Dell EMC PowerEdge R350

Technical Guide

DELLTechnologies

Notes, cautions, and warnings

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

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

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

Contents

System overview

The Dell EMC™ PowerEdge™ R350 is Dell's latest 1-socket, 1U rack server that is designed to run complex workloads using highly scalable memory, and network options. The system features the one Intel® Xeon Scalable Processor up to 4 DIMMs, PCI Express® (PCIe) 4.0 enabled expansion cards.

Key capabilities:

- One Intel® Xeon® E-2300 series processor with up to 8 cores per processor
- Four DDR4 DIMM slots, supports UDIMM 128 GB max, speeds up to 3200 MT/s
- Two redundant Hot-plug AC or DC power supply units
- Up to 8 x 2.5-inch or 4 x 3.5-inch SAS/SATA HDD/SSD drives
- Internal Boot: IDSDM or internal USB board
- iDRAC9 with lifecycle controller: Express, Enterprise, Datacenter, and OpenManage Enterprise advanced feature
- Rear access hot-plug BOSS-S2
- Onboard LOM 1 GbE x2
- RAID: PERC 10.5 and PERC 11 SW and HW RAID, and internal PERC
- PCI Express® (PCIe) 4.0 expansion slots

Topics:

Key workloads

PowerEdge R350 is versatile enough to address many customer segments and workloads affordably, that includes:

- SMB and ROBO: Data consolidation, file/print services, mail/messaging services, other collaboration and productivity applications, point of sale and web serving.

New technologies

Table 1. New technologies

Technology	Detailed Description
Intel® Xeon E-2300 series processors	- Core count: Up to 8 cores per processor
Memory	- 4 DDR4 DIMM slot, supports UDIMM 128 GB max, speeds up to 3200 MT/s - Supports unregistered ECC DDR4 DIMMs only
Flex IO	- Broadcom 5720 Dual port 1GbE - USB 3.0 x1, USB 2.0 x2 and VGA port - Serial port
PCIe	3 x PCIe Gen4 slots
Chipset (CHPST)	Intel C256 chipset
Dedicated PERC	Internal controllers: - H355 - H345 - HBA355i

Table 1. New technologies (continued)

Technology	Detailed Description
	● H755 External controllers: ● HBA355e
Power Supplies	● 600 W Platinum 100-240 VAC or 240 VDC redundant, hot swap

System features and generational comparison

The following table shows the comparison between the PowerEdge R350 with the PowerEdge R340.

Table 2. Features comparison

Feature	PowerEdge R350	PowerEdge R340
Processor	One Intel Xeon E-2300 series processors with up to 8 cores or one Intel Pentium processor with up to 2 cores	Coffee Lake-S E3-1200 V6 series. Pentium and celeron up to 95 W
Memory	4 DDR4 DIMM slot, supports UDIMM 128 GB max, speeds up to 3200 MT/s Supports unregistered ECC DDR4 DIMMs only	DDR4 up to 2666 MT/s, memory support 8,16 GB DDR4 UDIMMs
Storage drives	• Up to 4 x 3.5-inch SAS/SATA (HDD/SSD) • Up to 8 x 2.5-inch SAS/SATA (HDD/SSD) • Max 80TB for 4 HDD configurations	• Up to 8 x 2.5-inch hot-plug SAS/SATA (SSD) • Up to 4 x 3.5-inch hot-plug SAS/SATA (SSD)
Storage controllers	Internal Controllers • PERC H355, PERC H355f, PERC H345, PERC H755, PERC H755f, HBA355i, PERC H345f, HBA355f External Controllers • HBA355e Software RAID • S150	Internal Controllers • PERC H330, H730p, HBA330 External Controllers • 12Gbps SAS HBA Software RAID • S140
PCIe slots	3 x PCIe Gen4 slots • 1x8 Gen4 (x16 connector) low profile, half length • 1x8 Gen4 (x8 connector) low profile, half length • 1x4 Gen4 (x8 connector) for dedicated PERC only	2 x PCIe Gen3 slots • 1x8 Gen4 (x16 connector) low profile/Full-height, half length • 1x8 Gen4 (x8 connector) low profile, half length
Embedded NIC (LOM)	2 x 1GbE LOM	2 x 1GbE LOM
USB ports	Front Ports • 1 x iDRAC Direct (Micro-AB USB) port • 1 x USB 2.0 Rear Ports • 1 x USB 2.0 • 1 x USB 3.0	Front Ports • 2 x USB 2.0 Rear Ports • 2 x USB 3.0 Internal Ports • 1 x USB 3.0

Table 2. Features comparison (continued)

Feature	PowerEdge R350	PowerEdge R340
	Internal Ports ● 1 x USB 3.0 (Optional)	
Rack height	1U	1U
Power supplies	600 W Platinum 100-240 VAC or 240 VDC redundant, hot swap	Single or dual 350 W or 550 W hot-plug redundant platinum power supplies (100–240 V AC)
Embedded management	● iDRAC9 ● iDRAC Direct ● iDRAC Service Module ● iDRAC RESTful API with Redfish	● iDRAC Direct ● iDRAC RESTful API with Redfish ● iDRAC9 Enterprise
Front IO	● Power button w/LED x1 ● ID button w/LED x1 ● USB 2.0 x1 ● iDRAC MGMT USB x1 ● System Status LED x1	● Power button w/LED x1 ● ID button w/LED x1 ● USB 2.0 x1 ● iDRAC MGMT USB x1 ● System Status LED x1

Chassis views and features

Topics:

- Chassis views

Chassis views

Front view of the system

Figure 1. Front view of 8 x 2.5-inch drive system

Drive 0	Drive 1	Drive 2	N/A	
Drive 3	Drive 4	Drive 5	Drive 6	Drive 7
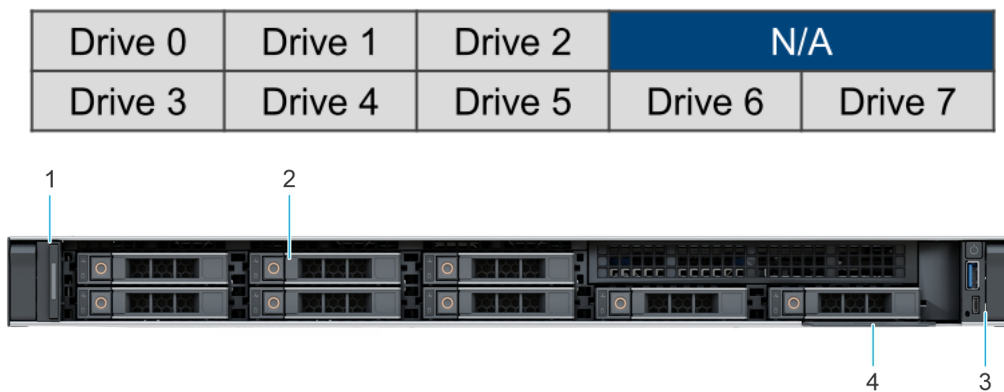
Table 3. Features available on the front of the system

Item	Ports, panels, and slots
1	Left control panel
2	Drive
3	Right control panel
4	Information tag

Figure 2. Front view of 4 x 3.5-inch drive system

ODD		N/A	
Drive 0	Drive 1	Drive 2	Drive 3
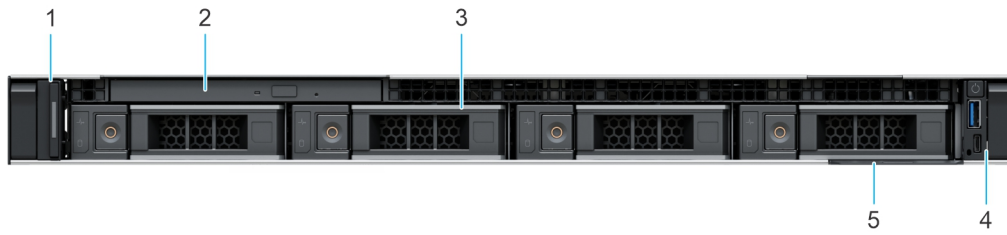
Table 4. Features available on the front of the system

Item	Ports, panels, and slots
1	Left control panel
2	ODD
3	Drive
4	Right control panel
5	Information tag

For more information about the ports, see the www.dell.com/poweredgemanuals section.

Rear view of the system
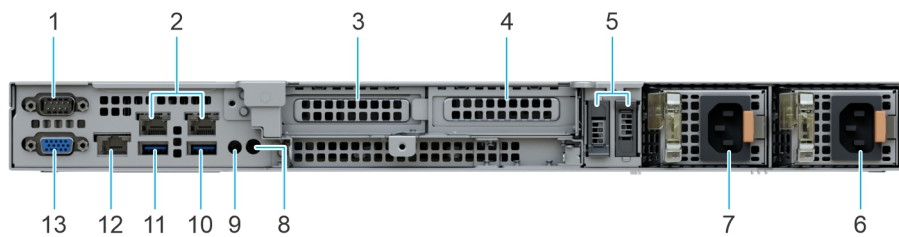
Figure 3. Rear view of the system 8 x 3.5-inch

Table 5. Rear view of the system ports

Item	Ports, panels, or slots
1	Serial connector
2	Ethernet ports
3	PCIe expansion card slot 1
4	PCIe expansion card slot 2
5	BOSS riser slots
6	Power supply unit (PSU 2)
7	Power supply unit (PSU 1)
8	System ID button
9	CMA jack
10	USB 3.2 Gen 1 port
11	USB 2.0 port
12	iDRAC ethernet port
13	VGA port

Inside the system
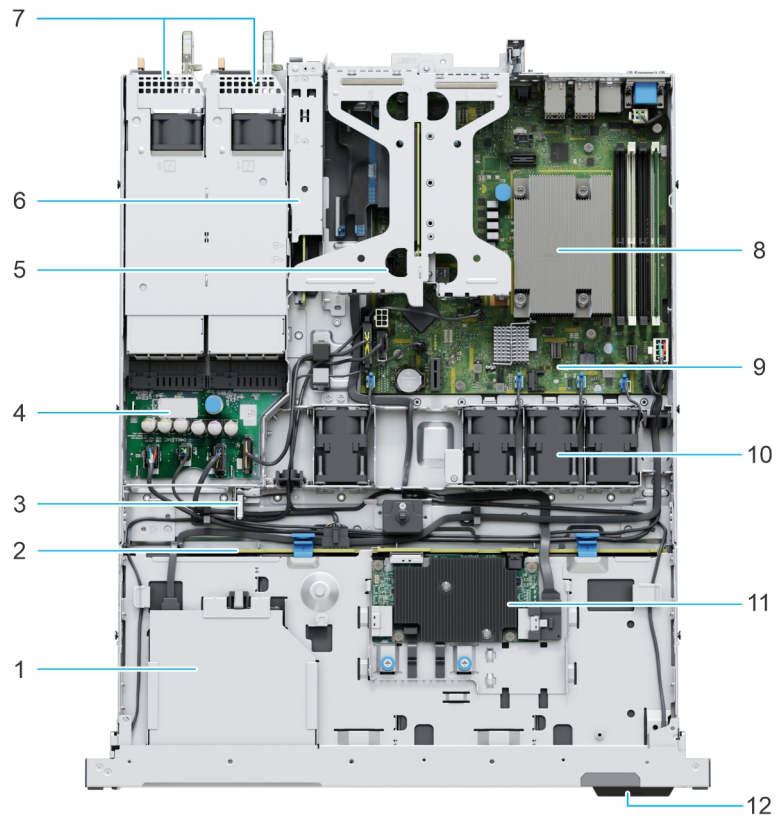
Figure 4. Inside the system

1. ODD
2. Drive backplane
3. Intrusion switch
4. Power interposer board
5. Butterfly riser
6. BOSS module
7. PSU 1 and PSU 2
8. Heat sink
9. System board
10. Fan
11. fPERC module
12. Information tag

Quick Resource Locator

Figure 5. Quick Resource Locator for R350

4

Processor

Topics:

Processor features

The following lists the features and functions that are in the upcoming Intel® Xeon E-2300 series processor offering:

● As an entry level server - Small businesses require reliability and security to support their critical business and customer data needs
● As an edge device or appliance - Edge servers or appliances with energy efficiency and performance at entry level prices
● As a secure cloud server - Protect the most sensitive portions of a workload or service with hardware-enhanced security

Supported processors

Table 6. Processor BIN stack

Processor	Clock Speed (GHz)	Cache (M)	Cores	Threads	Turbo	Memory Speed (MT/s)	Memory Capacity	TDP
E-2388G	3.2	16	8	16	Turbo	3200	128 GB	95 W
E-2378G	2.8	16	8	16	Turbo	3200	128 GB	80 W
E-2386G	3.5	12	6	12	Turbo	3200	128 GB	95 W
E-2378	2.6	16	8	16	Turbo	3200	128 GB	65 W
E-2374G	3.7	8	4	8	Turbo	3200	128 GB	80 W
E-2356G	3.2	12	6	12	Turbo	3200	128 GB	80 W
E-2336	2.9	12	6	12	Turbo	3200	128 GB	65 W
E-2334	3.4	8	4	8	Turbo	3200	128 GB	65 W
E-2324G	3.1	8	4	4	Turbo	3200	128 GB	65 W
E-2314	2.8	8	4	4	Turbo	3200	128 GB	65 W
G6505	4.2	4	2	4	No Turbo	2666	128 GB	58 W
G6405T	3.5	4	2	4	No Turbo	2666	128 GB	35 W

ⓘ **NOTE:** Graphics is not supported with E2300 series processors and cannot be enabled on Dell servers due to restriction in the chipset.

(i) **NOTE:** Hyper-Threading is enabled by default on all Intel Xeon E-2300 series processors.

Memory subsystem

The PowerEdge R350 supports up to 4 DDR4 DIMM slot, with up to 128 GB of memory and speeds of up to 3200 MT/s.

The PowerEdge R350 supports unregistered DIMMs (UDIMMs) only.

Topics:

* Supported memory
* Memory speed

Supported memory

Table 7. Memory technology comparison

Feature	PowerEdge R350 (DDR4)
DIMM type	UDIMM
Transfer speed	2933 MT/s, 2666 MT/s, and 3200 MT/s
Voltage	1.2 V (DDR4)

The following table lists the supported DIMMs for the R350 at launch. For the latest information on supported DIMMS, refer to the Memory NDA Deck. For information on memory configuration, see the Dell EMC PowerEdge R350 Installation and Service Manual at www.dell.com/poweredgemanuals.

Memory speed

The table below lists the performance details for R350 based on the quantity and type of DIMMs per memory channel.

Table 8. DIMM performance

DIMM type	Rank	Capacity	DIMM rated voltage and speed	DIMMs per Channel (DPC)
UDIMM	1R	8 GB / 16 GB	DDR4 (1.2V), 3200 MT/s	3200 MT/s
	2R	32 GB	DDR4 (1.2V), 3200 MT/s	3200 MT/s

Storage

Topics:

Storage controllers

- PowerEdge Hardware RAID controllers (PERC) series 10, 11 are designed for:
  - Enhanced performance
  - Fault tolerance
  - Simplified management of RAID array drives
- PowerEdge controller series 10, 11 support older legacy SAS and SATA drive interfaces
- Dell S150 is software RAID solution for PowerEdge systems.

Table 9. PERC Series controller offerings

Performance Level	Controller and Description
Entry	S150
Value	H355, H345, HBA355 (Internal)
Premium Performance	H755
External Controllers	HBA355e

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

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

Storage controller feature matrix

Table 10. Storage controller feature matrix

Model and Form Factors	Interface Support	PCI Support	SAS Connection	Cache Memory Size	Write Back Cache	RAID Levels	Max Drive Support	RAID Support
PowerEdge Server-Storage Controllers (PERC & SAS HBA) Series 11								
H755 Adapter	12 Gb/s SAS 6 Gb/s SAS/SATA 3 Gb/s SAS/SATA Gen3 (8 GT/s) NVMe	PCIe Gen 4	16 ports- 2 x 8 Internal	8 GB NV	Flash-Backed Cache	0,1, 5, 6, 10, 50, 60	16/controller 50 with SAS Expander *Platform limit	Hardware RAID

Table 10. Storage controller feature matrix (continued)

Model and Form Factors	Interface Support	PCI Support	SAS Connection	Cache Memory Size	Write Back Cache	RAID Levels	Max Drive Support	RAID Support
	Gen4 (16 GT/s) NVMe							
H755 Front (SAS/SATA Only)	12 Gb/s SAS 6 Gb/s SAS/SATA 3 Gb/s SAS/SATA	PCIe Gen 4	16 ports- 2 x 8 Internal	8 GB NV	Flash-Backed Cache	0,1, 5, 6, 10, 50, 60	16/controller 50 with SAS Expander *Platform limit	Hardware RAID
HBA355i Adapter	12 Gb/s SAS 6 Gb/s SAS/SATA 3 Gb/s SAS/SATA	PCIe Gen 4	16 ports- 2 x 8 Internal	N/A	N/A	N/A	16/controller 50 with SAS Expander *Platform limit	N/A
HBA355e Adapter	12 Gb/s SAS 6 Gb/s SAS/SATA 3 Gb/s SAS/SATA	PCIe Gen 4	16 ports- 4 x 4 Internal	N/A	N/A	N/A	240	N/A
H355 Adapter	12 Gb/s SAS 6 Gb/s SAS/SATA	PCIe Gen 4	16 ports- 2 x 8 Internal	N/A	N/A	0,1,10	Maximum 32	Hardware RAID
H355 Front	12 Gb/s SAS 6 Gb/s SAS/SATA	PCIe Gen 4	16 ports- 2 x 8 Internal	N/A	N/A	0,1,10	Maximum 32	Hardware RAID
PowerEdge Server-Storage Controllers (PERC & SAS HBA) Series 10								
PERC H345	12 Gb/s SAS 6 Gb/s SATA	PCI-Express 3.1	16 ports- 2 x 8 Internal	No Cache	No Cache	0,1,1 0 Note[1]	Maximum 32 RAID, or 32 Non-RAID	Hardware RAID
HBA - Internal HBA345	12 Gb/s SAS 6 Gb/s SATA	PCI-Express 3.1	16 ports- 2 x 8 Internal	No Cache	No Cache	No RAID Pass Through Only	Maximum 32	No RAID SAS HBA
PowerEdge Server-Storage Software RAID								
S150 Software RAID	6 Gb/s SATA	N/A	N/A	No Cache	No Cache	0,1, 5, 10	Maximum 12 SATA	Software RAID - Windows & Linux (Limited) Note 2

(i) **NOTE:**

1. RAID 5/50 removed from entry RAID card
2. SWRAID support for Linux provides a pre-boot configuration utility to configure MDRAID and degraded boot capability. See User's Guide for details.

This document is updated as changes happen, so for the latest be sure to bookmark it rather than downloading an offline copy or refer to the Storage Controller Matrix.

Internal storage configuration

Please see the Factory Configuration Matrix on Sales Portal.

Server storage controllers User Guide

● Server-Storage Controllers User's Guides, click here

IDSDM

The intended use of IDSDM is to support hypervisor boot: a minimal OS that primarily resides in memory and does not depend on the IDSDM heavily for I/O. Writes, in particular, should be minimized as the SD media can wear out.

The IDSDM card provides the following functions:

● Dual SD interface is maintained in a mirrored configuration (primary and secondary SD).
● Provides full RAID1 functionality.
● Dual SD cards are not required; the module can operate with only one card but will provide no redundancy.
● Enables support for Secure Digital eXtended Capacity (SDXC) cards.
● USB interface to host system.
● I2C interface to host system and onboard EEPROM for out-of-band status reporting.
● Onboard LEDs show status of each SD card.
● A BIOS Setup Redundancy setting supports Mirror Mode or Disabled.
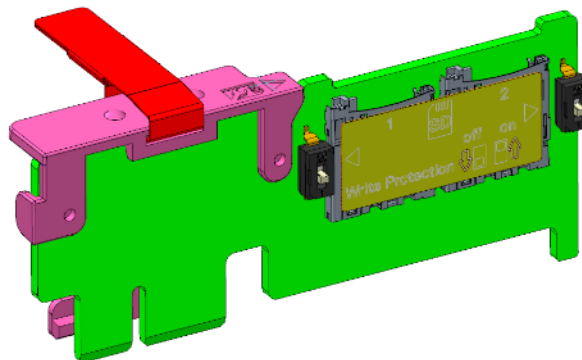
Figure 6. IDSDM card
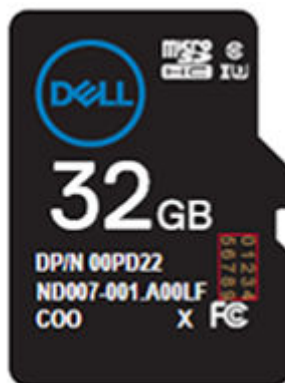
Figure 7. Artwork on uSD for iDSDM
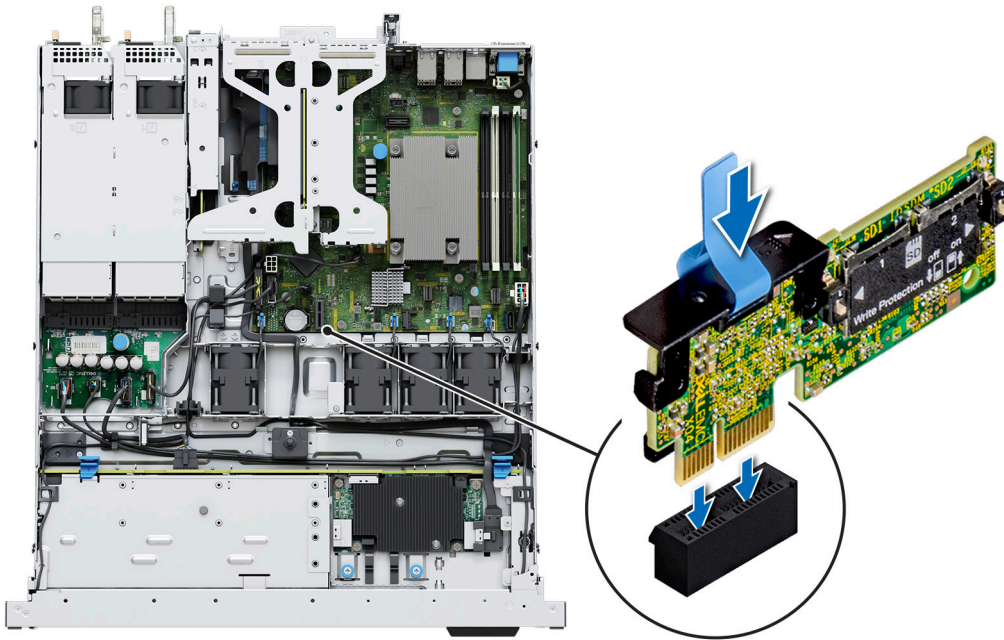
Figure 8. IDSDM

Internal USB
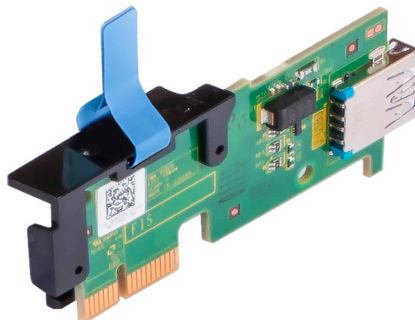
Figure 9. Internal USB

RAID - Redundant Array of Independent Disks

- Link to Help Me Choose: RAID Configuration here

Datasheets and PERC performance scaling decks

- Resource Page for Server-Storage (Sales Portal) click here
- PERC & SAS HBA Datasheets (To be updated)

Boot Optimized Storage Solution

Boot Optimized Storage Solution (BOSS) is a RAID solution that is designed for boot optimization and provides a separate RAID/SSD solution allowing customers to maximize server disk slots for data.

Dell provides the following BOSS card for this platform:

● BOSS S2

The HW RAID BOSS-S2 card is a RAID controller with a limited feature set that presents M.2 SATA-only SSDs as either Non-RAID disks or a single RAID1 volume. BOSS enables support for 240 GB and 480 GB disks from factory installation.

● Hardware: BOSS-S2 controller and carrier (x2)
● Reliability: Enterprise-Class M.2 SATA SSDs
● Supports dual 80 mm, Read Intensive (1DWPD), M.2 devices 240GB/480GB Standard – 960GB/1.9TB QNS
● Accessibility: Rear facing
● Serviceability: Full hot-plug support
● Supports hardware RAID1 and pass-through
● Marvell 88SE9230 SATA RAID controller
● Standard inbox AHCI drivers
● Supports UEFI and legacy boot
● LED for M.2 device
● Controlled firmware upgrade through iDRAC

Figure 10. BOSS-S2 controller
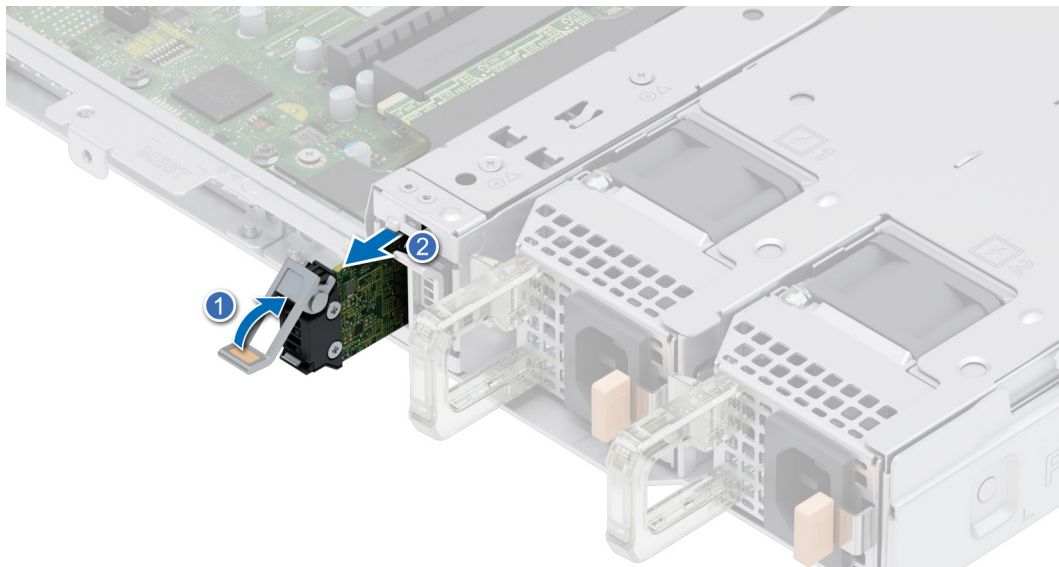
Figure 11. Removing the BOSS S2 card carrier

BOSS feature matrix

Table 11. BOSS feature matrix

BOSS card	Drive Size	RAID levels	Stripe size	Virtual disk cache function	Maximum number of virtual disks	Maximum number of drives supported	Drive types	PCIe support	Disk cache policy	Support for Non-RAID disks	Cryptographic digital signature to verify firmware payload	Hot Plug
BOSS S2 Adapter	M.2 devices are read-intensive with 240 GB or 480 GB capacity	RAID 1	Supports default 64K stripe size only	Write through	1	2	6 Gbps M.2 SATA SSDs	Gen2	Drive default	Yes (supports up to two disks)	Yes	Yes

Datasheets

- BOSS S2
- BOSS S2 DfD

BOSS User Guides

- BOSS S2

Supported Drives

The table shown below lists the internal drives supported by the R350. Refer to Agile for the latest SDL.

Table 12. Supported drives

Form Factor	Type	Speed	Rotational Speed	Capacities
2.5-inch	SATA	6 GB	SSD	480 GB, 960 GB, 1.92 TB, 3.84 TB
2.5-inch	SAS/vSAS	12 GB	SSD	400 GB, 800 GB, 960 GB, 1.92 TB, 3.84 TB, 7.68 TB
2.5-inch	SAS	12 GB	10K	600 GB, 1.2 TB, 2.4 TB
2.5-inch	SAS	12 GB	15K	600 GB, 900 GB
3.5-inch	SAS	12 GB	7.2K	2 TB,4 TB, 8 TB, 12 TB, 16 TB , 20 TB
3.5-inch	SATA	6 GB	7.2K	2 TB,4 TB, 8 TB, 12 TB, 16 TB , 20 TB
M.2	SATA	6 GB	SSD	240 GB, 480 GB

External Storage

The R350 supports the external storage device types listed in the table below.

Table 13. 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

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.

The PowerEdge Server Adapter Matrix posted to knowledge portal is the central repository for PowerEdge NIC, HBA and HCA information. The matrix covers:

● Part Numbers, Tied SKUs and Customer Kits
● Server Compatibility and Support
● Optics and Cable Support
● Systems Management
● Adapter Features
● Spec Sheet Links

This document is updated as changes happen, so be sure to bookmark it rather than downloading an offline copy to stay with the latest information.

ⓘ **NOTE:** This is a direct download link to an .XLSX and may not open in a tab as expected depending on your browser.

Expansion cards and expansion card risers

ⓘ **NOTE:** When an expansion card is not supported or missing, riser the iDRAC and Lifecycle Controller logs an event. This does not prevent your system from booting. However, if a F1/F2 pause occurs with an error message, see *Troubleshooting expansion cards* section in the *Dell EMC PowerEdge Servers Troubleshooting Guide* at www.dell.com/poweredgemanuals.

Topics:

• Expansion card installation guidelines

Expansion card installation guidelines
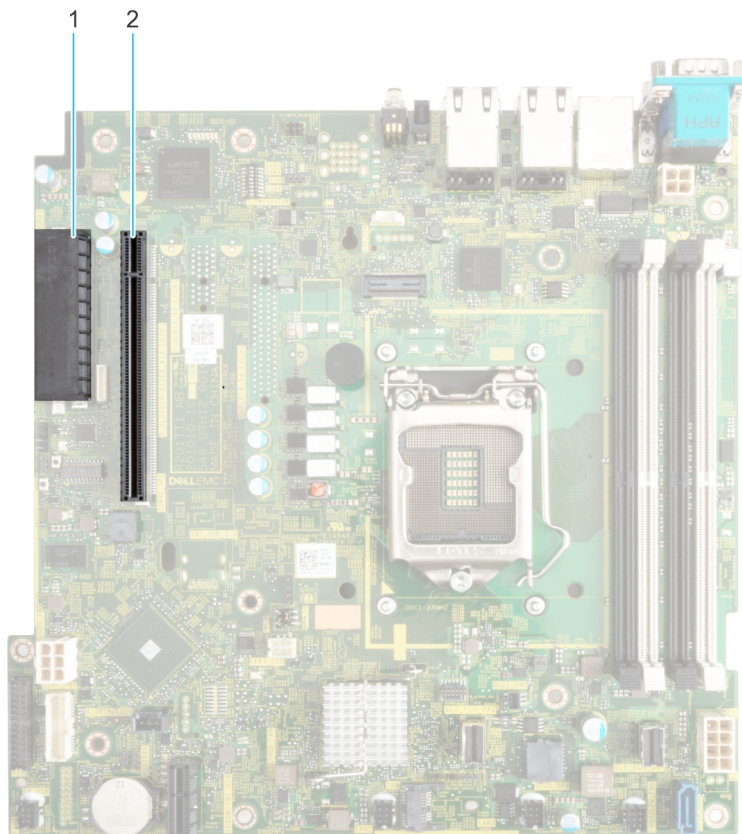
Figure 12. Expansion card slot connectors

1. Internal PERC connector
2. Butterfly riser connector

The following table describes the expansion card riser configurations:

Table 14. Expansion card riser configurations

Expansion card risers	PCIe Slots	Controlling processor	Height	Length	Slot width
NA	INT	Processor 1	Half Height	Half length	x8
Riser	2	Processor 1	Half Height	Half length	x16

Table 14. Expansion card riser configurations (continued)

Expansion card risers	PCIe Slots	Controlling processor	Height	Length	Slot width
Riser	1	Processor 1	Half Height	Half length	x8
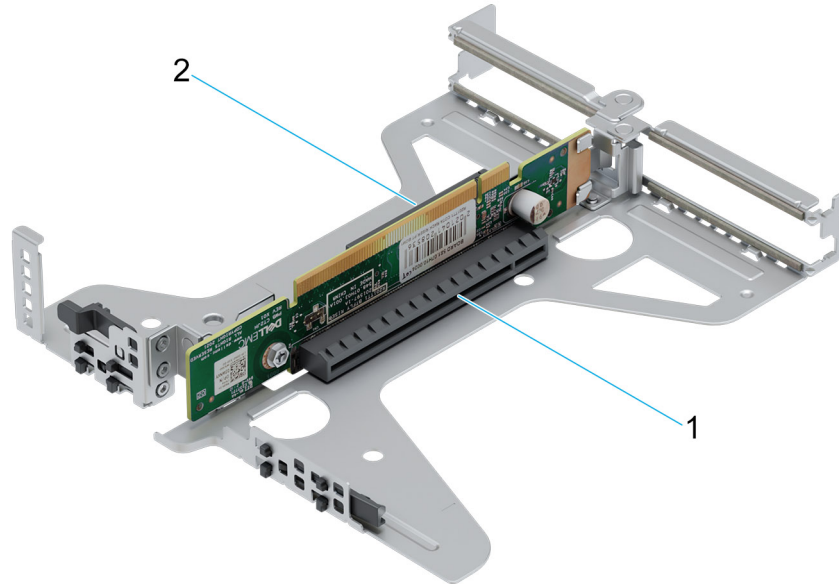
Figure 13. Butterfly riser

1. Slot 2 (Low profile) (x16 connector)
2. Slot 1 (Low profile) (x8 connector)

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

To ensure proper cooling and mechanical fit, the following table provides guidelines for installing expansion cards. 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 15. Configuration 0: butterfly riser

Card type	Slot priority	Maximum number of cards
Dell BOSS S2 Module	BOSS	1
Intel (NIC: 10 Gb)	1, 2	2
Broadcom (NIC: 10 Gb)	1, 2	2
Intel (NIC: 1 Gb)	1, 2	2
Broadcom (NIC: 1 Gb)	1, 2	2
Dell External Adapter	1, 2	2
aPERC 11	Integrated slot	1
FPERC 11	Integrated slot	1
FPERC 10.15	Integrated slot	1
aPERC 10.15	Integrated slot	1
FPERC HBA11	Integrated slot	1
aPERC HBA11	Integrated slot	1

Power, thermal, and acoustics

Topics:

- Power
- Thermal design
- PowerEdge R350 acoustics

Power

Table 16. 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: ● 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.
Fresh Air cooling	Refer to ASHRAE A3/A4 Thermal Restriction.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including: ● Power distribution units (PDUs)

Table 16. Power tools and technologies (continued)

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

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.

1. Reliability	• Component hardware reliability remains the top thermal priority. • System thermal architectures and thermal control algorithms are designed to ensure there are no tradeoffs in system level hardware life.
2. Performance	• Performance and uptime are maximized through the development of cooling solutions that meet the needs of even the densest of hardware configurations.
3. Efficiency	• 15G servers are designed with an efficient thermal solution to minimize power and airflow consumption, and/or acoustics for acoustical deployments. • Dell's advanced thermal control algorithms enable minimization of system fans speeds while meeting the above Reliability and Performance tenets.
4. Management	• System management settings are provided such that customers have options to customize for their unique hardware, environments, and/or workloads.
5. Forward Compatibility	• Forward compatibility means that thermal controls and thermal architecture solutions are robust to scale to new components that historically would have otherwise required firmware updates to ensure proper cooling. • The frequency of required firmware updates is thus reduced.

Figure 14. Thermal design characteristics

The thermal design of the PowerEdge R350 reflects the following:

- Optimized thermal design: The system layout is architected for optimum thermal design.
- System component placement and layout are designed to provide maximum airflow coverage to critical components with minimum expense of fan power.
- Comprehensive thermal management: The thermal control system regulates the fan speed based on several different responses from all system-component temperature sensors, as well as inventory for system configurations. Temperature monitoring includes components such as processors, DIMMs, chipset, the inlet air ambient, hard disk drives, and OCP.
- Open and closed loop thermal fan speed control: Open loop thermal control uses system configuration to determine fan speed based on inlet air ambient temperature. Closed loop thermal control method uses feedback temperatures to dynamically determine proper fan speeds.
- User-configurable settings: With the understanding and realization that every customer has unique set of circumstances or expectations from the system, in this generation of servers, we have introduced limited user- configurable settings residing in the iDRAC BIOS setup screen. For more information, see the Dell EMC PowerEdge R350 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 R350 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.

  (i) **NOTE:** The cooling performance may vary depending on ambient temperature and configurations

- Environmental Specifications: The optimized thermal management makes the R350 reliable under a wide range of operating environments.

PowerEdge R350 acoustics

Dell EMC PowerEdge R350 is a rack-mount server appropriate for attended data center environment. However, lower acoustical output is attainable with proper hardware or software configurations. For example, the minimum configuration of R350 is quiet enough for typical office environment.

R350 configuration specification is in ENG0020658. (refer to 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 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 Dell Enterprise category 3 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 17. 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 (i.e., set air mover speeds representative) for Idle at 28 & 35° C Ambient and for 100% loading and maximum configuration, at 35° C Ambient
Sound Power	LWA,m, B	≤ 5.2	≤ 5.5	≤ 5.8	Report
Sound Quality (both positions must meet limits): Front Binaural HEAD and Rear Microphone	Tones, Hz, dB	No prominent tones per criteria D.10.6 and D.10.8 of ECMA-74			Report tones
	Tonality, tu	≤ 0.35	≤ 0.35	≤ 0.35	Report
	Dell Modulation, %	≤ 40	≤ 40	≤ 40	Report
	Loudness, sones	Report	Report	Report	Report
	LpA-single point, dBA	Report	Report	Report	Report
Front Binaural HEAD	Transients	- 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			N/A

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 (i.e., set air mover speeds representative) for Idle at 28 & 35° C Ambient and for 100% loading and maximum configuration, at 35° C Ambient**
		○ Startup must proceed smoothly, i.e., 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"			
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

Acoustical performance

Dell EMC PowerEdge R350 is a rack-mount server appropriate for attended data center environment.

Table 18. Acoustical configurations of R350

Configuration	Volume	Feature Rich
Processor	1x Intel Rocket Lake, 65 W	1x Intel Rocket Lake,80 W
Processor Quantity	1	1
Memory	16 GB UDIMM	32 GB UDIMM
Memory Quantity	2	4
Apache Pass	N/A	N/A
NVDIMM	N/A	N/A
Storage	3.5-inch SATA 2-TB	2.5-inch SAS 600 GB 10k
Storage Quantity	2	8
Backplane	4 x 3.5-inch Hot swap	8 x 2.5-inch Hot swap
M.2	N/A	N/A

Table 18. Acoustical configurations of R350 (continued)

Configuration	Volume	Feature Rich
OCP	N/A	N/A
Power Supply Unit	600 W (60 mm)	600 W (60 mm)
Power Supply Quantity	2	2
PCI 1	PERC H355, 2x 1GbE Broadcom	PERC H755, 2x 1GbE Broadcom
Bezel	Yes	N/A
Other	N/A	N/A

Table 19. Acoustical performance of R350 acoustical configurations

Configuration		Volume	Feature Rich
Acoustical Performance: Idle/ Operating @ 25 °C Ambient			
$L_{wA,m}$ (B)	Idle	5.5	5.5
	Operating	5.5	5.5
K_v (B)	Idle	0.4	0.4
	Operating	0.4	0.4
$L_{pA,m}$ (dB)	Idle	40	40
	Operating	40	40
Prominent tones		No prominent tones in Idle and Operating	
Acoustical Performance: Idle @ 28 °C Ambient			
$L_{wA,m}$ (B)		5.5	5.5
K_v (B)		0.4	0.4
$L_{pA,m}$ (dB)		40	40
Acoustical Performance: Max. Loading @ 35 °C Ambient			
$L_{wA,m}$ (B)		5.6	7.8
K_v (B)		0.4	0.4
$L_{pA,m}$ (dB)		40	63

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

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

Prominent tones: Criteria of D.6 and D.11 of ECMA-74 are followed to determine if discrete tones are prominent and to report them, if so.

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

Operating mode: The maximum of the steady state acoustical output at 50% of Processor TDP or active HDDs per C.9.3.2 in ECMA-74 .

Rack, rails, and cable management

Key factors in selecting the proper rails include, Identifying:

- Type of rack in which the rails will be installed
- Spacing between the front and rear mounting flanges of the rack
- Type and location of any equipment mounted on the rear of the rack such as power distribution units (PDUs), and the overall depth of the rack

Refer the DellEMC Enterprise Systems Rail Sizing and Rack Compatibility Matrix for the following information:

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

Topics:

- Rack Rails

Rack Rails

The rail offerings for the PowerEdge R350 consist of two types — sliding and static. The sliding and static rail systems for the PowerEdge R350 provide tool-less support for four-post racks with tooled installation for square, round or threaded holes including all generations of Dell racks. Both also support tooled mounting in four-post threaded racks, and the static rails support tooled mounting in two-post (Telco) racks as well for added versatility.

The sliding rails for the PowerEdge R350 offer native support for threaded hole racks via the ReadyRails™ II mounting interface. The rails ship in the tool-less mounting configuration, but can be converted to the tooled configuration very quickly and easily as shown in the figure below.

Latch subassembly and pins can be removed for threaded rack mounting

Standard pan head screws (not included) can be used to mount the rails in the rack
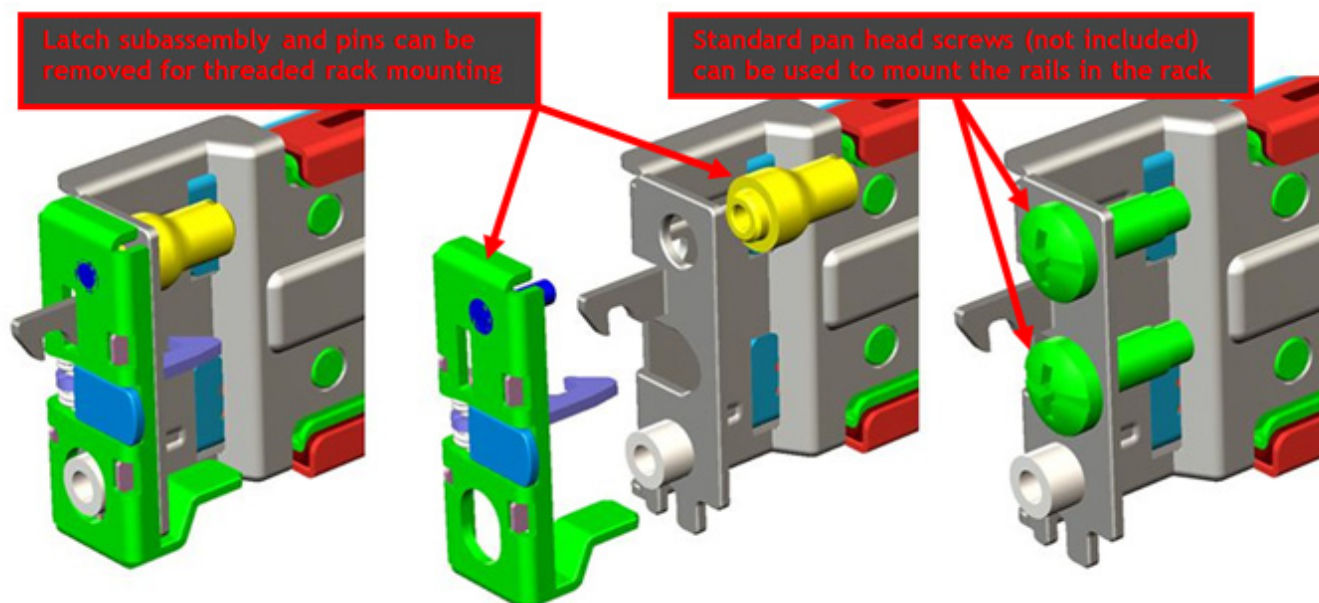
Figure 15. ReadyRails II Mounting Interface

One key factor in selecting the proper rails is identifying the type of rack in which they will be installed. Both the sliding rails and the static rails support tool-less mounting in 19-inch wide, EIA-310-E compliant square hole and unthreaded round hole four-post

racks. Both also support tooled mounting in threaded hole four-post racks, but only the static rails, as the more "universal" solution, support mounting in two-post (Telco) racks.

Table 20. Sliding and static rail configurations

Sliding and Static Rail								
Product	Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
				4–Post			2–Post	
				Square	Round	Thread	Flush	Center
PowerEdge R350	A12	ReadyRails II	Sliding	√	√	√[1]	X	X
	A8	ReadyRails	Static	√	√	√[1]	√[1]	√[1]

[1] Minor conversion required.

Note that screws are not included in either kit due to the fact that threaded racks are offered with a variety of thread designations. Users must therefore provide their own screws when mounting the rails in threaded racks.

ⓘ **NOTE:** Screw head diameter for the sliding rails must be 10 mm or less.

Other key factors governing proper rail selection include the spacing between the front and rear mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as power distribution units (PDUs), and the overall depth of the rack. The static rails offer a greater adjustability range and a smaller overall mounting footprint than the sliding rails. This is because of their reduced complexity and lack of need for CMA support.

Table 21. Rail adjustable range and rail depth specifications

Rail Adjustable Range and Rail Depth											
Product	Rail Identifier	Chassis configuration	Rail Type	Rail Adjustable Range (mm)						Rail Depth (mm)	
				Square*		Round*		Threaded*		without CMA	with CMA
				Min	Max	Min	Max	Min	Max		
PowerEdge R350	A12	2.5-inch	Sliding	631	868	617	861	631	883	720	845
		3.5-inch	Sliding	681	868	667	861	681	883	770	895
	A8		Static	608	879	594	872	618	898	622	-

* Values represent the distance between the front and rear mounting flanges on the rack.

ⓘ **NOTE:** The adjustment range of the rails is a function of the type of rack in which they are being mounted. The Min/Max values listed above represent the allowable distance between the front and rear mounting flanges in the rack. Rail depth without the CMA represents the minimum depth of the rail with the outer CMA brackets removed (if applicable) as measured from the front mounting flanges of the rack.

ⓘ **NOTE:** 3.5"HDD configurations utilize a self-adjusting slide feature. To fully install the system, this feature requires extra force during the last 50 mm travel.

Ready Rails II Sliding Rails for 4–Post Racks

- Support for tool-less installation in 19" EIA-310-E compliant square or unthreaded round hole four-post racks including all generations of Dell racks.
- Support for tooled installation in 19-inch EIA-310-E compliant threaded hole four-post racks.
- Support full extension of the system out of the rack to allow serviceability of key internal components.
- Support for optional cable management arm (CMA).
- Minimum rail mounting depth without the CMA (2.5-inch configuration): 720 mm
- Minimum rail mounting depth without the CMA (3.5-inch configuration): 770 mm
- Minimum rail mounting depth with the CMA (2.5-inch configuration): 845 mm
- Minimum rail mounting depth with the CMA (3.5-inch configuration): 895 mm
- Square-hole rack adjustment range (2.5-inch configuration): 631-868 mm

- Square-hole rack adjustment range (3.5-inch configuration): 681-868 mm
- Round-hole rack adjustment range (2.5-inch configuration): 617-861 mm
- Round-hole rack adjustment range (3.5-inch configuration): 667-861 mm
- Threaded-hole rack adjustment range (2.5-inch configuration): 631-883 mm
- Threaded-hole rack adjustment range (3.5-inch configuration): 681-883 mm

The sliding rails allow the system to be fully extended out of the rack for service. They are available with or without the optional cable management arm (CMA).
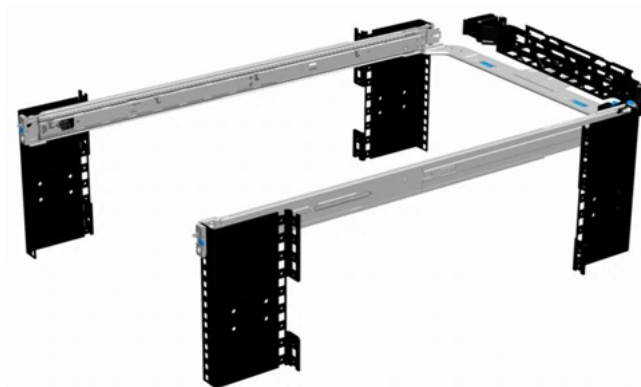
Figure 16. Sliding rails with optional CMA

Ready Rails Static Rails for 4-Post and 2-Post Racks

- Support tool-less installation in 19-inch EIA-310-E compliant square or unthreaded round hole four-post racks including all generations of Dell racks.
- Support tooled installation in 19-inch EIA-310-E compliant threaded hole four-post and two-post racks.
- Minimum rail mounting depth: 622 mm
- Square-hole rack adjustment range: 608-879 mm
- Round-hole rack adjustment range: 594-872 mm
- Threaded-hole rack adjustment range: 618-898 mm

The static rails support a wider variety of racks than the sliding rails. However, they do not support serviceability in the rack and are thus not compatible with the CMA.

Figure 17. Static rails

Cable Management Arm (CMA)

The optional cable management arm (CMA) for the PowerEdge R350 organizes and secures the cords and cables exiting the back of the server. It unfolds to allow the server to extend out of the rack without having to detach the cables. Some key features of the PowerEdge R350 CMA include:

- Large U-shaped baskets to support dense cable loads.
- Open vent pattern for optimal airflow.

- Ability to be mounted on either side by simply swinging the spring-loaded brackets from one side to the other.
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling.
- Includes a low-profile fixed tray to both support and retain the CMA in its fully closed position.
- Both the CMA and the tray mount without the use of tools via simple and intuitive snap-in designs.

The CMA can be mounted to either side of the sliding rails without the use of tools or the need for conversion. However, it is recommended that it be mounted on the side opposite to the power supplies to allow easier access to the power supplies and rear hard drives (if applicable) for service or replacement.

**Figure 18. System mounted in sliding rails with the CMA**

The PowerEdge R350 static rails are a "stab-in" design. This means that the inner (chassis) rail members must first be attached to the sides of the system and then inserted into the outer (cabinet) members installed in the rack.

Figure 19. System mounted in static rails in two-post center-mount configuration

Rack Installation

The PowerEdge R350 sliding rails are a "drop-in" design. This means that the system is installed vertically into the rails by inserting the standoffs on the sides of the system into the "J-slots" in the inner rail members with the rails in the fully extended position. The recommended method of installation is to first insert the rear standoffs on the system into the rear J-slots on the rails in order to free up a hand and then rotate the system down into the remaining J-slots while using the free hand to hold the rail against the side of the system.
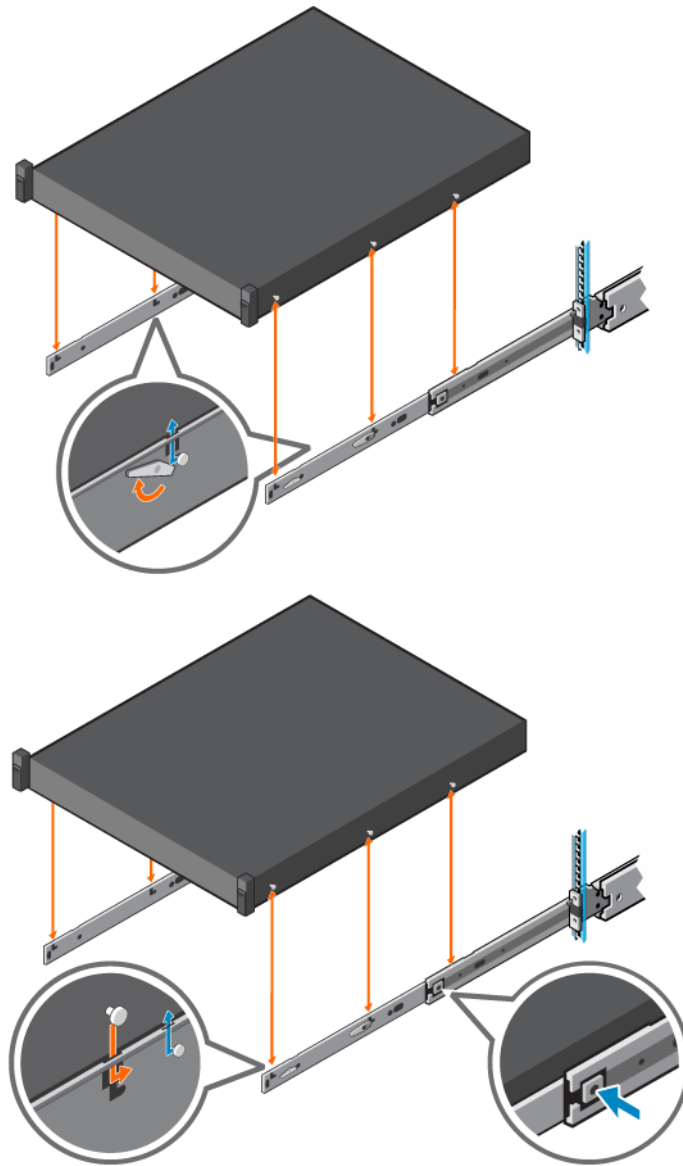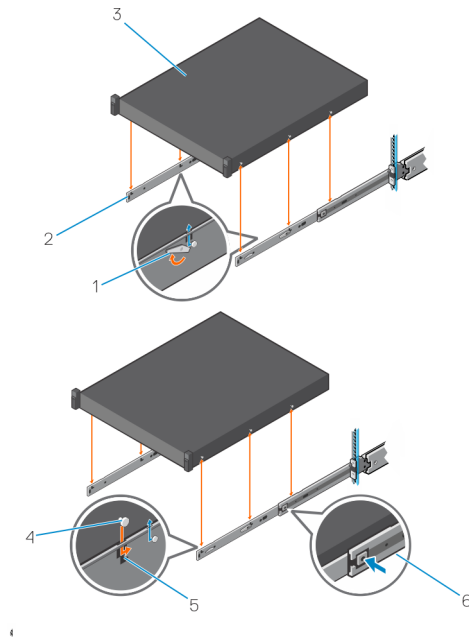
Figure 20. Sliding rails

Installing 15G Systems in Sliding Rails

To install the 15G system in sliding rails:

1. Pull the inner slide rails out of the rack until they lock into place.
   - Hold the system by its front and back ends and tilt the front end upward slightly.
   - Check the window on the sides of both rails to confirm that the heads of the standoffs are visible before adjusting or releasing your grip on the back end of the system.
   - Use your free hand to hold the rail against the side of the chassis if needed as the system is rotated downward into the remaining J-slots.
2. Locate the rear rail standoff on each side of the system and lower them into the rear J-slots of the slide assembly.
3. Rotate the system downward until all the rail standoffs are seated in the J-slots.
4. Push the system inward until the lock levers click into place. Press the slide-release lock buttons on both rails and slide the system into the rack.

Figure 21. Sliding rails installation

1. Server-lock latch (2)
2. inner slide rail (2)
3. system
4. standoff on the system
5. J-slot on the rail
6. slide-release lock latch (2)

Supported operating systems

The PowerEdge R350 system supports the following operating systems:

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

For more information, go to www.dell.com/ossupport.
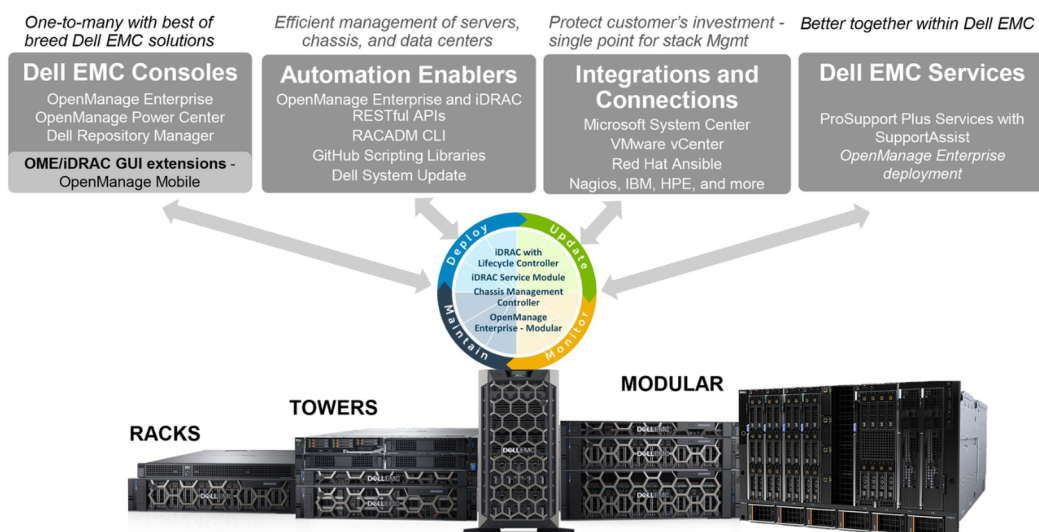
Dell EMC OpenManage systems management

Figure 22. Dell EMC OpenManage Portfolio

Dell EMC 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 EMC servers effectively and efficiently; in physical, virtual, local, and remote environments, operating in-band, and out-of-band (agent-free). The OpenManage portfolio includes innovative embedded management tools such as the integrated Dell Remote Access Controller (iDRAC), Chassis Management Controller and Consoles like OpenManage Enterprise, OpenManage Power Manager plug in, and tools like Repository Manager.

Dell EMC has developed comprehensive systems management solutions based on open standards and has integrated with management consoles that can perform advanced management of Dell hardware. Dell EMC has connected or integrated the advanced management capabilities of Dell hardware into offerings from the industry's top systems management vendors and frameworks such as Ansible, thus making Dell EMC platforms easy to deploy, update, monitor, and manage.

The key tools for managing Dell EMC PowerEdge servers are iDRAC and the one-to-many OpenManage Enterprise console. OpenManage Enterprise helps the system administrators in complete lifecycle management of multiple generations of PowerEdge servers. Other tools such as Repository Manager, which enables simple yet comprehensive change management.

OpenManage tools integrate with systems management framework from other vendors such as VMware, Microsoft, Ansible, and ServiceNow. This enables you to use the skills of the IT staff to efficiently manage Dell EMC PowerEdge servers.

Topics:

- Server and Chassis Managers
- Dell EMC consoles
- Automation Enablers
- Integration with third-party consoles
- Connections for third-party consoles
- Dell EMC Update Utilities
- Dell resources

Server and Chassis Managers

- Integrated Dell Remote Access Controller (iDRAC)
- iDRAC Service Module (iSM)

Dell EMC consoles

- Dell EMC OpenManage Enterprise
- Dell EMC Repository Manager (DRM)
- Dell EMC OpenManage Enterprise Power Manager plugin to OpenManage Enterprise
- Dell EMC OpenManage Mobile (OMM)

Automation Enablers

- OpenManage Ansible Modules
- iDRAC RESTful APIs (Redfish)
- Standards-based APIs (Python, PowerShell)
- RACADM Command Line Interface (CLI)
- GitHub Scripting Libraries

Integration with third-party consoles

- Dell EMC OpenManage Integrations with Microsoft System Center
- Dell EMC OpenManage Integration for VMware vCenter (OMIVV)
- Dell EMC OpenManage Ansible Modules
- Dell EMC OpenManage Integration with ServiceNow

Connections for third-party consoles

- Micro Focus and other HPE tools
- OpenManage Connection for IBM Tivoli
- OpenManage Plug-in for Nagios Core and XI

Dell EMC Update Utilities

- Dell System Update (DSU)
- Dell EMC Repository Manager (DRM)
- Dell EMC Update Packages (DUP)
- Dell EMC Server Update Utility (SUU)
- Dell EMC Platform Specific Bootable ISO (PSBI)

Dell resources

For additional information about white papers, videos, blogs, forums, technical material, tools, usage examples, and other information, go to the OpenManage page at https://www.dell.com/openmanagemanuals or the following product pages:

Table 22. Dell resources

Resource	Location
Integrated Dell Remote Access Controller (iDRAC)	https://www.dell.com/idracmanuals
iDRAC Service Module (iSM)	https://www.dell.com/support/kbdoc/000178050/
OpenManage Ansible Modules	https://www.dell.com/support/kbdoc/000177308/
OpenManage Essentials (OME)	https://www.dell.com/support/kbdoc/000175879/
OpenManage Mobile (OMM)	https://www.dell.com/support/kbdoc/000176046
OpenManage Integration for VMware vCenter (OMIVV)	https://www.dell.com/support/kbdoc/000176981/
OpenManage Integration for Microsoft System Center (OMIMSSC)	https://www.dell.com/support/kbdoc/000147399
Dell EMC Repository Manager (DRM)	https://www.dell.com/support/kbdoc/000177083
Dell EMC System Update (DSU)	https://www.dell.com/support/kbdoc/000130590
Dell EMC Platform Specific Bootable ISO (PSBI)	Dell.com/support/article/sln296511
Dell EMC Chassis Management Controller (CMC)	www.dell.com/support/article/sln311283
OpenManage Connections for Partner Consoles	https://www.dell.com/support/kbdoc/000146912
OpenManage Enterprise Power Manager	https://www.dell.com/support/kbdoc/000176254
OpenManage Integration with ServiceNow (OMISNOW)	Dell.com/support/article/sln317784

(i) **NOTE:** Features may vary by server. Please refer to the product page on https://www.dell.com/manuals for details.

Dell Technologies Services

Dell Technologies Services include a wide, customizable range of service choices to simplify the assessment, design, implementation, management and maintenance of IT environments and to help you transition from platform to platform. Depending on your current business requirements and the level of service right for you, we provide factory, on-site, remote, modular, and specialized services that fit your needs and budget. We'll help with a little or a lot—your choice—and provide access to our global resources.

For more information, see DellEMC.com/Services.

Topics:

- Dell EMC ProDeploy Enterprise Suite
- Dell EMC Data Migration Service
- Dell EMC ProSupport Enterprise Suite
- Dell EMC ProSupport Plus for Enterprise
- Dell EMC ProSupport for Enterprise
- Dell EMC ProSupport One for Data Center
- ProSupport for HPC
- Support Technologies
- Services for Data Security
- Dell Technologies Education Services
- Dell Technologies Consulting Services
- Dell EMC Managed Services

Dell EMC ProDeploy Enterprise Suite

ProDeploy Enterprise Suite gets your server out of the box and into optimized production—fast. Our elite deployment engineers with broad and deep experience utilizing best-in-class processes along with our established global scale can help you around the clock and around the globe. From simple to the most complex server installations and software integration, we take the guess work and risk out of deploying your new server technology.

		Basic Deployment	ProDeploy	ProDeploy Plus
Pre-deployment	Single point of contact for project management	-	●	In-region
	Site readiness review	-	●	●
	Implementation planning	-	●	●
	SAM engagement for ProSupport Plus entitled devices	-	-	●
Deployment	Deployment service hours	Business hours	24x7	24x7
	Remote guidance for hardware installation or Onsite hardware installation and packaging material removal	Onsite	Remote or Onsite	Onsite
	Install and configure system software	-	Remote	Onsite
	Install support software and connect with Dell Technologies	-	●	●
	Project documentation with knowledge transfer	-	●	●
Post-deployment	Deployment verification	-	●	●
	Configuration data transfer to Dell EMC technical support	-	●	●
	30-days of post-deployment configuration assistance	-	-	●
	Training credits for Dell EMC Education Services	-	-	●

Figure 23. ProDeploy Enterprise Suite capabilities

ⓘ **NOTE:** Hardware installation not applicable on selected software products.

Dell EMC ProDeploy Plus

From beginning to end, ProDeploy Plus provides the skill and scale needed to successfully execute demanding deployments in today's complex IT environments. Certified Dell EMC experts start with extensive environmental assessments and detailed migration planning and recommendations. Software installation includes set up of most versions of Dell EMC SupportAssist and OpenManage system management utilities. Post-deployment configuration assistance, testing, and product orientation services are also available.

Dell EMC ProDeploy

ProDeploy provides full service installation and configuration of both server hardware and system software by certified deployment engineers including set up of leading operating systems and hypervisors as well as most versions of Dell EMC SupportAssist and OpenManage system management utilities. To prepare for the deployment, we conduct a site readiness review and implementation planning exercise. System testing, validation, and full project documentation with knowledge transfer complete the process.

Basic Deployment

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

Dell EMC ProDeploy for HPC

HPC deployments require specialist that understand that cutting edge is yesterday's news. Dell EMC deploys the world's fastest systems and understands the nuances that make them perform. ProDeploy for HPC provides:
- Global team of dedicated HPC specialists
- Proven track record, thousands of successful HPC deployments
- Design validation, bench marking and production orientation

Learn more at http:/DellEMC.com/HPC-Services

ProDeploy for HPC

Get more out of your cluster starting Day One

ProDeploy for HPC
- Install & configure Cluster Management software
- Configure HPC nodes and switches
- Validate implemented design
- Product orientation
- Perform cluster benchmarking

TOP 500 The List. | Linpack Benchmark

Add-ons
Scalable HPC solution hardware installation in any combination to fit your system requirements:

1 HPC Add-on: Individual nodes
- Install individual server nodes
- Professionally labeled cabling
- BIOS configured for HPC
- OS installed

2 HPC Add-on: Storage
- Install HPC Storage Ready Bundle for NSS-HA

Note: Not available in Asia/Pacific countries including Japan and Greater China.

Figure 24. ProDeploy for HPC

Dell EMC Server Configuration Services

With Dell EMC Rack Integration and other Dell EMC PowerEdge Server Configuration Services, you save time by receiving your systems racked, cabled, tested, and ready to integrate into the data center. Dell EMC staff pre-configure RAID, BIOS and iDRAC settings, install system images, and even install third-party hardware and software.

For more information, see Server Configuration Services.

Dell EMC Residency Services

Residency Services helps customers transition to new capabilities quickly with the assistance of on-site or remote Dell EMC experts whose priorities and time you control. Residency experts can provide post implementation management and knowledge transfer related to a new technology acquisition or day-to-day operational management of the IT infrastructure.

Dell EMC Data Migration Service

Protect your business and data with our single point of contact to manage your data migration project. Your project manager will work with our experienced team of experts to create a plan using industry-leading tools and proven processes based on global best practices to migrate your existing files and data so your business system get up and running quickly and smoothly.

Dell EMC ProSupport Enterprise Suite

With the ProSupport Enterprise Suite, we help keep your IT systems running smoothly, so you can focus on running your business. We will help maintain peak performance and availability of your most essential workloads. ProSupport Enterprise Suite is a suite of support services that enable you to build the solution that is right for your organization.

Choose support models based on how you use technology and where you want to allocate resources. From the desktop to the data center, address everyday IT challenges, such as unplanned downtime, mission-critical needs, data and asset protection, support planning, resource allocation, software application management and more. Optimize IT resources by choosing the right support model.

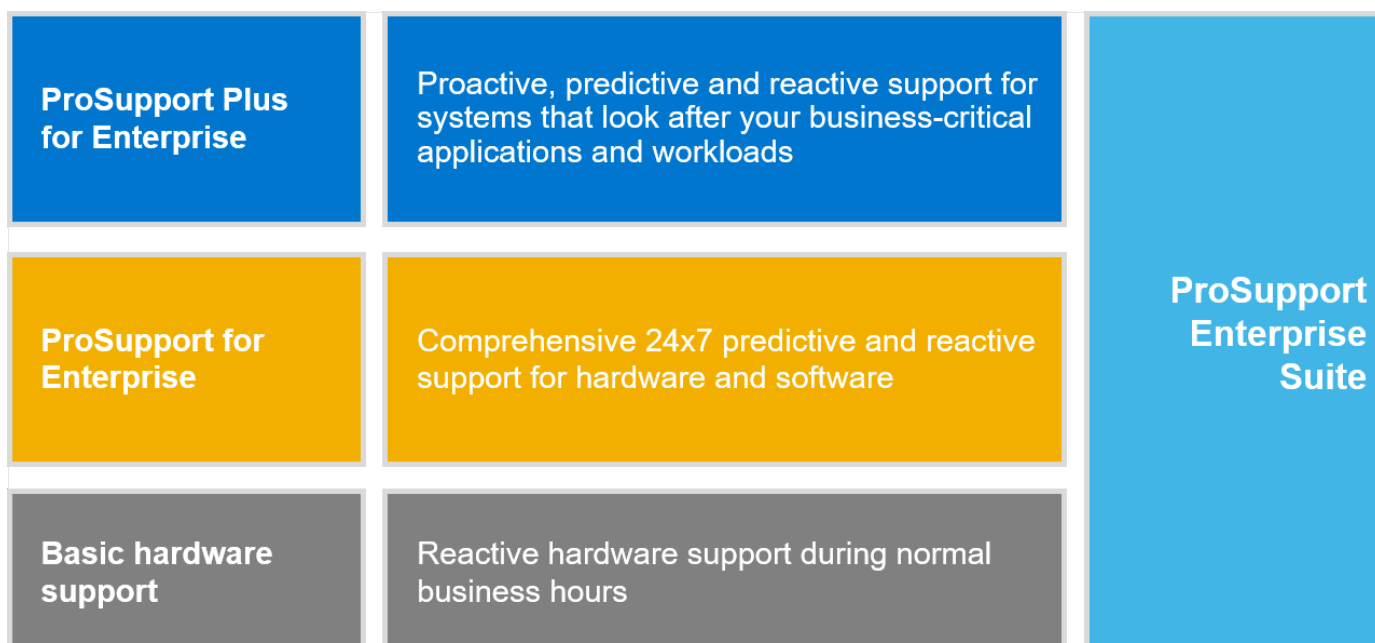|		
ProSupport Plus for Enterprise	Proactive, predictive and reactive support for systems that look after your business-critical applications and workloads	**ProSupport Enterprise Suite**
ProSupport for Enterprise	Comprehensive 24x7 predictive and reactive support for hardware and software	
Basic hardware support	Reactive hardware support during normal business hours	

Figure 25. Dell EMC ProSupport Enterprise Suite

Dell EMC ProSupport Plus for Enterprise

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

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

Dell EMC ProSupport for Enterprise

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

● 24x7 support through phone, chat and online
● Predictive, automated tools and innovative technology
● A central point of accountability for all hardware and software issues
● Collaborative 3rd party support
● Hypervisor, operating system and application support
● Consistent experience regardless of where you are located or what language you speak
● Optional onsite parts and labor response options including next business day or four-hour mission critical

ⓘ **NOTE:** Subject to service offer country availability.

Enterprise Support Services
Feature Comparison

	Basic	ProSupport	ProSupport Plus
Remote technical support	9x5	24x7	24x7
Covered products	Hardware	Hardware Software	Hardware Software
Onsite hardware support	Next business day	Next business day or 4hr mission critical	Next business day or 4 hr mission critical
3rd party collaborative assistance		●	●
Automated issue detection & proactive case creation		●	●
Self-service case initiation and management		●	●
Access to software updates		●	●
Priority access to specialized support experts			●
3rd party software support			●
Assigned Services Account Manager			●
Personalized assessments and recommendations			●
Semiannual systems maintenance			●

Availability and terms of Dell Technologies services vary by region and by product. For more information, please view our Service Descriptions available on Dell.com

Figure 26. Dell EMC Enterprise Support model

Dell EMC ProSupport One for Data Center

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

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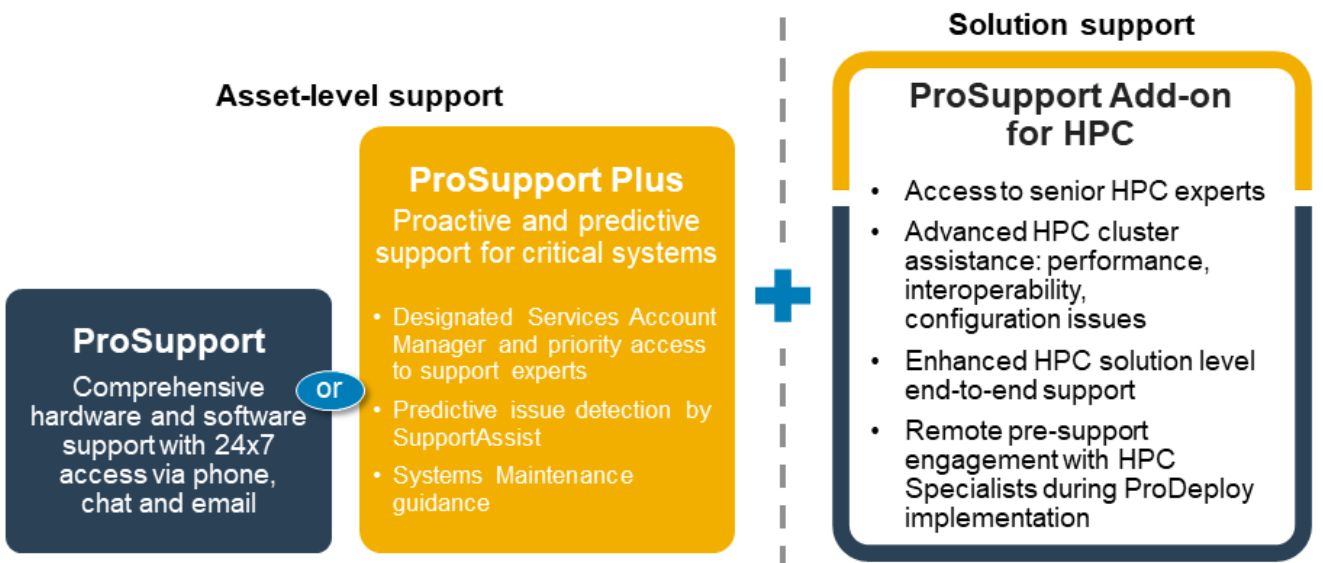
ProSupport for HPC

The ProSupport for HPC provides solution-aware support including:
- Access to senior HPC experts
- Advanced HPC cluster assistance: performance, interoperability & configuration
- Enhanced HPC solution level end-to-end support
- Remote pre-support engagement with HPC Specialists during ProDeploy implementation

Learn more at DellEMC.com/HPC-Services.

Figure 27. ProSupport for HPC

Support Technologies

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

Dell EMC SupportAssist

The best time to solve a problem is before it happens. The automated proactive and predictive technology SupportAssist helps reduce steps and time to resolution, often detecting issues before they become a crisis. Benefits include:

- Value—SupportAssist is available to all customers at no additional charge
- Improve productivity—replace manual, high-effort routines with automated support
- Accelerate time to resolution—receive issue alerts, automatic case creation, and proactive contact from Dell EMC experts
- Gain insight and control—optimize enterprise devices with on-demand ProSupport Plus reporting in TechDirect, and get predictive issue detection before the problem starts

ⓘ **NOTE:** SupportAssist is included with all support plans, but features vary based on service level agreement.

	Basic Hardware Warranty	ProSupport	ProSupport Plus
Automated issue detection and system state information collection	●	●	●
Proactive, automated case creation and notification		●	●
Predictive issue detection for failure prevention			●
Recommendation reporting available on-demand in TechDirect			●

Figure 28. SupportAssist model

Get started at Dell.com/SupportAssist

Dell EMC TechDirect

Boost IT team productivity when supporting Dell EMC systems. With over 1.4 million self-dispatches processed each year, TechDirect has proven its effectiveness as a support tool. You can:

- Self-dispatch replacement parts
- Request technical support
- Integrate APIs into your help desk

Or, access all your Dell EMC certification and authorization requirements. Train your staff on Dell EMC products, as TechDirect allows you to:

- Download study guides
- Schedule certification and authorization exams
- View transcripts of completed courses and exams

Register at techdirect.dell.

Services for Data Security

As data security concerns intensify, businesses require focused security strategies to help mitigate risk. Get end to end protection throughout the life of your technology. Keep sensitive data on failed parts completely in your control with Dell EMC Keep Your Hard Drive and Keep Your Component for Enterprise or render data unrecoverable on re-purposed or retired products with Dell EMC Data Sanitization and Data Destruction for Enterprise. Promote social responsibility while maintaining data security with Dell EMC Data Sanitization for Enterprise Offsite with Asset Resale & Recycle we can help customers secure data on specific Dell EMC Server and Storage products as well as similar third-party systems. As part of this service, we remove old systems from your environment, securely sanitize data and responsibly reuse or recycle those systems to contribute to a more sustainable future. No matter your need, risk of unauthorized access to sensitive information is eliminated.

Dell Technologies Education Services

Build the IT skills required to influence the transformational outcomes of the business. Enable talent and empower teams with the right skills to lead and execute 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 designed to help you achieve more from your hardware investment. The curriculum delivers the information and the practical, hands-on skills that you and your team need to confidently install, configure, manage, and troubleshoot your Dell EMC servers. To learn more or register for a class today, see LearnDell.com/Server.

Dell Technologies Consulting Services

Our expert consultants help you transform faster, and quickly achieve business outcomes for the high value workloads Dell EMC PowerEdge systems can handle.

From strategy to full-scale implementation, Dell Technologies Consulting can help you determine how to execute your IT, workforce, or application transformation.

We use prescriptive approaches and proven methodologies combined with Dell Technologies' portfolio and partner ecosystem to help you achieve real business outcomes. From multi-cloud, applications, DevOps, and infrastructure transformations, to business resiliency, data center modernization, analytics, workforce collaboration, and user experiences—we're here to help.

Dell EMC Remote Consulting Services

When you are in the final stages of your PowerEdge server implementation, you can rely on Dell EMC Remote Consulting Services and our certified technical experts to help you optimize your configuration with best practices for your software, virtualization, server, storage, networking, and systems management.

Dell EMC Managed Services

Reduce the cost, complexity, and risk of managing IT. Focus your resources on digital innovation and transformation while our experts help optimize your IT operations and investment with managed services backed by guaranteed service levels.

Appendix A. Additional specifications

Topics:

Chassis dimensions
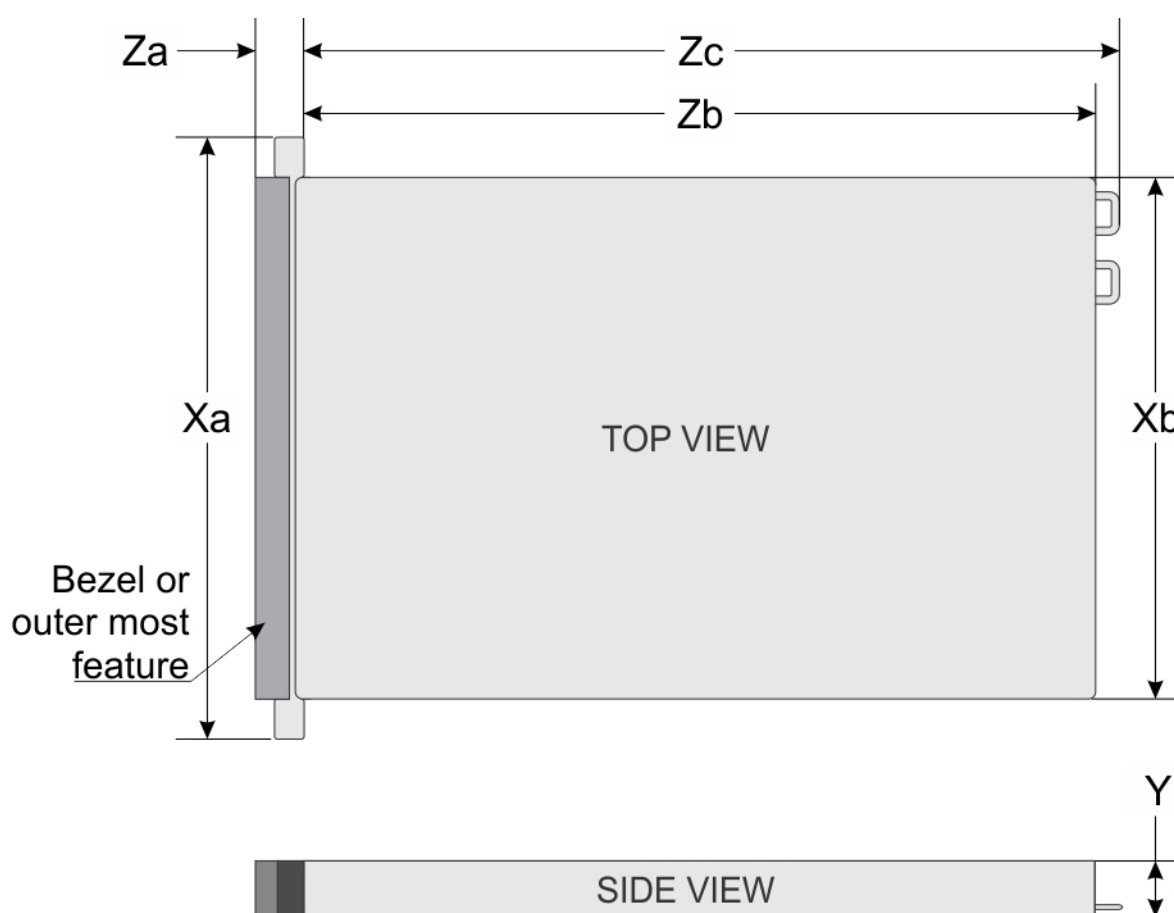
Figure 29. Chassis dimensions

Table 23. PowerEdge R350 chassis dimensions

Drives	Xa	Xb	Y	Za	Zb	Zc
4 x 3.5-inch	482.0 mm (18.98 inches)	434.0 mm (17.09 inches)	42.8 mm (1.7 inches)	35.64 mm (1.40 inches) With bezel	534.59 mm (21.04 inches) Ear to rear wall	563.3 mm (22.18 inches)

Table 23. PowerEdge R350 chassis dimensions (continued)

Drives	Xa	Xb	Y	Za	Zb	Zc
				22.0 mm (0.86 inches)Without bezel		Ear to PSU handle
8 x 2.5-inch	482.0 mm (18.98 inches)	434.0 mm (17.09 inches)	42.8 mm (1.7 inches)	35.64 mm (1.40 inches) With bezel 22.0 mm (0.86 inches) Without bezel	483.82 mm (19.04 inches) Ear to rear wall	512.53 mm (20.17 inches) Ear to PSU handle

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

Chassis weight

Table 24. PowerEdge R350 system weight

System configuration	Maximum weight (with all drives/SSDs)
4 x 3.5-inch	13.14 kg (28.96 pound)
8 x 2.5-inch	11.74 kg (25.88 pound)

NIC port specifications

The PowerEdge R350 system supports up to two 10/100/1000 Mbps Network Interface Controller (NIC) ports embedded on Motherboard.

Table 25. NIC port specification for the system

Feature	Specifications
LOM	1 GB x 2

Video specifications

The PowerEdge R350 system supports integrated Matrox G200 graphics controller with 16 MB of video frame buffer.

Table 26. Supported video resolution options for the system

Resolution	Refresh rate (Hz)	Color depth (bits)
1024 x 768	60, 72, 75, 85	8, 16, 32
1280 x 800	60, 75	8, 16, 32
1280 x 1024	60, 75, 85	8, 16, 32
1360 x 768	60	8, 16, 32
1440 x 900	60, 75, 85	8, 16, 32
1600 x 900	60	8, 16, 32
1600 x 1200	60, 65, 70, 75, 85	8, 16, 32
1680 x 1050	60, 75, 85	8, 16, 32

Table 26. Supported video resolution options for the system (continued)

Resolution	Refresh rate (Hz)	Color depth (bits)
1920 x 1080	60	8, 16, 32
1920 x 1200	60, 75, 85	8, 16, 32

USB Ports

Table 27. PowerEdge R350 USB specifications

Front		Rear		Internal (Optional)	
USB port type	No. of ports	USB port type	No. of ports	USB port type	No. of ports
USB 2.0-compliant port	One	USB 3.0-compliant port	One	Internal USB 3.0-compliant port	One
iDRAC Direct port (Micro-AB USB 2.0-compliant port)	One	USB 2.0-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
Peak Power (Highline/-100 V) Highline/-240 V	600 W
Peak Power (Lowline/-100 V Lowline/-120 V	N/A
DC	240 V

Environmental specifications

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

Table 29. Continuous Operation Specifications for ASHRAE A2

	Allowable continuous operations
Temperature range for altitudes <= 900 m (<= 2953 ft)	10–35°C (50–95°F) with no direct sunlight on the equipment
Humidity percent range (non-condensing at all times)	8% RH with -12°C minimum dew point to 80% RH with 21°C (69.8°F) maximum dew point

Table 29. Continuous Operation Specifications for ASHRAE A2 (continued)

	Allowable continuous operations
Operational altitude de-rating	Maximum temperature is reduced by 1ºC/300 m (33.8ºF/984 Ft) above 900 m (2953 Ft)

Table 30. Continuous Operation Specifications for ASHRAE A3

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

Table 31. Continuous Operation Specifications for ASHRAE A4

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

Table 32. Common Environmental Specifications for ASHRAE A2, A3, A4

	Allowable continuous operations
Maximum temperature gradient (applies to both operation and non-operation)	20ºC in an hour* (36ºF in an hour) and 5ºC in 15 minutes (41ºF in 15 minutes), 5ºC in an hour* (41ºF 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 65ºC (-104 to 149ºF)
Non-operational humidity limits	5% to 95% RH with 27ºC (80.6ºF) maximum dew point
Maximum non-operational altitude	12,000 meters (39,370 feet)
Maximum operational altitude	3,048 meters (10,000 feet)

Table 33. 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 34. 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 restrictions

ASHRAE A3/A4 Thermal restriction

The following list is the restriction for supporting fresh air in all the platform:

- BOSS(M.2) module is not supported.
- Redundant Power Supplies are required.
- 8 x 2.5-inch HDD support with HDD capability < 1 TB.
- Non Dell qualified peripheral cards and peripheral cards greater than 25 W are not supported.

Table 35. Fan population

Chassis	Configuration	Fan Q'ty	Fan Location
4x 3.5-inch hot plug	All Configuration	4x 4056	Fan 1, Fan 2, Fan 3, Fan 4
8x 2.5-inch hot plug	All Configuration	4x 4056	Fan 1, Fan 2, Fan 3, Fan 4

Appendix B. Standards compliance

The system conforms to the following industry standards.

Table 36. Industry standard documents

Standard	URL for information and specifications
ACPIAdvance Configuration and Power Interface Specification, v2.0c	https://uefi.org/specsandtesttools
Ethernet IEEE 802.3-2005	https://standards.ieee.org/
HDGHardware Design Guide Version 3.0 for Microsoft Windows Server	microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.mspx
IPMI Intelligent Platform Management Interface, v2.0	intel.com/design/servers/ipmi
DDR4 Memory DDR4 SDRAM Specification	jedec.org/standards-documents/docs/jesd79-4.pdf
PCI Express PCI Express Base Specification Rev. 2.0 and 3.0	pcisig.com/specifications/pciexpress
PMBus Power System Management Protocol Specification, v1.2	http://pmbus.org/Assets/PDFS/Public/PMBus_Specification_Part_I_Rev_1-1_20070205.pdf
SAS Serial Attached SCSI, v1.1	http://www.t10.org/
SATA Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2	sata-io.org
SMBIOS System Management BIOS Reference Specification, v2.7	dmtf.org/standards/smbios
TPM Trusted Platform Module Specification, v1.2 and v2.0	trustedcomputinggroup.org
UEFI Unified Extensible Firmware Interface Specification, v2.1	uefi.org/specifications
USB Universal Serial Bus Specification, Rev. 2.7	usb.org/developers/docs

Appendix C Additional resources

Table 37. Additional resources

Resource	Description of contents	Location
Installation and Service Manual	This manual, available in PDF format, provides the following information: ● Chassis features ● System Setup program ● System indicator codes ● System BIOS ● Remove and replace procedures ● Diagnostics ● Jumpers and connectors	Dell.com/Support/Manuals
Getting Started Guide	This guide ships with the system, and is also available in PDF format. This guide provides the following information: ● Initial setup steps	Dell.com/Support/Manuals
Rack Installation Guide	This document ships with the rack kits, and provides instructions for installing a server in a rack.	Dell.com/Support/Manuals
System Information Label	The system information label documents the system board layout and system jumper settings. Text is minimized due to space limitations and translation considerations. The label size is standardized across platforms.	Inside the system chassis cover
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 EMC contact information.	Inside the system chassis cover
Enterprise Infrastructure Planning Tool (EIPT)	The Dell EMC 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