

PowerEdge R940



Latest 4-socket, 3U monolithic rack server designed for complex workloads using highly scalable memory and network options.

The following documentation is designed as both an instructional aid and online reference material for the Dell EMC PowerEdge R940 rack server. The material introduces new technologies and features specific to the PowerEdge R940 in an effort to better prepare technicians to provide outstanding support to our customers.

Notes, cautions, and warnings

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

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

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

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System overview

Introduction

The Dell EMC PowerEdge R940 is a latest 4-socket, 3U monolithic rack server designed to run complex workloads using highly scalable memory, I/O, and network options. The system features the Intel Xeon Processor Scalable family, with up to 48 DDR4 DIMMs, up to 13 PCI Express (PCIe) 3.0 enabled expansion slots, and a choice of embedded NIC technologies.

The PowerEdge R940 is a general-purpose platform capable of handling demanding workloads and applications, such as data warehouses, ecommerce, databases, and high-performance computing (HPC).

The PowerEdge R940 adds extraordinary storage capacity options, making it well-suited for data-intensive applications that require greater storage, while not sacrificing I/O performance.

New Technologies

Table 1. New technologies

Technology	Detailed Description
Intel Xeon Processor Scalable family	Refer the Processor section for specific SKU details. <ul style="list-style-type: none"> 14nm process technology Intel Ultra Path Interconnect (UPI) up to 3 links @ 10.4GT/s with shelf-4 Up to 28 cores per socket with Hyper-Threading (HT) 6x DDR4 channels @ 2666 MT/s 2 DPC. 3 DPC not supported. Max TDP: 165W (Note: Higher TDP skus up to 240W – UI) Mismatched SKUs not allowed
Intel C620 Chipset	Intel Platform Controller Hub (PCH) with Intel Node Manager 4.0 ME
2666 MT/s DDR4 Memory	Select SKUs of the Intel Xeon Skylake Scalable family processors support 2666 MT/s memory. The R940 supports two DIMMs per channel max at 2666 MT/s with these processors. See the Memory section for additional speed/population details. <ul style="list-style-type: none"> 6x DDR4 Channels per socket, 2 DIMMs per channel (2DPC) Up to 2666 MT/s max (CPU sku and DIMM-dependent) RDIMMs up to 32GB & LRDIMMs up to 64GB & 128GB supported
iDRAC9 with Lifecycle Controller	The embedded systems management solution for PowerEdge features hardware and firmware inventory and alerting, in- depth memory alerting, faster performance, a dedicated gigabit port and many more features. See the OpenManage systems management section for details
Wireless Management	The Quick Sync feature is an extension of NFC based low bandwidth Quick sync interface. Quick Sync 2.0 will offer feature parity with NFC interface with improved user experience. Since the introduction of iDRAC in PowerEdge Server, the server management has been improved by adding different local and remote user interfaces (Web GUI, RACADM, WSMAN, BIOS F2 Setup, and LCD) to iDRAC. The addition of Quick Sync 1.0 (NFC) interface in 13G server with handheld devices (Mobile, tablet) and OMM Android application. To extend this Quick Sync feature to wide

Technology**Detailed Description**

variety of Mobile OS's with higher data throughput, the Quick Sync 2.0 version replaces NFC technology.

System features

Specifications

Table 2. Technical specifications

Feature	Specification
Form factor	3U rack
Processors	Intel Xeon Processor Scalable family
Processor sockets	2 socket or 4 sockets
Internal interconnect	Intel Ultra Path Interconnect (UPI) up to 10.4 GT/s
Chipset	Intel C620
Memory	<ul style="list-style-type: none"> Up to 6 TB-48 DIMM slots RDIMM-up to 32 GB LRDIMM-up to 64 GB and 128 GB
PCIe slots	Maximum 13 PCIe slots (three x8 slots and ten x16 slots)
RAID controller	<ul style="list-style-type: none"> H330+ H740P H840 12 Gb SAS HBA Software RAID: S140 Hardware RAID: M.2 SATA adapter (BOSS)
Drives	<ul style="list-style-type: none"> 2.5-in, 12 GB SAS and 6 GB SATA 8 hard drives on passive backplane 24 hard drives on active backplane with up to 12 PCIe NVMe hard drive capable universal slots.
Maximum internal storage	Up to 122 TBs using 12x2.5-in 3.84 TB SAS/SATA/SSD/NVMe + 12x2.5-in 6.4 TB NVMe PCIe SSD's.
Embedded NIC	<ul style="list-style-type: none"> Flexible Rack Network Daughter Cards (rNDC). PCIe Gen 3 x8
Power supply	<ul style="list-style-type: none"> Platinum AC supported power supplies: 1100 W, 1600 W, and 2000 W, 2400 W DC supported power supply: 1100 W
Availability	<ul style="list-style-type: none"> RDIMM, LRDIMM Hot-plug hard drives, redundant cooling fans, and power supply Internal Dual SD Module (IDSDM) Boot Optimized Storage Subsystem (BOSS) via M.2

Feature	Specification
Systems management	<ul style="list-style-type: none">• LC 3.x• OpenManage• QuickSync2.0• OMPC3• Digital License Key• iDRACDirect (dedicated micro-USB port)• Easy Restore• vFlash
Operating systems	<ul style="list-style-type: none">• RedHat Enterprise Linux 6.9 Server x86_64• RedHat Enterprise Linux 7.3 Server x86_64• Novell SuSE Linux Enterprise Server 11 (with PLDP) SP4x86_64• Novell SuSE Linux Enterprise Server 12 SP2 x86_64• MS, Windows Server 2016• MS, Windows Server 2012 R2

For more information on the specific versions and additions, visit Dell.com/OSsupport.

Chassis views and features

Chassis view and features

Front panel view and features

The following components are located on the front of the PowerEdge R940:

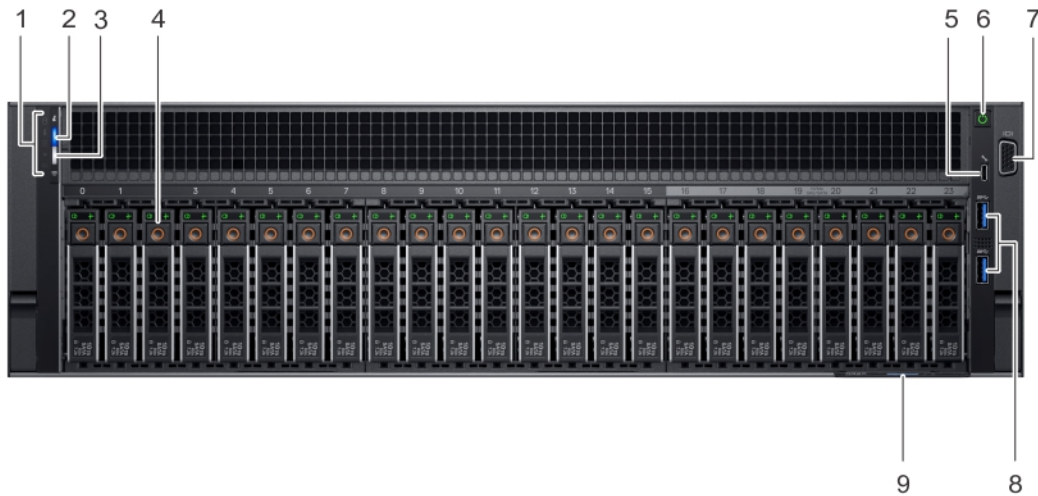


Figure 1. PowerEdge R940 front panel

- 1 Left control panel
- 2 System health and system identifier
- 3 iDRAC Quick Sync 2 wireless indicator
- 4 Hard drives
- 5 USB management port
- 6 Power button
- 7 Video connector
- 8 USB management port/iDRAC Direct
- 9 Information tag

For more information on the HDD numbering, see the Dell PowerEdge R940 Hardware Owner's Manual on www.dell.com/support

Back view features

The following components are located on the back of the PowerEdge R940:

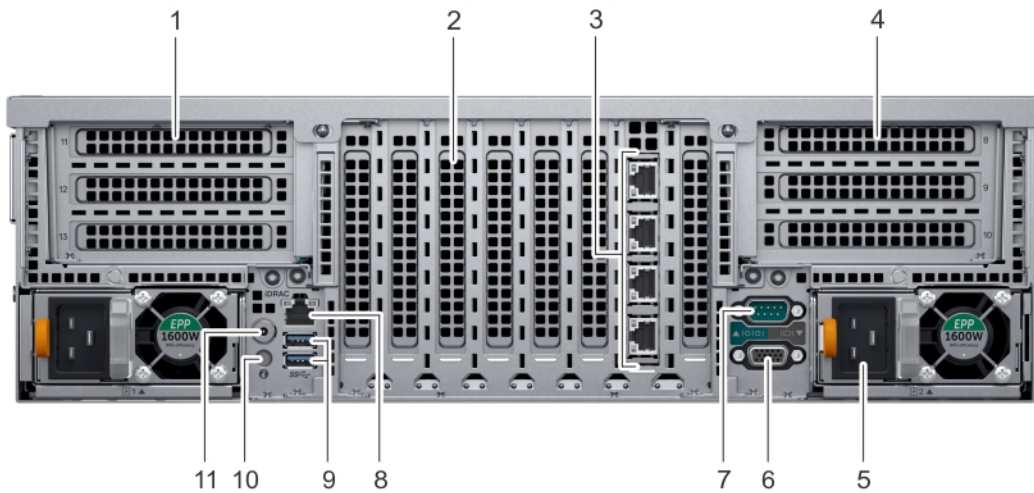


Figure 2. PowerEdge R940 back view

- 1 Half-height PCIe expansion card slot
- 2 Full-height PCIe expansion slots
- 3 Ethernet connector (4)
- 4 Half-height PCIe expansion card slot
- 5 Power supply unit (2)
- 6 Video port
- 7 Serial port
- 8 iDRAC9 Enterprise port
- 9 USB port
- 10 System identification button
- 11 Status indicator cable port

2.5-in x8 hard drive passive backplane

This passive backplane allows 8x2.5-in SAS/SATA hard drives to be connected to the backplane. As a passive backplane, it does not support the flexible assignment of hard drives to nodes. Each node in the chassis gets equal number of total available hard drives.

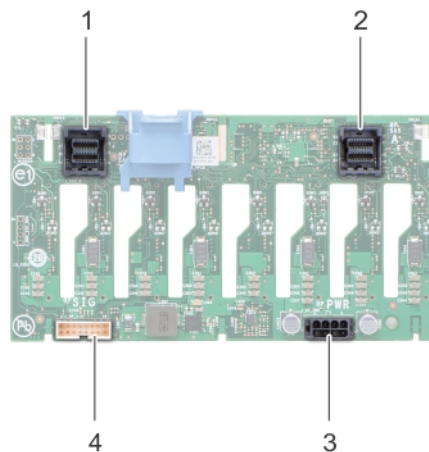


Figure 3. Hard drive backplane 2.5-in x8

- 1 SAS connector (J_SAS_B)
- 2 SAS connector (J_SAS_A)
- 3 Power connector (J_BP_PWR)
- 4 Signal connector (J_BP_SIG)

2.5-in x24 hard drive active backplane

The active backplane is capable of supporting 24x2.5-in SAS/SATA hard drives and 12x NVMe hard drives. A SAS Expander Daughter Card is necessary to achieve higher volume hard drive configuration and it is integrated with the backplane via Xcede hard drive and power connectors.

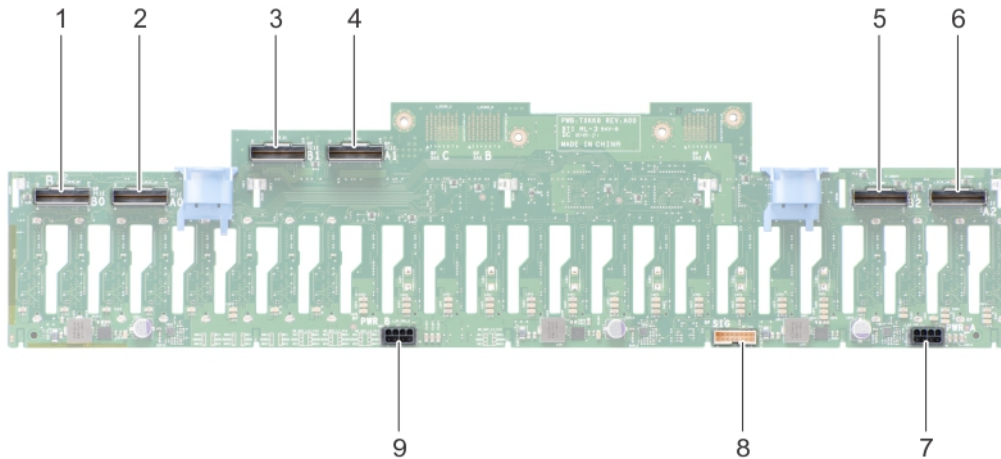


Figure 4. Hard drive backplane 2.5-in x24

- 1 PCIe connector (J_PCIE_B2)
- 2 PCIe connector (J_PCIE_A2)
- 3 PCIe connector (J_PCIE_B1)
- 4 PCIe connector (J_PCIE_A1)
- 5 PCIe connector (J_PCIE_B0)
- 6 PCIe connector (J_PCIE_A0)
- 7 PCIe connector (J_BP_PWR_A)
- 8 Signal connector (J_BP_SIG)
- 9 PCIe connector (J_BP_PWR_B)

Control panels, LCD and LED

For more information about the PowerEdge R940 control panels, see the PowerEdge R940's Owner's Manual at Dell.com/Support/Manuals.

Quick Resource Locator (QRL)

The Embedded Service Tag (EST) this generation will contain the Service Tag number and the iDRAC password. Embedding the Service Tag and iDRAC password in the QRL allows the mobile application to display information on their configuration, warranty status, specific iDRAC password and service level agreement. Additionally, the EST will allow us to understand how our customers are using QRL.

The following image shows the service tag QRL label:



Figure 5. Service tag QRL label

The QRL EST label has a service tag embedded into the QR code that the QRL website uses to look up system info in the service tag data base. From that database the QRL website pulls warranty info and factory configuration details. After viewing this, the customer can move on to the product page.

The following image shows the chassis QRL label:

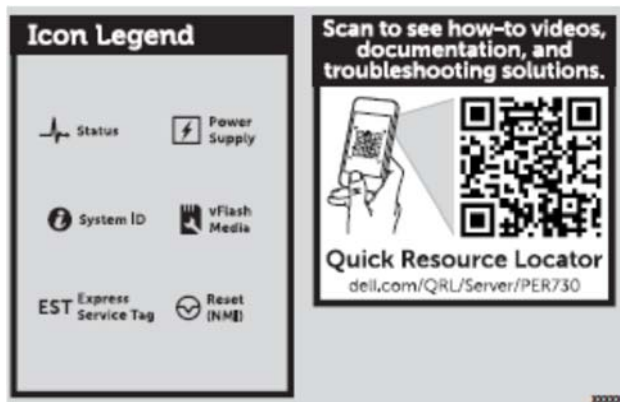


Figure 6. Chassis QRL label

Security features

The latest generation of PowerEdge servers has the features listed in the table to help ensure the security of your data center.

Table 3. Security features

Security feature	Description
Cover latch	A tooled latch is integrated in the top cover to secure it to the rack chassis.
TPM	The Trusted Platform Module (TPM) is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM 1.2 is supported.
Power-off security	BIOS has the ability to disable the power button function.

Processor Features

The Intel Xeon Skylake Scalable family is the next generation core architecture with improved Instructions per Cycle (IPC) and other architectural improvements. The Intel Xeon Skylake Scalable family features are as follows:

- Virtual address space of 48 bits and a physical address space of 46 bits.
- Intel Hyper-Threading Technology (Intel® HT Technology) when enabled allow each core to support two threads.
- First Level Cache (FLC) 64 KB total. The FLC is comprised of a 32 KB ICU (Instruction Cache) and 32 KB DCU (Data Cache).
- MB Mid-Level Cache (MLC) per core (non-inclusive with the LLC).
- Intel® Advanced Vector Extensions 512 (Intel® AVX-512) with a single AVX512 fused multiply add (FMA) execution units. SKUs which support Advanced RAS enable a 2nd FMA execution unit.

Supported Processors

Table 4. Supported processor levels and features

Processor levels	Features
81xx-Platinum	<ul style="list-style-type: none"> • 2S-2UPI, 2S-3UPI, 4S-2UPI, 4S-3UPI, and 8S-3UPI capability • 6-ch DDR4 @ 2666 • 3 UPI links @ 10.4GT/s • Intel® Turbo Boost • Intel® Hyper-Threading • Intel® AVX-512 (2 512-bit FMAs) • 48 lanes PCIeGen3 • Node Controller Support • Advanced RAS
61xx-Gold	<ul style="list-style-type: none"> • 2S-2UPI, 2S-3UPI, 4S-2UPI, and 4S-3UPI capability • 6-ch DDR4 @ 2666 • 3 UPI links @ 10.4GT/s • Intel® Turbo Boost • Intel® Hyper-Threading • Intel® AVX-512 (2 512-bit FMAs) • 48 lanes PCIeGen3 • Node Controller Support • Advanced RAS
51xx-Gold	<ul style="list-style-type: none"> • 2S-2UPI & 4S-2UPI capability • 6-ch DDR4 @ 2400 • 2 UPI links @ 10.4GT/s • Intel® Turbo Boost • Intel® Hyper-Threading

Processor levels

Features

- Intel® AVX-512 (11512-bit FMA)
- 48 lanes PCIeGen3
- Advanced RAS

Table 5. Feature comparison table

Feature	81xx-Platinum	61xx-Gold	51xx-Gold
Number of UPI links	3	3	2
UPI speed	10.4 GT/s	10.4 GT/s	10.4 GT/s
Supported topologies	3 UPI: 2S-2UPI,2S-3UPI, 4S-2UPI, 4S-3UPI, 8S-3UPI	3 UPI: 2S-2UPI,2S-3UPI, 4S-2UPI, 4S-3UPI	2S-2UPI,4S-2UPI
Node Controller Support	Yes	Yes	No
Number of memory channels	6	6	6
DDR4 speed	2666	2666	2400
Memory capacity	768 GB, 1.5 TB-SKUs: 8180, 8176, 8170, and 8160	768 GB, 1.5 TB-SKUs: 6140, 6134, and 6142	768 GB

Processor installation

For processor installation instructions, see the Dell PowerEdge R940 Hardware Owner's Manual

Chipset

The Intel C620 PCH provides extensive I/O support. Functions and capabilities include:

- ACPI Power Management Logic Support, Revision 4.0a
- PCI Express* Base Specification Revision 3.0
- Integrated Serial ATA host controller, supports data transfer rates of up to 6 Gb/s on all ports.
- xHCI USB controller with SuperSpeed USB 3.0 ports
- Direct Media Interface
- Enhanced Serial Peripheral Interface
- Flexible I/O—Allows some high speed I/O signals to be configured as PCIe* root ports, PCIe* uplink for use with certain PCH SKUs, SATA (and sSATA), or USB 3.0.
- General Purpose Input Output (GPIO)
- Low Pin Count interface, interrupt controller, and timer functions
- System Management Bus Specification, Version 2.0
- Integrated Clock Controller / Real Time Clock Controller
- Intel® High Definition Audio and Intel® Smart Sound Technology
- Integrated 10/1 Gb Ethernet
- Integrated 10/100/1000 Mbps Ethernet MAC
- Supports Intel Rapid Storage Technology Enterprise
- Supports Intel Active Management Technology and Server Platform Services
- Supports Intel Virtualization Technology for Directed I/O
- Supports Intel Trusted Execution Technology

- JTAG Boundary Scan support
- Intel QuickAssist Technology
- Intel Trace Hub for debug

Supported Memory

The PowerEdge R940 supports up to 48 DIMM slots, with up to 6 TB of memory and speeds up to 2666 MT/s. Supported DIMMs are registered (RDIMMs) and load reduced (LRDIMMs) DIMMs which uses a buffer to reduce memory loading and provide greater density allowing maximum memory capacity.

Memory speed

The PowerEdge R940 supports memory speeds of 2666 MT/s, 2400 MT/s, and 1866 MT/s depending on the DIMM types installed and configured. All memory on all of the processors and channels run at the same speed and voltage. The operating speed of the memory is determined by the maximum speed supported by the processor, the speed settings in BIOS, and the operating voltage of the system.

Table 6. Memory configuration based on quantity and quality of DIMM

DIMM type	DIMM ranking	Capacity	DIMM rated voltage and speed	Max speed (MT/s) on 1 DPC	Max speed (MT/s) on 2 DPC
RDIMM	1R/2R	8 GB, 16 GB, 32 GB	DDR4 (1.2 V), 2666 MT/s	2666	2666
LRDIMM	4R/8R	64 GB, 128 GB	DDR4 (1.2 V), 2666 MT/s	2666	2666

Memory configurations and population rules

The R940 supports flexible memory configurations ranging from 8 GB (minimum) to 128 GB (maximum). The R940 supports up to 12 DIMMs per processor or 24 DIMMs in a dual-processor and 48 DIMMs in a quad-processor configuration. Each R940 has 6 memory channels per processor, with each channel supporting up to 2 DIMMs.

The R940 server support flexible memory configuration according to the following population rules:

- If DIMMs of different speeds are mixed, all channels across all processors operate at the slowest DIMM's common frequency.
- DIMM type:
 - All DIMMs must be DDR4 RDIMM and LRDIMM
 - Only one type of DIMM is allowed per system-RDIMM, or LRDIMM. They cannot be mixed.
- DIMMs with different data width (x4 and x8 data width) can be mixed.
- The largest DIMM capacity is placed first (slot A1 first, then A2 and so on). The second CPU mirrors the first CPU population rule.
- Maximum of two different capacity DIMMs are allowed in the system.
- Maximum of two different rank DIMMs are allowed in the system.

Table 7. DIMM mixing support

DIMM types	RDIMM	LRDIMM	3DS LRDIMM
RDIMM	allowed	not allowed	not allowed
LRDIMM	not allowed	allowed	not allowed
3DS LRDIMM	not allowed	not allowed	allowed

Memory RAS features

Reliability, Availability, and Serviceability (RAS) features help keep the system online and operational without significant impact to performance, and decreases data loss and crashing issues. RAS helps in rapid and accurate diagnosis of system faults.

Table 8. Supported RAS features

Feature	Description
Dense configuration optimized profile	Increased memory reliability can be a result from this selectable platform profile that adjusts parameters to reduce faults regarding refresh rates, speed, temperature and voltage.
Memory demand and patrol scrubbing	Demand scrubbing is the ability to write corrected data back to the memory once a correctable error is detected on a read transaction. Patrol scrubbing proactively searches the system memory, repairing correctable errors.
Recovery from single DRAM device failure (SDDC)	Recovery from Single DRAM Device Failure (SDDC) provides error checking and correction that protects against any single memory chip failure as well as multi-bit errors from any portion of a single memory chip.
Failed DIMM isolation	This feature provides the ability to identify a specific failing DIMM channel pair, thereby enabling the user to replace only the failed DIMM pair.
Memory mirroring	Memory mirroring is a method of keeping a duplicate (secondary or mirrored) copy of the contents of memory as a redundant backup for use if the primary intra-socket memory fails. The mirrored copy of the memory is stored in memory of the same processor socket.
Memory address parity protection	This feature provides the ability to detect transient errors on the address lines of the DDR channel.
Memory sparing (rank)	Memory sparing allocates one rank per channel as a spare. If excessive correctable errors occur in a rank or channel, they are moved to the spare area while the operating system is running to prevent the errors from causing an uncorrectable failure.
Memory thermal throttling	This feature helps to optimize power/performance and can also be used to prevent DIMMs from overheating.

Storage

The PowerEdge R940 provides storage expandability that allows you to adapt to your workload and operational demands. With comprehensive storage options, the R940 offer various drive types, internal and external storage controllers, and different backplanes for varied number of drives.

Topics:

- [Supported hard drives](#)
- [RAID Controllers](#)
- [Internal persistent storage](#)
- [External storage](#)

Supported hard drives

Table 9. Supported hard drives

Form factor	Type	Speed	Rotational speed	Capacities
2.5-inch	<ul style="list-style-type: none"> • SATA • SSD 	6 GB	N/A	400GB, 480GB, 800GB, 960GB, 1200GB, 1600GB, 1920GB, 3200GB, 3840GB, 7680GB, 960GB(SED FIPS), 1920GB(SED FIPS)
2.5-inch	<ul style="list-style-type: none"> • SATA 	6 GB	7.2 K	1TB, 2TB
2.5-inch	<ul style="list-style-type: none"> • SAS 	12 GB	7.2 K	1TB, 2TB, 2TB(SED FIPS)
2.5-inch	<ul style="list-style-type: none"> • SAS • SSD 	12 GB	N/A	400GB, 480GB, 800GB, 960GB, 1600GB, 1920GB, 3200GB, 3840GB, 7680GB, 15360GB, 1600GB(SED FIPS), 1920GB(SED FIPS), 3200GB(SED FIPS), 3840GB(SED FIPS)
2.5-inch	<ul style="list-style-type: none"> • SAS 	12 GB	10 K	600GB, 1.2TB, 1.8TB, 2.4TB, 1.2TB(SED FIPS), 2.4TB (SED FIPS)
2.5-inch	<ul style="list-style-type: none"> • SAS 	12 GB	15 K	300GB, 600GB, 900GB, 900GB (SED FIPS)

RAID Controllers

The PowerEdge R940 supports full height PERC adapter form factor only in slot 1 (for primary) and slot 6 (for secondary), and does not support mini PERC form factors. The PERC controller offerings for R940 will be a heavy leverage of the 13G PERC family. New to the

R940 PERC controller is the Harpoon-based Premium Performance tier offering. This high-end offering will drive IOPs performance and enhanced SSD performance.

Table 10. PERC series offerings

Performance level	Controller and description
Entry	S140 (NVMe, M.2 SATA) SW RAID SATA
Value	H330+, 12Gb SAS HBA (External) Fury IOC Memory: None x8 12 Gb SAS x8 PCIe 3.0
Premium performance	H740P, H840 Harpoon 8x8 ROC Memory: 4/8GB, NV 72-bit

Internal persistent storage

The PowerEdge R940 offers two internal persistent storage:

- Lifecycle Controller 3.0
- IDSDM/vflash module
- Boot Optimized Storage Subsystem (BOSS)

Lifecycle Controller 3.0

For more information on Lifecycle Controller 3.0, visit [Dell Lifecycle Controller integration for configuration manager](#).

IDSDM/vflash module

This module contains the Internal Dual SD Module (IDSDM) and vflash card that are combined into a single card module. There are two SKUs available:

- vflash
- vflash + IDSDM

The IDSDM with vflash module has a dedicated slot at the back of the system chassis. This is a Dell-proprietary PCIe x1 slot that uses a USB 3.0 interface to host. In the system, the IDSDM and vflash card size changes from SD to microSD and the supported capacity for IDSDM microSD cards are 16 GB, 32 GB, or 64 GB, while for vflash the capacity is 16 GB only. The write-protect switch is built onboard the IDSDM/vflash module.

Boot Optimized Storage Subsystem (BOSS)

BOSS is offered as a means of booting 14G servers to a full OS in the following scenarios:

- A solution such as IDSDM may be desired, but the target OS is a full OS (not just hypervisor).

- The user does not to trade off the standard hot-plug hard drive slot for OS install.

BOSS is a PCIe card in the front to support up to two 80mm or 110mm M.2 SATA or PCIe x1 devices.

NOTE: The portfolio solution using a PCIe carrier card is not supported on R940.

NOTE: BOSS drives and daughter card are not hot-plug capable.

External storage

Table 11. Supported 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 12Gb MD-series JBODs

Optical drives

The R940 does not support internal optical drives. However, external USB optical drives will be supported.

Tape drives

The R940 does not support internal tape drives. However, external tape backup devices will be supported. Below is a list of supported external tape drives:

- External RD1000 USB
- External LTO-5, LTO-6, and LTO-7 6 Gb SAS tape drives
- 114X rack mount chassis with LTO-5, LTO-6, and LTO-7 6 Gb SAS tape drives
- TL1000 with LTO-5, LTO-6, and LTO-7 6 Gb SAS tape drives
- TL2000 with LTO-5, LTO-6, and LTO-7 6 Gb SAS and 8Gb FC tape drives
- TL4000 with LTO-5, LTO-6, and LTO-7 6 Gb SAS and 8Gb FC tape drives
- ML6000 with LTO-5, LTO-6, and LTO-7 6 Gb SAS and 8Gb FC tape drives

Networking and PCIe

The PowerEdge R940 offer balanced, scalable I/O capabilities including integrated PCIe 3.0 expansion slots. Dell network adapters and daughtercards let you choose the right network fabric without using up valuable PCI slots. Pick the speed, technology, vendor and other options such as switching independent partitioning lets you share and manage bandwidth on 10 Gbe connections.

PCIe expansion

For information on card installation, requirements, and slot priorities, see the PowerEdge R940 Owner's Manual on Dell.com/Support/Manuals.

PCIe slots

Systems with 2 socket processors (without Processor Expansion Module) supports up to 7 PCIe Gen3 expansion slots. Systems with 4 socket processors (with Processor Expansion Module) supports up to 13 PCIe Gen3 expansion slots.

PCIe expansion cards

PCIe slot mapping

Table 12. PCIe slot mapping

Physical location	Slot number	Form factor	Controlling CPU	Slot electrical bandwidth/ Physical connector	Power	Length
Baseboard	1	Full height	CPU1	PCIe GEN3 x8 (x16 connector)	25 W	half length
Baseboard	2	Full height	CPU1	PCIe GEN3 x16 (x16 connector)	75 W	half length
Baseboard	3	Full height	CPU1	PCIe GEN3 x16 (x16 connector)	75 W	half length
Baseboard	4	Full height	CPU2	PCIe GEN3 x16 (x16 connector)	75 W	half length
Baseboard	5	Full height	CPU2	PCIe GEN3 x8 (x16 connector)	25 W	half length
Baseboard	6	Full height	CPU2	PCIe GEN3 x8 (x16 connector)	25 W	half length
Baseboard	7	Full height	CPU2	PCIe GEN3 x16 (x16 connector)	75 W	half length
Riser 1 on PEM for 4 socket configuration	8	Full height	CPU3	PCIe GEN3 x16 (x16 connector)	75 W	10.5" (~3/4 length)
Riser 1 on PEM for 4 socket configuration	9	Full height	CPU3	PCIe GEN3 x16 (x16 connector)	25 W	half length
Riser 1 on PEM for 4 socket configuration	10	Full height	CPU3	PCIe GEN3 x16 (x16 connector)	25 W	half length

Physical location	Slot number	Form factor	Controlling CPU	Slot electrical bandwidth/ Physical connector	Power	Length
Riser 2 on PEM for 4 socket configuration	11	Full height	CPU4	PCIe GEN3 x16 (x16 connector)	75 W	10.5" (~3/4 length)
Riser 2 on PEM for 4 socket configuration	12	Full height	CPU4	PCIe GEN3 x16 (x16 connector)	25 W	half length
Riser 2 on PEM for 4 socket configuration	13	Full height	CPU4	PCIe GEN3 x16 (x16 connector)	25 W	half length

Power, thermal, and acoustics

Power, thermal and acoustics

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

Power consumption and energy efficiency

Table 13. Power tools and technologies

Feature	Description
Power supply units (PSU) portfolio	Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.
Tools for right-sizing	Energy Smart Solution Advisor (ESSA) is a tool that can help you determine the most efficient configuration possible. With Dell's ESSA, you can calculate the power consumption of your hardware, power infrastructure, and storage. ESSA can help you determine exactly how much power your server will use at a given workload, and the PSU Advisor can help you choose the best, most efficient PSU for your workload. Learn more at Dell.com/calc .
Industry compliance	Energy Smart Data Center Assessment is a Dell Services offering that uses infrastructure and thermal analysis to help maximize system efficiency. Learn more at Dell.com/EnergySmart .
Industry compliance	Dell's servers are compliant with all relevant industry certifications and guidelines, including 80 PLUS, Climate Savers, and ENERGY STAR.
Power monitoring accuracy	PSU power monitoring improvements include: <ul style="list-style-type: none"> • Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel Node Manager for circuit- breaker fast capping.

Feature	Description
Systems management	<p>iDRAC9 Enterprise provides server- level management that monitors, reports, and controls power consumption at the processor, memory, and system level.</p> <p>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.</p>
Active power management	<p>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 Enterprise and OpenManage Power Center that allows policy-based management of power and thermal at the individual server, rack, and data center level.</p> <p>Hot spare reduces power consumption of redundant power supplies.</p> <p>Thermal control of fan speed optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption.</p> <p>Idle power enables Dell servers to run as efficiently when idle as when at full workload.</p>
Fresh Air cooling	<p>FAC is supported with certain configuration limitations. With the thermal design and reliability of Dell products, you can have the capability to operate at excursion- based temperatures beyond the industry standard of 35°C (95°F) without impacting your availability model. This solution takes into account servers, networking, storage, and other infrastructure.</p>
Rack infrastructure	<p>Dell offers some of the industry’s highest- efficiency power infrastructure solutions, including:</p> <ul style="list-style-type: none"> • Power Distribution Units (PDUs) • Uninterruptible Power Supplies (UPSs) • Energy Smart containment rack enclosures

Power supply units

Energy Smart power supplies have intelligent features, such as the ability to dynamically optimize efficiency while maintaining availability and redundancy. Also featured are enhanced power-consumption reduction technologies, such as high-efficiency power conversion and advanced thermal-management techniques, and embedded power-management features, including high-accuracy power monitoring.

The following power supply unit options are available for the R940:

- 1100W, 1100W DC
- 1600W
- 2000W
- 2400W (UI)

The PowerEdge R940 supports up to 2 AC or DC power supplies with 1+1 redundancy, auto sensing, and auto-switching capability.

Table 14. Power supply efficiency levels

Power supply output	Class	10%	20%	50%	100%
1100W AC	Platinum	89.00%	93.00%	94.50%	92.00%
1100W DC	Platinum	80.00%	88.00%	91.00%	88.00%
1600W AC	Platinum	87.00%	90.00%	94.00%	91.00%
2000W AC	Platinum	89.00%	93.00%	94.00%	91.00%

Thermal and acoustics

Thermal management of PowerEdge R940 delivers high performance for the right amount of cooling to components at the lowest fan speeds across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges (see Environmental Specifications) . The benefits to you are lower fan power consumption (lower server system power and data center power consumption) and greater acoustical versatility. The PowerEdge R940 is quiet enough to be used in an office environment in typical and minimum configurations.

Thermal design

The thermal design of the PowerEdge R940 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, NDC, and GPU.
- 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 iDRAC9 BIOS setup screen. For more information, see the PowerEdge R940 Owner's Manual on [Dell support](#).
- Cooling redundancy: The R940 allow N+1 fan redundancy, allowing continuous operation with one fan failure in the system.

Acoustical design

The acoustical design of the PowerEdge R940 reflects the following:

- Versatility: The R940 saves power draw in the data center but are also quiet enough for office environment in typical and minimum configurations. You may find that the system is sufficiently quiet where the sound it emits blends into the environment.
- Adherence to Dell's high sound quality standards: Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles and hums. One of the sound quality metrics in the Dell specification is prominence ratio of a tone.
- Noise ramp and descent at boot-up from power off: Fan speeds and noise levels ramp during the boot process (from power- off to power- on) in order to add a layer of protection for component cooling in the event that the system were not to boot properly. In order to keep the boot-up process as quiet as possible, the fan speed reached during boot-up is limited to about half of full speed.
- Noise level dependencies: If acoustics is important to you, several configuration choices and settings are important to consider:
 - For lower acoustical output, use a small number of lower rotational- speed SATA hard drives, nearline SAS hard drives, or non-rotational devices like SSDs. 15k hard drives generate more acoustic noise than that of lower rotational- speed hard drives, and noise increases with number of hard drives.
 - Fan speeds and noise may increase from baseline factory configurations if certain profiles are changed by the user or the system configurations are updated. The following is a list of items that impact fan speeds and acoustical output:

- iDRAC9 BIOS settings: Performance Per Watt (DAPC or OS) may be quieter than Performance or Dense Configuration (iDRAC Settings > Thermal > Max. Exhaust Temperature or Fan speed offset).
- The quantity and type of PCIe cards installed: This affects overall system acoustics. Installation of more than two PCIe cards results in an increase in overall system acoustics.
- PCIe controller-based SSD drives: Drives such as Express flash drives and Fusion- IO cards require greater airflow for cooling, and result in significantly higher noise levels.
- Systems with an H330 PERC: This configuration may be quieter than those with an H730P PERC with battery backup. However, higher noise levels result when a system is configured as non-RAID.
- Hot spare feature of power supply unit: In the system default setting, the Hot Spare Feature is disabled; acoustical output from the power supplies is lowest in this setting.

Rack Rails

The rail offerings consist of sliding rails only.

The sliding rails allow the system to be fully extended out of the rack for service. There is also an optional Cable Management Arm (CMA) and optional Strain Relief Bar (SRB).



Figure 7. Sliding rails with optional CMA and optional SRB

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"-wide, EIA-310-E-compliant square hole and unthreaded round hole 4-post racks. Both also support tool-ed mounting in threaded hole 4-post racks, but only the static rails, as the more universal solution, support mounting in 2-post (Telco) racks.

Table 15. Sliding rail

Product	Rail identifier	Rail type	Mounting interface	Rail adjustability range (mm)						Min rail mounting depth (mm)		
				Square		Round		Threaded		Without CMA or SRB	With CMA	With SRB
				min	max	min	max	min	max			
R940	B12	Sliding	ReadyRails II	600	894	586	887	600	909	773	926	877

① **NOTE:** 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.

① **NOTE:** Screw head diameter for the sliding rails must be 10 mm or less.

Cable Management Arm (CMA) and Strain Relief Bar (SRB)

The optional cable management arm (CMA) and Strain Relief Bar (SRB) organizes and secures the cords and cables exiting the back of the server. The CMA supports up to medium size cable loads and unfolds to allow the server to extend out of the rack without having to

detach the cables. The SRB is a bar that supports large cable loads and also allows the server to extend out of the rack without having to detach the cables if cable service loops are created.

Some key features of the 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

Some key features of the SRB include:

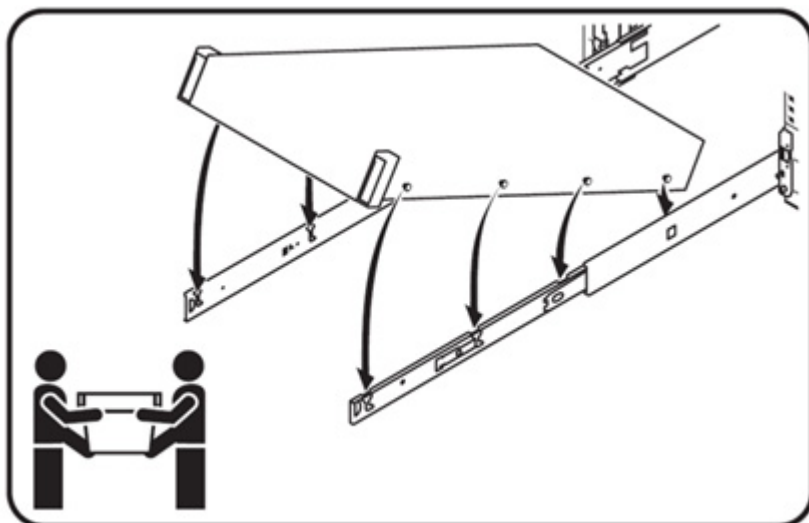
- Sturdy bar that supports large cable loads.
- Controls stresses on connectors.
- Utilizes hook-and-loop straps rather than plastic tie wraps to make securing cables quick and eliminates the risk of cable damage.
- Cables can be segregated into discrete, purpose specific bundles.
- Attaches to the rails without the use of tools via simple and intuitive latching design.

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.



Rack Installation

The 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. As with all 2U systems, a minimum of two people are required in order to properly install the system in the rails.

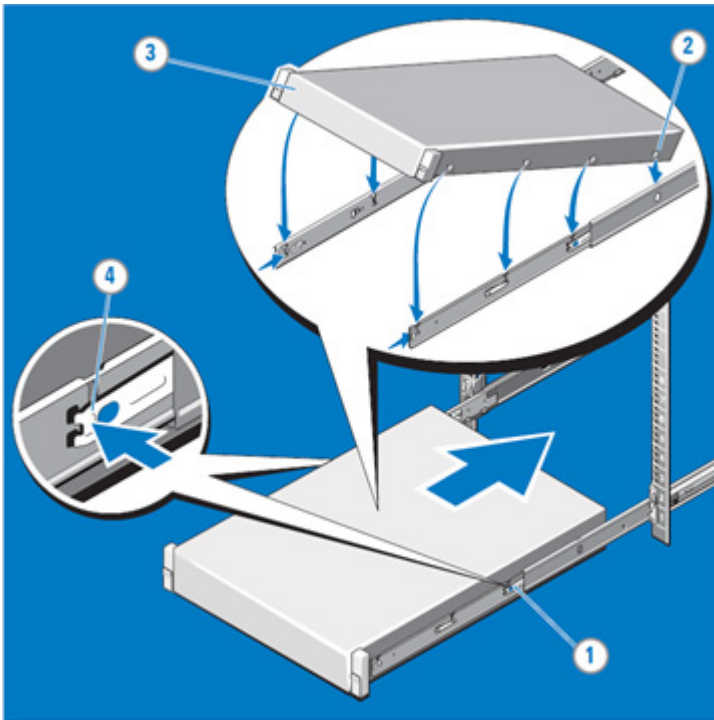


① | **NOTE:** The 2U system requires two people for installation due to its heavier weight.

Installing 14G Systems in Sliding Rails

To install the 14G 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.



Supported operating system

Table 16. Supported operating system

Operating system	PQM part number
RedHat Enterprise Linux 6.9 Server x86_64	VM93R
RedHat Enterprise Linux 7.3 Server x86_64	V9RKV
Novell SuSE Linux Enterprise Server 11 (with PLDP) SP4 x86_64	YN80M
Novell SuSE Linux Enterprise Server 12 SP2 x86_64	CM3M5
MS, Windows Server 2016	XW2CG
MS, Windows Server 2012 R2	Y1V44
Ubuntu LTS 14.04	N/A

Supported virtualization

Table 17. Virtualization support

Operating system	Release	Install version
VMware	vSphere 2016 U1-N version	ESXi
VMware	vSphere v6.0 U3-N-1 version	ESXi
Citrix	Xen Server 7.1.x	N/A

OpenManage systems management

The Dell OpenManage systems management portfolio includes powerful hardware and software management tools and consoles. OpenManage simplifies the lifecycle of deploying, updating, monitoring and maintaining your Dell PowerEdge servers.

Topics:

- [iDRAC Lifecycle controller](#)
- [Agent-free management](#)
- [Agent-based management](#)
- [OpenManage consoles](#)
- [OpenManage systems management tools, utilities and protocols](#)
- [Integration with third-party consoles](#)
- [OpenManage connections with third-party consoles](#)
- [Server management operations](#)

iDRAC Lifecycle controller

The PowerEdge server provides storage expandability that allows you to adapt to your workload and operational demands. With comprehensive storage options, the server offer various drive types, internal and external storage controllers, and different backplanes for varied number of drives. The microcontroller is responsible for acting as an interface or gateway between the host system (i.e., server management software) and the peripheral devices. These peripheral devices, which may or may not be Intelligent Platform Management Interface (IPMI) compliant, consist of the power supplies, the storage backplane, integrated storage controllers, control panel with semi-intelligent display, and Lifecycle Controller.

iDRAC features and comparison

iDRAC9 is available in basic, express, and enterprise options.

Table 18. iDRAC feature comparison

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
Interface/Standards								
Redfish	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IPMI 2.0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DCMI 1.5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Web-based GUI—HTML5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Racadm command line—local/remote	Yesses	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
SMASH-CLP—SSH-only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Telnet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SSH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Serial redirection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WSMAN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Network Time Protocol		No	Yes	Yes	Yes	Yes	Yes	Yes
Connectivity								
Shared NIC	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Dedicated NIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VLAN tagging	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IPv4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IPv6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DHCP (new default; no static IP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DHCP with Zero Touch	No	No	No	No	No	No	No	Yes
Dynamic DNS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OS pass-through	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
iDRAC Direct-Front panel USB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Connection View	No	Yes	No	Yes	No	Yes	No	Yes
NFS v4	No	Yes	No	Yes	No	Yes	No	Yes
SMB3.0 with NTLM v1 and NTLM v2	No	Yes	No	Yes	No	Yes	No	Yes
Security								
Role-based authority	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local users	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SSL encryption	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IP blocking	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Directory services—AD, LDAP	No	No	No	No	No	No	Yes	Yes
2-factor authentication	No	No	No	No	No	No	Yes	Yes
Single sign-on	No	No	No	No	No	No	Yes	Yes
PK authentication	No	No	Yes	Yes	Yes	Yes	Yes	Yes
FIPS 140-2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Secure UEFI boot-certificate management	No	Yes	No	Yes	No	Yes	No	Yes

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
Lock down mode	No		No		No		No	Yes
Unique iDRAC default password	No	Yes	No	Yes	No	Yes	No	Yes
Customizable Security Policy Banner-login page	No	Yes	No	Yes	No	Yes	No	Yes
Quick Sync 2.0-optional auth for read operations	No	Yes	No	Yes	No	Yes	No	Yes
Quick Sync 2.0-add mobile device number to LCL	No	Yes	No	Yes	No	Yes	No	Yes
Remote Presence								
Power control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Boot control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Serial-over-LAN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Virtual Media	No	No	No	No	Yes	Yes	Yes	Yes
Virtual Folders	No	No	No	No	No	No	Yes	Yes
Remote File Share	No	No	No	No	No	No	Yes	Yes
Virtual Console	No	No	No	No	Yes	Yes	Yes	Yes
HTML5 access to virtual console	No	No	No	No	Yes	Yes	Yes	Yes
VNC connection to OS	No	No	No	No	No	No	Yes	Yes
Quality/bandwidth control	No	No	No	No	No	No	Yes	Yes
Virtual Console collaboration —6 users	No	No	No	No	No	No	Yes	Yes
Virtual Console chat	No	No	No	No	No	No	Yes	Yes
Virtual Flash partitions	No	No	No	No	No	No	Yes	Yes
Group manager	No	No	No	No	No	No	No	Yes
HTTP/HTTPS support along with HFS/CIFS	No	Yes	No	Yes	No	Yes	No	Yes
Power and Thermal								
Real-time power meter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power thresholds & alerts	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Real-time power graphing	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Historical power counters	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Power capping	No	No	No	No	No	No	Yes	Yes
Power Center integration	No	No	No	No	No	No	Yes	Yes
Temperature monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Temperature graphing	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
Health Monitoring								
Full agent-free monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predictive failure monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SNMPv1, v2 and v3—traps and gets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Email alerting	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Configurable thresholds	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fan monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power Supply monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Memory monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CPU monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RAID monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NIC monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HD monitoring—enclosure	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Out of Band Performance Monitoring	No	No	No	No	No	No	Yes	Yes
Alerts for excessive SSD wear	No	Yes	No	Yes	No	Yes	No	Yes
Customizable settings for Exhaust Temperature	No	Yes	No	Yes	No	Yes	No	Yes
Update								
Remote agent-free update	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Embedded update tools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sync with repository—scheduled updates	No	No	No	No	No	No	Yes	Yes
Auto update	No	No	No	No	No	No	Yes	Yes
Improved PSU firmware updates	No	Yes	No	Yes	No	Yes	No	Yes
Deployment and Configuration								
Local configuration via F10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Embedded OS deployment tools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Embedded configuration tools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AutoDiscovery	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Remote OS deployment	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Embedded driver pack	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
Full configuration inventory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inventory export	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remote configuration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zerotouch configuration	No	No	No	No	No	No	Yes	Yes
System Retire/Repurpose	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Server Configuration Profile in GUI	No	Yes	No	Yes	No	Yes	No	
Diagnostics, Service and Logging								
Embedded diagnostic tools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Part Replacement	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Server Configuration Backup	No	No	No	No	No	No	Yes	Yes
Server Configuration Restore	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Easy Restore—system configuration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Easy Restore Auto Timeout	No	Yes	No	Yes	No	Yes	No	Yes
LED health status indicator	No	No	No	No	No	No	No	No
LCD screen—iDRAC9 requires optional bezel	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes
Quick Sync—require NFC bezel	Yes	No	Yes	No	N/A	No	Yes	No
Quick Sync 2.0—requires BLE/WiFi hardware	No	Yes	No	Yes	No	N/A	No	Yes
iDRAC Direct—front USB mgmt port	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
iDRAC Service Module (iSM) embedded	No	Yes	No	Yes	No	Yes	No	Yes
iSM to inband alert forwarding to consoles	No	Yes	No	Yes	No	Yes	No	Yes
Crash screen capture	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Crash video capture	No	No	No	No	No	No	Yes	Yes
Boot capture	No	No	No	No	No	No	Yes	Yes
Manual reset for iDRAC—LCD ID button	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remote reset for iDRAC—requires iSM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Virtual NMI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OS watchdog	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Features	iDRAC8 Basic	iDRAC9 Basic	iDRAC8 Express	iDRAC9 Express	iDRAC8 Express for Blades	iDRAC9 Express for Blades	iDRAC8 Enterprise	iDRAC9 Enterprise
SupportAssist Report—embedded	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
System Event Log	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lifecycle Log	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enhanced logging in the Lifecycle controller log	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Work notes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remote Syslog	No	No	No	No	No	No	Yes	Yes
License management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Improved customer experience								
iDRAC -Faster processor, more memory	No	Yes	No	Yes	No	Yes	No	Yes
GUI rendered in HTML5	No	Yes	No	Yes	No	Yes	No	Yes
Add BIOS configuration to iDRAC GUI	No	Yes	No	Yes	No	Yes	No	Yes
iDRAC support for SW RAID licensing	No	Yes	No	Yes	No	Yes	No	Yes

Agent-free management

As Dell EMC PowerEdge servers have embedded server lifecycle management, in many cases, there is no need to install an OpenManage systems management software agent into the operating system of a PowerEdge server. This greatly simplifies and streamlines the management footprint.

Agent-based management

Most systems management solutions require pieces of software, called agents, to be installed on each node in order to be managed within the IT environment. Additionally, the same agent is often used as a local interface into the hardware health and may be accessed remotely as a management interface, typically referred to as a one-to-one interface. For customers that continue to use agent-based solutions, Dell provides OpenManage Server Administrator.

OpenManage consoles

The central console in a systems management solution is often referred to as the one-to-many console. The central console provides a rapid view and insight into the overall health of all systems in the IT environment. The Dell EMC systems management portfolio includes several powerful consoles, depending upon your needs, including the following:

- **Dell OpenManage Essentials**—OpenManage Essentials (OME) is a systems management console that provides a comprehensive view of Dell systems, devices, and components in an enterprise network. It is used to monitor Dell PowerEdge servers, EqualLogic and PowerVault storage, and PowerConnect™ switches; to update and configure Dell servers; and to create asset reports. OpenManage Essentials also communicates health status alerts for Dell servers, storage, and network devices to the Dell KACE™ K1000 service desk. OpenManage Essentials is available as a no-charge software download from Dell.com/Support. When connected through OME, you can use Dell OpenManage Mobile (OMM) to securely perform a subset of data center monitoring and remediation tasks from a mobile device.
- **OpenManage Power Center**—Dell's power management solution, the Dell OpenManage Power Center (OMPC) management console, provides increased visibility to power consumption, anomalies, and utilization through fine-grained instrumentation. This enables

increased control, improved rack density, faster response times, greater accuracy, and broader decision-making intelligence than would otherwise be possible. When used with a suitably licensed PowerEdge server (with a Dell iDRAC Enterprise license), OMPC leverages Intel Node Manager technology for platform-level power reporting and capping of Intel chipsets. Power Center then communicates with iDRAC to provide node, rack, row or data-center level aggregation of power-management data, as well as execution of control policy — making it easy for IT professionals to identify areas to gain efficiencies and cut wasteful costs.

OpenManage systems management tools, utilities and protocols

OpenManage systems management tools and utilities consist of the following:

- **Dell EMC Repository Manager:** The Dell EMC Repository Manager (RM) is a stand-alone GUI-based productivity tool that helps simplify the process of managing downloads and baseline BIOS, firmware and driver updates. Repository Manager can create deployment disks as well as create and manage customized repositories.
- **Dell EMC Update Packages:** The Dell EMC Update Packages (DUP) is a self-contained executable in a standard package format that updates a software element on a Dell server such as the BIOS, a driver, firmware and other software updates.
- **Dell EMC OpenManage Deployment Toolkit:** The Dell EMC OpenManage Deployment Toolkit (DTK) is a CLI-based tool that includes a set of utilities for configuring and deploying Dell PowerEdge systems, and can be used to build scripted, unattended OS installations to deploy large numbers of servers in a reliable fashion.
- **RACADM:** The RACADM command-line utility provides a scriptable interface that allows you to locally or remotely configure iDRAC7.
- **IPMITool:** IPMITool includes scriptable console application programs used to control and manage remote systems using the IPMI version 1.5 and later protocol.
- **Web Services for Management (WSMAN):** WSMAN is a SOAP-XML-based protocol for exchanging system management information. Dell's implementation provides remote management capabilities through a secure and standards-based Web Services-Management (WS-MAN) interface to PowerEdge servers and blade server node chassis.

Integration with third-party consoles

OpenManage provides integration with several leading third-party consoles, including:

- **OpenManage Integration Suite for Microsoft System Center**—This suite helps you further streamline, automate and simplify your most essential IT management tasks. For more information, visit <http://www.dell.com/learn/us/en/04/solutions/dcsm-microsoft-system-center>.
- **OpenManage Integration for VMware vCenter**—This plug-in allows IT administrators to monitor, provision, and manage the physical PowerEdge server hardware and firmware from a dedicated menu accessed through the VMware vCenter console using the same role-based access control model as vCenter, combining physical server management. For more information, visit <http://www.dell.com/learn/us/en/04/virtualization/management-plug-in-for-vmware-vcenter>.
- **BMC Software**—Dell EMC and BMC Software work together to simplify IT by ensuring tight integration between Dell EMC server, storage, and network management functionality and the BMC Software process and data center automation products.

OpenManage connections with third-party consoles

OpenManage Connections gives you an easy path to adding support for third-party devices, so you can continue to use your existing management tools while easily adding server systems to your existing IT environment. Integrate new systems at your own pace. Manage new servers and storage with your legacy management tools, while extending the useful life of your existing resources. With OpenManage Connections you can add monitoring and troubleshooting to your IT infrastructure.

- OpenManage Connection for Nagios
- OpenManage Connection for Oracle
- OpenManage Connection for HP
- OpenManage Connection for IBM
- OpenManage Connection for CA

For more information on these OpenManage Connections, visit <http://www.dell.com/learn/us/en/04/solutions/dcsm-partner-consoles>.

Server management operations

OpenManage systems management is centered on automating the server management lifecycle — deploy, update, monitor and maintain. To manage an infrastructure properly and efficiently, you must perform all of these functions easily and quickly. iDRAC9 with Lifecycle Controller technology provides you with these intelligent capabilities embedded within the server infrastructure. This allows you to invest more time and energy on business improvements and less on maintenance. Figure 16 illustrates the various operations that can be performed during the server’s lifecycle.

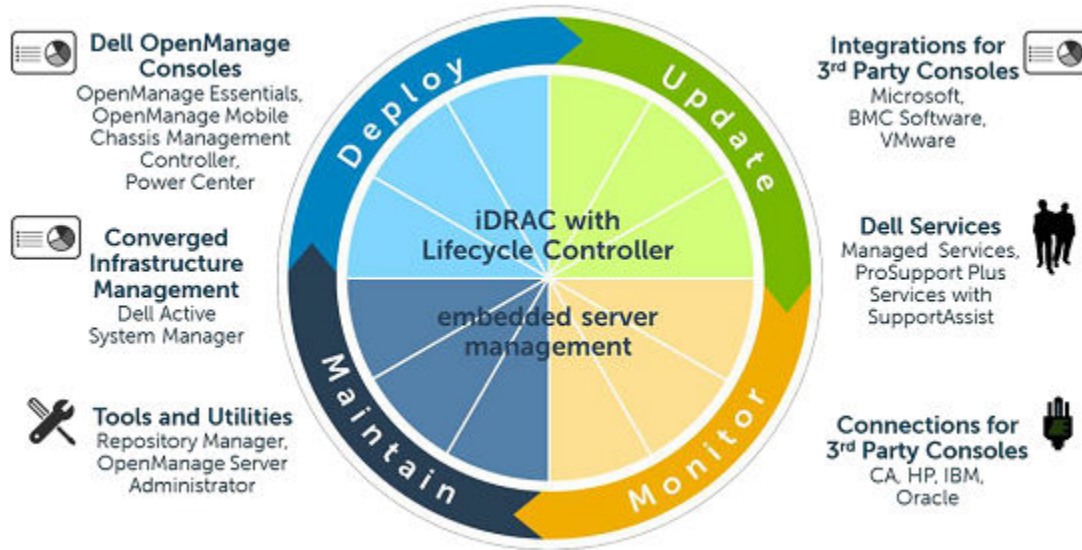


Figure 8. Systems management server lifecycle

Table 19. One-to-one and one-to-many operations

Operation	One-to-one	One-to-many
Deploy	<ul style="list-style-type: none"> • Lifecycle Controller GUI • DTK 	<ul style="list-style-type: none"> • OpenManage Integration for VMware vCenter • OpenManage Integration for BMC BladeLogic • OpenManage Integration for Microsoft System Center Configuration Manager
Update	<ul style="list-style-type: none"> • iDRAC9 with Lifecycle Controller • Repository Manager • DUP • SUU • OpenManage Integration for VMware vCenter 	<ul style="list-style-type: none"> • OpenManage Essentials • OpenManage Integration for Microsoft System Center Configuration Manager
Monitor	<ul style="list-style-type: none"> • iDRAC9 with Lifecycle Controller • OMSA 	<ul style="list-style-type: none"> • OpenManage Essentials • OpenManage Power Center • OpenManage Integration for VMware vCenter • OpenManage Integration for Microsoft System Center Operations Manager
Maintain	<ul style="list-style-type: none"> • iDRAC9 with Lifecycle Controller • IPMI 	<ul style="list-style-type: none"> • Lifecycle Controller Remote Services Remediate and replace parts: • OpenManage Integration for Microsoft System Center Virtual Machine Manager (SCVMM)

- Server Pro Management Pack and Lifecycle Controller Integration (DLCI)

For additional detailed information on Dell's systems management portfolio, visit Dell.com/OpenManage.

Appendix A. Additional specifications

Chassis dimensions

The following image shows the dimensions of the PowerEdge R940 chassis:

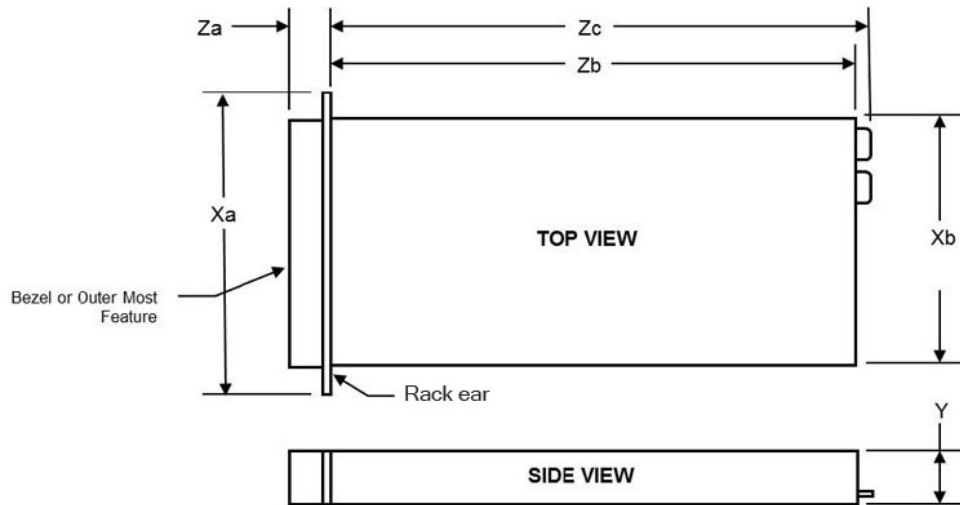


Figure 9. PowerEdge R940 chassis dimension

- Xa: 482.0 mm
- Xb: 434.0 mm
- Y: 130.3 mm
- Za (with bezel): 35.84 mm
- Za (without bezel): 22.0 mm
- Zb: 762.2 mm
- Zc: 777.046 mm

Environmental specifications

NOTE: For additional information about environmental measurements for specific system configurations, see [Dell.com/environmental_datasheets](https://www.dell.com/environmental_datasheets).

Table 20. Temperature specifications

Temperature	Specifications
Storage	-40°C to 65°C (-40°F to 149°F)
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Maximum temperature gradient (operating and storage)	20°C/h (68°F/h)

Table 21. Relative humidity specifications

Relative humidity	Specifications
Storage	5% to 95% RH with 33°C (91°F) maximum dew point. Atmosphere must be non-condensing at all times.
Operating	10% to 80% relative humidity with 26°C (78.8°F) maximum dew point.

Table 22. Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.26 G _{rms} at 5 Hz to 350 Hz (all operation orientations).
Storage	1.87 G _{rms} at 10 Hz to 500 Hz for 15 min (all six sides tested).

Table 23. Maximum shock specifications

Maximum shock	Specifications
Operating	One shock pulse in the positive z axis of 40 G for 2.3 ms in all operational orientations.
Storage	Six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71 G for up to 2 ms.

Table 24. Maximum altitude specifications

Maximum altitude	Specifications
Operating	3048 m (10,000 ft)
Storage	12,000 m (39,370 ft)

Table 25. Operating temperature de-rating specifications

Operating temperature de-rating	Specifications
Up to 35°C (95°F)	Maximum temperature is reduced by 1°C/300 m (1°F/547 ft) above 950 m (3,117 ft).
35°C to 40°C (95°F to 104°F)	Maximum temperature is reduced by 1°C/175 m (1°F/319 ft) above 950 m (3,117 ft).
40°C to 45°C (104°F to 113°F)	Maximum temperature is reduced by 1°C/125 m (1°F/228 ft) above 950 m (3,117 ft).

Particulate and gaseous contamination specifications

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

Table 26. Particulate contamination specifications

Particulate contamination	Specifications
Air filtration	<p>Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit.</p> <p>NOTE: This condition applies to data center environments only. Air filtration requirements do not apply to IT equipment designed to be used outside a data center, in environments such as an office or factory floor.</p> <p>NOTE: Air entering the data center must have MERV11 or MERV13 filtration.</p>
Conductive dust	<p>Air must be free of conductive dust, zinc whiskers, or other conductive particles.</p> <p>NOTE: This condition applies to data center and non-data center environments.</p>
Corrosive dust	<ul style="list-style-type: none"> Air must be free of corrosive dust. Residual dust present in the air must have a deliquescent point less than 60% relative humidity. <p>NOTE: This condition applies to data center and non-data center environments.</p>

Table 27. Gaseous contamination specifications

Gaseous contamination	Specifications
Copper coupon corrosion rate	<300 Å/month per Class G1 as defined by ANSI/ISA71.04-1985.
Silver coupon corrosion rate	<200 Å/month as defined by AHSRAE TC9.9.

NOTE: Maximum corrosive contaminant levels measured at ≤50% relative humidity.

Standard operating temperature

Table 28. Standard operating temperature specifications

Standard operating temperature	Specifications
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Humidity percentage range	10% to 80% Relative Humidity with 26°C (78.8°F) maximum dew point.

Expanded operating temperature

Table 29. Expanded operating temperature specifications

Expanded operating temperature	Specifications
≤ 10% of annual operating hours	<p>5°C to 40°C at 5% to 85% RH with 29°C dew point.</p> <p>NOTE: Outside the standard operating temperature (10°C to 35°C), the system can operate continuously in temperatures as low as 5°C and as high as 40°C.</p> <p>For temperatures between 35°C and 40°C, de-rate maximum allowable dry bulb temperature by 1°C per 175 m above 950 m (1°F per 319 ft).</p>
≤ 1% of annual operating hours	<p>–5°C to 45°C at 5% to 90% RH with 29°C dew point.</p> <p>NOTE: Outside the standard operating temperature (10°C to 35°C), the system can operate down to –5°C or up to 45°C for a maximum of 1% of its annual operating hours.</p> <p>For temperatures between 40°C and 45°C, de-rate maximum allowable temperature by 1°C per 125 m above 950 m (1°F per 228 ft).</p>

NOTE: When operating in the expanded temperature range, system performance may be impacted.

NOTE: When operating in the expanded temperature range, ambient temperature warnings maybe reported on the LCD panel and in the System Event Log.

Video specifications

Table 30. R940 video specifications

Resolution	Refresh rate	Horizontal frequency	Pixel clock
1024 x 768	60 Hz	48.4 kHz	65.0 MHz
1280 x 800	60 Hz	49.7 kHz	83.5 MHz
1280 x 1024	60 Hz	64.0 kHz	108.0 MHz
1360 x 768	60 Hz	47.71 kHz	85.5 M
1440 x 900	60 Hz	55.9 kHz	106.5 MHz
1600 x 900	60 Hz (RB)	55.54 kHz	97.75 M
1600 x 1200	60 Hz	75.0 kHz	162.0 MHz
1680 x 1050	60 Hz (RB)	64.7 kHz	119.0 MHz
1920 x 1080	60 Hz	67.158 kHz	173.0 MHz
1920 x 1200 60	60 Hz	74.556 kHz	193.25 MHz

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

USB peripherals

USB peripherals are supported through the front and back USB ports on the R940. The front ports, back and internal ports are USB 3.0 compliant.

Appendix B. Standards compliance

Table 31. Industry standard documents

Standard	URL for information and specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	acpi.info
Ethernet IEEE 802.3-2005	standards.ieee.org/getieee802/802.3.html
HDG Hardware Design Guide Version 3.0 for Microsoft Windows Server	microsoft.com/whdc/system/platform/pcdesign/desguide/serverdg.mspx
IPMI Intelligent Platform Management Interface, v2.0	intel.com/design/servers/ipmi
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	pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	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. 2.0	usb.org/developers/docs

Appendix C Additional resources

Table 32. Additional resources

Resource	Description of contents	Location
Owner's Manual	<p>This manual, available in PDF format, provides the following information:</p> <ul style="list-style-type: none"> • Chassis features • System Setup program • System messages • System codes and indicators • System BIOS • Remove and replace procedures • Troubleshooting • Diagnostics • Jumpers and connectors 	Dell.com/Support/Manuals
Getting Started Guide	<p>This guide ships with the system, and is also available in PDF format. This guide provides the following information:</p> <ul style="list-style-type: none"> • Initial setup steps • Key system features • Technical specifications 	Dell.com/Support/Manuals
Rack Installation Instructions	This document ships with the rack kits, and provides instructions for installing a server in a rack.	Dell.com/Support/Manuals
Information Update	This document ships with the system, is also available in PDF format online, and provides information on system updates.	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
Energy Smart Solution Advisor (ESSA)	The Dell online ESSA enables easier and more meaningful estimates to help you determine the most efficient configuration possible. Use ESSA to calculate the power consumption of your hardware, power infrastructure, and storage.	Dell.com/calc

Appendix D. Support and deployment services

Server Deployment Services

Our Server Deployment Services can maximize the value of your servers quickly using our expert server deployment engineers. With over 10,000 server deployment projects each year, we have experience, best practices, and comprehensive deployment tools to install, configure, and integrate your new solution optimally and correctly. Our deployment experts will assess your environment and understand your goals, then design and integrate your server solution for you.

Table 33. Server deployment capabilities

	Server Installation	Server Integration
Place single server in target workspace	Yes	
Rack, cable, and label servers	Yes	
Install image	Yes	
Connect to network	Yes	Yes
Test and validate connection	Yes	Yes
Install operating system		Yes
Install applications		Yes
Perform advanced configuration services		Yes
Remote configuration services		Yes
Virtualization		Yes
Converged infrastructure		Yes
Test and validate data center integration		Yes

Remote Consulting Services

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

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 gets up and running quickly and smoothly.

ProSupport Plus (for business-critical servers)

When you purchase your PowerEdge server, we recommend ProSupport Plus, our proactive and preventative support for your business-critical systems. ProSupport Plus provides you with all the benefits of ProSupport, plus access to a dedicated Technical Account Manager and our elite ProSupport Plus engineers. ProSupport Plus gives you quick and efficient resolutions, working along with our [SupportAssist](#) technology that enables us to get ahead of issues in your environment before they become problems.

ProSupport Enterprise Suite

With Dell EMC ProSupport Services, we can help you keep your operation running smoothly, so you can focus on running your business. We will help you maintain peak performance and availability of your most essential workloads. Dell EMC ProSupport 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 your IT resources by choosing the right support model.

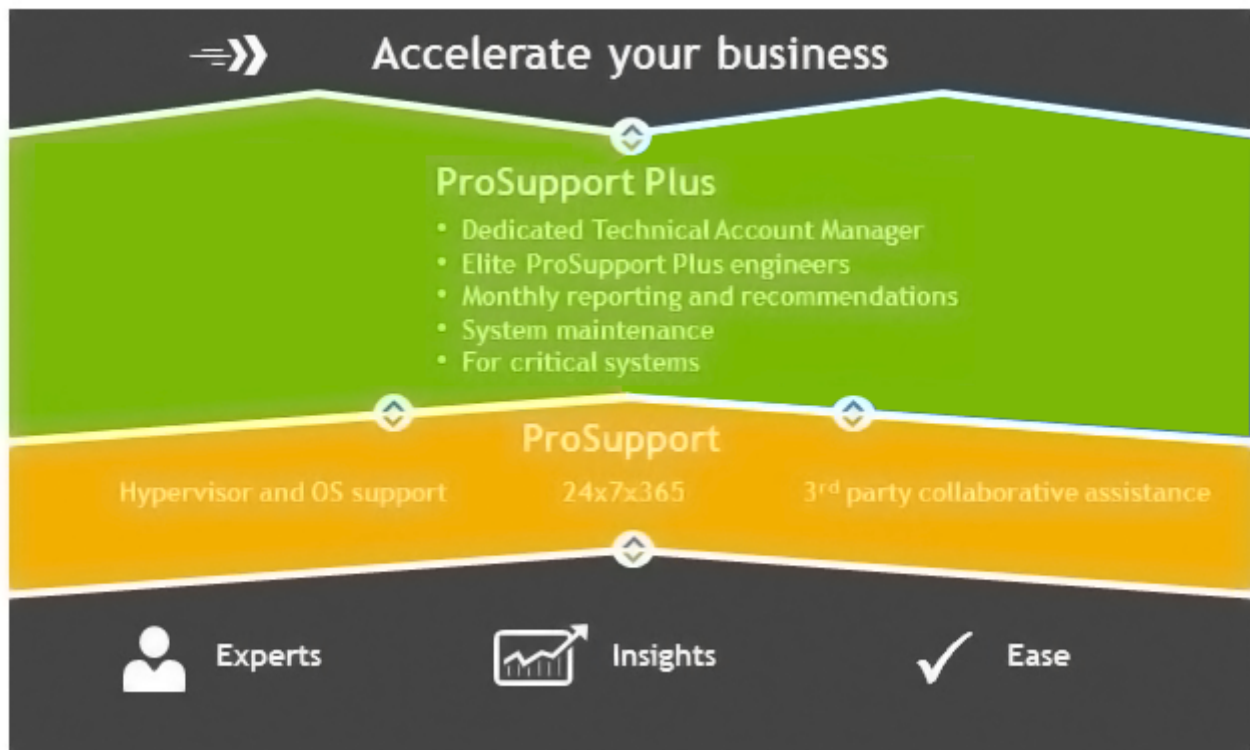


Figure 10. ProSupport Enterprise Suite

ProSupport

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

- 24x7x365 access to certified hardware experts
- Collaborative support assistance with over 195 third-party vendors
- Hypervisor and operating system support
- Onsite parts and labor response options including next business day or four-hour mission critical

ProSupport Flex for Data Center

ProSupport Flex for Data Center offers flexible site-wide support for hyperscale data centers with more than 1,000 assets. Built on standard ProSupport components, Flex for Data Center leverages our global scale while being tailored to suit your needs. While not for everyone, it offers a flexible solution for those with large and complex environments. When you choose ProSupport Flex for Data Center, you will get:

- Enterprise-wide support that covers your entire data center.
- A dedicated Technical Account Manager with remote, on-site, part-time and full-time options.
- Dedicated elite ProSupport Flex technical and field engineers who are trained on your environment and configurations.
- Flexible on-site support and parts options that fit your operational model
- A tailored support plan for your operations staff.

	ProSupport	ProSupport Plus	ProSupport Flex for Data Center
Technical support access	24x7	24x7	24x7
Parts and labor response	NBD or Mission Critical	NBD or Mission Critical	Flexible
TechDirect online cases and dispatch	✓	✓	✓
SupportAssist remote monitoring	✓	✓	✓
Dispatch monitoring and crisis management	✓	✓	✓
Escalation management	✓	✓	✓
Hypervisor and OS support	✓	✓	✓
Collaborative 3 rd party software support	✓	✓	✓
SupportAssist proactive resolution	✓	✓	✓
Direct access to elite ProSupport Plus engineers		✓	✓
Dedicated Technical Account Manager		✓	✓
Monthly health check and performance recommendations		✓	✓
Monthly contract renewal and service history reporting		✓	✓
System maintenance (as needed)		✓	✓
Dedicated technical and field support teams			✓
Site-wide entitlement and contract			✓
Case management API			✓

Figure 11. ProSupport Enterprise Suite comparison

Additional professional services

Dell Education Services

Dell Education Services offers the PowerEdge server training courses designed to help you achieve more with your hardware investment. The curriculum is designed in conjunction with the server development team, as well as Dell’s technical support team, to ensure that the training delivers the information and practical, hands-on skills you and your team need to confidently manage and maintain your Dell server solution. To learn more or register for a class today, visit LearnDell.com/Server.

Dell Global Infrastructure Consulting Services

Dell Global Infrastructure Consulting Services use skilled solution architects, innovative tools, automated analysis and Dell’s intellectual property to give you rapid insight into the root causes of unnecessary complexity. We seek better answers than traditional service models,

and our strategy is to help you quickly identify high-impact, short-duration projects that deliver return on investment (ROI) and free up resources. The results are practical, action-oriented plans with specific, predictable, measurable outcomes. From data center optimization to server virtualization to systems management, our consulting services can help you build a more efficient enterprise.

Dell managed services

Dell Managed Services are a modular set of lifecycle services designed to help you automate and centrally configure, deploy, and manage your day-to-day data center operations. These services extend your existing on-premise IT infrastructure with off-premise cloud services designed to better address challenges with mobility, highly distributed organizations, security, compliance, business continuity, and disaster preparedness.