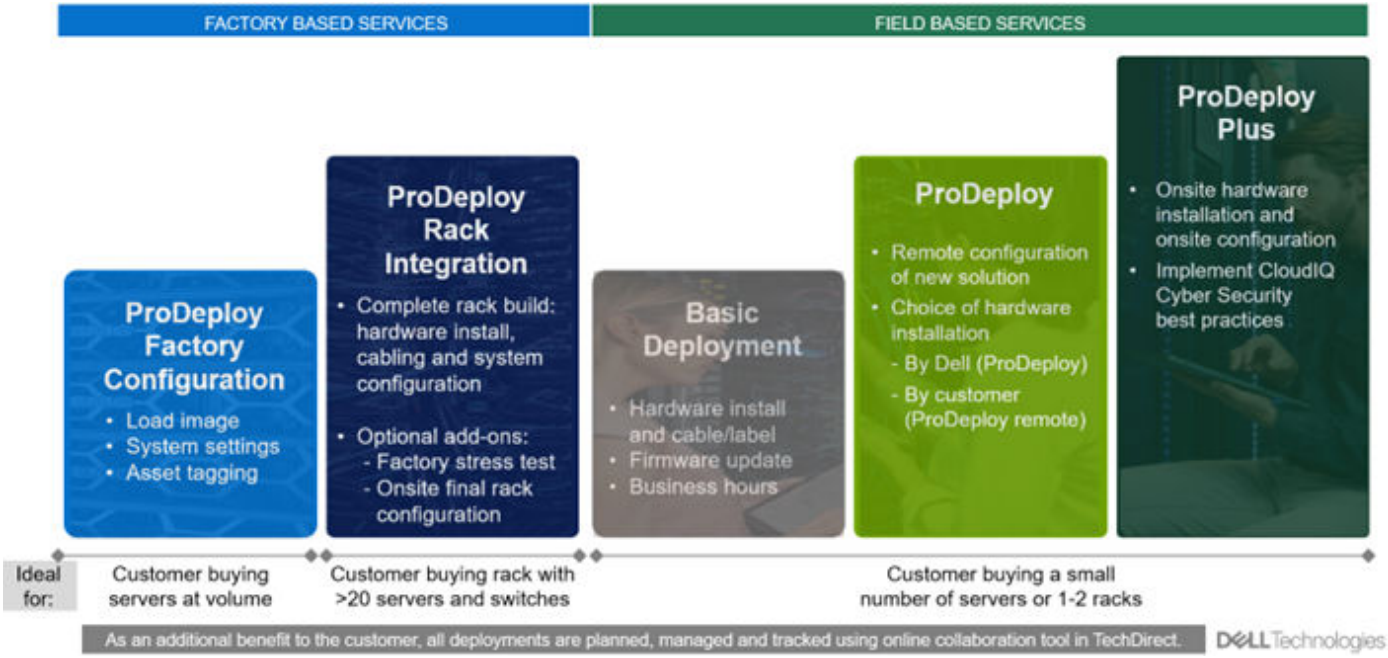

Figure 9. ProDeploy Infrastructure Suite

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

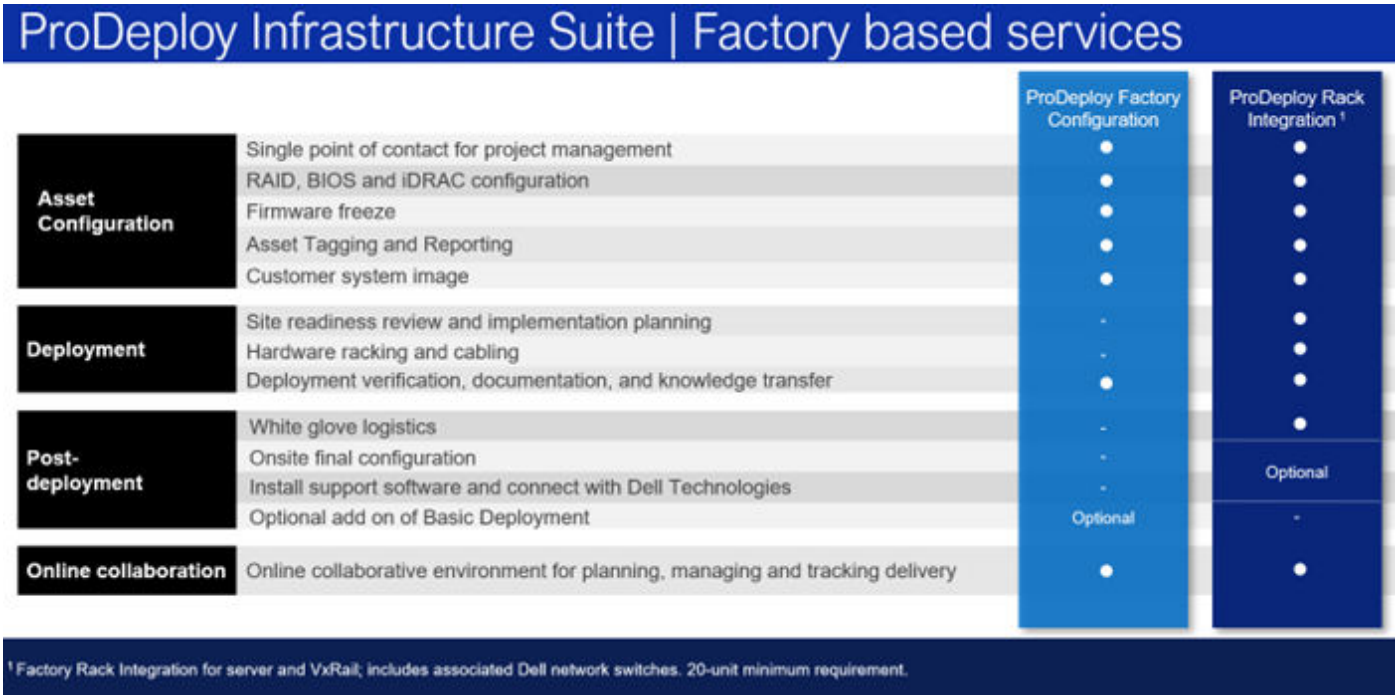

Figure 10. ProDeploy Infrastructure Suite - Factory services

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.

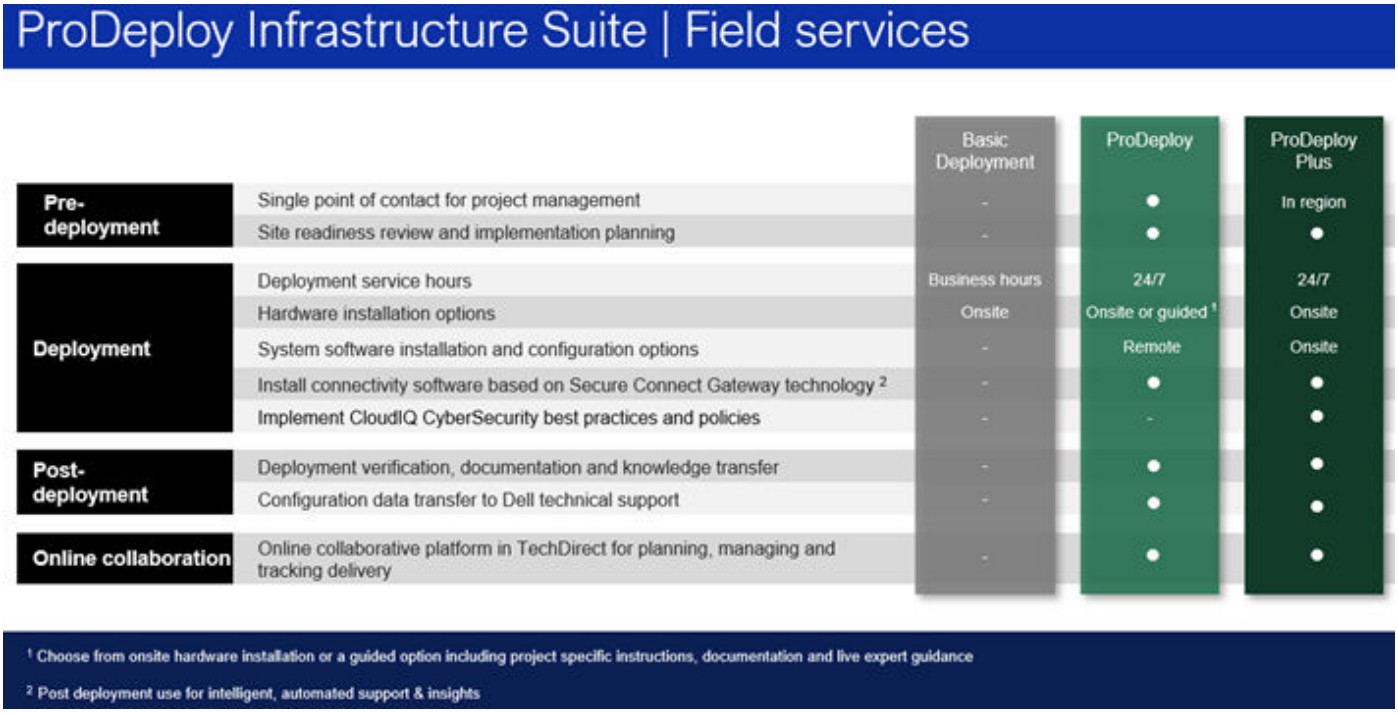

Figure 11. ProDeploy Infrastructure Suite - Field services

Supplemental Deployment Services

Additional ways to expand scope or deploy for unique scenarios.

Two Host Adder (requires PD/PDP)

Deploying new storage, compute, or networking devices may require interconnection to other servers (also called hosts). The Dell delivery team will set up four hosts per device as part of every ProDeploy service. For example, if the customer is buying two storage arrays the ProDeploy service will automatically include connectivity of four hosts each (4x2=8 total hosts per project since there are two devices). This supplemental "Two Host Adder" service provides for the configuration of additional hosts above what is already provided as part of the ProDeploy service. In many cases, customers can work with us while we set up the included hosts, so they may understand how to do the rest themselves. Always ask the customer how many hosts are

being connected and sell the host adder depending on the customer's technology skillset. Note that this service applies to the connectivity of Dell devices not 3rd party devices.

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

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

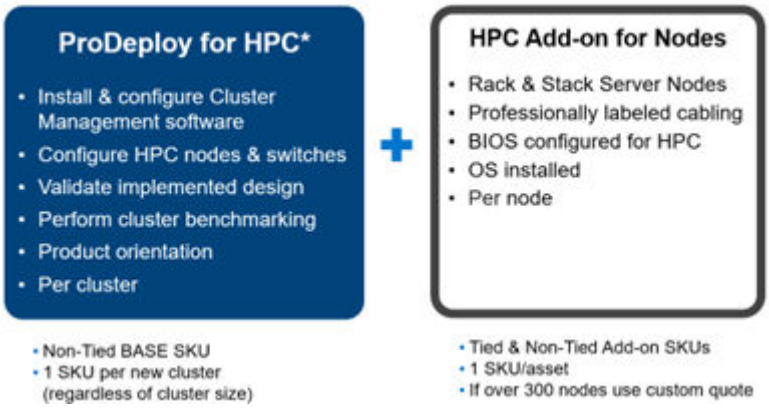

Figure 12. Standard deliverables of ProDeploy for HPC

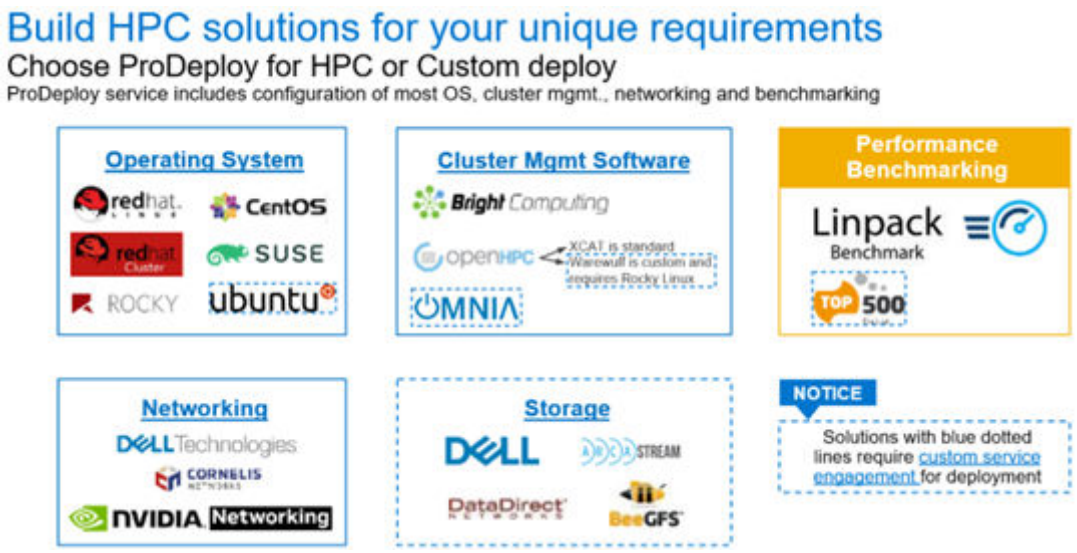

Figure 13. Visual view of HPC deployment options to include hardware and software

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 Anisble automation use cases, some customers need additional assistance with GitOps. By the end of the service, the customer will have the foundational components required to accelerate automation and understand how the programming works together: Day 1 and Day 2 use case automation scripts (ansible modules), CI/CD tool (Jenkins), and Version control (Git).

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.

Figure 14. 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

Resources

Services for PowerEdge.

13

Appendix A: Additional specifications

Topics:

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

Chassis dimensions

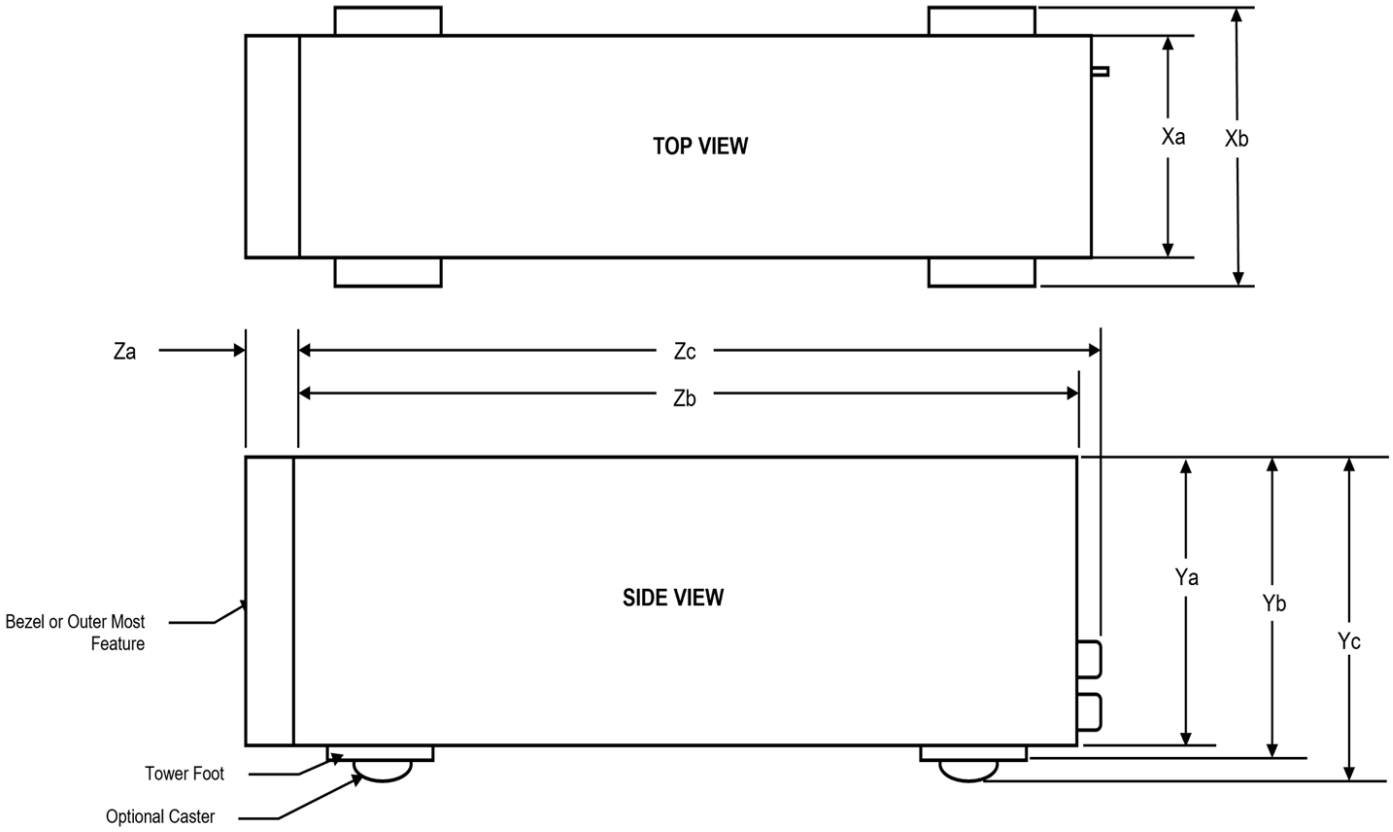

Figure 15. Chassis dimensions

Table 26. Chassis dimension for the system

Drives	Xa	Xb	Ya	Yb	Yc	Za (with bezel)	Za (without bezel)	Zb	Zc
3 x 3.5-inch + 2 x 2.5-inch cable	125.0 mm (4.92 inches)	132.52 mm	329.5 mm (12.97 inches)	332.5 mm (13.09 inches)	N/A	5 mm (0.19 inches)	N/A	403.8 mm (15.89 inches)	420.55 mm (16.55 inches)

Table 26. Chassis dimension for the system

Drives	Xa	Xb	Ya	Yb	Yc	Za (with bezel)	Za (without bezel)	Zb	Zc
SAS/SATA HDD/SSD drives from PERC		(5.21 inches)							

System weight

Table 27. PowerEdge T160 system weight

System configuration	Maximum weight (with all drives/SSDs)
A server with fully populated drives	11.64 kg (25.66 lbs)
A server without drives and PSU installed	6.31 kg (13.91 lbs)

NIC port specifications

The PowerEdge T160 system supports up to two 10/100/1000 Mbps Network Interface Controller (NIC) ports embedded on the LAN on Motherboard (LOM).

Table 28. NIC port specification for the system

Feature	Specifications
LOM on Planar	2 x 1 GbE
Network Card	1 GbE x 4, 10 GbE x 2, 10 GbE x 4

Video specifications

The PowerEdge T160 system supports integrated Matrox G200eW graphics controller with 16 MB of video frame buffer.

Table 29. Supported video resolution options

Resolution	Refresh rate (Hz)	Color depth (bits)
640 x 480	60 Hz	32
640 x 480	72 Hz	32
640 x 480	75 Hz	32
640 x 480	85 Hz	32
800 x 600	60 Hz	32
800 x 600	72 Hz	32
800 x 600	75 Hz	32
800 x 600	85 Hz	32
1024 x 768	60 Hz	32
1024 x 768	72 Hz	32
1024 x 768	75 Hz	32
1024 x 768	85 Hz	32

Table 29. Supported video resolution options (continued)

Resolution	Refresh rate (Hz)	Color depth (bits)
1280 x 800	60 Hz	32
1280 x 800	75 Hz	32
1280 x 1024	60 Hz	32
1280 x 1024	75 Hz	32
1360 x 768	60 Hz	32
1440 x 900	60 Hz	32
1440 x 900	60 Hz (RB)	32
1600 x 900	60 Hz (RB)	32
1600 x 900	60 Hz (RB)	32
1600 x 1200	60 Hz	32
1600 x 1200	60 Hz (RB)	32
1680 x 1050	60 Hz (RB)	32
1680 x 1050	60 Hz	32
1920 x 1080	60 Hz	32
1920 x 1080	60 Hz (RB)	32
1920 x 1200	60 Hz	32
1920 x 1200	60 Hz (RB)	32

Ports specifications

Table 30. PowerEdge T160 port specifications

Front		Rear		Internal	
Port type	**No. of ports**	**Port type**	**No. of ports**	**Port type**	**No. of ports**
USB 3.2 Gen1	One	USB 2.0	Three	USB 3.2 Gen1	One
iDRAC Direct (Micro-AB USB) port	One	USB 3.2 Gen1	Three		

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

PSU rating

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

Table 31. PSUs High line and Low line ratings

—	300 W Bronze 120 mm	500 W Platinum 120 mm
AC High Line	300 W	500 W
AC Low Line	300 W	500 W
High Line 240 VDC	N/A	N/A
High Line 200 - 380 VDC	N/A	N/A

Table 31. PSUs High line and Low line ratings (continued)

—	300 W Bronze 120 mm	500 W Platinum 120 mm
DC -(48 to 60 V)	N/A	N/A

The PowerEdge T160 supports a single cabled AC power supply unit.

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

Table 32. PSU efficiency level

Efficiency Targets by Load						
Form factor	**Output**	**Class @115 V AC**	**10%**	**20%**	**50%**	**100%**
Cabled 120 mm	300 W	Bronze	-	82.00%	85.00%	82.00%
	500 W	Platinum	-	90.00%	92.00%	89.00%

Environmental specifications

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

Table 33. Continuous Operation Specifications for ASHRAE A2

Temperature	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 34. Continuous Operation Specifications for ASHRAE A3

Temperature	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 35. Continuous Operation Specifications for ASHRAE A4

Temperature	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 36. Continuous Operation Specifications for Rugged Environment

Temperature	Allowable continuous operations
Temperature range for altitudes <= 900 m (<= 2953 ft)	5–55°C (41–131°F) with no direct sunlight on the equipment
Humidity percent range (non-condensing at all times)	8% RH with -12°C minimum dew point to 90% RH with 24°C (75.2°F) maximum dew point
Operational altitude de-rating	Maximum temperature is reduced by 1°C/125 m (33.8°F/410 Ft) above 900 m (2953 Ft).

Table 37. Common Environmental Specifications for ASHRAE A2, A3, A4, and Rugged

Allowable continuous operations	
Maximum temperature gradient (applies to both operation and non-operation).	20°C in an hour* (36°F in an hour) and 5°C in 15 minutes (41°F in 15 minutes), 5°C in an hour* (41°F in an hour) for tape **NOTE:** * - Per ASHRAE thermal guidelines for tape hardware, these are not instantaneous rates of temperature change.
Non-operational temperature limits	-40 to 65°C (-40 to 149°F)
Non-operational humidity limits	5% to 95% RH with 27°C (80.6°F) maximum dew point
Maximum non-operational altitude	12,000 meters (39,370 ft)
Maximum operational altitude	3,048 meters (10,000 ft)

Table 38. 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 39. 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 air restrictions

ASHRAE A3/A4 environment

- BOSS-N1 is not supported
- Non-Dell qualified peripheral cards and /or peripheral cards greater than 25 W are not supported

Thermal restriction matrix

Table 40. Label reference

Label	Description
STD	Standard
HPR	High performance
HSK	Heat sink

Table 41. Thermal restriction matrix

-	TDP	Number of Cores	3x 3.5 inch Chip SATA	3x 3.5 inch PERC SAS/SATA	3x 3.5 inch + 2x 2.5 inch Chip SATA	3x 3.5 inch + 2x 2.5 inch PERC SAS/SATA
			HSK/FAN type	HSK/FAN type	HSK/FAN type	HSK/FAN type
CPU TDP	95 W	8	HPR/STD	HPR/STD and HPR (PCIe)	HPR/STD and HPR (PCIe)	HPR/STD and HPR (PCIe)
	95 W	6	HPR/STD	HPR/STD and HPR (PCIe)	HPR/STD and HPR (PCIe)	HPR/STD and HPR (PCIe)
	80 W	8	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	80 W	6	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	65 W	8	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	65 W	6	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	55 W	4	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	46 W	2	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)
	35 W	2	STD/STD	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)	STD/STD and HPR (PCIe)

NOTE: If a BOSS or a PCIe card is installed or a 2.5 inch drive is installed in the 2.5 inch drive bay, an HPR PCI fan is needed for all the configurations.

14

Appendix A. Standards compliance

The system conforms to the following industry standards.

Table 42. Industry standard documents

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

15

Appendix C Additional resources

Table 43. Additional resources

Resource	Description of contents	Location
Installation and Service Manual	This manual, available in PDF format, provides the following information: • Chassis features • System Setup program • System indicator codes • System BIOS • Remove and replace procedures • Diagnostics • Jumpers and connectors	Dell.com/Support/Manuals
Getting Started Guide	This guide ships with the system, and is also available in PDF format. This guide provides the following information: • Initial setup steps	Dell.com/Support/Manuals
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