PowerEdge VRTX

Technical Guide

The world's first integrated IT solution designed from the ground up specifically for office environments.

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1 System overview

Introduction

The Dell™ PowerEdge™ VRTX platform brings order to chaos, redefines IT operations and allows users to deploy performance anywhere. PowerEdge VRTX is a powerful, scalable and easy-to-manage solutions platform, optimized specifically for office environments. Clear up the complexity of disparate hardware, multiple management tools and hardware sprawl with an optimized platform that integrates up to four PowerEdge M-series server nodes, storage, networking and management into a compact 5U chassis.

With extensive scalability available inside the chassis, additional servers and hard drives can be inserted without the need for more floor space or rack space, and without any additional cables.

VRTX's feature-rich, two-socket, half-height Dell PowerEdge M520 and M620 server nodes are proven platforms and technologies that deliver exceptional flexibility and scalable performance. With a choice of up to 12 3.5-inch or 25 2.5-inch hot-plug hard drives delivering up to 48TB, VRTX is equipped with massive internal shared storage, keeping you ahead of the pace of data growth.

Integrate networking through the 1GbE internal switch module or an optional Ethernet pass-through module with eight 1GbE ports. Take advantage of flexible, expandable I/O with eight PCI Express® (PCIe) slots — three full-height/full-length and five low-profile/half-length. Capitalize with redundant 1100W AC power supplies, fans, blower modules and chassis management controllers.

Simplified systems management, without compromise

VRTX's Chassis Management Controller (CMC) resolves the problems of systems management tool proliferation and complexity by providing converged management of server nodes, shared storage, networking and power in a unified tool, all managed through a single console.

The CMC's intuitive, easy-to-use GUI can be accessed from a web browser, and works together with a variety of Dell OpenManage™ tools including the Integrated Dell Remote Access Controller version 7 (iDRAC7) with Lifecycle Controller embedded in each server node. Embedded management in the VRTX platform allows IT administrators to manage this Dell hardware in physical, virtual, local and remote environments, and gives the choice of managing the system out-of-band, completely agent-free, or in-band with or without a systems management software agent installed.

CMC's unified management console for VRTX server nodes, storage and networking can reduce complexity, enhance productivity and help to enable maximum uptime, which in turn can reduce administration time and the cost of ownership.

For remote management, OpenManage Essentials, a free software download from Dell.com/Support, monitors and manages multiple VRTX platforms in different locations. Exclusive to VRTX systems with Enterprise-licensed CMC, the geographical mapping feature of OpenManage Essentials can be configured to show each system's location as well as system and component health status.

OpenManage iDRAC with Lifecycle Controller integrates and connects to leading third-party systems management solutions (such as those from Microsoft, VMware and BMC Software), so users can maintain a single point of control and capitalize on an existing systems management investment.

Flexibility within a stable platform

VRTX is both flexible and stable. Flexible in its extensive hardware configurability and scalability, while consistent and uniform in performing systems management operations. These characteristics

give users confidence that VRTX can readily adapt to accommodate new workload requirements, while protecting existing investments in hardware, software, management tools, and skills.

New technologies

VRTX shared storage provides a massive amount of local storage within the chassis — up to 48TB with the 3.5-inch hard drive chassis. The storage is shared among the server nodes and is managed through the VRTX CMC. Using the CMC, you can create and assign virtual disks to single or multiple server nodes.

You can also use the CMC to flexibly assign PCIe slots to server nodes — up to four PCIe slots to a single server node. The assignments are flexible during initial setup in that any PCIe slot may be assigned to any server node, and the assignment may then be reassigned. Table 1 summarizes the other new technologies that the Dell PowerEdge VRTX platform uses.

Table 1.   New technologies

New technologies	Detailed descriptions
Intel Xeon processor E5-2400, E5-2600 and E5-2600 v2 product families	New Intel processors that work with the Intel C602 series chipset. These processors are more advanced than the previous generation and have embedded PCIe lanes that improve I/O performance.
Intel C602 series chipset	New Intel Platform Controller Hub (PCH) chip that replaced the ICH.
1866MT/s DDR3 memory	Advanced Intel Xeon E5-2600 processors support 1600MT/s memory; Intel Xeon E5-2600 v2 processors support 1866MT/s memory.
LRDIMM	This new memory option, load reduced DIMM (LRDIMM), is designed with a buffer chip (or chips) to replace the register to help minimize loading. LRDIMMs can increase overall server system memory capacity and speed.
Flexible LOM	The Dell Select Network Adapter options allow you to customize your LAN port combinations from your choice of controller vendors.
PERC S110 software RAID Solution	This new software RAID solution supports RAID 0, 1, 5 and 10; supports maximum of four hot-plug SATA hard drives or SATA solid-state drives.
Next-generation Dell PowerEdge RAID Controller (PERC) options	VRTX supports the new PERC8 controller cards with improved functionality and faster performance.
iDRAC7 with Lifecycle Controller	The second-generation embedded systems management solution for Dell servers provides agent-free hardware and firmware inventory and alerting, in-depth memory alerting, faster performance, a dedicated gigabit port, and many more features.
Advanced power management	VRTX supports advanced power monitoring and power capping tools that can help manage power consumption.
Fresh Air cooling	Dell has tested and validated an integrated data center solution that enables you to operate at higher temperatures or even chiller-less.

Failsafe hypervisors	The internal dual SD module enables Dell's unique failsafe virtualization architecture, ensuring uptime by providing failover capability for embedded hypervisors, such as VMware® vSphere® ESXi™ and Microsoft Windows Server 2012 Hyper-V®.

Specifications

Table 2 lists the technical specifications for the PowerEdge VRTX platform. For the latest information on supported features, visit Dell.com/PowerEdge.

Table 2.   Technical specifications

Feature	Technical specification
Form factor	5U rackable tower chassis Tower configuration: • H: 48.4 cm (19.1 in) with system feet • W: 31.0 cm (12.2 in) with system feet opened • D: 73.0 cm (28.7 in) • Weight (empty) = 31.7 kg (69.7 lb) • Weight (maximum) = 74.8 kg (164.9 lb) Rack configuration: • H: 21.9 cm (8.6 in) • W: 48.2 cm (19.0 in) • D: 73.0 cm (28.7 in) • Weight (empty) = 24.7kg (54.5 lb) • Weight (maximum) = 68.7kg (151.5 lb)
Server node options	Up to four hot-plug, serviceable Dell PowerEdge M620 and M520
Storage	Shared PERC8
Power supplies	Redundant power supply units • 110/220V auto-sensing • Redundant power supplies support 2+2 (AC redundancy), and 3+1, 2+1, and 1+1 (power supply redundancy) modes
Cooling	VRTX comes standard with six hot-pluggable, redundant fan modules and four blower modules • Based on Dell Energy Smart Technologies, VRTX fans and blowers are a breakthrough in power and cooling efficiency • The fans and blowers deliver low-power consumption, but also use next-generation fan technologies to ensure the lowest possible amount of fresh air is consumed to cool the enclosure
Input devices	• Front control panel with interactive graphical LCD — Supports initial configuration wizard — Local server blade, enclosure, and module information and troubleshooting • Two USB keyboard/mouse connections and one video connection for local front "crash cart" console connections • Optional DVD-RW
Drive bays and hard drives	Up to 12 x 3.5in NLSAS, SAS, or SAS SSD hot-plug drives or Up to 25 x 2.5in NLSAS, SAS, or SAS SSD hot-plug drives

Feature	Technical specification
Embedded NIC	1GbE internal switch module (standard) with 16 internal 1GbE ports and 8 external ports
	Ethernet pass-through module with 8 external ports (optional)
I/O slots	Eight flexible PCIe slots
	• Three full-height/full-length slots (150W) with double-wide card support (225W)
	• Five low-profile/half-length slots (25W)
Systems management	Chassis Management Controller (CMC), a unified management tool, manages all resources — server nodes, storage, networking, and power — inside the chassis
	• Delivers comprehensive functionality that is easy to use
	• Monitors up to nine VRTX systems (up to 36 servers) from a single, consolidated CMC console
	• Provides local and remote management
	• Enterprise or Express CMC licensing
	• Optional redundant Chassis Management Controller
	• Server nodes each contain proven iDRAC7 with Lifecycle Controller for agent-free systems management fully supported within the OpenManage product portfolio and select third-party management solutions
Rack support	ReadyRails™ II sliding rails for 4-post racks with square, round, or threaded holes

2 System features

The Dell PowerEdge VRTX integrates compute and storage capabilities through a 5U rackable tower chassis. VRTX supports up to four 12th generation, hot-plug PowerEdge M520 or PowerEdge M620 blade servers. The M620 is a half-height blade server that supports up to 24 DIMMs and two processors. The M520 is a half-height blade server that supports up to 12 DIMMs and two processors.

VRTX can be configured into four different chassis types:

- Tower form factor supporting up to twelve 3.5-inch drives (Figure 1)
- Tower form factor supporting up to twenty-five 2.5-inch drives (Figure 2)
- 5U rack form factor supporting up to twelve 3.5-inch drives (top of Figure 3)
- 5U rack form factor supporting up to twenty-five 2.5-inch drives (bottom of Figure 3)

Figure 1.   VRTX tower with 3.5-inch drives

Figure 2.   VRTX tower with 2.5-inch drives

Figure 3.   VRTX rack with 3.5-inch (top) and 2.5-inch (bottom) drives

The chassis design of the VRTX is optimized for easy access to components and for airflow for effective and efficient cooling. Figure 4 shows components on the back of the VRTX chassis including the PCIe expansion cards, CMC ports, blower modules and I/O modules.

Figure 4.   VRTX back view

VRTX provides the features and components listed in Table 3.

Table 3.   VRTX chassis features

Feature	Description
Power button	Powers on the system
LCD panel	Provides system information and status or error messages
Drives	Up to 24 front-accessible, hot-plug, 2.5-inch drives or up to 12 front-accessible, hot-plug, 3.5-inch drives; see the Storage section for details
USB connectors	Two ports for keyboard and mouse connection
Information tag	Slide-out label panel for system information including the Express Service tab, embedded NIC, and MAC address

Feature	Description
Video connector	Connects a monitor to the system
Optical drive	Optional SATA DVD-ROM drive or DVD+/-RW drive
Vents	Vents for the temperature sensor
Server modules	Up to four PowerEdge M520 or M620 server modules specifically configured for the enclosure
Power supply units	Up to four 1100W AC
PCIe expansion card slots	Connects up to three full-height and five low-profile PCIe expansion cards
I/O module ports	Network interface for I/O modules
Serial connector	DB-9 serial connector for local CMC configuration
CMC ports	Two ports; connects the primary CMC
Blower modules	Four modules provide cooling for the server modules
Quick Resource Locator (QRL)	Use a smartphone application to scan this code on the chassis to access additional information and resources for the server, including videos, reference materials, service tag information, and Dell contact information

VRTX offers the features listed in Table 4 to help ensure the security of your data center.

Table 4.   VRTX security features

Security feature	Description
Cover latch	A tooled latch is integrated on the top cover with a coin key lock to secure the system.
Bezel	An optional metal bezel is mounted to the chassis front to provide the Dell ID. A lock on the bezel is used to protect unauthorized access to hard drives. System status is viewable on the LCD screen when the bezel is installed.
TPM	The Trusted Platform Module (TPM) is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. It also supports the Intel Xeon TXT functionality. TPM can also be used to enable the BitLocker™ hard drive encryption feature in Windows Server 2008. TPM 1.2 is supported. No TPM version is available for China or Russia.
Power-off security	BIOS has the ability to disable the power button function.
Intrusion alert	When the cover is opened, the intrusion alert switch circuit closes to indicate intrusion to CMC. When enabled, the software will provide notification that the cover has been opened.
Secure mode	For the server nodes, BIOS has the ability to enter a secure boot mode through Setup. This mode includes the option to lock out the server node power and server node NMI switches on the control panel or set up a system password.

Figure 5 illustrates the underlying architecture of VRTX.

For more detailed information on features and descriptions for VRTX, see the *Dell PowerEdge VRTX Systems Owner's Manual* on Dell.com/Support/Manuals.

Figure 5.   PowerEdge VRTX block diagram
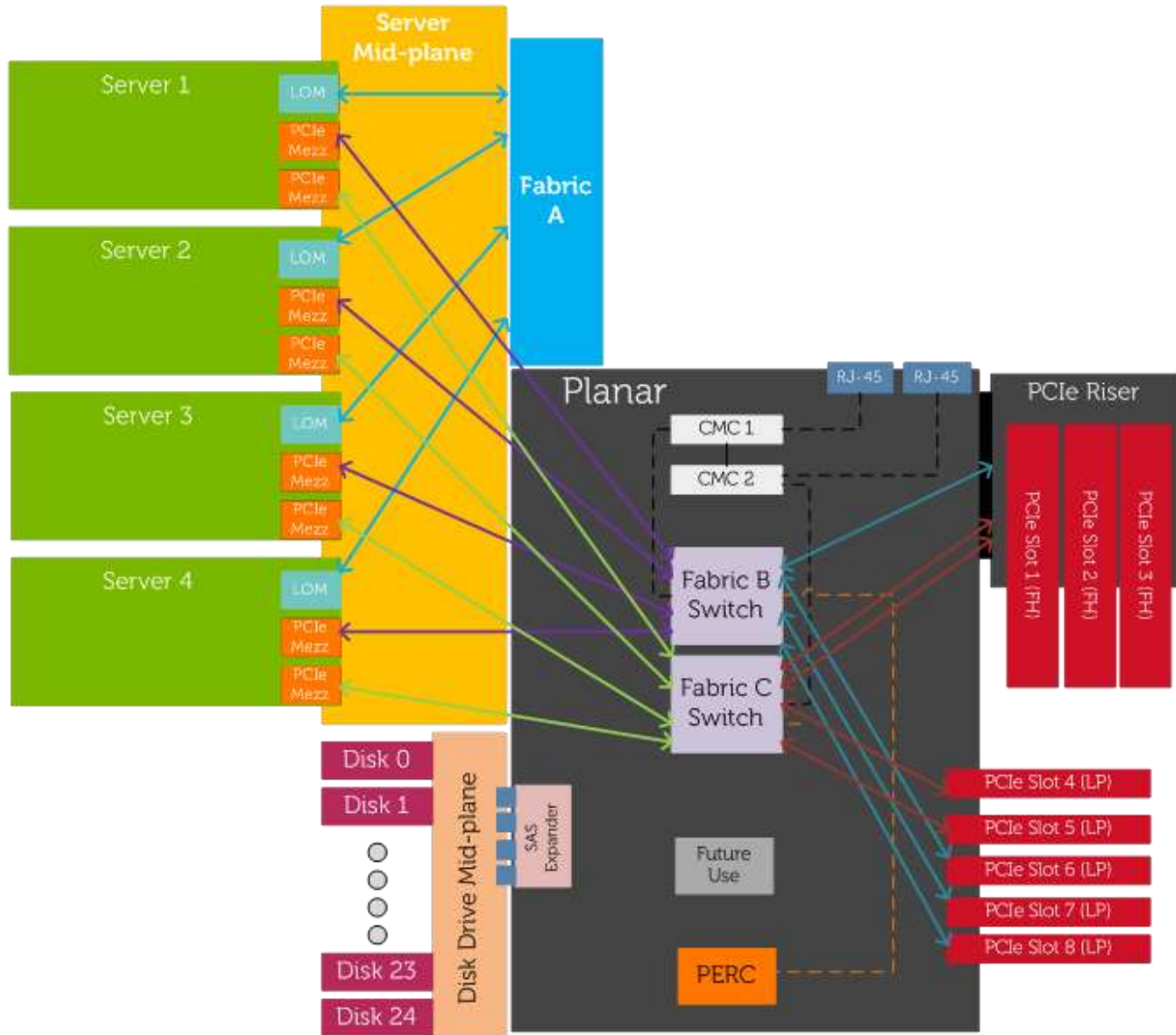
NOTE: Not shown to scale

3 Processors

See the *Dell PowerEdge M520 Technical Guide* and the *Dell PowerEdge M620 Technical Guide* at Dell.com/PowerEdge for detailed information on supported processors.

For more information on the Intel Xeon processor E5 product family, visit Intel.com.

4 Memory

See the *Dell PowerEdge M520 Technical Guide* and the *Dell PowerEdge M620 Technical Guide* on Dell.com/PowerEdge for detailed information on supported memory.

5 Storage

The PowerEdge VRTX platform provides comprehensive, shared internal storage options, including several drive types to choose from. VRTX supports up to 48TB of internal, low-latency storage.

All four server nodes have access to the full storage space. Each server node sees the storage as its own singular storage pool. You can assign virtual disks to single server nodes or across server nodes (with clustering) using the CMC.

Infrastructure

One of the key differentiators for VRTX is the integrated shared storage. Virtualization support at remote sites requires shared storage for VM migration. To date, shared storage solutions have been too expensive for these applications; however VRTX is able to leverage existing PERC technology to deliver a low-cost 6Gb/s direct-attached storage (DAS) solution and virtualization support.

The PERC provides multiple channels of virtual I/O. PCIe switches provide the ability to map virtual functions to multiple servers through virtual PCIe hierarchies. CMC has a web interface you can use to create maps to the servers, and create and assign corresponding virtual drives. Figure 6 shows the Virtual Disks tab on the CMC web interface.

Figure 6.   CMC Virtual Disks tab
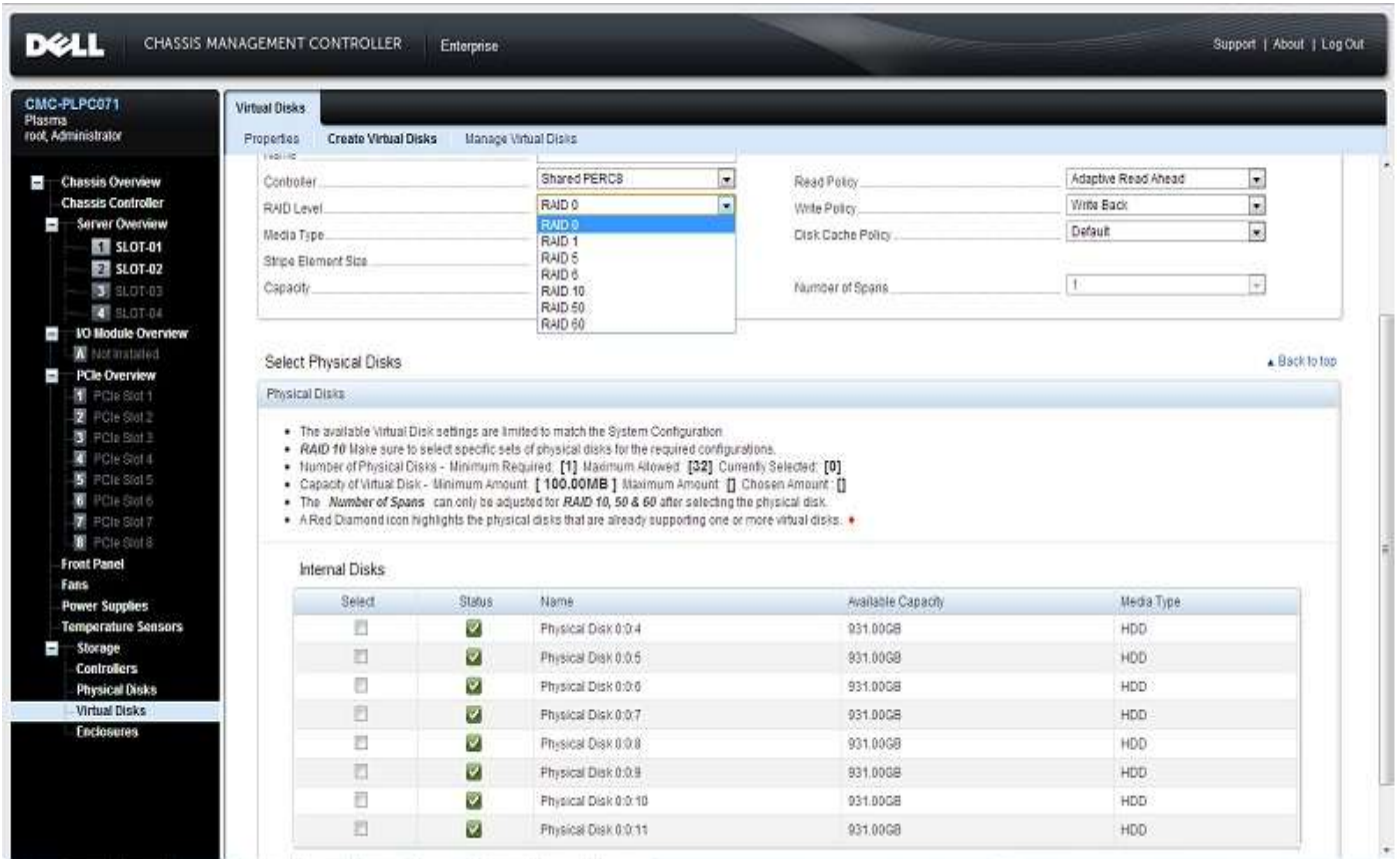
Supported hard drives

The VRTX shared storage supports the internal drives listed in Table 5.

Table 5.   Supported hard drives

Form factor	Type	Speed (rpm)	Capacities
2.5"	Nearline SAS (6Gb)	7.2K	500GB, 1TB
	SAS (6Gb)	10K	600GB, 900GB, 1.2TB
	SAS (6Gb)	15K	146GB, 300GB
	SSD (SLC)	N/A	200GB, 400GB
3.5"	Nearline SAS (6Gb)	7.2K	1TB, 2TB, 3TB, 4TB
	SAS (6Gb)	10K	600GB, 900GB, 1.2TB
	SAS (6Gb)	15K	300GB, 450GB, 600GB

For the latest information on supported hard drives, visit Dell.com/PowerEdge.

PERC8 storage controller

The shared PERC8 card is located between the storage array and the power distribution board on the VRTX planar. The shared PERC8 slot routes SAS to the nearby planar miniSAS connectors, which are used to internally cable SAS from the PERC to the SAS expander cards in the storage array.

The VRTX shared PERC8 card has additional features, beyond a standard monolithic PERC-mini card, at the driver and firmware level to support shared storage. A unique PCIe ID is used to indicate shared storage capability and compatibility in the VRTX system.

For more information about the latest PERC offerings, see Dell.com/PERC.

6 Networking

VRTX supports up to eight Ethernet connections on the back of the system. The Fabric A infrastructure supports either a pass-through or a switch card installed in the back of the chassis. These cards plug directly into the midplane.

Fabric A is limited by the following physical restraints:

- Fabric A internal connections limited to four server nodes times four lanes, or 16 lanes total
- Fabric A bulkhead space for external connection is limited to eight RJ45 connectors
- Fabric A is limited to a single cold service card

For Fabric A, the M520 uses a quad-port 1GbE LOM. The M620 has a network daughtercard (NDC) option for Fabric A that includes Broadcom and Intel cards.

Fabric A system management

The system management paradigm for Fabric A is non-redundant. A single SMBus, serial port or Ethernet management fabric is presented to the CMC for Fabric A, including the pass-through mode which is fabric redundant.

Fabric A pass-through cards

The 1GB Ethernet pass-through card is defined as having no single points of failure at the Ethernet signal level. Maximum Ethernet signal pass-through is limited to eight lanes due to the bulkhead limit of eight RJ45 connectors.

Figure 7.   Fabric A Ethernet pass-through card configuration
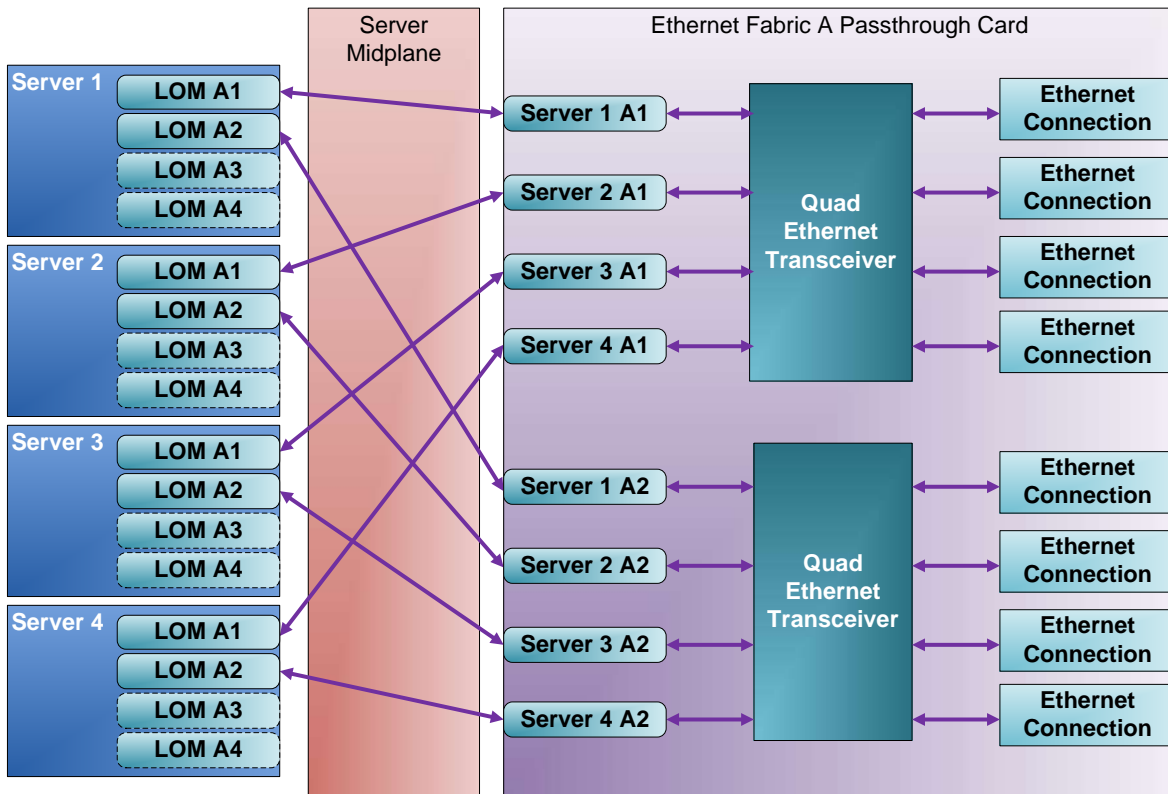
Fabric A switches

A single switch is implemented for all I/O, and allows maximum signal consolidation without forcing bifurcation of the Ethernet fabric. Switches accept up to 16 lanes from Fabric A and output up to eight lanes at the external ports. A switch is the only Fabric A card that can support the full four-lane count from Fabric A. When equipped with four M520 servers and quad-port LOMs, VRTX can take full advantage of all 16 internal ports (four per server node).

Figure 8.   Fabric A Ethernet switch configuration
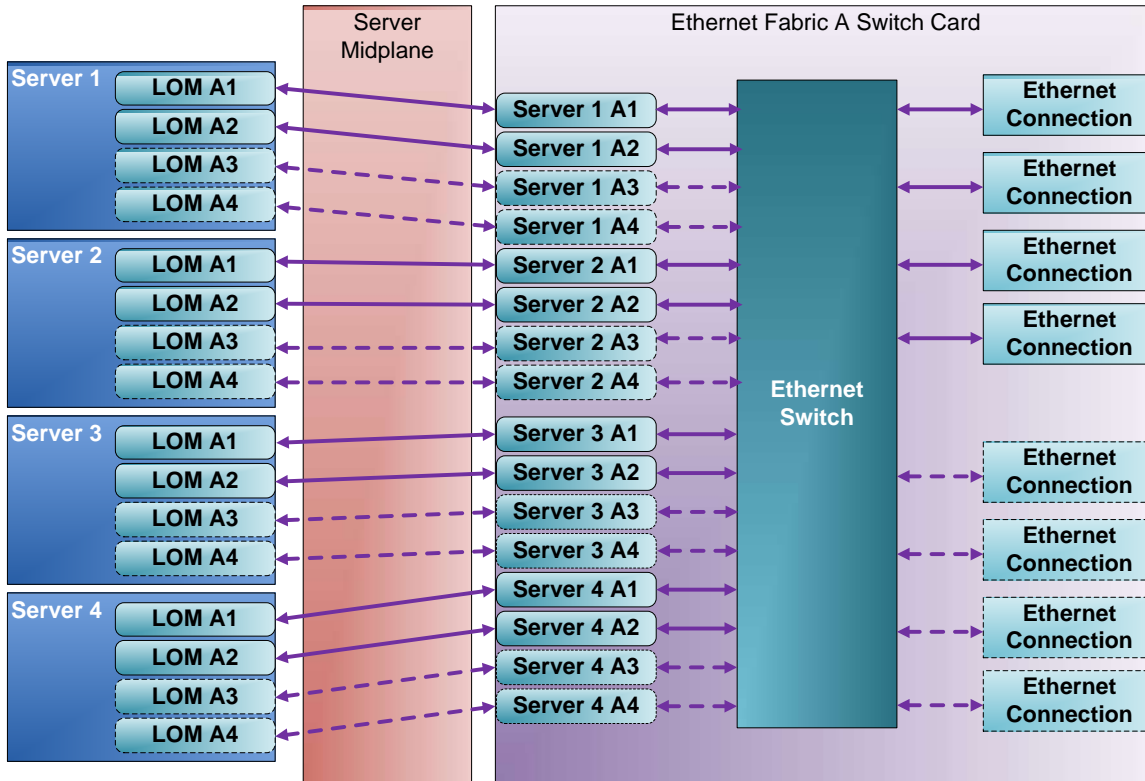
7 PCIe Infrastructure

Instead of using traditional I/O modules for Fabric B or Fabric C, Dell has designed the PowerEdge VRTX to use PCIe slots using two PCIe switches — one for Fabric B and one for Fabric C. Each PCIe switch ties into one of the two mezzanine cards on the server nodes.

The Fabric B PCIe switch provides connectivity to the following:

- PCIe slot 3
- PCIe slot 5
- PCIe slot 6
- PCIe slot 7
- PCIe Slot 8
- Shared PowerEdge RAID Controller (SPERC)

The Fabric C PCIe switch provides connectivity to the following:

- PCIe slot 1
- PCIe slot 2
- PCIe slot 4
- PCIe slot 5

The PCIe slots are non-shared and thereby dedicated to one server node within the PowerEdge VRTX system. The PCIe slots can be reassigned to a different server through the CMC as needed. Each slot is capable of being exclusively assigned to any server node, although it does require powering the server node off. You can assign up to four PCIe slots to one server node.

Supported PCIe cards

VRTX supports the following PCIe expansion cards.

- AMD FirePro™ W7000
- 6Gb/s SAS HBA (low-profile and full-height)
- Broadcom® dual-port 1Gb (low-profile and full-height)
- Intel dual-port 1Gb (low-profile and full-height)
- Intel dual-port 10Gb Base-T (low-profile and full-height)
- Intel dual-port 10Gb Base-SFP+ (low-profile and full-height)
- Intel quad-port 1Gb (low-profile and full-height)
- Broadcom dual-port 10Gb Base-SFP+ (low-profile and full-height)

8 Power, thermal and acoustics

Lower overall system-level power draw is a result of Dell's breakthrough system design. The PowerEdge VRTX chassis maximizes performance-per-watt through a combination of power and cooling, energy efficient technologies, and tools. Additionally, VRTX has 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

With the rise in the cost of energy coupled with increasing data center density, Dell provides tools and technologies to help you realize greater performance with less energy cost and waste. More efficient data center usage can reduce costs by slowing the need for additional data center space. Table 6 lists the tools and technologies Dell offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

Table 6.   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.
Tools for right-sizing	**Energy Smart Solution Advisor (ESSA)** helps 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/ESSA.
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: • 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 OpenManage 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	**iDRAC7 Enterprise** with Lifecycle Controller provides server-level management that monitors, reports, and controls power consumption at the processor, memory, and system level. **Dell OpenManage Power Center** delivers group power management at the rack, row, and data center level for servers, power distribution units (PDUs), and uninterruptible power supplies.

Feature	Description
Active power management	**Intel Node Manager** is an embedded technology that provides individual server-level power reporting and power limiting functionality. Dell offers a complete power management solution comprised of Intel Node Manager accessed through Dell iDRAC7 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.
Dell Fresh Air cooling	With the thermal design and reliability of Dell products, you have the capability to operate at excursion-based temperatures. This solution comprises servers, networking, storage, and infrastructure that run beyond the industry standard of 35°C (95°F) without impacting your availability model. Find additional information at Dell.com/FreshAir.
Rack infrastructure	Dell offers some of the industry's highest-efficiency power infrastructure solutions, including: • Power distribution units • Uninterruptible power supplies (UPS) • Energy Smart containment rack enclosures Find additional information at Dell.com/Rack Infrastructure for the Efficient Data Center.

Find additional information at Dell.com/PowerAndCooling and Power.com/PowerCenter.

Power supply units

VRTX is powered by two to four Dell 1100W PSUs. VRTX uses these PSUs to support both low-line (115 VAC) and high-line (220 VAC) power sources. Dell 1100W PSUs support a maximum of four PSUs with the current sharing circuitry. The low-line and high-line power capabilities are roughly equivalent, with only slightly more power available in high-line power sources.

VRTX PSUs support three power supply redundant options (1+1, 2+1, or 3+1) or one AC redundancy mode (2+2).

Due to the strict acoustic requirements for VRTX, it is preferred to always run four PSUs in the system for best distribution of the power loading and lowest fan speed for the PSU fans. PSU fans exhibit an exponential increase in noise based upon fan speed.

Table 7.   1100W PSU specifications

Attribute	Value
80 Plus	Platinum Plus
Power factor correction	Active

Attribute	Value
FCC classification	Class A
Max output current	108.0 Amps
Input voltage range	90–264VAC, 47–63Hz
Iin (100-240VAC) for rating on safety label	12.0 Amps -6.5 Amps
Initial in-rush current	55 Amps (peak)
Secondary in-rush current	25 Amps (peak)

Table 8.   1100W PSU efficiency

	10% load	20% load	50% load	100% load
Power supply efficiency at 115VAC	87%	91%	92.5%	90%
Power supply efficiency at 230VAC	89%	93%	94.5%	92%

Thermal

Four blower modules with dual blowers are located on the back of the VRTX chassis. Six fans are located between the SAS backplane and expander cards and the system planar components. You can check fan status using the control panel LCD or the systems management interfaces.

In chassis standby mode, all components are unpowered except the CMC, the LCD control panel, and two fans for cooling the CMC components. For chassis standby mode, the system needs to run one or two fans at low RPM to ensure that the CMCs are properly cooled.

Acoustics

PowerEdge VRTX has been consciously designed with an open office layout in mind, including its acoustical design. Acoustic intensity has been minimized as a function of delivered airflow, and tones (buzzes, hums, whistles) have been removed. The result is a smooth sound generally masked by that of normal office air conditioning or conference room conversations. Certain configurations and utilizations are quieter than others — if your environment is acoustically sensitive, Dell can help you choose the right configuration.

Figure 9.   VRTX acoustics

Value measured at your ears		Equivalent familiar noise experience
LpA, dBA, re 20 µPa	Loudness, sones	
90	80	Loud concert
75	39	Data center, vacuum cleaner, voice must be elevated to be heard
60	10	Conversation levels
45	4	Whispering, open office layout, normal living room
35	2	Quiet office
30	1	Quiet library
20	0	Recording studio

PowerEdge VRTX with standard M620s → (45 / 4)

PowerEdge VRTX with all "enhanced acoustics" M620s and/or all M520s → (35 / 2)

For background information on Dell Enterprise acoustics, such as metrics and operating conditions, see the Dell white paper Dell Enterprise Acoustics.

Data summary for VRTX acoustics

Acoustical data for a typical configuration[1] 2.5-inch hard drive version of the VRTX platform with three sample blade configurations and utilizations in 23 $\pm$ 2 °C ambient (per ISO acoustical standards) are as follows:

- All M520 server nodes at idle and operating[2]
  - LwA-UL[3] = 5.5 bels
  - LpA[4] = 37 dBA
  - No prominent tones[5]
  - What this means: These levels would be masked by most open office environments, such as air-conditioning noise and conference room conversation. For this configuration, the system at 50% workload sounds the same as at idle.
- One or more M620 server nodes with the enhanced acoustics processor and heatsink option
  - Idle[2]
    - LwA-UL[3] = 5.5 bels
    - LpA[4] = 37 dBA
  - Operating[2]
    - LwA-UL[3] = 5.8 bels
    - LpA[4] = 38 dBA
    - No prominent tones[5]
  - What this means: These levels would be masked by most open office environments, such as air-conditioning noise and conference room conversation. For this configuration, the system at 50% workload is 30% louder than at idle. The enhanced acoustics option uses fewer

balanced DIMMs; 16 balanced DIMMs versus 24 balanced DIMMs with a standard M620 blade server.

- One or more M620 server nodes with the standard processor and heatsink option
  - Idle[2]
    - > LwA-UL[3] = 5.5 bels
    - > LpA[4] = 37 dBA
  - Operating[2]
    - > LwA-UL[2] = 6.2 bels
    - > LpA[3] = 41 dBA
    - > No prominent tones[4]
  - What this means: Operating values would begin to compete with normal conference room environments or conversation levels depending upon proximity to PowerEdge VRTX chassis. For this configuration, the system at 50% workload is 50% louder than at idle.

Other acoustical information includes the following:

- TurboBoost mode: Acoustical levels can be further reduced during operating mode by choosing to turn TurboBoost mode off for the processor.
- Utilization: As workload on the processor increases, acoustical levels also increase. The M520 and the enhanced acoustics M620 are less sensitive to utilization changes, but the standard M620 exhibits significant acoustical change with utilization. As utilization exceeds 50% workload, acoustical output exceeds those values listed for operating above for the respective configuration.
- Transients: As utilization changes, such as from moderate to high workloads, blower module speeds may temporarily exceed the steady-state values causing the acoustics to temporarily increase.
- Background noise levels vary from office to office and around the world, affecting what we hear. For example, some offices may not use air conditioning and not experience the associated broadband ambient background noise. If you are in a quiet open office area, you may wish to choose one of the quieter acoustical configurations, such as the enhanced acoustics option for the M620.

Data summary footnotes

[1]Typical configuration:

- Three M520 or M620 server nodes with Intel Xeon E5-2660 processors
- Six 8GB DIMMs
- Sixteen 10k 2.5-inch hard disk drives
- Four 1100W power supplies

[2]Test conditions follow sections 3.1 and 5.3 of ISO 7779 (2010) for idle and operating, where operating is simulated by exercising processor at 50% of the thermal design power (TDP.)

[3]LwA − UL: Upper limit sound power levels (LwA) calculated per section 4.4.1 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).

[4]LpA: Front bystander position A-weighted sound pressure level calculated per section 4.3 of ISO 9296 (1988) and measured in accordance with ISO 7779 (2010). The system is placed at a deskside location next to the standard ISO 7779 table.

[5]Prominent tone: Criteria of D.6 and D.11 of ECMA-74 11th edition (2010) are followed to determine if discrete tones are prominent; system is placed in deskside location next to ISO 7779 table and acoustic transducer is at front bystander position, ref ISO 7779.

9 Rack, rails and cable management

VRTX supports ReadyRails II sliding rails for 4-post racks and cable management arm (CMA) options:

- Support for toolless installation in 19-inch EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks
- Support for tooled installation in 19-inch EIA-310-E compliant threaded hole 4-post racks
- Support full extension of the system out of the rack to allow serviceability of key internal components
- Support for optional CMA
- Minimum rail mounting depth without the CMA: 714 mm
- Minimum rail mounting depth with the CMA: 845 mm
- Square-hole rack adjustment range: 608-915 mm
- Round-hole rack adjustment range: 594-908 mm
- Threaded-hole rack adjustment range: 608-930 mm

The rails ship in the toolless mounting configuration but can be converted to the tooled configuration very quickly and easily. Table 9 lists the rack rail system that the VRTX system supports. Note that static rail mounting in 2-post racks is not supported.

Table 9.   Supported rack rail system

Product	Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
VRTX	C3	ReadyRails II	Sliding	✓	✓	✓	x	x

Other factors to consider when deploying the VRTX system include the spacing between the front and back mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as PDUs, and the overall depth of the rack. See Table 10 for more information.

Table 10.   Rail adjustability range

Product	Rail identifier	Rail type	Rail adjustability range (mm)						Rail depth (mm)	
			Square		Round		Threaded		without CMA	with CMA
			Min	Max	Min	Max	Min	Max		
VRTX	C3	Sliding	608	915	594	908	608	930	756	845

Note that the adjustment range of the rails is a function of the type of rack in which they are being mounted. The minimum and maximum values listed above represent the allowable distance between the front and rear mounting flanges in the rack. Rail depth represents the minimum depth of the rail as measured from the rack front mounting flanges when the rail rear bracket is positioned all the way forward.

Cable management

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

The optional CMA for the VRTX organizes and secures the cords and cables exiting the back of the server and unfolds to allow the server to extend out of the rack without having to detach the cables. Key features of the VRTX CMA include:

- Large U-shaped baskets to support dense cable loads
- Open vent pattern for optimal airflow
- Mounting on either side by simply swinging the attachment housings from one side to the other
- Simple and intuitive snap-in mounting design eliminates the need for tools for both the CMA and tray
- Hook-and-loop straps, rather than plastic tie wraps, to eliminate the risk of cable damage during cycling
- Low-profile fixed tray to both support and retain the CMA in its fully closed position

10 Operating systems and virtualization

The Dell PowerEdge VRTX supports a wide range of industry-standard operating systems and virtualization software. For the latest information on supported operating systems, see Dell.com/OSsupport.

Supported operating systems

Table 11 lists the operating systems supported on the VRTX platform.

Table 11.   Primary operating systems support

Operating system	Platform	Edition
Microsoft Windows Server 2012	x64	Standard Enterprise Datacenter
Microsoft Windows Server 2008 R2 SP1	x64	Standard Enterprise Datacenter HPC
Microsoft Windows Server 2008 SP2	x32	Standard Enterprise
	x64	Standard Enterprise Datacenter

Supported virtualization

Table 12 lists virtualization support on the VRTX platform.

Table 12.   Virtualization support

Operating system		Install version	Factory options	Internal dual SD module install support
VMware	vSphere v5.1	ESXi	FI/DIB	Yes
Hyper-V	Integrated in Windows Server operating system	2008, 2008 R2, 2012	FI/DIB	No

11 Dell OpenManage systems management

Whether your IT environment consists of a few servers or a few thousand servers, the Dell OpenManage systems management portfolio provides comprehensive management for evolving IT environments. OpenManage is based on open standards and offers both agent-free and agent-based server lifecycle management functionality for Dell PowerEdge servers. OpenManage solutions help you automate and streamline essential hardware management tasks.

The advanced management capabilities of Dell OpenManage also integrate and connect with third-party systems management solutions that you may already use, making Dell platforms easy to manage and deploy in any IT environment. If you have already standardized on offerings from industry leaders, such as BMC Software, Microsoft, VMware or other vendors, you can leverage OpenManage integration and connections developed for use with your existing systems management framework to efficiently manage Dell servers, storage, business-client PCs, and network devices.

OpenManage systems management solutions consist of a combination of embedded management features and software products that help you automate and simplify the entire server lifecycle: deploy, update, monitor, and maintain. OpenManage solutions are innovatively designed for simplicity and ease of use to help you reduce complexity, save time, achieve efficiency, control costs, and empower productivity.

Systems management solutions

Dell systems management solutions include a wide variety of tools, products, and services that enable you to leverage an existing systems management framework. As shown in Figure 10, Dell systems management solutions are centered on the OpenManage embedded server management feature iDRAC7 with Lifecycle Controller.

Figure 10. Dell systems management solutions
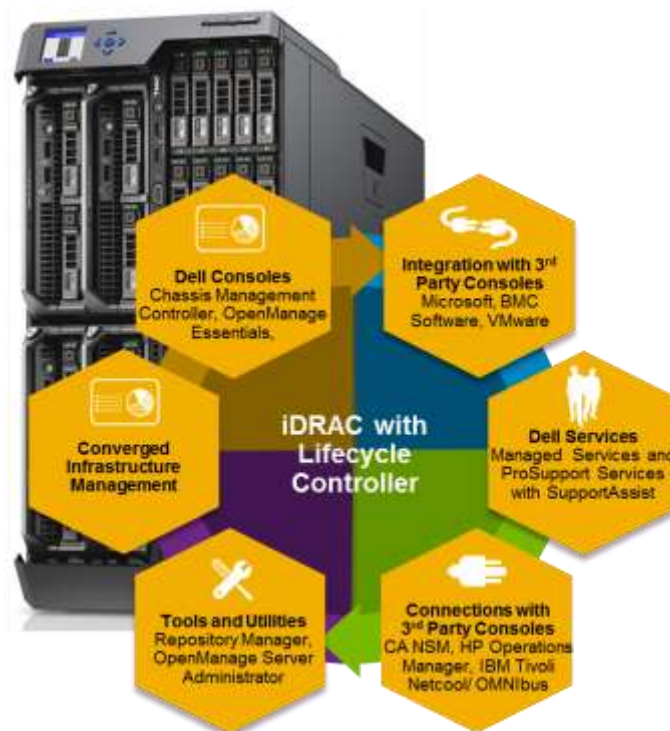
OpenManage systems management

The Dell OpenManage systems management portfolio includes powerful hardware and software management tools and consoles.

iDRAC7 with Lifecycle Controller

The Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller is the heart of the second generation of Dell PowerEdge embedded management functionality. In addition to enabling agent-free management, iDRAC7 with Lifecycle Controller provides remote access to the system — whether or not there is a functioning operating system or hypervisor running on the server. These embedded features help simplify and automate all aspects of server lifecycle management: deployment, updates, monitoring and maintenance. Table 13 describes the functions and benefits of iDRAC7 with Lifecycle Controller.

Table 13.   iDRAC7 with Lifecycle Controller functions and benefits

Feature	Function	Benefit
Out-of-band	iDRAC7 with Lifecycle Controller offers real-time, out-of-band discovery, inventory, deployment, monitoring, alerting and updates for server nodes and internal storage	Manage servers independent of the OS/hypervisor type or status — even if an OS/hypervisor is not installed or operational
Single code base	All Dell PowerEdge 12th generation servers use the same embedded management hardware and firmware	Simplified, consistent, and uniform maintenance across server platforms
Dedicated GigE port (PowerEdge rack and tower systems)	Gigabit Ethernet replaces 10/100 on predecessor iDRAC6	Fast throughput for better performance; compatibility with setup for switches
Email alerts	Simplified, informative, and actionable messaging including key information on systems and components, warranty, service tag,	More detail allows IT administrators to be more efficient in diagnosing and remediating if an issue occurs; alerts include a direct, embedded URL in the email notification to further speed resolution
vFlash media	Enabled with iDRAC7 Enterprise	Allows for use of a non-Dell SD card
Electronic licensing	To obtain a software license key for iDRAC7 Express or iDRAC7 Enterprise after server purchase, submit a request to purchase a software license key through the Dell Licensing Portal or with a Dell sales representative.	If iDRAC7 Express or iDRAC7 Enterprise is ordered at the time of purchase, a license key will be factory installed. For customers who purchase a key after the point of purchase, Dell electronic licensing enables license upgrades and accompanying feature enhancements that will not require installation of additional hardware or system downtime.

iDRAC7 with Lifecycle Controller for VRTX configuration options

iDRAC7 Enterprise is the standard offering for VRTX as it is designed for optimal remote management. The Express version of iDRAC7 with Lifecycle Controller is optional and offers a reduced feature set for cost-conscious customers. iDRAC7 Enterprise and Express are available for the PowerEdge VRTX M620 and M520 server nodes. Table 14 compares the features available with iDRAC7 Express or iDRAC7 Enterprise.

Table 14.   Detailed feature comparison for iDRAC7 Enterprise and iDRAC7 Express for VRTX

	Feature	iDRAC7 Express	iDRAC7 Enterprise
Interface and Standards Support	IPMI 2.0	Yes	Yes
	Web-based GUI	Yes	Yes
	SNMP and IPMI discovery	Yes	Yes
	WS-MAN	Yes	Yes
	SMASH-CLP (SSH)	Yes	Yes
	RACADM command line (SSH and local)	Yes	Yes
	RACADM command line (remote)	Yes	Yes
	NTP and time zone support	Yes	Yes
Connectivity	DNS	Yes	Yes
	VLAN tagging	Yes	Yes
	IPv4	Yes	Yes
	IPv6	Yes	Yes
	Dynamic DNS	Yes	Yes
Security and Authentication	Role-based authority	Yes	Yes
	Local users	Yes	Yes
	SSL encryption	Yes	Yes
	Active Directory	No	Yes
	Generic LDAP support	No	Yes
	Two-factor authentication[1]	No	Yes
	Single sign-on	No	Yes
	Public key authentication (for SSH)	No	Yes
Remote Management and Remediation	Embedded diagnostics	Yes	Yes
	Remote firmware update	Yes	Yes
	Server power control	Yes	Yes
	Serial-over-LAN (with proxy)	Yes	Yes
	Serial-over-LAN (no proxy)	Yes	Yes

	Feature	iDRAC7 Express	iDRAC7 Enterprise
Remote Management and Remediation	Last crash screen capture	Yes	Yes
	Last crash video capture/playback	Yes	Yes
	Boot video capture/playback	No	Yes
	Virtual Media[2]	Yes	Yes
	Virtual Console[2]	Yes	Yes
	Virtual Console sharing	No	Yes
	Remote Virtual Console launch	No	Yes
	Virtual folders	No	Yes
	Virtual Console chat	No	Yes
	Remote file share	No	Yes
	Virtual Flash	No	Yes
	Virtual Flash partitions	No	Yes
Monitoring and Power	Sensor monitoring and alerting	Yes	Yes
	SNMP Alerts (v1, v2)	Yes	Yes
	SNMPv3 Gets	Yes	Yes
	Email alerts	Yes	Yes
	DIMM ranking	Yes	Yes
	Historical power counters	Yes	Yes
	Power budgeting	Yes	Yes
	Real-time power monitoring	Yes	Yes
	Real-time power graphing	Yes	Yes
	Real-time power capping	No	Yes
Logging	System event log	Yes	Yes
	RAC log	Yes	Yes
	Trace log	Yes	Yes
	Lifecycle Controller Log	Yes	Yes
	Remote sysLog	No	Yes
Lifecycle Controller	Local updates	Yes	Yes
	Driver packs	Yes	Yes
	One-to-many hardware configuration (WS-MAN or RACADM)	Yes	Yes
	Asset inventory export	Yes	Yes
	Remote services (via WS-MAN)	Yes	Yes
	Settings restoration for replaced parts	Yes	Yes

Feature	iDRAC7 Express	iDRAC7 Enterprise
System backup and restore	No	Yes

1 Two-factor authentication is available via ActiveX and therefore only supports Internet Explorer®.
2 Virtual Console and Virtual Media are available via both Java and ActiveX plug-ins.

Upgrade options after point of sale (APOS)

You can evaluate and purchase upgrades from Dell from your iDRAC web interface with no need to install additional hardware. You have a choice of ordering either the software-only license, or ordering an Enterprise license that includes an 8GBor 16GB vFlash SD card. The vFlash is factory installed, but requires a license key for activation. You may also purchase and use a non Dell-supplied SD card if you need more memory. You can create multiple partitions on the SD card, but individual partition size is limited to 4GB.

Agent-based systems management

Most systems management solutions require software agents to be installed on each compute node in order to be managed within the IT environment. Additionally, the systems management 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 prefer to use agent-based management solutions, Dell provides OpenManage Server Administrator software as an alternative to embedded, agent-free systems management.

OpenManage Server Administrator

The Dell OpenManage Server Administrator (OMSA) agent provides a comprehensive, one-to-one systems management solution for both local and remote servers and their storage. OMSA can help simplify single-server monitoring with a secure CLI or web interface. It can also be used to view system configuration, inventory, health, and performance.

Agent-free embedded systems management

Dell PowerEdge 12th generation servers include embedded server management via the onboard iDRAC7 with Lifecycle Controller, so in many cases there is no need to install an OpenManage systems management software agent into the operating system running on a Dell PowerEdge VRTX system. This greatly simplifies and streamlines monitoring and management for these platforms.

Dell OpenManage consoles

Chassis Management Controller console

As mentioned previously, the Dell CMC is a systems management hardware and software solution for managing multiple VRTX server nodes and chassis. The CMC is a hot-pluggable module inserted inside the VRTX chassis. Dell also offers an option to install a second redundant CMC module within the VRTX chassis. The CMC provides a secure interface that allows an IT administrator to inventory, perform configuration and monitoring tasks, remotely power on/off server nodes, and enable alerts for events related to the VRTX chassis, server nodes and components, shared storage and networking within the VRTX system. The CMC uses iDRAC7 with Lifecycle Controller to perform management functions, such as opening a remote console session from the CMC interface.

As Table 15 shows, additional advanced functionality is available with the default Enterprise CMC license as opposed to an Express license for CMC. CMC licensing is required in addition to iDRAC7 with Lifecycle Controller licenses. Each Dell PowerEdge server module within the VRTX platform must have an iDRAC7 with Lifecycle Controller license, either Enterprise or Express, in the equivalent level (Enterprise or Express license) for the CMC. The CMC is used to manage the VRTX platform, not just the server modules, so separate licenses are required.

Table 15.   Enterprise and Express CMC licensing for VRTX

Feature	Express	Enterprise
CMC network	Yes	Yes
CMC serial port	Yes	Yes
CMC stacking port	Yes	Yes
RACADM (SSH, Local and Remote)	Yes	Yes
WS-MAN	Yes	Yes
SNMP	Yes	Yes
Telnet	Yes	Yes
SSH	Yes	Yes
Web-based interface	Yes	Yes
Email alerts	Yes	Yes
LCD deployment	Yes	Yes
CMC settings restore and backup	No	Yes
Remote sysLog	No	Yes
Directory services	No	Yes
Single sign-on support	No	Yes
Two-factor authentication	No	Yes
Public key authentication	No	Yes
Remote file share	No	Yes
Enclosure level power capping	No	Yes
Dynamic power supply engagement	No	Yes
Multi-chassis management	No	Yes
FlexAddress enablement	No	Yes
PCIe adapter mapping	No	Yes
Virtual adapter-to-slot mapping	No	Yes
Virtual adapter-to-slot unmapping	Yes	Yes
One-to-many server firmware update	No	Yes
One-to-many configuration	No	Yes
OME VRTX Geographic View enablement	No	Yes

For more information on these and other features, see the *VRTX CMC User Guide* at
Dell.com/EnterpriseManagement and go to the Dell Tech Center page for CMC at Dell.com/omcmc. For the
Dell online License Management portal, go to Dell.com/Support/Retail/lkm.

Dell OpenManage Essentials v1.2 console

OpenManage Essentials (OME) provides a comprehensive view of Dell systems, devices, and components in an enterprise network. It is used to discover, inventory and monitor Dell PowerEdge servers, Compellent, EqualLogic™ and PowerVault™ storage, Force 10 and PowerConnect™ switches, and business client PCs; to perform agent-free updates and configuration for Dell 11th–12th-generation servers; and to create asset reports including service tag and warranty information.

OpenManage Essentials also communicates health status alerts for Dell servers, storage, and network devices to the Dell KACE™ K1000 service desk and enables automated hardware monitoring and support functionality through integration with the Dell SupportAssist proactive remote support service.

Exclusive to enterprise-licensed VRTX systems, OpenManage Essentials provides Geographic View for VRTX to map, monitor, and manage geographically dispersed VRTX systems across town or around the globe. IT administrators and service providers can instantly locate and access remote VRTX systems, drill down on component and warranty information, and perform agent-free monitoring and updates to the VRTX Chassis Management Controller (CMC), shared hardware components in the chassis, the server nodes, and components on the server nodes. OpenManage Essentials is available as a no-charge software download from Dell.com/Support.

OpenManage systems management tools and utilities

Dell Repository Manager

The Dell Repository Manager (RM) is a standalone 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 OpenManage Server Update Utility

The Dell Server Update Utility (SUU) is a DVD-based application for identifying and applying BIOS and firmware updates to Dell PowerEdge servers.

Dell OpenManage Systems Build and Update Utility

The Dell System Build and Update Utility (SBUU) provides one-to-one and one-to-many deployment and single-server update capabilities in the pre-operating system environment.

Dell Update Packages

The Dell Update Packages (DUPs) are self-contained executables in standard package format that update software elements on Dell PowerEdge servers, such as the BIOS, drivers, firmware and other software updates.

Dell OpenManage Deployment Toolkit

The Dell 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 quantities of Dell servers in a reliable fashion.

RACADM

The RACADM command-line utility provides a scriptable interface that allows local or remote configuration iDRAC7 with Lifecycle Controller.

IPMITool

The IPMITool includes scriptable console application programs used to control and manage remote systems using IPMI version 1.5 and later protocol versions.

OpenManage Integration with third-party consoles

Dell OpenManage integrates iDRAC with Lifecycle Controller functionality with several leading third-party consoles, including Microsoft System Center, VMware vCenter, BMC Software BladeLogic and ProactiveNet Performance Management.

Microsoft System Center offers management of applications, services, physical resources, hypervisors, software defined networks, configuration, and automation in a single comprehensive platform. For customers with existing investments in MS System Center, Dell offers the OpenManage Integration Suite for Microsoft System Center, a portfolio of software tools that streamline and optimize the efficiency and effectiveness of managing Dell hardware with System Center.

Dell OpenManage Integration Suite for Microsoft System Center includes:

Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)

This suite of Dell Server Management Packs enables several functions through System Center Operations Manager, including agent-free and agent-based in-band and out-of band discovery and monitoring of PowerEdge racks, towers, blades and VRTX systems,

Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager (SCCM)

This tool provides Dell Lifecycle Controller Integration (DLCI), within SCCM to manage Dell PowerEdge servers agent-free, including auto-discovery, operating system deployment and configuration of hardware elements, (RAID, NIC, BIOS, iDRAC), OS and hypervisor agnostic updates, firmware management, and system viewer utilities.

Dell Server Deployment Pack and Dell Hardware Update Catalogs

Dell Server Deployment Pack automates bare-metal configuration and deployment of a variety of Microsoft Windows operating system and application versions from a central location to Dell PowerEdge servers across a network.

Dell Server Update Catalogs scan and update BIOS, firmware and drivers for PowerEdge servers, blades and VRTX.

Dell Server PRO Management Pack with PRO-Tips for Microsoft System Center Virtual Machine Manager (SCVMM)

This pack integrates Dell PowerEdge server knowledge with Microsoft System Center 2012 Virtual Machine Manager (SCVMM) and Operations Manager (SCOM). Dell Server PRO Management Pack provides effective management of Dell physical servers that host virtual workloads running on Microsoft Windows Server Hyper-V by monitoring the health of the host system and enabling recommendations and remedial actions (PRO-Tips) when a compromised system is identified.

Dell Management Plug-in for VMware vCenter

This plug-in allows IT administrators to monitor, provision, and manage the physical PowerEdge server, blade and VRTX hardware and firmware from a dedicated Dell menu accessed through the VMware vCenter console. IT administrators use the same role-based, access-control model within vCenter to combine physical and virtual server management

BMC Software

BMC offers best-in-class integration of OpenManage iDRAC with Lifecycle Controller technology within select BMC Enterprise Systems Management (ESM) portfolio products.

OpenManage Connections with third-party consoles

Dell OpenManage Connections are designed specifically for monitoring Dell server and storage platforms within infrastructures managed by HP Operations Manager, IBM Tivoli Netcool/OMNIbus or Computer Associates (CA) Network and Systems Management (NSM). OpenManage Connections improve operational efficiency and flexibility in managing Dell hardware in large heterogeneous data center environments.

Dell OpenManage Connection for Computer Associates Network and Systems Management

This connection enables monitoring of PowerEdge servers and PowerVault storage arrays in environments managed by Computer Associates Network and Systems Management (CA NSM) with no installation of the CA agent required on the Dell hardware.

Dell OpenManage Connection for HP Operations Manager

This connection enables several functions through HP Operations Manager, including auto-grouping, SNMP trap reception, global health monitoring, and a context-sensitive launch of OpenManage Server Administrator.

Dell OpenManage Connection for IBM Tivoli Netcool/OMNIBus

This connection provides event monitoring capabilities to monitor Dell PowerEdge servers and Dell EqualLogic systems. It allows event monitoring, automatic event correlation, and launching device consoles from the Netcool/OMNIbus console.

Dell server management operations

Dell OpenManage systems management automates the most essential hardware management tasks — deploy, update, monitor and maintain. Figure 11 illustrates systems management operations that are performed more efficiently, and with fewer tools, through utilization of the Dell PowerEdge embedded management feature iDRAC7 with Lifecycle Controller.

Figure 11.   Systems management server lifecycle

Table 16 lists the products that are available for one-to-one and one-to-many operations, and when they are used in the server's lifecycle:

Table 16.   One-to-one and one-to-many operations

Operation	One-to-one	One-to-many	
Deploy	• iDRAC with Lifecycle Controller GUI • DTK • SBUU	• Symantec Deployment Server • OpenManage Integration for VMware vCenter • KACE K1000 Appliance • Lifecycle Controller Remote Services • BMC BladeLogic integration with Lifecycle Controller	• Dell Server Deployment Pack (DSDP) for Microsoft System Center Configuration Manager and Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager
Update	• iDRAC7 with Lifecycle Controller GUI • Repository Manager • DUP • SUU • SBUU • OpenManage Integration for VMware vCenter	• Dell OpenManage Essentials • Lifecycle Controller Remote Services	• Dell Update Catalogs for Microsoft System Center Configuration Manager • Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager

Operation	One-to-one	One-to-many
Monitor	• iDRAC7 with Lifecycle Controller • OMSA	• Dell OpenManage Essentials • BMC ProactiveNet Performance Management integration with Lifecycle Controller • Dell OpenManage Power Center	• OpenManage Integration for VMware vCenter • BMC ProactiveNet Performance Management integration with Lifecycle Controller • Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)
Maintain	• IPMI • iDRAC7 with Lifecycle Controller GUI	• Lifecycle Controller Remote Services	Remediate: • Dell Server PRO Management Pack for Microsoft System Center Virtual Machine Manager (SCVMM) Automated configuration of replaced parts to preexisting settings: • Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager

For additional detailed information on Dell's systems management portfolio, see the *Dell Systems Management Overview Guide* on Dell.com/Support/Manuals.

Appendix A. Additional specifications

Chassis dimensions and weight

The VRTX chassis dimensions for the tower and rack form factors differ due to chassis feet and rack ears. Also, while chassis depth measured at the base chassis sheet metal is less than 26 inches, server handles and power supply handles increase the depth slightly.

Table 17.   VRTX tower form factor dimensions

VRTX tower variations	Dimensions
Height with system feet	48.4 cm (19.1 in)
Height without system feet	46.4 cm (18.3 in)
Width without system feet	21.9 cm (8.6 in)
Width with system feet open	31.0 cm (12.2 in)
Depth with or without bezel	73.0 cm (28.7 in)
Weight (empty)	31.7 kg (69.7 lb)
Weight (maximum)	74.8 kg (164.9 lb)

Table 18.   VRTX rack form factor dimensions

VRTX tower variations	Dimensions
Height	21.9 cm (8.6 in)
Width without rack ears	44.6 cm (17.6 in)
Width with rack ears	48.2 cm (19.0 in)
Depth with or without bezel	73.0 cm (28.7 in)
Weight (empty)	24.7 kg (54.5 lb)
Weight (maximum)	68.7 kg (151.5 lb)

Environmental specifications

Table 19 details the environmental specifications for VRTX. For additional information about environmental measurements for specific system configurations, see Dell.com/environmental_datasheets.

Table 19.   Environmental specifications

Dell Fresh Air: temperature, humidity, altitude de-rating	
Expanded operation	Expanded operating temperature ranges are supported for fresh air environments.
	≤10% of annual operating hours: 5°C to 40°C at 5% to 85% RH with 26°C dew point.
	≤1% of annual operating hours: −5°C to 45°C at 5% to 90% RH with 26°C dew point.
	Outside the standard operating temperature (10°C to 35°C), the system can operate down to 5°C or up to 40°C for a maximum of 10% of its annual operating hours. For temperatures between 35°C and 40°C, de-rate maximum allowable dry bulb temperature by 1°C per 175m above 950m (1°F per 319ft).
	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.
	For temperatures between 40°C and 45°C, de-rate maximum allowable dry bulb temperature by 1°C per 125m above 950 m (1°F per 228ft).
	When operating in the expanded temperature range, system performance may be impacted.
	When operating in the expanded temperature range, ambient temperature warnings may be reported on the LCD and in the System Event Log.
	Various configuration limitations will apply to systems eligible to run in the expanded operating temperature ranges.
Continuous operation	10°C to 35°C (50°F to 95°F) at 20% to 80% relative humidity with 26°C (78.8°F) maximum dew point (maximum wet bulb temperature). De-rate maximum allowable dry bulb temperature at 1°C per 300m above 900m (1°F per 547ft above 2953ft).
Temperature	
Operating	See Dell Fresh Air for temperature information
Storage	−40°C to 65°C (-40°F to 149°F) with a maximum temperature gradation of 20°C per hour
Relative humidity	
Operating	See Dell Fresh Air for relative humidity information
Storage	5% to 95% at a maximum wet bulb temperature of 33°C (91°F); atmosphere must be non-condensing at all times
Maximum vibration	
Operating	0.26 Grms at 5Hz to 350Hz for 15 minutes
Storage	1.54 Grms at 10Hz to 250Hz for 15 minutes
Maximum shock	
Operating	One shock pulse in the positive z axis (one pulse on each side of the system) of 31G for up to 2.6ms
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 71G for up to 2ms

Altitude	
Operating	−15.2m to 3048m (−50 ft to 10,000 ft)
Storage	−15.2m to 10,668m (−50 ft to 35,000 ft)
Airborne contaminant level	
Class G1 or lower as defined by ISA-S71.04-1985	

USB peripherals

VRTX supports USB peripherals through the front USB ports, which are USB 2.0 compliant.

Appendix B. Standards compliance

VRTX conforms to the industry standards in Table 20.

Table 20.   Industry standards documentation

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
DDR3 Memory DDR3 SDRAM Specification, Rev. 3A	jedec.org/download/search/JESD79-3C.pdf
LPC Low Pin Count Interface Specification, Rev. 1.1	developer.intel.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0 and 3.0	.pcisig.com/specifications/pciexpress
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	trustedcomputinggroup.org
UEFI Unified Extensible Firmware Interface Specification, v2.1	uefi.org/specs
USB Universal Serial Bus Specification, Rev. 2.0	usb.org/developers/docs
Windows Logo Windows Logo Program System and Device Requirements, v3.10	microsoft.com/whdc/winlogo/hwrequirements.mspx

Appendix C. Additional resources

Table 21 provides a list of documents and websites that provide for more information about VRTX.

Table 21.   Additional resources

Resource	Description of contents	Location
Dell PowerEdge VRTX Systems Owner's 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
Dell PowerEdge VRTX Getting Started Guide	This guide ships with the system, and is also available in PDF format on the Dell support site. 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 system in a rack.	Dell.com/Support/Manuals
Cable Management Arm Installation Instructions	This document ships with the rack kits, and provides instructions for installing the cable management arm on a rack.	Dell.com/Support/Manuals
System Information Label	The system information label documents the system board layout and system jumper settings.	On the system
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.	On the system
Information Update	This document ships with the system, and is also available in PDF format on the Dell support site. This document provides system update information.	Dell.com/Support/Manuals

Resource	Description of contents	Location
Energy Smart Solution Advisor (ESSA)	This Dell online advisor 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/ESSA
OpenManage Advisor	Use this simple web-based utility to assist in determining systems management requirements for IT environments of all sizes. Enter end-user information in the tool to determine a recommended systems management solution bases upon user-specified criteria.	Dell.com/openmanageadvisor
Power and cooling technologies	Provides details for improving energy efficiency in the data center.	Dell.com/PNC
Energy management	Provides information on Dell Fresh Air cooling solutions.	Dell.com/FreshAir
Operating system matrix for Dell PowerEdge systems	Provides updated information on which operating systems are available on which PowerEdge systems.	Dell.com/OSsupport
WS-MAN Script Library	Web Services for Management (WS-MAN) is a standards-based protocol for managing servers, devi ces and applications. The Dell WS-MAN Script Library helps simplify development of customized scripts.	delltechcenter.com/page/Scripting+the+Dell+Lifecycle+Controller
Processor and chipset	Provides more information about system processors and chipset.	Intel.com
Dell PowerEdge RAID controllers	Provides more information on Dell PERC cards.	Dell.com/PERC
Power distribution unit	Provides help selecting a PDU.	DellPDU.com
Uninterruptible power supply	Provides help selecting a UPS model.	DellUPS.com
Volatility information	Contact your Dell Sales Representative.	
Dell Enterprise Acoustics	White paper that explores the mechanisms of, people's reaction to, language of, and Dell's work to control noise from Enterprise products.	Dell.com/downloads/global/products/pedge/en/acoustical-education-dell-enterprise-white-paper.pdf