Dell EMC PowerEdge XR2

Technical Guide

Regulatory Model: XXregulatory-modelXX
Regulatory Type: XXregulatory-typeXX

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.

May 2020

Rev. A02

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System overview

Introduction

The Dell PowerEdge XR2 is the latest rugged 2-socket, 1U rack server designed to run complex workloads in locations constrained by space or environmental challenges. The system is built for military purposes, that has shock and vibration requirements, oil and gas, and marine ship board transportation usage. The system features the Intel® Xeon® Processor Scalable family, up to 16 DIMMs, PCI Express (PCIe) 3.0 enabled expansion slots, and a choice of network interface technologies to cover NIC and LOM.

The PowerEdge XR2 adds new storage capacity options, making it well suited for software defined storage and data intensive applications that require greater storage, while not sacrificing I/O performance.

New technologies

The PowerEdge XR2 incorporates a number of new technologies to improve performance and flexibility. Below are the list of the new technologies offered:

- Intel Xeon Processor Scalable family
- Intel Lewisburg chipset
- 2666 MT/s DDR4 memory
- NVMe connection direct to processors
- Integrated M.2 module
- Optional M.2 based Boot Optimized Storage Solution (BOSS) module
- Dual core ARM processor for iDRAC
- Advanced vector cooling for PCIe slots
- NVMe SSD support

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System features

Product comparison

Table 1. Product comparison table

Feature	PowerEdge XR2	PowerEdge R420xr
Processors	Intel Xeon Processor Scalable Family	Intel Xeon processor E5-2400 v2 product family
Chipset	Intel C620	Intel C610
Memory	16 x DDR4 RDIMM/LRDIMM	12 x DDR3 RDIMM and UDIMM
Disk Drives	• 8 x 2.5-inch SAS/SATA SSD • 4 x 2.5-inch NVMe SSD + 4 x 2.5 inch SAS/SATA • 2 x 2.5-inch NVMe SSD + 6 x 2.5 inch SAS/SATA	4 x 2.5-inches SAS/SATA SSD only
PCIe Slots	Up to 2 x PCIe Gen3	Up to 2 x PCIe Gen3
RAID Controller	• S140 (NVMe) **NOTE: S140 is not supported as factory installed.** • HBA330 (Internal) • H730P • H330	• S110 • H310 • H710 • H710P • H810 (external)
Backplane	• 8 x 2.5 inch SAS/SATA • 4 x 2.5 inch NVMe SSD + 4 x 2.5 inch SAS/SATA • 2 x 2.5 inch NVMe SSD + 6 x 2.5 inch SAS/SATA	• 4 x 2.5 inch or 3.5 inch SAS/SATA
Embedded NIC	2 x 1Gb LOM and optional LAN on riser card: • 2 X 1Gb • 2 X 10Gb • 2 X 10Gb SFP+ • 2 X 25Gb SFP+	2 x 1Gb
Power Supplies	• Dual hot-plug redundant 550 W AC • Dual hot-plug redundant - 48V 600 W DC **NOTE:** **The DC Power Supply for the XR2 uses the Anderson Power Products Saf-D-Grid power connector. The compatible power cords from Anderson Power Products are model**	Dual hot-plug redundant 550 W AC

Feature	PowerEdge XR2	PowerEdge R420xr
	2035KZx and 2058KZx, where 'x' is the length in meters.	
Remote Management	iDRAC9	iDRAC7
LCD module	LCD module option in bezel	LCD by default
TPM	TPM 2.0 China, TPM1.2, TPM2.0	TPM China, TPM1.2, TPM2.0

USB ports	• Front: 2 ports
	  • 1 standard USB 2.0
	  • 1 Micro USB dedicated to iDRAC
	• Rear: 2 ports (USB 3.0)
	• Internal: 1 port(USB 2.0)
		One port

iDRAC Direct front port	Micro USB	USB type A
Cooling Fan	Up to 6 fan support	Up to 6 fan support
IDSDM Module	• Internal Dual SD Module (IDSDM) and vFlash	Internal Dual SD Module (IDSDM)
BOSS Module	Integrated 2 x M.2 ports HWRAID BOSS w/ 2x M.2 ports	None
PERC	Mini - PERC 9 (dedicated slot)	Mini - PERC 8 (dedicated slot)
GPU	1 x low profile, up to 75 W(single wide)	None

Specifications

Table 2. Technical specifications

Feature	Specification
Form factor	1U rack server

Chassis dimension	• Height: 42.80 mm — 1.69 inches
	• Width: 482.0 mm — 18.97 inches
	• Depth with bezel:
	• 8 x 2.5 inch
	  • Front bezel to rear PSU handle: 610.8 mm (24.04 inches)
	  • Front bezel to rear wall: 577.5 mm (22.73 inches)
	• Depth without bezel:
	• 8 x 2.5 inch
	  • Front bezel to rear PSU handle: 581.34 mm (22.88 inches)
	  • Front bezel to rear wall: 548.25 mm (21.58 inches)

Processors	Intel Xeon Processor Scalable Family
Processor sockets	Up to 2-sockets
Chipset	Intel C621-1G
Memory	• Up to 2 TB • Support up to 16 DIMMs • Speeds up to 2666 MT/s • Supports RDIMM and LRDIMM • Supports registered ECC DDR4 DIMM only
RAID controller	• HBA330(Internal)

Feature	Specification
	• S140(NVMe) **NOTE: S140 is not supported as factory installed.** • H330 • H730P
Drive bays	8 x 2.5 inch SAS/SATA 4 x 2.5 inch NVMe SSD + 4 x 2.5 inch SAS/SATA 2 x 2.5 inch NVMe SSD + 6 x 2.5 inch SAS/SATA
PCIe slots	Up to 2x PCIe Gen3 slots (x16)
Power supply	• 550W, 51.3 mm-Platinum • -48V 600W DC
GPU	NVIDIA T4
Systems management	Version 2.0
Operating systems	• Windows Server • RHEL • SUSE Linux Enterprise Server • Ubuntu • vSphere ESXi • XenServer

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Chassis views and features

Inside the system

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

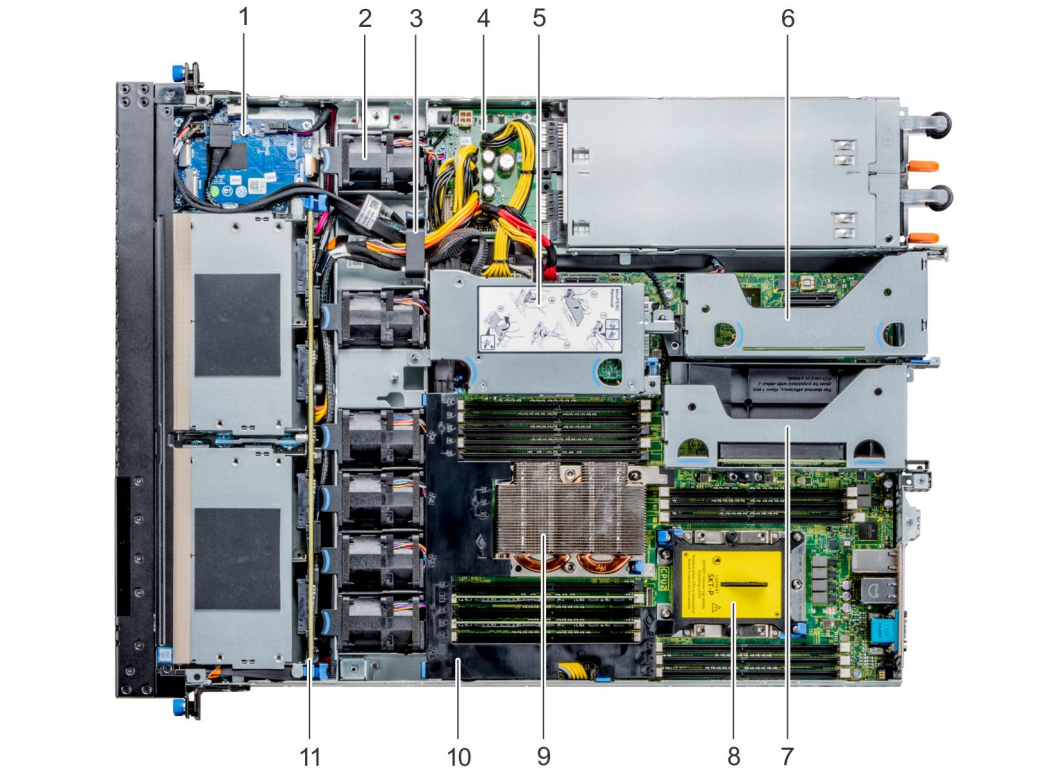

Figure 1. Inside the system

1. Front IO board (VGA, ESATA, M.2, internal USB port, and smart card controller)
2. Cooling fan (one processor configuration- 5 fans, two processor configuration - 6 fans)
3. Cabling latch
4. Power interposer board
5. MiniPERC riser or NVMe PERC riser
6. Low profile expansion riser 2
7. Low profile expansion riser 1
8. Processor 2 blank
9. Heat sink and processor 1
10. Air shroud
11. Hard drive backplane

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Processor

The new Intel Xeon Processor Scalable Family processor is the most advanced compute core featuring a new core micro architecture optimized to accelerate a wide range of compute workloads. It delivers improved TCO through the best per core performance.

Topics:

Processor features

The list below shows the features of the Intel Xeon Scalable Family processor:

- Up to 24 cores with Intel HT Technology (2 threads/core)
- Intel Turbo Boost technology (excludes Bronze processors)
- Between 85W-150W TDP
- Up to 1280GB/socket memory capacity on all standard processor
- 14nm process Technology
- Rebalanced Cache Hierarchy: 1.375MB Last level Cache/core
- Support for Intel AVX-512
- Intel Ultra Path Interconnect (UPI) with bandwidth up to 10.4 GT/s
- 6 channels DDR4 per CU RDIMM and LRDIMM
- 2133, 2400, 2666 speeds at 2 DIMMs per channel
- Memory Protection Extensions (MPX) support
- Integration of next generation Intel Omni-Path Fabric controller on select -F processors
- Up to 48 PCIe lanes per CPU with x16, x8, and x4 Bifurcation support
- PCI Express 3.0 (2.5, 5.0, 8.0GT/s)
- Separate Reference with Independent Spread Spectrum Clocking (SRIS)
- MCTP Scaling
- Per Core P-State (PCPS)
- Uncore Frequency Scaling (UFS)
- Energy Efficient Turbo (EET)
- On die PMAX detection

Supported processors

Table 3. Supported processors

Processor number	TDP (W)	Core count	Segment	SLX/CXL
6252	150	24	Gold	CXL
6248	150	20	Gold	CXL
6242	150	16	Gold	CXL
6240	150	18	Gold	CXL
6238	140	22	Gold	CXL
6234	130	8	Gold	CXL
6230	125	20	Gold	CXL
6226	125	12	Gold	CXL

Processor number	TDP (W)	Core count	Segment	SLX/CXL
6222V	115	20	Gold	CXL
6152	140	22/44	Gold	SKL
6140	140	18/36	Gold	SKL
6126	125	12/24	Gold	SKL
6130	125	16/32	Gold	SKL
6138	125	20/40	Gold	SKL
6132	140	14/28	Gold	SKL
5222	105	4	Gold	CXL
5220	125	18	Gold	CXL
5218	125	16	Gold	CXL
5217	115	8	Gold	CXL
5215	115	10	Gold	CXL
5122	105	4/8	Gold	SKL
5118	105	12/24	Gold	SKL
5120	105	14/28	Gold	SKL
5120T	105	14/28	Gold	SKL
4216	100	16	Silver	CXL
4215	85	8	Silver	CXL
4214	85	12	Silver	CXL
4210	85	10	Silver	CXL
4208	85	8	Silver	CXL
4112	85	4/24	Silver	SKL
4108	85	8/16	Silver	SKL
4110	85	8/16	Silver	SKL
4114	85	10/20	Silver	SKL
4116	85	12/24	Silver	SKL
3204	85	6	Bronze	CXL
3104	85	6/6	Bronze	SKL
3106	85	8/8	Bronze	SKL

Chipset

The Lewisburg 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 up to 6 Gb/s on all ports
- xHCI USB controller with SuperSpeed USB 3.0 ports
- Direct Media Interface
- Serial Peripheral 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 10/10/1000 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 deb

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Memory

The XR2 supports up to 16 DIMMs, with up to 2 TB of memory and speeds of up to 2666 MT/s.

The XR2 supports registered (RDIMMs) and load reduced DIMMs (LRDIMMs) which use a buffer to reduce memory loading and provide greater density, allowing for the maximum platform memory capacity. Unbuffered DIMMs (UDIMMs) are not supported.

Topics:

Memory speed

The XR2 supports memory speeds of 2666 MT/s, 2400 MT/s, 2133 MT/s, and 1866 MT/s depending on the DIMM types installed and the configuration. All memories on all processors and channels run at the same speed and voltage. By default, this speed is the highest speed supported by the CPU and the DIMMs. For example, both DIMMs and CPUs must be capable of running at 2666 MT/s in order for memory to run at 2666 MT/s (specific CPU/DIMM configuration required).

CPU SKUs in the Platinum and Gold category support up to 2666 MT/s memory speed while CPU SKUs in Silver and Bronze category support up to 2400 MT/s memory speed. The operating speed of the memory is also determined by the maximum speed that is supported by the processor, the speed settings in the BIOS, and the operating voltage of the system.

Table 4. Memory performance details

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

Memory module installation guides

The XR2 server supports flexible memory configurations ranging from capacities of 8 GB (minimum) to 2 TB (maximum). CPU1 supports up to 10 DIMMs and CPU2 support up to 6 DIMMs.

The XR2 system supports a flexible memory configuration, according to the following population rules:

- Speed: If DIMMs of different speeds are mixed, all channels across all processors operate at the slowest DIMM's common frequency.
- DIMM type: RDIMM/LRDIMM cannot be mixed within a system.
- DIMMs with different data widths can be mixed. For 14G, DIMMs with x4 and x8 data widths are supported and mixing is allowed.
- Mixing DIMMs with different capacities are allowed:
  - Population rules require the largest capacity DIMM be placed first (slot A1 populated first, then A2, and so on... The second CPU mirrors the first CPU population).
  - Maximum of two different capacity DIMMs allowed in a system
- Mixing DIMMs with different ranks are allowed:
  - Maximum of two different rank DIMMs allowed in a system.

Memory RAS features

Reliability, Availability, and Serviceability (RAS) features help keep the system online and operational without significant impact to performance, and can decrease data loss and crashing due to errors. RAS aids in rapid, accurate diagnosis of faults which require service.

Table 5. 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.

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Storage

The chassis design for 14G XR2 supports a single storage configuration with support for up to 8 x 2.5-inch drives.

Topics:

Supported drives and SSD drives

Table 6. Supported SATA/SAS drives

Form factor	Type	Speed	Capacities
2.5-inch	SATA/SSD/SATA SSDs(SED)	6Gb	240GB, 400GB, 480GB, 800GB, 960GB, 1600GB, 1920GB, 3200GB, 3840GB
2.5-inch	SAS and SSD, SAS SSDs(SED/FIPS)	12Gb	400GB, 480GB, 800GB, 960GB, 960GB (SED/FIPS), 1.6TB, 1.92TB, 1.92T (SED/FIPS) 3.84TB, 3.84 (SED/FIPS), 7.6TB
2.5-inch	PCIe NVMe SSD	12Gb	375GB, 960GB, 1TB, 1.6TB, 3.2TB, 3.84TB, 4TB, 6.4TB

NOTE: All capacities might not be available with Self-encrypting drive(SED) and Federal Information Processing Standards(FIPS) drives.

NOTE: The speed might vary depending on the drive type.

Storage controllers

In order to reduce complexity and provide manageable system storage, the PowerEdge XR2 offers support for one version of PCIe low-profile form factor internal storage controller and three versions of external storage controllers internal PCIe slot.

Table 7. PERC series offerings

Performance level	Controller description
Entry	S140 (NVMe) **NOTE: S140 is not supported as factory installed.**
Value	• H330 • HBA330
Performance	H730P

IDSDM/vFlash module

The module contains the Internal Dual SD Module (IDSDM) and vFlash module that are combined into a single card module. The vFlash module is no longer accessible from outside of the chassis. There are two SKUs available:

- vFlash only
- vFlash + IDSDM

The card sits at the back of the chassis, in a Dell EMC proprietary PCIe slot using a USB 3.0 interface to host. The IDSDM and vFlash card size changes from SD to microSD and the supported capacity for IDSDM microSD cards are 16 GB, 32 GB, and 64 GB, while for vFlash the capacity is 16 GB only. The write-protection is on the module.

Boot Optimized Storage Subsystem (BOSS)

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

- A solution such as IDSDM may be desired, however the target OS is a full OS (not just a hypervisor).
- The user does not wish to trade off standard hot plug drive slots for the OS install.
- A separate hardware RAID is required for OS boot so that data drives can be in the Passthrough mode with an HBA.

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

Integrated M.2 boot solution

The PowerEdge XR2 includes an integrated dual M.2 SATA solution for boot. This is offered as a means of booting the system to a full OS in the following scenarios:

- A solution such as IDSDM may be desired, but the target OS requires greater capacity than can be provided by SD media.
- The user does not wish to trade off standard hot plug drive slots for OS install.
- A separate controller is required for OS boot so that data drives can be in Passthrough mode with an HBA.
- No hardware RAID is required for OS boot.
- The user does not wish to utilize a PCIe slot with the Boot Optimized Storage Subsystem (BOSS) solution.

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PCIe slots

The PowerEdge XR2 offers balanced, scalable I/O capabilities, including integrated PCIe 3.0-capable expansion card slots. Dell EMC Network Daughter Cards allow you to choose the right network fabric without using up a valuable PCIe slot. You can pick the speed, technology, vendor, and other options, such as switch-independent partitioning, which allows you to share and manage bandwidth on 10 GbE connections. For the latest information on all supported add-in PCIe expansion cards, please talk to your Dell representative or visit the page at Dell.com/support. For more information on server network adapters, go to www.dell.com/us/business/p/networking-cards.

Topics:

PCIe expansion cards

The XR2 has the following four riser cards:

- Right riser (Riser 1) - One x16 PCIe Gen3 for low-profile half length cards or one x16 PCIe Gen3 for full height half length cards – connected to CPU1
- Left riser (Riser 2) - One x16 PCIe Gen3 for low-profile half length cards – connected to CPU2
- LOM riser
- Internal riser - One x8 PCIe Gen3 for internal PERC.

PCIe expansion card riser configurations

Table 8. PCIe expansion card riser configurations

Expansion card riser	PCIe slots on the riser	Height	Length	Link
LOM riser	Slot 1	Unique to Dell	Unique to Dell	x8
Right riser	Slot 2	Low Profile	Half Length	x16
	Slot 2	Full Height	Half Length	x16
Internal riser	Slot-integrated	Platform specific	Platform specific	x8
Left riser	Slot 3	Low Profile	Half Length	x16

PCIe expansion cards

Table 9. Optional GPU

Type	Card
GPU	NVIDIA T4

NIC

For the latest information on all supported add-in PCIe expansion cards, visit the page at Dell.com/support.

For more information on server network adapters, visit www.dell.com/us/business/p/networking-cards.

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Power, Thermal, and Acoustics

The lower overall system-level power draw is a result of the breakthrough system design developed by Dell EMC. The system aims to maximize performance per watt through a combination of energy efficient technologies, optimized thermal designs and intelligent fan control algorithms. The system fan control algorithms use an extensive array of sensors that automatically monitor power and thermal activity to minimize fan speeds based on system cooling requirements, reducing the power required for cooling.

Topics:

Power consumption and energy efficiency

With the rise in the cost of energy that is coupled with increasing data center density, Dell EMC provides tools and technologies to help you realize greater performance with lower energy cost and wastage. More efficient data center usage can reduce costs by slowing the need for additional data center space. The following table lists the tools and technologies that Dell EMC offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

Table 10. Power tools and technologies

Feature	Description
Power supply units (PSU) portfolio	PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy.
Tools for right-sizing	Enterprise Infrastructure Planning Tool (EIPT) is a tool that helps you to plan and tune your computer and infrastructure equipment for maximum efficiency. EIPT helps you by calculating hardware power consumption, power infrastructure, and storage. You can learn more at Dell.com/calc
Industry compliance	Dell EMC'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: • Power monitoring accuracy of 1%, whereas the industry standard is 5% • More accurate reporting of power • Better performance under a power cap
Power capping	Use Dell EMC'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	Dell EMC's servers are compliant with all relevant industry certifications and guidelines, including 80 PLUS, Climate Savers, and ENERGY STAR. 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

Feature	Description
	that is comprised of Intel Node Manager that is accessed through Dell iDRAC9 Enterprise and OpenManage Power Center that allows policy- based management of power and thermals at the individual server, rack, and data center level. Hot spare reduces power consumption of redundant power supplies. Thermal control of fan 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	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.
Rack infrastructure	Dell EMC offers some of the industry's highest- efficiency power infrastructure solutions, including: • Power distribution units (PDUs) • Uninterruptible power supplies (UPSs) • Energy smart containment rack enclosures

Power supply units

The PowerEdge XR2 supports two AC power supplies with 1 + 1 redundancy, auto sensing, and auto switching capability and one DC power supply.

Table 11. Power supply efficiency levels

Form factor	Output	Class	10%	20%	50%	100%
Redundant 51.3 mm	550W AC	Platinum	82%	90%	94%	91%
Redundant 51.3 mm	600W DC	NA	85%	88%	92%	92%

Thermal and acoustics

Thermal management of PowerEdge XR2 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 45°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.

Thermal design

The PowerEdge XR2 server cooling builds on the features and capability of previous servers but expands support for higher power processors, PCIe cooling, and increased hard drive count. A new chassis mechanical architecture enables increased airflow capability for cooling of higher power and dense system configurations and results in fewer system restrictions and increased feature density. Dell Server thermal, mechanical, and thermal control designs are based on the following key principal and order of priority:

- 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.
- Performance

    - Performance and uptime are maximized through the development of cooling solutions that meet the needs of even the most complicated of hardware configurations.
- Efficiency
    - Dell EMC servers are designed with an efficient thermal solution to minimize power and airflow consumption, and/or acoustics for acoustical deployments.
    - Advanced thermal control algorithms enable minimization of system fans speed while meeting the above reliability and performance principle.
- Management
    - System management settings are provided such that customers have options to customize for their unique hardware, environments, and/or workloads.
- 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.

The thermal design of the PowerEdge XR2 reflects the following:

- Optimized thermal design: The system layout is designed 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 XR2 Owner's Manual on Support.Dell.com/Manuals and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on Dell.com
- Cooling redundancy: The XR2 allows N+1 fan redundancy, allowing continuous operation with one fan failure in the system.

Acoustical design

The acoustical design of the PowerEdge XR2 reflects the following:

- Versatility: The XR2 saves you power draw in the data center but is also quiet enough for office environment in minimum configurations. You may find that the system is sufficiently quiet where the sound it emits blends into the environment.
- Adherence to Dell EMC'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 EMC 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, near line SAS hard drives, or non-rotational devices like SSDs. The 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 noises 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.
        - Using a GPU card: This 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 H330 PERC: This configuration may be quieter than those with a 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.

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Rails

The rack rail systems for the PowerEdge XR2 provide tool-less support for 4-post racks with square or unthreaded round mounting holes, including all generations of Dell racks. This system supports the following types of rails:

- Static rails
- Sliding rails
- Rugged rails

The optional cable management arm (CMA) can be mounted on either the left or right side of the sliding rails without the use of tools for fast and easy deployment.

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Dell EMC OpenManage systems management

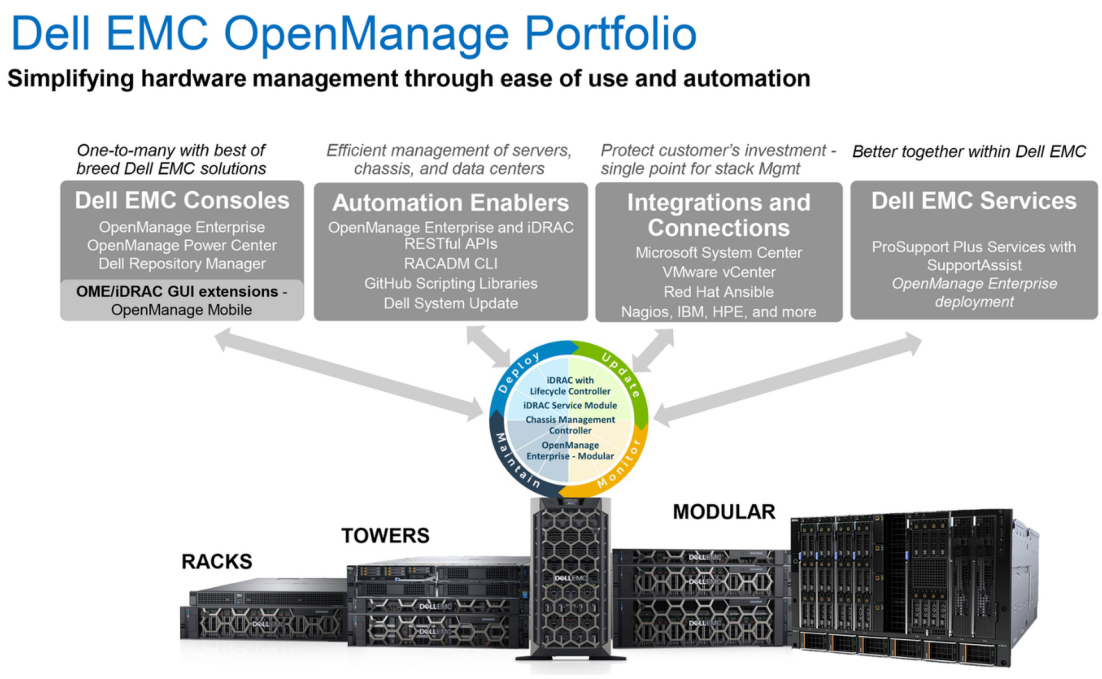

Figure 2. Dell EMC OpenManage Portfolio

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.

Appendix A. Additional specifications

Power supply specifications

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.

Chassis dimensions

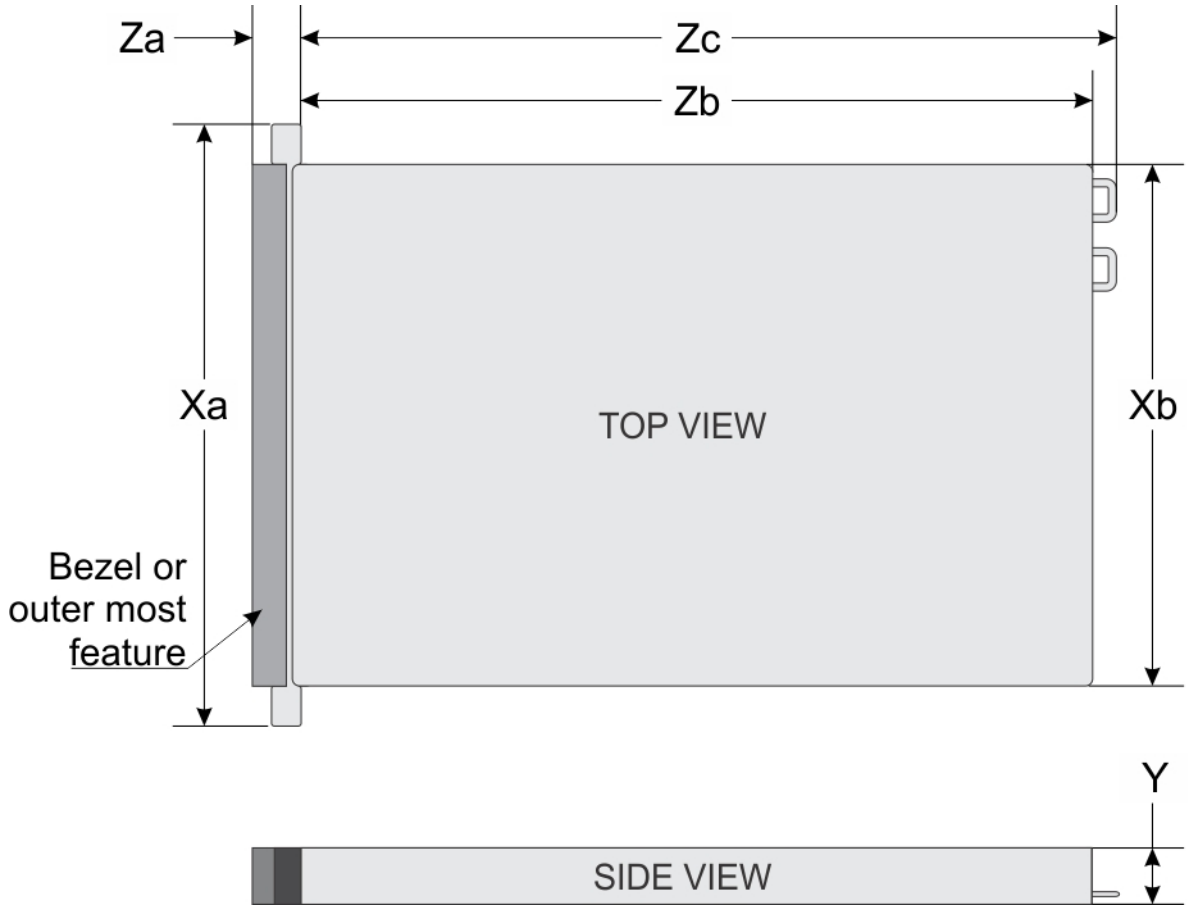

Figure 3. Dimensions of the Dell EMC PowerEdge XR2 system

Table 12. Dimensions of the PowerEdge XR2 system

Xa	Xb	Y	Za (with bezel)	Za (without bezel)	Zb	Zc
482.6 mm (19 inches)	434.0 mm (17.08 inches)	42.8 mm (1.68 inches)	63.15mm (2.46 inches)	33.9 mm (1.32 inches)	516.4 mm (20.33 inches)	545.65 mm (21.48 inches)

Environmental specifications

The table below details the environmental specifications for the XR2. For additional information about environmental measurements for specific system configurations, see the XR2 Owner's Manual at Dell.com/support/manuals.

Table 13. Temperature specifications

Temperature	Specifications
Storage	–40°C–70°C (–40°F–158°F) per Mil-Std 810G Method 501.6, Proc 1
Continuous operation (for altitude less than 950m or 3117ft	5°C to 45°C (41°F to 113°F) with no direct sunlight on the equipment **NOTE: Certain system configurations may require reductions in the upper temperature limits** **NOTE: The performance of the system may be impacted when operating above the upper temperature limit or with a faulty fan.**
Maximum temperature gradient (operating and storage)	20°C/h (68°F/h)

Table 14. 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 29°C (84.2°F) maximum dew point.

Table 15. Maximum vibration specifications

Maximum vibration	Specifications
Operating	Random vibration per Mil-Std 810G method 514.7, 0.00220783 g2/Hz at 10-500 Hz (overall 1.04$_{Grms}$) (x, y, and z axes)
Storage	Vertical: 5-500 Hz at 1.04$_{Grms}$, Transverse: 5-500 Hz at 0.204$_{Grms}$, Longitudinal: 5-500 Hz at 0.740$_{Grms}$, 1 hour per axis MIL-STD-810G, Method 514.7, Figure 514.6, Procedure I, Category 4, Figure 514.6C-1 (US highway truck vibration)

Table 16. Maximum shock specifications

Maximum shock	Specifications
Operating	40G, 11 ms, saw tooth, 3 shocks, +/- per axis MIL-STD-810G, Method 516.7, Procedure I
Storage	40G, 11 ms, saw tooth, 3 shocks, +/- per axis MIL-STD-810G, Method 516.7, Procedure V
Packaged	36-inch all 6 sides and 1 corner MIL-STD-810G, Method 516.7, Procedure IV

Table 17. Maximum altitude specifications

Maximum altitude	Specifications
Operating	Mil-Std 810G method 500.6, Proc. II, air carriage, 15,000 ft for 1 hour after stabilization, 4572 m (15,000 ft)

Maximum altitude	Specifications
Storage	Mil-Std 810G method 500.6, Proc. I, 40,000 ft for 1 hour after stabilization ,12,192 m (40,000 ft)

Table 18. Operating temperature de-rating specifications

Operating temperature de-rating	Specifications
Up to 35°C (95°FJ)	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°FJ)	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°FJ)	Maximum temperature is reduced by 1°C/125 m (1°F/228 ft) above 950 m (3,117 ft).

Table 19. Standard operating temperature specifications

Standard operating temperature	Specification
Continuous operation (for altitude less than 950m or 3117ft)	5°C to 45°C (41°F to 113°F) with no direct sunlight on the equipment. **NOTE: The 150W CPU support is only up to 35°C.** **NOTE: GPU continuous operation is support up to 30°C.**

Table 20. Expanded operating temperature specifications

Expanded operating temperature	Specifications
Continuous operation	5°C to 45°C at 5% to 85% RH with 29°C dew point. **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 45°C.** For temperatures between 35°C and 45°C, de-rate maximum allowable temperature by 1°C per 175 m above 950 m (1°F per 319 ft).
≤ 1% of annual operating hours	-5°C to 55°C at 5% to 90% RH with 29°C dew point. **NOTE: Outside the standard operating temperature (10°C to 35°C), the system can operate down to -5°C or up to 55°C for a maximum of 1% of its annual operating hours.** **NOTE: GPU expanded operating temperature is up to 37°C for selected configurations.** For temperatures between 40°C and 55°C, de-rate maximum allowable temperature by 1°C per 125 m above 950 m (1°F per 228 ft).

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

Video specifications

The PowerEdge XR2 supports the integrated Matrox G2000eW3 graphics card.

Table 21. Video resolution and refresh rate

Resolution	Refresh rate	Horizontal frequency	Pixel clock	Rear panel	Front panel
1024 x 768	60 Hz	48.4 kHz	65.0 MHz	Yes	Yes
1280 x 800	60 Hz	7 kHz	5 MHz	Yes	Yes

Resolution	Refresh rate	Horizontal frequency	Pixel clock	Rear panel	Front panel
1280 x 1024	60 Hz	7 kHz	0 MHz	Yes	TBD
1360 x 768	60 Hz	71 kHz	5 MHz	Yes	Yes
1440 x 900	60 Hz	9 kHz	5 MHz	Yes	TBD
1600 x 900	60 Hz (RB)	54 kHz	75 MHz	Yes	Yes
1600 x 1200	60 Hz	0 kHz	0 MHz	TBD	TBD
1680 x 1050	60 Hz (RB)	7 kHz	0 MHz	Yes	TBD
1920 x 1080	60 Hz	158 kHz	0 MHz	TBD	No
1920 x 1200	60 Hz	74.556 kHz	193.25 MHz	TBD	No

NOTE: 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.

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Appendix B. Standards compliance

Table 22. 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

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Appendix C. Additional resources

Table 23. 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 messages • System codes and indicators • System BIOS • Remove and replace procedures • Troubleshooting • 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 • 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

ProDeploy Enterprise Suite and Residency Services

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		●	●
	Technology Service Manager (TSM) engagement for ProSupport Plus entitled devices			●
Deployment	Deployment service hours	Business hours	24x7	24x7
	Onsite hardware installation*	●	●	●
	Packaging materials disposal	●	●	●
	Install and configure system software		●	Onsite
	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 4. ProDeploy Enterprise Suite capabilities

NOTE: Hardware installation not applicable on selected software products.

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.

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.

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.

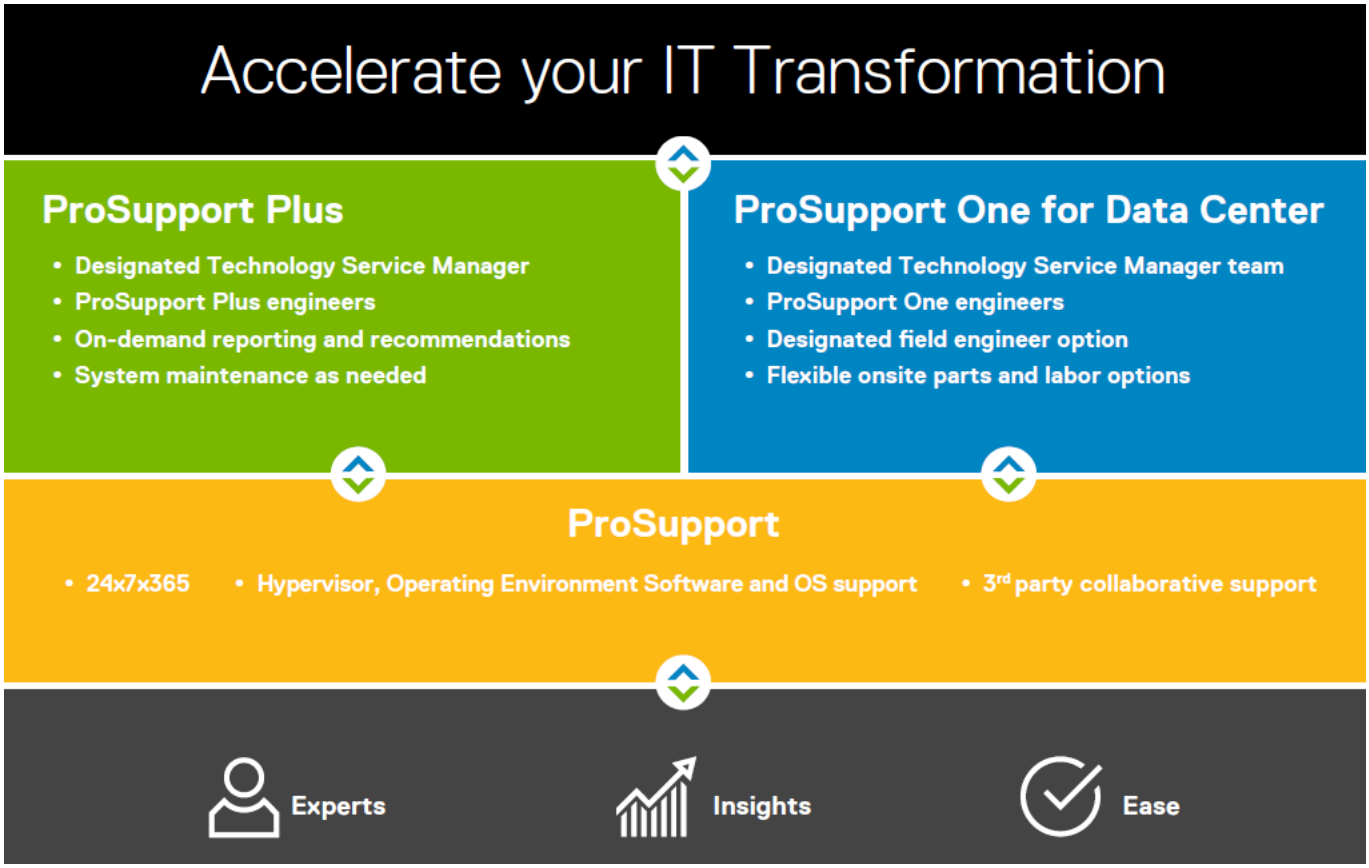

Figure 5. ProSupport Enterprise Suite

ProSupport Plus

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

- An assigned Technology Service Manager who knows your business and your environment
- Access to senior ProSupport engineers for faster issue resolution
- Personalized, preventive recommendations based on analysis of support trends and best practices from across the Dell EMC 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

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 and software experts

- Collaborative 3rd party support
- Hypervisor and OS support
- Consistent level of support available for Dell EMC hardware, software and solutions
- Onsite parts and labor response options including next business day or four-hour mission critical

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, it offers a truly unique solution for Dell EMC's largest customers with the most complex environments.

- Team of assigned Technology Services 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	ProSupport Plus	ProSupport One for Data Center
Remote technical support	24x7	24x7	24x7
Parts and labor response options	Next business day or Mission Critical	Next business day or Mission Critical	Flexible
Automated issue detection and case creation	●	●	●
Self-service case initiation and management	●	●	●
Hypervisor and OS support.	●	●	●
Priority access to specialized support experts		●	●
Designated Technology Service Manager		●	●
Personalized assessments and recommendations		●	●
On-demand support and utilization reports		●	●
Systems Maintenance guidance		Semiannual	Optional
Designated technical and field support teams			●

Figure 6. Enterprise Support feature comparison

Support Technologies

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

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.

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 7. SupportAssist model

Get started at Dell.com/SupportAssist

TechDirect

Boost your IT teams 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 needs. 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.com

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 EMC'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 EMC server solution. To learn more or register for a class today, visit LearnDell.com/Server.

Dell EMC Global Infrastructure Consulting Services

Dell EMC Global Infrastructure Consulting Services use skilled solution architects, innovative tools, automated analysis and Dell EMC's intellectual property to give rapid insight into the root causes of unnecessary complexity. We seek better answers than traditional service models, and our strategy is to help 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 build a more efficient enterprise.

Dell EMC Managed Services

Dell EMC 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.