

# PowerEdge R720 and R720xd



## Technical Guide



Built to run complex workloads using highly scalable memory, I/O capacity, and flexible network options.



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# Table of contents

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1	System overview.....	6
	Introduction.....	6
	New technologies .....	7
2	System features .....	8
	Specifications .....	8
	Comparison of PowerEdge systems .....	10
3	Chassis views and features.....	11
	Chassis views.....	11
	Chassis features .....	14
4	Processors.....	18
	Processor features.....	18
	Supported processors.....	19
	GPU support.....	19
	Chipset.....	20
5	Memory.....	21
	Supported memory .....	21
	Memory configurations .....	22
	Memory speed .....	23
	Memory RAS features.....	24
6	Storage.....	25
	Internal storage .....	25
	External storage .....	27
	Storage controllers.....	27
	Optical drives.....	29
	Tape drives.....	29
7	Networking and PCIe .....	30
	Select Network Adapters.....	30
	PCIe expansion .....	32
8	Power, thermal, and acoustics .....	34
	Power consumption and energy efficiency.....	34
	Power supply units .....	35
	Thermal and acoustics.....	36
9	Rack rails and cable management.....	39
	Sliding and static rail systems.....	39
	Cable management arm.....	41
10	Operating systems and virtualization .....	42
	Supported operating systems.....	42
	Supported virtualization .....	43
11	Dell OpenManage systems management.....	44
	Systems management solutions.....	44
	OpenManage systems management .....	45
	Dell server management operations.....	49
Appendix A.	Additional specifications.....	52
	Chassis dimensions .....	52
	Chassis weight.....	52
	Power supply specifications .....	53
	Environmental specifications .....	53
	Video specifications .....	54
	Rack rail specifications .....	55
	USB peripherals.....	55



Appendix B. Standards compliance .....	56
Appendix C. Additional resources.....	57

## Tables

Table 1. New technologies .....	7
Table 2. Technical specifications .....	8
Table 3. Comparison of PowerEdge R710, R720, and R720xd .....	10
Table 4. Chassis features .....	14
Table 5. Security features .....	16
Table 6. Supported processors .....	19
Table 7. Memory technologies supported .....	21
Table 8. DIMMs supported .....	22
Table 9. Memory speed capabilities .....	23
Table 10. Memory RAS features .....	24
Table 11. Chassis options .....	25
Table 12. Supported hard drives .....	26
Table 13. Supported external storage device types.....	27
Table 14. RAID controllers .....	28
Table 15. Supported Select Network Adapter options and features .....	31
Table 16. PCIe expansion slots.....	32
Table 17. Supported NICs and HBAs.....	32
Table 18. Supported PCIe expansion cards .....	33
Table 19. Power tools and technologies .....	34
Table 20. Power supply efficiency .....	36
Table 21. R720 acoustical performance (2.5-inch chassis) .....	38
Table 22. R720xd acoustical performance (2.5-inch chassis) .....	38
Table 23. Supported rack rail system .....	40
Table 24. Primary operating system support .....	42
Table 25. Virtual guest operating system support .....	43
Table 26. Virtualization support .....	43
Table 27. iDRAC7 with Lifecycle Controller functions and benefits.....	45
Table 28. Feature comparison for iDRAC7 Express and Enterprise .....	46
Table 29. One-to-one and one-to-many operations .....	50
Table 30. Chassis weight .....	52
Table 31. Power supply specifications .....	53
Table 32. Environmental specifications .....	53
Table 33. Supported video modes.....	54
Table 34. Rail adjustability ranges .....	55
Table 35. Industry standard documents .....	56
Table 36. Additional resources .....	57

## Figures

Figure 1. R720 front view (2.5" chassis with bezel) .....	11
Figure 2. R720 front view (2.5" chassis without bezel) .....	11
Figure 3. R720xd front view (with bezel) .....	12
Figure 4. R720xd front view (2.5-inch chassis without bezel) .....	12
Figure 5. R720 back view .....	12
Figure 6. R720xd back view.....	13
Figure 7. R720 internal chassis view .....	13
Figure 8. R720xd internal chassis view.....	14
Figure 9. R720 LCD control panel.....	15
Figure 10. R720xd LED panel .....	15
Figure 11. QRL code inside chassis.....	16
Figure 12. Rack network daughter card (NDC).....	30



Figure 13. 750W power supply unit (R720) .....	36
Figure 14. Sliding rails with optional CMA .....	39
Figure 15. Static rails .....	40
Figure 16. Dell systems management solutions .....	44
Figure 17. Systems management server lifecycle .....	50
Figure 18. Chassis dimensions .....	52



# 1 System overview

## Introduction

The Dell™ PowerEdge™ R720 and R720xd are Dell's latest 2-socket, 2U rack servers that are designed to run complex workloads using highly scalable memory, I/O capacity, and flexible network options. Both systems feature the Intel® Xeon® processor E5-2600 product family, up to 24 DIMMS, PCI Express® (PCIe) 3.0 enabled expansion slots, and a choice of NIC technologies.

The PowerEdge R720 is a general-purpose platform with highly expandable memory (up to 768GB) and impressive I/O capabilities to match. The R720 can readily handle very demanding workloads, such as data warehouses, e-commerce, virtual desktop infrastructure (VDI), databases, and high performance computing (HPC) as a data node.

In addition to the R720's capabilities, the R720xd offers extraordinary storage capacity, making it well suited for data-intensive applications that require storage and I/O performance, like medical imaging and email servers.

## Manage data overload

Keep pace with the explosion of data in the virtual age with the flexible I/O and storage capabilities of the R720 and R720xd. The R720 supports up to sixteen internal hard drives to increase your capacity, while optional hot-plug, front-access Express Flash PCIe solid-state drives (up to four) enable performance-enhancing, in-box storage tiering.

The PowerEdge R720xd allows you to quickly access and process vast amounts of data with up to twenty-six internal hot-plug hard disks. The R720xd is a great solution for any mid-size or large business that requires scalability in storage capacity.

## Tailor your network fabric

The R720 and R720xd allow you to tailor your network throughput to match your application needs, enabling added I/O performance. Select Network Adapters, Dell's flexible NIC technology, let you choose the right network fabric without using up a valuable PCI slot. You can pick speed, technology, vendor and other options, like switch independent partitioning (SIP) that lets you share and manage bandwidth on 10GbE connections.

## Virtualize more

Maximize your data center's application capacity by expanding your virtual environment using the large memory footprint of the R720 and R720xd. Choose an industry-leading hypervisor and take advantage of our system management capability to manage both physical and virtual assets. Redundant failsafe hypervisors can also help maximize your virtual machines' uptime. Dell's Virtual Integrated System™ (VIS) solution lets you enable complex virtualization environments in just a few mouse clicks.

## Dell OpenManage systems management

The Dell OpenManage™ systems management portfolio includes the Integrated Dell Remote Access Controller (iDRAC) with Lifecycle Controller. Dell embedded server management features help IT Administrators manage Dell servers in physical, virtual, local and remote environments, operating in-band or out-of-band, with or without a systems management software agent. OpenManage also integrates with and connects to third-party systems management solutions so you can maintain your single point of control and capitalize on your existing investment. OpenManage solutions



simplify the lifecycle of deploying, updating, monitoring, and maintaining your Dell PowerEdge servers.

## New technologies

New technologies featured on the PowerEdge R720 and R720xd systems are detailed in Table 1.

**Table 1. New technologies**

New technologies	Detailed descriptions
<b>Intel Xeon processor E5-2600 product family</b>	This new family of Intel processors has embedded PCIe lanes for improved I/O performance. See the Processors section for details.
<b>Intel C600 series chipset</b>	The Intel Platform Controller Hub (PCH) chip is used on the R720 and R720xd.
<b>1600 MT/s DDR3 memory</b>	Certain models of E5-2600 series processors support 1600 MT/s memory. The R720 and R720xd support two DIMMs per channel at 1600 MT/s with these processors. See the Memory section for details.
<b>LRDIMM</b>	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. See the Memory section for more information.
<b>Flexible LOM</b>	Dell's Select Network Adapter options allow you to customize your LAN port combinations from your choice of controller vendors. See the Networking and PCIe section for details.
<b>Next generation PERC options</b>	The R720 and R720xd support new PERC controller cards with improved functionality and faster performance. See the Storage section for details.
<b>PERC S110 software RAID solution</b>	This new software RAID solution supports RAID 0, 1, 5 and 10 and supports a maximum of four hot-plug SATA HDDs or SSDs. See the Storage section for details.
<b>Express Flash drives<sup>1</sup></b>	Dell Express Flash PCIe solid-state drives provide fast performance without requiring processor resources or capturing DRAM. The R720 supports up to four Express Flash drives. The R720xd does not support Express Flash drives.
<b>iDRAC7 with Lifecycle Controller</b>	The new embedded system management solution for Dell servers features hardware and firmware inventory and alerting, in-depth memory alerting, faster performance, a dedicated gigabit port and many more features. See the Dell OpenManage systems management section for details.
<b>Internal GPU support</b>	The R720 supports internal graphics processing units (GPUs) for extreme computing power to solve high performance computing (HPC) needs. The R720xd does not support internal GPUs. See the Processors section for details.
<b>Advanced power management</b>	The R720 and R720xd support advanced power monitoring and power capping tools that can help manage power consumption.
<b>DC power supply<sup>1</sup></b>	A new 1100W DC power supply option will be available for the R720 and R720xd.
<b>Failsafe hypervisors</b>	The internal dual SD module enables Dell's unique Failsafe Virtualization architecture, ensuring uptime by providing failover capability for embedded hypervisors, such as VMware® ESXi™.
<b>Fresh air cooling</b>	Dell has tested and validated an integrated data center solution that enables you to operate at higher temperatures or even chiller-less. See the Power, thermal, and acoustics section for details.

<sup>1</sup>Available Q2 2012



## 2 System features

Compared to the previous generation of Dell™ PowerEdge™ servers, the R720 and R720xd have more drive bay options, more PCIe slots, a larger memory footprint, flexible I/O, Express Flash PCIe solid-state drives (available Q2 2012), advanced system management, and hot-plug redundant cooling. The R720 also supports optional dual internal RAID controllers and up to four optional internal GPUs.

### Specifications

Table 2 lists the technical specifications for the PowerEdge R720 and R720xd systems. For the latest information on supported features, visit [Dell.com](http://Dell.com).

**Table 2. Technical specifications**

Feature	Specification		
<b>Form factor</b>	2U rack		
<b>Processors</b>	Intel® Xeon® processor E5-2600 product family		
<b>Processor sockets</b>	2		
<b>Front side bus (FSB)</b>	2 Intel QuickPath Interconnect (QPI) links; 6.4 GT/s; 7.2 GT/s; 8.0 GT/s		
<b>Cache</b>	2.5MB per core; core options: 2, 4, 6, 8		
<b>Chipset</b>	Intel C600		
<b>Memory<sup>1</sup></b>	Up to 768GB (24 DIMM slots): 2GB/4GB/8GB/16GB/32GB DDR3 up to 1600MT/s		
<b>PCIe slots</b>	<table border="0"> <tr> <td style="vertical-align: top;"><b>R720:</b> 7 PCIe slots: One x16 full-length, full-height Three x8 full-length, full-height Three x8 half-length, half-height</td> <td style="vertical-align: top;"><b>R720xd:</b> 6 PCIe slots: Two x16 full-length, full-height One x8 full-length, full-height Three x8 half-length, half-height</td> </tr> </table>	<b>R720:</b> 7 PCIe slots: One x16 full-length, full-height Three x8 full-length, full-height Three x8 half-length, half-height	<b>R720xd:</b> 6 PCIe slots: Two x16 full-length, full-height One x8 full-length, full-height Three x8 half-length, half-height
<b>R720:</b> 7 PCIe slots: One x16 full-length, full-height Three x8 full-length, full-height Three x8 half-length, half-height	<b>R720xd:</b> 6 PCIe slots: Two x16 full-length, full-height One x8 full-length, full-height Three x8 half-length, half-height		
<b>RAID controller</b>	<table border="0"> <tr> <td style="vertical-align: top;"><b>Internal controllers:</b> PERC S110 (software RAID; R720 only) PERC H310 PERC H710 PERC H710P</td> <td style="vertical-align: top;"><b>External HBAs (RAID):</b> PERC H810  <b>External HBAs (non-RAID):</b> 6Gbps SAS HBA</td> </tr> </table>	<b>Internal controllers:</b> PERC S110 (software RAID; R720 only) PERC H310 PERC H710 PERC H710P	<b>External HBAs (RAID):</b> PERC H810  <b>External HBAs (non-RAID):</b> 6Gbps SAS HBA
<b>Internal controllers:</b> PERC S110 (software RAID; R720 only) PERC H310 PERC H710 PERC H710P	<b>External HBAs (RAID):</b> PERC H810  <b>External HBAs (non-RAID):</b> 6Gbps SAS HBA		
<b>Hard drives (hot-plug)</b>	<p><b>R720 drive bay options:</b></p> <ul style="list-style-type: none"> <li>Up to 16 x 2.5"</li> <li>Up to 8 x 2.5" + 8 x 2.5" (with dual RAID controllers)</li> <li>Up to 8 x 2.5"</li> <li>Up to 8 x 2.5" + 4 x 2.5" Express Flash<sup>2</sup> or up to 8 x 3.5"</li> </ul> <p><b>R720xd drive bay options:</b></p> <ul style="list-style-type: none"> <li>Up to 24 x 2.5" (front) + 2 x 2.5" (back) or</li> <li>Up to 12 x 3.5" (front) + 2 x 2.5" (back)</li> </ul> <p><b>Hard drive options:</b></p> <ul style="list-style-type: none"> <li>2.5" SAS SSD, SATA SSD, SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K)</li> <li>2.5" Express Flash PCIe SSD<sup>2</sup> (R720 only)</li> <li>3.5" SAS (15K), nearline SAS (7.2K), SATA (7.2K)</li> </ul> <p>Self-encrypting drives (SEDs) available</p>		





Feature	Specification
<b>Integrated NIC</b>	<p><b>Select Network Adapter options:</b>            Broadcom® Quad Port 1GbE BASE-T (no TOE or iSCSI offload)            Intel Quad Port 1GbE BASE-T (no TOE or iSCSI offload)            Intel Dual Port 10GbE BASE-T with 2 x 1GbE (FCoE capability enabled on the 10GbE ports)            Broadcom Dual Port 10GbE SFP+ with 2 x 1GbE (TOE and iSCSI offload available on 10GbE ports)</p>
<b>Power supply</b>	Auto-ranging, Platinum efficiency 495W, 750W, 1100W AC or Gold efficiency 1100W DC <sup>2</sup>
<b>Availability</b>	High-efficiency, hot-plug, redundant power supplies; hot-plug drive bays; TPM; dual internal SD support; hot-plug redundant fan; optional bezel; luggage-tag; ECC memory, interactive LCD screen (R720 only); extended thermal support; ENERGY STAR® compliant; switch independent partitioning
<b>Remote management</b>	iDRAC7 with Lifecycle Controller iDRAC7 Express (default), iDRAC7 Enterprise (upgrade option) 8GB vFlash media (upgrade option), 16GB vFlash media (upgrade option)
<b>Systems management</b>	Dell OpenManage™ Essentials and Dell Management Console Dell OpenManage Power Center OpenManage Connections: <ul style="list-style-type: none"> <li>• OpenManage Integration Suite for Microsoft® System Center</li> <li>• Dell Management Plug-in for VMware® vCenter™</li> <li>• OpenManage Connections for HP Operations Manager, IBM Tivoli® Netcool®, and CA Network and Systems Management</li> </ul> IPMI 2.0 compliant
<b>Rack support</b>	ReadyRails™ sliding rails with optional cable management arm for 4-post racks
<b>Operating systems</b>	Microsoft Windows Server® 2008 R2 SP1, x64 (includes Hyper-V™ v2) Microsoft Windows® HPC Server 2008 Microsoft Windows Small Business Server 2011 SUSE® Linux® Enterprise Server Red Hat® Enterprise Linux  <b>Optional embedded hypervisors:</b> Citrix® XenServer™ VMware vSphere™ For more information on the specific versions and additions, visit <a href="http://Dell.com/OSsupport">Dell.com/OSsupport</a> .

<sup>1</sup>GB means 1 billion bytes and TB means 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less

<sup>2</sup>Available Q2 2012



## Comparison of PowerEdge systems

The PowerEdge R720 and R720xd are replacements for the predecessor R710 system, three systems which are compared in Table 3. For the latest information on supported features, visit [Dell.com](http://Dell.com).

**Table 3. Comparison of PowerEdge R710, R720, and R720xd**

Feature	PowerEdge R710	PowerEdge R720 (new)	PowerEdge R720xd (new)
<b>Chassis</b>	2U rack	2U rack	2U rack
<b>Processors</b>	Intel® Xeon® processors 5500 and 5600 series	Intel Xeon processor E5-2600 product family	Intel Xeon processor E5-2600 product family
<b>Front Side Bus (FSB)</b>	Intel QuickPath Interconnect	Intel QuickPath Interconnect	Intel QuickPath Interconnect
<b>Memory<sup>1</sup></b>	18 x DDR3 RDIMM and UDIMM Up to 288GB	24 x DDR3 RDIMM, UDIMM, and LRDIMM Up to 768GB	24 x DDR3 RDIMM, UDIMM, and LRDIMM Up to 768GB
<b>Hard drive bays (hot plug)</b>	Up to 8 x 2.5" or 6 x 3.5"	Up to 16 x 2.5" or 8 x 3.5"	Up to 24 x 2.5" + 2 x 2.5" or 12 x 3.5" + 2 x 2.5"
<b>RAID controller</b>	PERC 6/i, SAS 6/iR, PERC 6/E, H200, H700, H800	PERC S110, H310, H710, H710P, H810 (external); supports multiple (2) internal RAID controllers	PERC H310, H710, H710P, H810 (external)
<b>PCI slots</b>	4 PCIe 2.0	7 PCIe 3.0	6 PCIe 3.0
<b>Express Flash drives<sup>2</sup></b>	Not supported	Up to 4	Not supported
<b>Onboard NICs</b>	4 x 1GbE with optional TOE	Select Network Adapter: minimum configuration of 4 x 1Gb, 10GbE (optional)	Select Network Adapter: minimum configuration of 4 x 1Gb, 10GbE (optional)
<b>Power supplies</b>	Hot-plug, redundant power supply units: 570W or 870W	Hot-plug, redundant power supply units: 495W, 750W, 1100W, 1100W DC <sup>1</sup>	Hot-plug, redundant power supply units: 495W, 750W, 1100W, or 1100W DC <sup>2</sup>
<b>Power efficiency</b>	Gold	Platinum	Platinum
<b>Systems management</b>	Dell OpenManage™ Dell Management Console Lifecycle Controller 1.x	Dell OpenManage Essentials Dell Management Console Lifecycle Controller 2.x OpenManage Power Center	Dell OpenManage Essentials Dell Management Console Lifecycle Controller 2.x OpenManage Power Center
<b>Remote management</b>	iDRAC6 (Express or Enterprise) with Lifecycle Controller 1.x	iDRAC7 (Express or Enterprise) with Lifecycle Controller 2.x	iDRAC7 (Express or Enterprise) with Lifecycle Controller 2.x
<b>Internal GPU</b>	Not supported	2 x 300W (double wide) or 4 x 150W (single wide)	Not supported
<b>Availability</b>	Hot-plug drives, redundant cooling, hot-plug, redundant power supply units, internal SD module	Hot-plug drives, hot-plug redundant cooling, hot-plug redundant power supply units, internal dual SD module	Hot-plug drives, hot-plug redundant cooling, hot-plug redundant power supply units, internal dual SD module

<sup>1</sup>GB means 1 billion bytes and TB means 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less

<sup>2</sup>Available Q2 2012



### 3 Chassis views and features

The Dell™ PowerEdge™ R720 and R720xd implement a new chassis design which supports an increased number of DIMMs, PCIe slots, and hard drives, relative to their predecessor servers. The following sections provide external and internal views of the systems and describe the chassis features.

For information on features and descriptions for these systems, see the *Dell PowerEdge R720 and R720xd Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

#### Chassis views

The R720 and R720xd are available in several chassis options with varying numbers of drive bays. Note that a chassis cannot be reconfigured or upgraded after point of purchase.

##### R720 front views

The R720 supports up to sixteen 2.5" or up to eight 3.5" front-accessible, hot-plug hard drives that are secured by a removable front bezel. Other front-panel features include an interactive LCD control panel, two USB connectors, a video connector, and a vFlash media card slot.

**Figure 1. R720 front view (2.5" chassis with bezel)**



**Figure 2. R720 front view (2.5" chassis without bezel)**



## R720xd front views

The R720xd supports up to twenty-four 2.5" or up to twelve 3.5" front-accessible, hot-plug hard drives that are secured by a removable front bezel. Other front-panel features include an LED control panel, a USB connector, and a video connector.

**Figure 3. R720xd front view (with bezel)**



**Figure 4. R720xd front view (2.5-inch chassis without bezel)**



## R720 back view

The R720 back panel includes features such as redundant hot-plug power supply units (PSUs), four Ethernet connectors, PCI expansion slots, and many other features that are described in the rest of this guide.

**Figure 5. R720 back view**



## R720xd back view

In addition to the R720 back-panel features, the R720xd also includes two optional 2.5-inch hot-plug drives in the back of the system.

**Figure 6. R720xd back view**



## Internal chassis views

The chassis design of the R720 and R720xd is optimized for easy access to components and for airflow for effective and efficient cooling. The R720 and R720xd support up to 24 DIMMs, 2 processors, hot-plug redundant fans, and many other components and features that are described in this guide.

**Figure 7. R720 internal chassis view**

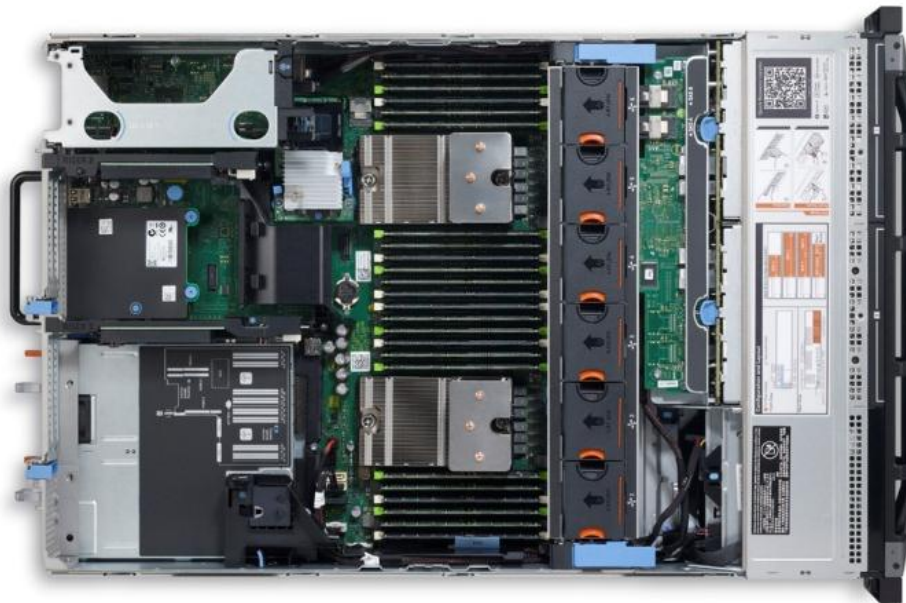


Figure 8. R720xd internal chassis view



For additional system views, see the *Dell PowerEdge R720 and R720xd Systems Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

## Chassis features

Table 4 lists the chassis features for the R720 and R720xd systems. For additional information on these features, see the *Dell PowerEdge R720 and R720xd Systems Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

Table 4. Chassis features

Feature	Description
<b>Power button and indicator</b>	ACPI-complaint power button with an integrated green power LED
<b>NMI button</b>	Recessed non-maskable interrupt (NMI) button used to troubleshoot software and device driver errors; use only if directed to do so by qualified support personnel or by the operating system's documentation
<b>System identification button</b>	Buttons on the back and front of a system to help identify the unit in a data center environment
<b>Hard drive activity LEDs</b>	Indicate the status and activity of the hard drives
<b>USB connectors</b>	Two (R720) or one (R720xd) front, two back, and one internal USB connector
<b>vFlash media reader</b>	Supports one vFlash media card (the R720 slot is located in the front of the system and the R720x slot is located in the back); functionality is activated only when iDRAC Enterprise is enabled
<b>Video connector</b>	Connects a monitor to the system
<b>LCD control panel</b>	Provides user access to buttons, display, and I/O interfaces (R720 only)
<b>LED panel</b>	Indicates the status of system conditions (R720xd only)
<b>Hard drives</b>	Front-accessible, hot-plug hard drives plus two optional back-accessible hot-plug hard drives (R720xd only)



Feature	Description
<b>Optical drive (optional)</b>	The R720 supports one optional slimline SATA DVD-ROM drive or DVD+/-RW drive; R720xd does not support an internal optical drive
<b>System identification panel</b>	Slide-out label panel for system information
<b>Serial connector</b>	Connects a serial device to the system and for console redirect
<b>iDRAC7 Enterprise port</b>	Dedicated management port for optional iDRAC7 Enterprise
<b>Security cable slot</b>	Connects cable lock to system
<b>PCIe expansion card slots</b>	The R720 supports up to seven PCIe expansion cards; R720xd supports up to six PCIe expansion cards
<b>Ethernet connectors</b>	Choice of network connectors through Select Network Adapter family
<b>Power supply units</b>	Up to two back-accessible, hot-plug power supplies
<b>Power supply indicators</b>	Indicate whether system has power
<b>NIC indicators</b>	Indicate network activity and status
<b>Quick Resource Locator (QRL)</b>	This code on the chassis can be scanned by a phone application to access information about the server

### LCD control panel (R720)

The R720 system control panel is located on the front of the chassis to provide user access to buttons, display, and I/O interfaces. For more information on the R720 LCD control panel, see the *Dell PowerEdge R720 and R720xd Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

**Figure 9. R720 LCD control panel**



### LED panel (R720xd)

The R720xd LED panel is located on the front of the chassis to indicate the status of system conditions. For more information on the R720xd LED panel, see the *Dell PowerEdge R720 and R720xd Systems Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

**Figure 10. R720xd LED panel**



## Quick Resource Locator

A useful feature included with Dell™ PowerEdge 12<sup>th</sup> generation servers is the Quick Resource Locator (QRL)—a model-specific Quick Response (QR) code that is located on the server (shown in Figure 11). Just use your phone to access the Dell QRL application to learn more about the server.

**Figure 11. QRL code inside chassis**



This QRL code allows you to:

- View step-by-step videos, including overviews of system internals and externals, as well as detailed, concise, task-oriented videos and installation wizards
- Locate reference materials, including searchable owner's manual content, LCD diagnostics, and an electrical overview
- Look up your service tag so you can quickly gain access to your specific hardware configuration info and warranty information
- Contact Dell directly (by link) to get in touch with technical support and sales teams and provide feedback to Dell

These codes provide an easy way to retrieve the critical support information you need when you need it, making you more efficient and effective in managing your hardware.

## Security features

The latest generation of PowerEdge servers has the features listed in Table 5 to help ensure the security of your data center.

**Table 5. Security features**

Security feature	Description
<b>Cover latch</b>	A toolled latch is integrated in the top cover to secure it to the rack chassis.
<b>Front bezel</b>	An optional metal bezel is mounted to the chassis front to provide the Dell ID. A lock on the bezel is used to protect un-authorized access to hard drives. System status is viewable on the LCD or LED panel when the bezel is installed.





Security feature	Description
<b>TPM</b>	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.
<b>Power-off security</b>	BIOS has the ability to disable the power button function.
<b>Intrusion alert</b>	An internal switch is used to detect chassis intrusion.
<b>Secure mode</b>	BIOS has the ability to enter a secure boot mode through system setup. This mode includes the option to lock out the power and NMI switches on the control panel or set up a system password.



## 4 Processors

The Dell™ PowerEdge™ R720 and R720xd feature the Intel® Xeon® processor E5-2600 product family, offering an ideal combination of performance, power efficiency, and cost. These processors provide high performance no matter what your constraint is—floor space, power, or budget—and on workloads that range from the most complicated scientific exploration to crucial web-serving and infrastructure applications. In addition to providing raw performance gains, improved I/O is also made possible with Intel Integrated I/O, which can reduce latency by adding more lanes and doubling bandwidth. This helps to reduce network and storage bottlenecks, unleashing the processor's performance capabilities.

### Processor features

The new Intel Xeon processor E5-2600 product family not only adds new features, but also improves upon many features of the predecessor Intel Xeon processor 5600 series, including:

- Up to two additional cores and up to 8MB more last level cache
- More memory—six additional DIMMs and support for up to 32GB DIMMs, which increases memory capacity from 288GB (R710) to 768GB (R720/R720xd)
- Intel Integrated I/O has support for up to 80 lanes of PCIe 3.0, which can reduce latency
- Faster connections are provided throughout the system with support for DDR3 1600 MT/s memory and 8.0 GT/s QPI
- Intel Data Direct I/O (DDIO) allows I/O traffic to skip the main system memory and be directed straight to the processor cache, which can provide a significant reduction in latency as well as allowing memory to remain in a low-power state
- Intel Advanced Vector Extensions offer up to double the floating point operations per clock cycle by doubling the length of registers, which can be useful for addressing very complex problems or dealing with large-number calculations, which are integral to many technical, financial, and scientific computing problems
- Intel Turbo Boost Technology 2.0 delivers up to double the boost than the previous-generation turbo technology
- Continued improvements to both Intel TXT and AES-NI help to better protect systems and data

For more information on the Intel® Xeon® processor E5-2600 product family, visit [intel.com](http://intel.com).



## Supported processors

The R720 and R720xd support up to two processors with up to eight cores per processor. Table 6 lists the Intel Xeon processors supported by the PowerEdge R720 and R720xd. For the latest information on supported processors, visit [Dell.com](http://Dell.com).

**Table 6. Supported processors**

Model	Speed	Cache	QPI	Cores	Turbo	TDP
<b>E5-2690<sup>1</sup></b>	2.9GHz	20M	8.0 GT/s	8	Yes	135W
<b>E5-2680</b>	2.7GHz	20M	8.0 GT/s	8	Yes	130W
<b>E5-2670</b>	2.6GHz	20M	8.0 GT/s	8	Yes	115W
<b>E5-2667</b>	2.9GHz	15M	8.0 GT/s	6	Yes	130W
<b>E5-2665</b>	2.4GHz	20M	8.0 GT/s	8	Yes	115W
<b>E5-2660</b>	2.2GHz	20M	8.0 GT/s	8	Yes	95W
<b>E5-2650L</b>	1.8GHz	20M	8.0 GT/s	8	Yes	70W
<b>E5-2650</b>	2.0GHz	20M	8.0 GT/s	8	Yes	95W
<b>E5-2643</b>	3.3GHz	10M	8.0 GT/s	4	Yes	130W
<b>E5-2640</b>	2.5GHz	15M	7.2 GT/s	6	Yes	95W
<b>E5-2637</b>	3.0GHz	5M	6.4 GT/s	2	Yes	80W
<b>E5-2630</b>	2.3GHz	15M	7.2 GT/s	6	Yes	95W
<b>E5-2630L</b>	2.0GHz	15M	7.2 GT/s	6	Yes	60W
<b>E5-2620</b>	2.0GHz	15M	7.2 GT/s	6	Yes	95W
<b>E5-2609</b>	2.4GHz	10M	6.4 GT/s	4	No	80W
<b>E5-2603</b>	1.8GHz	10M	6.4 GT/s	4	No	80W

<sup>1</sup>R720 only; not supported on R720xd.

For information on processor installation and configuration, see the *Dell PowerEdge R720 and R720xd Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

## GPU support

Graphics processing unit (GPU) technology is supported on the R720, which can provide accelerated performance for a variety of applications, including virtual desktop infrastructure (VDI) and high-performance computing (HPC) implementations.

The R720xd does not support internal or external GPUs.

### Internal GPU support

The R720 can support two 300W, full-length, double-wide GPUs or up to four 150W, full-length, single-wide GPUs. Each GPU can support up to 6GB of dedicated GDDR5 memory. Active-cooled GPU cards are not supported. For a list of supported GPUs, see Table 18.



## External GPU support

The R720 can connect to the PowerEdge C410x through a host interface card (HIC) and an iPass cable. Both the NVIDIA® and Dell x16 HIC require one x16 PCIe slot. Each HIC can support up to four GPUs. The R720 can support up to four GPUs maximum. For a list of supported GPU HICs, see Table 18.

## Operating system support for GPUs

Some operating systems have not been validated to support GPUs. See Table 24 and Table 25 for more information on operating system support of GPUs.

## Chipset

The Intel C600 chipset is implemented on the PowerEdge R720 and R720xd. For more information, visit [intel.com](http://intel.com).



## 5 Memory

More memory options are available than ever before with the Dell™ PowerEdge™ R720 and R720xd—greater capacities, higher frequencies, and more flexibility. The R720 and R720xd support up to 768GB of memory (24 DIMMs) and speeds up to 1600 MT/s, providing high performance in a variety of applications. High memory density means there is no compromise when it comes to virtualization.

Increase your uptime and reduce data loss, due to Dell's focus on reliability, availability, and serviceability (RAS) features. RAS aids in the rapid and accurate diagnosis of faults which require service, increasing your memory reliability. System uptime is reinforced with RAS features like memory mirroring, sparing, and many others.

In addition to supporting existing unbuffered DIMMs (UDIMMs) and registered DIMMs (RDIMMs), the R720 and R720xd support load reduced DIMMs (LRDIMMs), which use a buffer to reduce memory loading and provide greater density, allowing for the maximum platform memory capacity.

### Supported memory

Table 7 lists the memory technologies supported by the R720 and R720xd.

**Table 7. Memory technologies supported**

Feature	UDIMM	RDIMM	LRDIMM
Register	No	Yes	Yes
Buffer	No	No	Yes
Frequencies	800, 1066, 1333, or 1600MT/s	800, 1066, 1333, or 1600MT/s	1066 or 1333MT/s
Ranks supported	1 or 2	1, 2, or 4	4
Capacity per DIMM	2 or 4GB	2, 4, 8, 16, or 32GB	32GB
Maximum DIMMS per channel	2	3	3
DRAM technology	x8	x4 or x8	x4
Temperature sensor	Yes	Yes	Yes
ECC	Yes	Yes	Yes
SDDC	Yes (with advanced ECC mode)	Yes	Yes
Address parity	Yes	Yes	Yes



Table 8 lists the DIMMs supported on the R720 and R720xd. For the latest information on supported memory, visit [Dell.com](http://Dell.com).

**Table 8. DIMMs supported**

Capacity (GB)	Speed (MT/s)	Type	Ranks per DIMM	Data width	SDDC support	Voltage
2	1333	RDIMM	1	x8	Advanced ECC	1.35
2	1333	UDIMM	1	x8	Advanced ECC	1.35
2	1600	RDIMM	1	x8	Advanced ECC	1.5
4	1333	RDIMM	2	x8	Advanced ECC	1.35
4	1333	RDIMM	1	x4	All modes	1.35
4	1333	UDIMM	2	x8	Advanced ECC	1.35
4	1600	RDIMM	2	x8	Advanced ECC	1.5
8	1333	RDIMM	2	x4	All modes	1.35
8	1600	RDIMM	2	x4	All modes	1.5
16	1333	RDIMM	2	x4	All modes	1.35
16	1600	RDIMM	2	x4	All modes	1.5
32	1333	LRDIMM	4	x4	All modes	1.35
32	1333	RDIMM	4	x4	All modes	1.35

## Memory configurations

Flexible memory configurations are supported on the R720 and R720xd, ranging from capacities of 2 GB (minimum) to 768 GB (maximum). The R720 and R720xd support up to 12 DIMMs per processor (up to 24 DIMMs in a dual-processor configuration). Each server has four memory channels per processor, with each channel supporting up to three DIMMs.

Both systems support a flexible memory configuration, according to the following basic rules:

- **Speed:** If DIMMs of different speeds are mixed, all channels across all processors operate at the slowest DIMM's common frequency.
- **DIMM type:** Only one type of DIMM is allowed per system: UDIMM, RDIMM, or LRDIMM. These types cannot be mixed.

The following additional memory-population guidelines apply to the R720 and R720xd:

- Up to two quad-rank (QR) DIMMs and up to three dual-rank (DR) or single-rank (SR) DIMMs may be populated per channel.
- DIMMs must be installed in each channel, starting with the DIMM farthest from the processor.
- DIMMs should be installed with largest rank count to smallest. For example, if DR DIMMs are mixed with SR DIMMs, DR DIMMs should be placed in the lowest DIMM slots, followed by the SR DIMMs.

For more information on memory configuration and population, see the *Dell PowerEdge R720 and R720xd Systems Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).



## Memory speed

Memory speeds of 1600 MT/s, 1333 MT/s, 1066 MT/s, and 800 MT/s are supported on the R720 and R720xd, depending on the DIMM types installed and the configuration. All memory on all processors and channels run at the same speed and voltage. By default, the systems run at the highest speed for the channel with the lowest DIMM voltage and speed. The operating speed of the memory is also determined by the maximum speed supported by the processor, the speed settings in the BIOS, and the operating voltage of the system.

Table 9 lists the memory configuration and performance details for the R720 and R720xd, based on the population of the number and type of DIMMs per memory channel.

**Table 9. Memory speed capabilities**

DIMM type	DIMM 0	DIMM 1	DIMM 2	# of DIMMs	Speed (MT/s)			
					800	1066	1333	1600
UDIMM	SR			1	•	•	•	
	DR			1	•	•	•	
	SR	SR		2	•	•	•	
	SR	DR		2	•	•	•	
	DR	DR		2	•	•	•	
RDIMM	SR			1	•	•	•	•
	DR			1	•	•	•	•
	QR			1	•	•		
	SR	SR		2	•	•	•	•
	SR	DR		2	•	•	•	
	DR	DR		2	•	•	•	•
	QR	SR		2	•			
	QR	DR		2	•			
	QR	QR		2	•			
	SR	SR	SR	3	•	•		
	SR	SR	DR	3	•	•		
	SR	DR	DR	3	•	•		
	DR	DR	DR	3	•	•		
LRDIMM	QR			1		•	•	
	QR	QR		2		•	•	
	QR	QR	QR	3		•		



## 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 10 describes the memory RAS features supported on the R720 and R720xd.

**Table 10. Memory RAS features**

Feature	Description
<b>Dense configuration optimized profile</b>	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
<b>Memory demand and patrol scrubbing</b>	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.
<b>Recovery from single DRAM device failure (SDDC)</b>	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.
<b>Failed DIMM isolation</b>	This feature provides the ability to identify a specific failing DIMM channel pair, thereby enabling the user to replace only the failed DIMM pair.
<b>Memory mirroring: intra-socket</b>	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 memory fails. The mirrored copy of the memory is stored in memory of the same processor socket.
<b>Memory address parity protection</b>	This feature provides the ability to detect transient errors on the address lines of the DDR channel.
<b>Memory sparing (rank)</b>	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.
<b>Memory thermal throttling</b>	This feature helps to optimize power/performance and can also be used to prevent DIMMs from overheating.

For information on memory mirroring and sparing configurations, see the *Dell PowerEdge R720 and R720xd Owner's Manual* on [Support.Dell.com/Manuals](https://support.dell.com/Manuals). Memory RAID is not supported.





## 6 Storage

The Dell™ PowerEdge™ R720 and R720xd provide storage expandability that allows you to adapt to your workload and operational demands. With comprehensive storage options, the R720 and R720xd offer various drive types, internal and external storage controllers, and different chassis and backplanes for varied numbers of drives.

Due to their massive internal storage capacities, the R720 and R720xd are optimized for a variety of implementations, including virtual desktop infrastructure (VDI) environments and collaboration solutions. The R720 supports up to 16 and the R720xd supports up to 26 internal 2.5-inch drives.

Features such as Express Flash PCIe solid-state drives (available Q2 2012) and CacheCade™ provide vastly accelerated performance over previous technologies. Dell Express Flash drives use PCIe lanes to connect directly to the processor and chipset and are easily accessible by hot-plug drive bay. CacheCade uses Dell PERC storage controllers to accelerate performance over hard drives or traditional solid-state drives.

### Internal storage

The R720 and R720xd are available in several hot-plug, hard-drive chassis options, as detailed in Table 11. Note that the chassis option must be selected at the point of purchase and cannot be changed or upgraded later.

**Table 11. Chassis options**

PowerEdge server	Chassis option
<b>R720</b>	16 x 2.5" drives
	8 x 2.5" + 8 x 2.5" drives (with dual RAID controllers)
	8 x 2.5" drives
	8 x 2.5" + 4 x Express Flash <sup>1</sup> drives
	8 x 3.5" drives
<b>R720xd</b>	24 x 2.5" drives (front) + 2 x 2.5" drives (back) <sup>2</sup>
	12 x 3.5" drives (front) + 2 x 2.5" drives (back) <sup>2</sup>

<sup>1</sup>Available Q2 2012

<sup>2</sup>Back-accessible 2.5" drives are optional



## Supported hard drives

Table 12 lists the internal hard drives supported by the R720 and R720xd. For the latest information on supported hard drives, visit [Dell.com](http://Dell.com).

**Table 12. Supported hard drives**

Form factor	Type	Speed (rpm)	Capacities
3.5"	SATA (3Gb)	7.2K	250GB, 500GB, 1TB, 2TB
	Nearline SAS (6Gb)	7.2K	1TB, 2TB, 3TB
	SAS (6Gb)	15K	300GB, 600GB
2.5"	SATA (3Gb)	7.2K	250GB, 500GB, 1TB
	Nearline SAS (6Gb)	7.2K	500GB, 1TB, 1TB (SED)
	SAS (6Gb)	10K	300GB, 600GB, 900GB, 900GB (SED)
	SAS (6Gb)	15K	146GB, 300GB, 300GB (SED)
	SAS SSD (SLC, 6Gb)	N/A	200GB, 400GB
	SATA SSD (MLC, 3Gb)	N/A	100GB, 200GB
	Express Flash PCIe SSD (SLC) <sup>1</sup>	N/A	175GB, 350GB

<sup>1</sup>Available Q2 2012

## Express Flash drives

Express Flash drives use PCIe and SSD technologies to provide performance, scalability, and optimal serviceability. Accelerated performance with high IOPs is made possible without requiring processor resources or capturing DRAM. Also, Express Flash drives use a standardized, 2.5-inch hot-plug form factor, which saves critical PCIe slot space by moving drives from the back to the front of the system and allows a common management process for all drives.

The PowerEdge R720 has an option to support up to four hot-plug Express Flash PCIe SSD drives (available Q2 2012) in the 2.5-inch chassis.

The R720xd does not support Express Flash drives.



## External storage

Table 13 lists the types of external storage devices supported by the R720 and R720xd.

**Table 13. Supported external storage device types**

Device type	Description
<b>External tape</b>	Supports connection to external USB tape products (supports boot from Dell PowerVault™ RD1000)
	Supports connection to external SAS tape products
	Supports connection to external FC tape products
	Supports connection to external SCSI tape products (legacy support only)
	Supports connection to external iSCSI tape products
<b>NAS / IDM appliance software</b>	Supports NAS software stack
<b>Dell PowerVault NAS</b>	Supports connection to current PowerVault NAS (Network Attached Storage) products
<b>PowerVault DAS</b>	Supports connection to current PowerVault direct-attach storage (DAS) (including JBOD and RBOD enclosures) products
<b>PowerVault SAN</b>	Supports connection to current PowerVault storage area network (SAN) (including Dell EqualLogic™, iSCSI, Dell-EMC arrays, and JBOD disk enclosures) products
<b>PowerVault IDM</b>	Supports connection to current PowerVault intelligent data management (IDM) (archive solutions, de-duplication, B2D, and data-protection appliances) products

## Storage controllers

Dell provides highly capable RAID options for you to ensure that your data remains safe. Dell's RAID controller options offer impressive performance improvements, including the following features:

- **FastPath™ I/O:** This feature can help accelerate performance when operating on SSDs.
- **Split mirror:** This function allows you to break mirrored disk connection in order to quickly replace a drive.
- **Physical disk power management (Dimmer Switch™):** This feature allows for power control of spare or idle drives, which can save energy and operating expenses.

### Supported RAID controllers

The newest line of PowerEdge RAID Controllers (PERCs) offer high I/O performance for a variety of uses, including database applications and streaming digital media environments.

The PERC S110 is supported on the R720 (3.5-inch chassis only) and is not supported on the R720xd.



Table 14 lists the RAID controllers supported on the R720 and R720xd.

**Table 14. RAID controllers**

Controller	Description	Features	RAID modes	Form factor	Usage model
<b>PERC H810</b> External	Eight-port, external, 6Gb/s PCIe RAID controller that supports up to 192 SATA and SAS HDDs or SSDs	Includes 1GB NV DDR3 cache, premium performance and feature set, security SED/EKMS, and SSD as cache	0, 1, 10, 5, 50, 6, 60	Adapter	Premium performance
<b>PERC H710P</b> Internal	Eight-port, internal, 6Gb/s PCIe RAID controller that supports up to 32 SATA and SAS HDDs or SSDs	Includes 1GB NV DDR3 cache, premium performance and feature set, security SED/EKMS, and SSD as cache	0, 1, 10, 5, 50, 6, 60	Adapter	Premium performance
<b>PERC H710</b>	Eight-port, internal, 6Gb/s PCIe RAID controller that supports up to 32 SATA and SAS HDDs or SSDs	Includes 512MB DDR3 cache, advanced feature set, security SED/EKMS, and SSD as cache	0, 1, 10, 5, 50, 6, 60	Adapter	Performance
<b>PERC H310</b>	Eight-port, internal, 6Gb/s PCIe RAID controller that is a low-cost, entry-level solution supporting up to 32 SATA and SAS HDDs or SSDs	Supports hot-plug drives, expansion, tape drives, pass-thru	0, 1, 10, 5, 50	Adapter	Value
<b>PERC S110</b> Software RAID (R720 only)	3Gb/s SATA software RAID controller that is a low-cost, entry-level solution, supporting up to four physical disks or eight virtual disks	Supports hot-plug SATA drives (4-drive maximum); no expansion; Microsoft® Windows® only	0, 1, 5, 10	Motherboard -embedded SATA	Entry-level

For more information about the latest PERC offerings, see [Dell.com/PERC](http://Dell.com/PERC).

## CacheCade

CacheCade is a technology that provides automated storage tiering on SSDs with the PERC H810 and H710P. It works by detecting the most-often accessed data and copying it over time to the CacheCade SSD(s) where that cached data is accessed directly, instead of accessing the hard disk drives. This can dramatically increase how your applications respond when they are under peak traffic times and how they perform when response time is critical.

CacheCade provides cost-effective performance scaling for database-type applications that perform lots of random reads, and saves the cost of adding extra drives.



## Optical drives

The PowerEdge R720 supports one of the following internal optical drive options:

- DVD-ROM
- DVD+RW

The R720xd does not support an internal optical drive.

## Tape drives

The R720 supports the Dell PowerVault™ RD1000 internal backup device on the 2.5-inch chassis only. Internal tape drives are not supported on the R720, and the R720xd does not support any internal backup device.



## 7 Networking and PCIe

The Dell™ PowerEdge™ R720 and R720xd offer balanced, scalable I/O capabilities, including integrated PCIe 3.0-capable expansion slots. Dell Select Network Adapters, Dell's network daughter cards, let you choose the right network fabric without using up a valuable PCI slot. Pick the speed, technology, vendor, and other options, such as switch independent partitioning, which lets you share and manage bandwidth on 10GbE connections.

### Select Network Adapters

The Select Network Adapter family is purpose-built and includes flexible LAN on Motherboard (LOM) card options for Dell PowerEdge 12<sup>th</sup> generation servers. The Select Network Adapter form factor delivers the value of LOM integration with the system, including BIOS integration and shared port for manageability while providing the flexibility of a modular card.

The PowerEdge R720 and R720xd support one custom network daughter card (NDC), as part of Select Network Adapters family, to house the complete LOM subsystem. There are two form factors of Select Network Adapters—one for blade servers and one for rack servers (shown Figure 12). The rack NDC options supported on the R720 and R720xd include a selection of 1GbE and 10GbE port cards, such as 1000Base-T, 10GBASE-T and 10Gb SFP+.

**Figure 12. Rack network daughter card (NDC)**



Table 15 lists the available Select Network Adapter options and supported features for the R720 and R720xd.

**Table 15. Supported Select Network Adapter options and features**

Features	Broadcom® 5720 Base-T	Intel® I350 Base-T	Broadcom 57800 SFP+	Intel X540 Base-T
<b>Ports</b>	4 x 1Gb	4 x 1Gb	2 x 1Gb + 2 x 10Gb	2 x 1Gb + 2 x 10Gb
<b>Supported speed</b>	1Gb	1Gb	1Gb and 10Gb	1Gb and 10Gb
<b>SR-IOV</b>	Not supported	Not supported	Not supported	Supported (10GE only)
<b>iSCSI HBA</b>	Not supported	Not supported	Supported <sup>1</sup>	Not supported
<b>EEE</b>	Supported	Supported	Not supported	Not supported
<b>FCoE</b>	Not supported	Not supported	Not supported	Supported <sup>2</sup>
<b>Switch independent partitioning</b>	Not supported	Not supported	Supported <sup>3</sup>	Not supported
<b>DCB</b>	Not supported	Not supported	Not supported	Supported <sup>4</sup>
<b>iSCSI TLV</b>	Not supported	Not supported	Not supported	Supported <sup>5</sup>

<sup>1</sup>Only 10GbE ports have iSCSI HBA support.

<sup>2</sup>Only 10GbE ports have FCoE support.

<sup>3</sup>Only 10GbE ports have Switch Independent Partitioning support. The maximum number of partitions supported is four (two partitions per 10Gb port). 1Gb ports do not support switch independent partitioning.

<sup>4</sup>Only 10GbE ports have DCB support.

<sup>5</sup>Only 10GbE ports have iSCSI TLV support.

## System management integration

With R720 and R720xd, the job of deploying, updating, monitoring, and maintaining the Select Network Adapters is fast and easy. System management integration features include the following:

- Pre-boot: Use the Dell Lifecycle Controller graphical user interface (GUI) to set configuration such as bandwidth allocation or firmware revision level
- Post-boot: Agent-free out-of-band or high-speed in-band connection over LOM through the Operating System/BMC pass-thru feature for sensory information
- Automation of firmware and driver version deployment upon component replacement
- Automatic monitoring of NIC status and notification on SNMP traps
- Local or remote re-configuration of any NIC, physical or virtual



- PXE boot enabled on all LOM and NDCs for ease of use
- Boot from SAN (iSCSI, FCoE) configuration for networking devices through the USC

## PCIe expansion

For information on card installation, requirements, and slot priorities, see the *PowerEdge R720 and R720xd Systems Owner's Manual* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).

### PCIe slots

The R720 and R720xd provide greatly expanded PCIe slot capability over their predecessor servers. This is made possible by the 40 PCIe lanes available from each processor in the system. The R720 and R720xd have been designed to be PCIe 3.0 compliant in order to take full advantage of the processor capabilities. Table 16 details the R720 and R720xd PCIe slots.

**Table 16. PCIe expansion slots**

System	R720	R720xd
<b>Slots<sup>1</sup></b>	7	6
<b>Slot types</b>	One x16 full-length, full-height Three x8 full-length, full-height Three x8 half-length, half-height	Two x16 full-length, full-height One x8 full-length, full-height Three x8 half-length, half-height

<sup>1</sup>In a single-processor configuration, slots 1–4 are not usable

### PCIe expansion cards

The R720 and R720xd support a variety of PCIe expansion cards. Table 17 lists the supported add-in NICs and HBAs for the R720 and R720xd.

**Table 17. Supported NICs and HBAs**

Type	Adapter
<b>1Gb/10Gb NICs</b>	Broadcom 5720 2x1Gb (1Gb)
	Broadcom 5720 4x1Gb (1Gb)
	Intel I350 2x1Gb (1Gb)
	Intel I350 4x1Gb (1Gb)
	Broadcom 2x10Gb 57810S SFP+ (10Gb)
	Intel X540 2x10Gb SFP+ (10Gb)
	Intel X540 2x10Gb BT (10Gb)
	QLogic® QLE8262 2x10G SFP+ (10Gb)
	Brocade® BR1020 2x10G SFP+ (10Gb)
<b>FC4/FC8 HBAs</b>	QLogic QLE2460 (4Gb)
	QLogic QLE2462 (4Gb)
	QLogic QLE2560 (8Gb)
	QLogic QLE2562 (8Gb)





Type	Adapter
	Emulex <sup>®</sup> LPe12000 (8Gb)
	Emulex LPe12002 (8Gb)
	Brocade BR815 (8Gb)
	Brocade BR825 (8Gb)

In addition to the NICs and HBAs listed in Table 17, the supported PCIe expansion cards for the R720 and R720xd are listed in Table 18.

**Table 18. Additional supported PCIe expansion cards**

Type	Adapter
<b>GPUs (R720 only)</b>	NVIDIA <sup>®</sup> M2090 (double wide)
	NVIDIA M2075 (double wide)
	NVIDIA M2070Q (double wide)
	NVIDIA M2070 (double wide)
	AMD V7800P FirePro™ (single wide)
<b>GPU HICs (R720 only)</b>	NVIDIA HIC
	Dell PLX HIC
<b>PCIe SSDs</b>	Fusion-io <sup>®</sup> IoDrive <sup>®</sup> 640GB V1
	Fusion-io PCIe SSD V2
<b>PCIe bridge</b>	PCIe bridge adapter for front-accessible, hot-plug Express Flash PCIe SSDs (available Q2 2012)

For the latest information on supported PCIe expansion cards for the R720 and R720xd, visit [Dell.com](http://Dell.com).



## 8 Power, thermal, and acoustics

Lower overall system-level power draw is a result of Dell's breakthrough system design. PowerEdge servers maximize performance per watt through a combination of power and cooling, energy efficient technologies, and tools. Additionally, PowerEdge servers have an extensive collection of sensors that automatically track thermal activity, which helps regulate temperature thereby reducing server noise and power consumption.

### Power consumption and energy efficiency

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 19 lists the tools and technologies Dell offers to help you achieve your data center goals by lowering power consumption and increasing energy efficiency.

**Table 19. Power tools and technologies**

Feature	Description
<b>Power supply units (PSU) portfolio</b>	Dell's PSU portfolio includes intelligent features such as dynamically optimizing efficiency while maintaining availability and redundancy. Find additional information in the Power supply units section.
<b>Tools for right-sizing</b>	<p><b>Energy Smart Solution Advisor (ESSA)</b> is a tool that can help you determine the most efficient configuration possible. With Dell's ESSA, you can calculate the power consumption of your hardware, power infrastructure, and storage. ESSA can help you determine exactly how much power your server will use at a given workload, and the PSU Advisor can help you choose the best, most efficient PSU for your workload. Learn more at <a href="http://Dell.com/calc">Dell.com/calc</a>.</p> <p><b>Energy Smart Data Center Assessment</b> is a Dell Services offering that uses infrastructure and thermal analysis to help maximize system efficiency. Learn more at <a href="http://Dell.com/EnergySmart">Dell.com/EnergySmart</a>.</p>
<b>Industry compliance</b>	Dell's servers are compliant with all relevant industry certifications and guidelines, including 80 PLUS, Climate Savers, and ENERGY STAR®.
<b>Power monitoring accuracy</b>	PSU power monitoring improvements include: <ul style="list-style-type: none"><li>• Dell's power monitoring accuracy is currently 1%, whereas the industry standard is 5%</li><li>• More accurate reporting of power</li><li>• Better performance under a power cap</li></ul>
<b>Power capping</b>	Use Dell's systems management to set the power cap limit for your systems to limit the output of a PSU and reduce system power consumption. Dell is the first hardware vendor to leverage Intel® Node Manager for circuit-breaker fast capping.
<b>Systems management</b>	<p><b>iDRAC7 Enterprise</b> provides server-level management that monitors, reports, and controls power consumption at the processor, memory, and system level.</p> <p><b>Dell OpenManage™ Power Center</b> delivers group power management at the rack, row, and data center level for servers, power distribution units, and uninterruptible power supplies.</p>



Feature	Description
	<b>Intel Node Manager</b> 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 iDRAC Enterprise and OpenManage Power Center that allows policy-based management of power and thermals at the individual server, rack, and data center level.
<b>Active power management</b>	<p><b>Hot spare</b> reduces power consumption of redundant power supplies.</p> <p><b>Thermal control of fan speed</b> optimizes the thermal settings for your environment to reduce fan consumption and lower system power consumption.</p> <p><b>Idle power</b> enables Dell servers to run as efficiently when idle as when at full workload.</p>
<b>Fresh air cooling</b>	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. Find additional information at <a href="http://Dell.com/FreshAir">Dell.com/FreshAir</a> .
<b>Rack infrastructure</b>	<p>Dell offers some of the industry's highest-efficiency power infrastructure solutions, including:</p> <ul style="list-style-type: none"> <li>• <a href="#">Power distribution units</a> (PDUs)</li> <li>• <a href="#">Uninterruptible power supplies</a> (UPS)</li> <li>• <a href="#">Energy Smart containment rack enclosures</a></li> </ul> <p>Find additional information at: <a href="http://content.dell.com/us/en/enterprise/power-and-cooling-technologies-components-rack-infrastructure.aspx">http://content.dell.com/us/en/enterprise/power-and-cooling-technologies-components-rack-infrastructure.aspx</a>.</p>

Find additional information at [Dell.com/PowerAndCooling](http://Dell.com/PowerAndCooling) and [Power.com/PowerCenter](http://Power.com/PowerCenter).

## Power supply units

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

The following power supply unit options are available for the R720 and R720xd:

- 495W AC
- 750W AC
- 1100W AC
- 1100W DC (available Q2 2012)



Figure 13 shows a 750W power supply unit extended from an R720 system.

**Figure 13. 750W power supply unit**



The PowerEdge R720 and R720xd support up to two AC or DC power supplies with 1 + 1 redundancy, auto sensing, and auto-switching capability.

Dell PSUs have achieved Platinum efficiency levels as shown in Table 20.

**Table 20. Power supply efficiency**

Form factor	Output	Class	Efficiency targets by load			
			10%	20%	50%	100%
Redundant 86mm	495W	Platinum	82.0%	90.0%	94.0%	91.0%
	750W	Platinum	82.0%	90.0%	94.0%	91.0%
	1100W	Platinum+	89.0%	93.0%	94.5%	92.0%
	1100W DC <sup>1</sup>	Gold	80.0%	88.0%	92.0%	88.0%

<sup>1</sup>1100W DC power supply available Q2 2012.

## Thermal and acoustics

Thermal management of PowerEdge R720 and R720xd delivers high performance for the right amount of cooling to components at the lowest fan speeds across a wide range of ambient temperatures from 10°C to 35°C (50°F to 95°F) and to extended ambient temperature ranges (see Table 32) . The benefits to you are lower fan power consumption (lower server system power and data center power consumption) and greater acoustical versatility. The PowerEdge R720 is quiet enough to be used in an office environment in typical and minimum configurations, and the R720xd can also operate at a similar level in certain configurations.

### Thermal design

The thermal design of the PowerEdge R720 and R720xd reflect the following:

- **Optimized thermal design:** The system layout is architected for optimum thermal design. System component placement and layout are designed to provide maximum airflow coverage to critical components with minimum expense of fan power.



- **Comprehensive thermal management:** The thermal control system regulates the fan speed based on several different responses from all system-component temperature sensors, as well as inventory for system configurations. Temperature monitoring includes components such as processors, DIMMs, chipset, the inlet air ambient, hard disk drives, NDC, and GPU.
- **Open and closed loop thermal fan speed control:** Open loop thermal control uses system configuration to determine fan speed based on inlet air ambient temperature. Closed loop thermal control method uses feedback temperatures to dynamically determine proper fan speeds.
- **User-configurable settings:** With the understanding and realization that every customer has unique set of circumstances or expectations from the system, in this generation of servers, we have introduced limited user-configurable settings residing in the iDRAC7 BIOS setup screen. For more information, see the PowerEdge R720 and R720xd Systems Owner's Manual on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals) and "Advanced Thermal Control: Optimizing across Environments and Power Goals" on [Dell.com](http://Dell.com).
- **Cooling redundancy:** The R720 and R720xd allow N+1 fan redundancy, allowing continuous operation with one fan failure in the system.
- **Environmental specifications:** The optimized thermal management makes the R720 and R720xd reliable under a wide range of operating environments as shown in Table 32.

## Acoustical design

The acoustical design of the PowerEdge R720 and R720xd reflect the following:

- **Versatility:** The R720 and R720xd save you power draw in the data center but are also quiet enough for office environment in typical and minimum configurations. Compare the values for LpA in Table 21 and Table 22 for these configurations, and note that they are lower than ambient measurements of typical office environments. You may find that the system is sufficiently quiet where the sound it emits blends into the environment.
- **Adherence to Dell's high sound quality standards:** Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles and hums. One of the sound quality metrics in the Dell specification is prominence ratio of a tone, which is listed in Table 21 and Table 22.
- **Noise ramp and descent at bootup 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 bootup process as quiet as possible, the fan speed reached during bootup is limited to about half of full speed.
- **Noise level dependencies:** If acoustics is important to you, several configuration choices and settings are important to consider:
  - For lower acoustical output, use a small number of lower rotational-speed SATA hard drives, nearline SAS hard drives, or non-rotational devices like SSDs. 15k hard drives generate more acoustic noise than that of lower rotational-speed hard drives, and noise increases with number of hard drives.
  - Fan speeds and noise may increase from baseline factory configurations if certain profiles are changed by the user or the system configurations are updated. The following is a list of items that impact fan speeds and acoustical output:
    - > **iDRAC7 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.
- > **Utilization of 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 an H310 PERC:** This configuration may be quieter than those with an H710 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.

Table 21 and Table 22 detail the acoustical performance for the R720 and R720xd.

**Table 21. R720 acoustical performance (2.5-inch chassis)**

Configuration (23 ± 2°C ambient)	CPUs	Hard drives	Power supply unit	Memory	PCI card/HDD controller	Operating mode	L <sub>WA</sub> -UL <sup>1</sup> (bels)	L <sub>pA</sub> <sup>2</sup> (dBA)	Prominent tones <sup>3</sup>
<b>Minimum</b>	1	1 x 250GB SATA (7.2k)	1 x 495W	1 x 8GB	1 x PERC H310	Idle	4.0	20	None
						Stressed <sup>4</sup>	4.1	20	None
<b>Typical</b>	2	6 x 300GB SAS (10K)	2 x 750W	8 x 8GB	1 x PERC H710, 1 x GbE NIC	Idle	4.4	25	None
						Stressed <sup>4</sup>	4.5	26	None

**Table 22. R720xd acoustical performance (2.5-inch chassis)**

Configuration (23 ± 2°C ambient)	CPUs	Hard drives	Power supply unit	Memory	PCI card/HDD controller	Operating mode	L <sub>WA</sub> -UL <sup>1</sup> (bels)	L <sub>pA</sub> <sup>2</sup> (dBA)	Prominent tones <sup>3</sup>
<b>Minimum</b>	1	1 x 250GB SATA (7.2k)	1 x 495W	1 x 8GB	1 x PERC H310	Idle <sup>4</sup>	4.7	28	None
						Stressed <sup>5</sup>	4.8	28	None
<b>Typical</b>	2	14 x 300GB SAS (10K)	2 x 750W	8 x 8GB	1 x PERC H710, 1 x GbE NIC	Idle <sup>4</sup>	4.8	28	None
						Stressed <sup>5</sup>	5.0	30	None

<sup>1</sup>L<sub>WA</sub> – UL is the upper limit sound power levels (L<sub>WA</sub>) calculated per section 4.4.1 of ISO 9296 (1988) and measured in accordance to ISO 7779 (2010).

<sup>2</sup>L<sub>pA</sub> is the average A-weighted sound pressure level from the four bystander positions calculated per section 4.3 of ISO9296 (1988) and measured in accordance with ISO7779 (2010). The system is placed in a half rack enclosure (base of system is 25 cm above reflective floor).

<sup>3</sup>Prominent tone: Criteria of D.6 and D.11 of ECMA-74 11th ed. (2010) are followed to determine if discrete tones are prominent. The system is placed in a half rack enclosure (base of system is 75 cm above reflective floor) and acoustic transducer is at front bystander position, ref ISO7779 (2010 Section 8.6.2).

<sup>4</sup>Idle: Reference ISO7779 (2010) definition 3.1.7; system is running in its OS but no other specific activity.

<sup>5</sup>Stressed processor: An operating mode per ISO7779 (2010) definition 3.1.6. The software SPECpower at 50% loading is activated to stress the processors.

For more information on Dell's acoustical design, see the [Dell Enterprise Acoustics](#) white paper.



## 9 Rack rails and cable management

The rack rail systems for the Dell™ PowerEdge™ R720 and R720xd provide toolless support for 4-post racks with square or unthreaded round mounting holes, including all generations of Dell racks. Compared to the predecessor R710 sliding rails that required the use of adapter brackets, the sliding rails for the R720 and R720xd now offer native support for threaded-hole racks with the new ReadyRails™ II mounting interface.

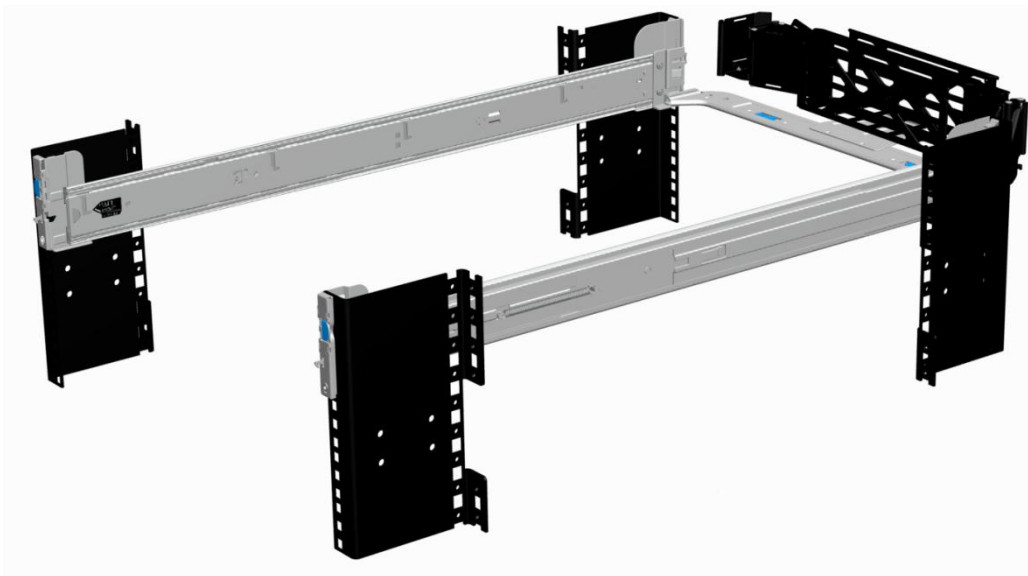
The optional cable management arm (CMA) can be mounted on either the left or right side of the sliding rails without the use of tools for fast and easy deployment.

### Sliding and static rail systems

The R720 and R720xd support both sliding rails and static rails. Both rails have a new slim rail design that supports the wide system chassis.

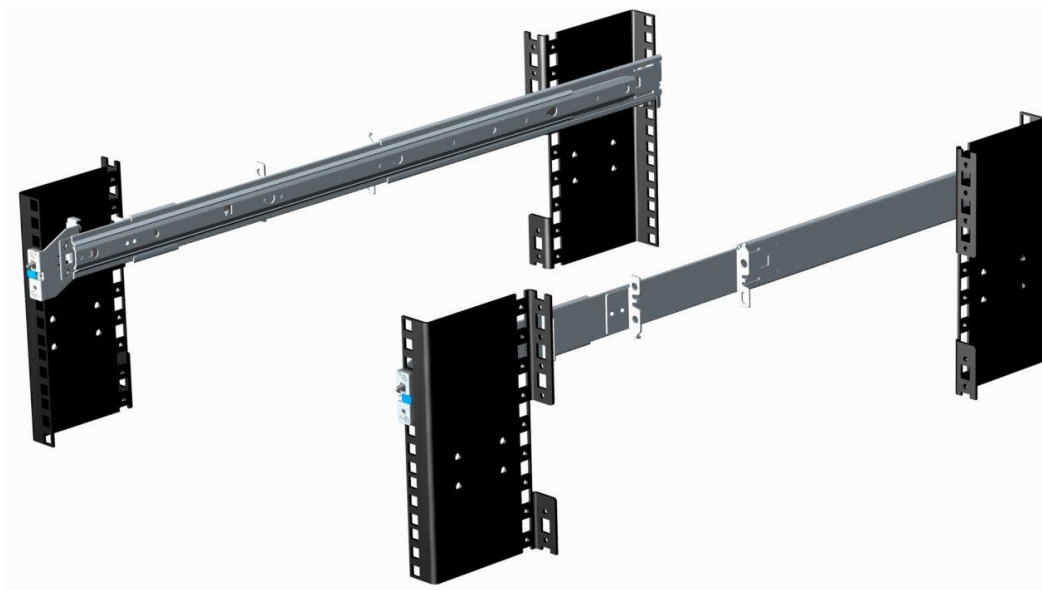
The sliding rails (shown in Figure 14) allow the system to be fully extended out of the rack for service and are available with or without the optional cable management arm (CMA).

**Figure 14. Sliding rails with optional CMA**



The static rails (shown in Figure 15) support a wider variety of racks than the sliding rails, but do not support serviceability in the rack and are not compatible with the CMA.

**Figure 15. Static rails**



One key factor in selecting the proper rails is identifying the type of rack in which they will be installed. Both the sliding rails and the static rails support toolless mounting in 19"-wide, EIA-310-E compliant square hole and unthreaded round-hole 4-post racks. Both also support tooled mounting in threaded hole 4-post racks, but only the static rails, as the more universal solution, support mounting in 2-post (Telco) racks.

Table 23 lists the rack rail systems that the R720 and R720xd support.

**Table 23. Supported rack rail system**

System	Rail identifier	Mounting interface	Rail type	Rack types supported				
				4-post			2-post	
				Square	Round	Thread	Flush	Center
R720/R720xd	B6	ReadyRails II	Sliding	✓	✓	✓	X	X
	B4	ReadyRails	Static	✓	✓	✓	✓	✓

For detailed information about rail dimensions, see the Rack rail specifications section in Appendix A. For more information on installing the T620 in a rack, see the *Rack Installation Instructions* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).





## Cable management arm

The optional cable management arm (CMA) for the R720 and R720xd 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. Some key features of the CMA include:

- Large U-shaped baskets to support dense cable loads
- Open vent pattern for optimal airflow
- Ability to be mounted on either side
- Use of 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
- Ability to mount the CMA and tray without the use of tools, due to snap-in designs

For more information on installing the R720 and R720xd in a rack, see the *Rack Installation Instructions* on [Support.Dell.com/Manuals](https://support.dell.com/manuals).



## 10 Operating systems and virtualization

The Dell™ PowerEdge™ R720 and R720xd support a wide range of industry-standard operating systems and virtualization software.

### Supported operating systems

Table 24 lists the primary operating systems supported on the R720 and R720xd. For the latest information on supported operating systems, see [Dell.com/OSsupport](http://Dell.com/OSsupport).

**Table 24. Primary operating system support**

Operating System	Platform	Edition
Red Hat® Enterprise Linux® 5.7	x32 x64	N/A
Red Hat Enterprise Linux 6.1	x64	N/A
Red Hat Enterprise Linux for HPC	x64	N/A
SUSE® Linux Enterprise Server 11 SP2	x64	N/A
SUSE Linux Enterprise Server 10 SP4	x64	N/A
Microsoft® Windows® Small Business Server 2011 <sup>1</sup>	x64	Standard Premium add-on
Microsoft Windows Server® 2008 with SP2	x86	Web Standard Enterprise
Microsoft Windows Server 2008 R2 with SP1	x64 (with Microsoft Hyper-V™ role enabled)	Web Standard Enterprise Datacenter
Microsoft Windows Server 2008 R2 with SP1	x64 (with Hyper-V role enabled)	Web Standard Enterprise Datacenter HPC

<sup>1</sup>Not validated for use with GPUs



Support of the operating systems listed in Table 25 is limited to a virtual environment as a guest operating system. Please contact the software vendor for additional support or questions about running the operating system in a virtualized environment.

**Table 25. Virtual guest operating system support**

Operating System	Platform	Edition
<b>Microsoft Windows 2003<sup>1</sup></b>	x86	Web
<b>Microsoft Windows 2003 R2 with SP2<sup>1</sup></b>	x86	Standard Enterprise
	x64	Standard Enterprise Datacenter

<sup>1</sup>Not validated for use with AMD GPUs

## Supported virtualization

One of the key features for virtualization on the R720 and R720xd is the support for a fail-safe hypervisor. By running the hypervisor on an optional SD card and installing a backup copy on the other mirrored SD card, you can protect against hardware failure and maximize virtualization uptime. Table 26 highlights the virtualization support for the R720 and R720xd.

**Table 26. Virtualization support**

Operating systems	Version	Options	
	vSphere <sup>®</sup> v4.1 U2	ESX <sup>®</sup> Classic	DIB
	vSphere v4.1 U2	ESXi <sup>®</sup> Installable	DIB
<b>VMware<sup>®1</sup></b>	vSphere v4.1 U2	ESXi Embedded	FI
	vSphere v5.0	ESXi (one version)	DIB
	vSphere v5.0 U1 <sup>2</sup>	ESXi (one version)	FI/DIB
<b>Citrix<sup>®</sup></b>	XenServer <sup>®</sup> v6.0	—	DIB

FI = factory install; DIB = drop in box

<sup>1</sup>vSphere Fault Tolerance is supported with these versions for the R720 (not for the R720xd)

<sup>2</sup>Available Q2 2012



# 11 Dell OpenManage systems management

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

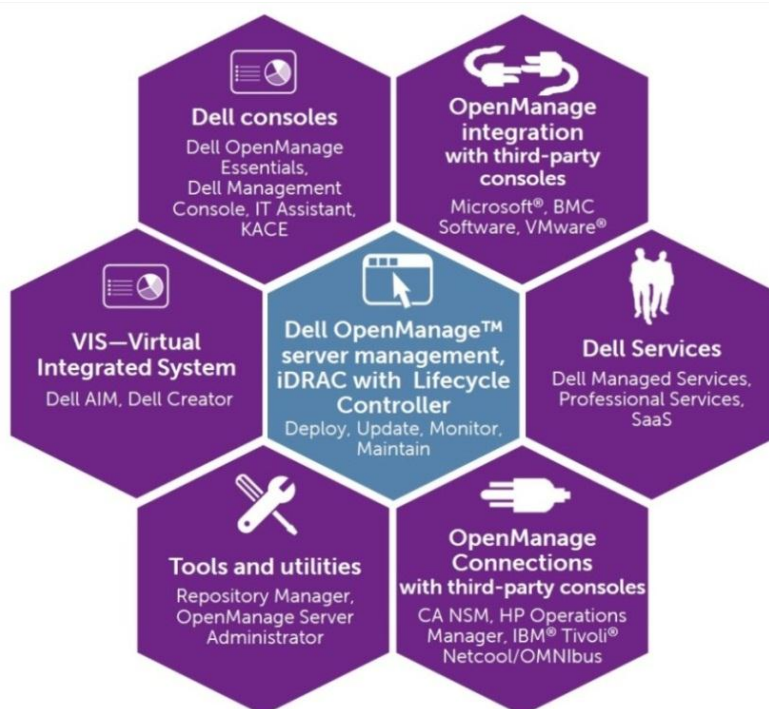
The advanced management capabilities of Dell OpenManage also integrates into offerings from other popular systems management solutions that you may already use, making Dell platforms easy to manage and deploy in any IT environment. This ensures your IT services are available when your business needs them. If you have already standardized on offerings from industry leaders, such as BMC Software, Microsoft, Symantec, 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.

Start with a firm foundation for efficient hardware management using OpenManage tools, utilities, and management consoles. 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 16, Dell systems management solutions are centered around OpenManage server management, featuring iDRAC with Lifecycle Controller.

Figure 16. Dell systems management solutions



## OpenManage systems management

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

### 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 server 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 running on the server. These embedded features improve all aspects of a typical server lifecycle. Table 27 describes the functions and benefits of iDRAC7 with Lifecycle Controller.

**Table 27. iDRAC7 with Lifecycle Controller functions and benefits**

Feature	Function	Benefit
<b>Out of band (OOB)</b>	iDRAC7 offers real-time, agent-free OOB monitoring, inventory, and alerting for servers, direct-attach storage, and network cards	Receive hardware notifications and email alerts, independent of the OS or hypervisor type or status—even if an OS or hypervisor is not installed
<b>Single code base</b>	All server types have the same embedded management hardware and firmware	Simplified and consistent maintenance across server platforms
<b>Dedicated GigE port (PowerEdge rack and tower systems)</b>	Gigabit Ethernet replaces 10/100 on predecessor iDRAC6	Fast throughput for better performance; compatibility with setup for switches
<b>Email alerts</b>	Simplified, more informative, and expanded coverage than previous versions of iDRAC	Explicit, detailed information allows IT administrators to be more efficient in diagnosing and remediating an issue; an embedded URL in e-mail alert notifications enables launch to iDRAC7 GUI or virtual console
<b>vFlash media</b>	Enabled with iDRAC7 Enterprise	Allows for use of a non-Dell SD card
<b>Enhanced power management</b>	Integration with Intel Node Manager provides data center level power monitoring and capping (requires iDRAC7 Enterprise)	Fine tune data center power usage and report on historical power usage by rack, row or room using OpenManage Power Center
<b>Electronic licensing</b>	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	New systems come with digital license installed in the factory; free 30-day trial versions are available; uses a license management portal versus paper-based licenses to simplify license management



## iDRAC feature comparison

iDRAC7 Enterprise is available for the PowerEdge R720 and R720xd, and Dell also offers an option of iDRAC7 Express. A detailed feature comparison for iDRAC7 Enterprise and iDRAC7 Express is shown in Table 28.

**Table 28. Feature comparison for iDRAC7 Express and Enterprise**

Feature (function)	iDRAC7 Enterprise	iDRAC7 Express
Local configuration with USC	•	•
IPMI 2.0	•	•
Embedded diagnostics	•	•
Local OS install	•	•
Local updates	•	•
Driver pack	•	•
Shared NIC (LOM)	•	•
Remote update	•	•
Power control	•	•
Encryption	•	•
Crash screen capture <sup>1</sup>	•	•
IPv6	•	•
Auto-discovery	•	•
Auto-recovery	•	•
Web GUI	•	•
Remote CLI	•	•
Local/SSH CLI	•	•
Serial redirection	•	•
Remote configuration	•	•
Email alerts	•	•
SNMP alerts	•	•
Power monitoring	•	•
Comprehensive monitoring	•	•
Dedicated NIC 1Gbps (100MB in iDRAC6)	•	
Part replacement	•	
Backup and restore configurations	•	
Virtual console (4 user)	•	
Virtual console chat	•	
Support for customer-supplied SD cards for vFlash media	•	



Feature (function)	iDRAC7 Enterprise	iDRAC7 Express
Virtual flash partitions	•	
Virtual media	•	
Virtual folders	•	
Remote file share	•	
Crash video playback	•	
Boot record/playback	•	
Power capping	•	
Enterprise group power management	•	
Directory services (AD, LDAP)	•	
PK authentication	•	
Two-factor authentication <sup>2</sup>	•	

<sup>1</sup>Requires OMSA agent on target server; <sup>2</sup>Uses Microsoft® ActiveX® on Internet Explorer® only

## Agent-based management

Most systems management solutions require pieces of software, called agents, to be installed on each node in order to be managed within the IT environment. Additionally, the same agent is often used as a local interface into the hardware health and may be accessed remotely as a management interface, typically referred to as a one-to-one (1:1) interface. For customers that continue to use agent-based solutions, Dell provides OpenManage Server Administrator.

### OpenManage Server Administrator

The Dell OpenManage Server Administrator (OMSA) agent gives you 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 command-line interface (CLI) or Web-based management graphical user interface (GUI). It can also be used to view system configuration, inventory, health, and performance.

### Agent-free management

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

## Dell consoles

The central console in a systems management solution is often referred to as the one-to-many (1:M) console. The central console provides a rapid view and insight into the overall health of all systems in the IT environment. The Dell systems management portfolio includes several powerful consoles, depending upon your needs, including the following:

- **Dell OpenManage Essentials**— OpenManage Essentials (OME) is a recently released systems management console that provides a comprehensive view of Dell systems, devices, and components in an enterprise network. It is used to monitor Dell PowerEdge servers, EqualLogic™ and PowerVault™ storage, and PowerConnect™ switches; to update and configure



Dell servers; and to create asset reports. OpenManage Essentials also communicates health status alerts for Dell servers, storage, and network devices to the Dell KACE™ K1000 service desk. OpenManage Essentials is available as a no-charge software download from [Support.Dell.com](http://Support.Dell.com).

- **Dell Management Console**—Dell Management Console (DMC) offers sophisticated data-center management capabilities with comprehensive reporting features. DMC can perform basic hardware management and can manage operating systems and applications using various plug-ins from Symantec.
- **Dell IT Assistant**—Dell IT Assistant (ITA) is a console for managing Dell servers, storage arrays, and other components distributed throughout a network. Dell IT Assistant allows for easy identification of system issues through alerts, helping to reduce system downtime. Systems administrators can easily monitor systems anywhere within their network using ITA. ITA is supported on the R720 and R720xd, however, enhanced functionality is now available with OpenManage Essentials.

## OpenManage systems management tools and utilities

Dell OpenManage systems management tools and utilities consist of the following:

- **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 your 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 (DUP) is a self-contained executable in a standard package format that updates a software element on a Dell server such as the BIOS, a driver, firmware and other software updates.
- **Dell 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 large numbers of servers in a reliable fashion.
- **RACADM**—The RACADM command-line utility provides a scriptable interface that allows you to locally or remotely configure iDRAC7.
- **IPMITool**—IPMITool includes scriptable console application programs used to control and manage remote systems using the IPMI version 1.5 and later protocol.

## Integration with third-party consoles

Dell OpenManage easily integrates with several leading third-party consoles, including:

- **Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)**—This suite of server management packs enables several functions through System Center Operations Manager, including in-band discovery and monitoring of racks and towers, out-of-band discovery and monitoring through iDRAC with Lifecycle Controller, as well as performance and advanced monitoring.





- **Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager (SCCM)**—This pack contains Dell Lifecycle Controller Integration (DLCI), which integrates OpenManage functions in SCCM to manage the Dell PowerEdge servers, 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 PRO Management Pack for Microsoft System Center Virtual Machine Manager (SCVMM)**—This pack manages Dell physical servers and hosts of virtual machines (VMs) by using Microsoft System Center Operations Manager/System Center Essentials (SCOM/SCE) and System Center Virtual Machine Manager (SCVMM). It provides guidance for remedial actions based on alerts to best manage virtual machines and handle the impacts appropriately.
- **Dell Management Plug-in for VMware® vCenter™**—This plug-in allows IT administrators to monitor, provision, and manage the physical PowerEdge server hardware and firmware from a dedicated Dell menu accessed through the VMware vCenter console using the same role-based access control model as vCenter, combining physical server management.
- **BMC Software**—Dell and BMC Software work together to simplify IT by ensuring tight integration between Dell server, storage, and network management functionality and the BMC Software process and data center automation products.

## OpenManage Connections with third-party consoles

Dell OpenManage provides connections with many third-party consoles, including:

- **Dell OpenManage Connection for Computer Associates Network and Systems Management**—This connection allows you to monitor PowerEdge servers and PowerVault storage arrays from within the Computer Associates Network and Systems Management (CA NSM) console.
- **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 is centered on automating the server management lifecycle—deploy, update, monitor, and maintain. To manage an infrastructure properly and efficiently, you must perform all of these functions easily and quickly. iDRAC7 with Lifecycle Controller technology provides you with these intelligent capabilities embedded within the server infrastructure. This allows you to invest more time and energy on business improvements and less on maintenance. Figure 17 illustrates the various operations that can be performed during the server’s lifecycle.



Figure 17. Systems management server lifecycle



Table 29 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 29. One-to-one and one-to-many operations

Operation	One-to-one	One-to-many
<b>Deploy</b>	<ul style="list-style-type: none"> <li>• Lifecycle Controller GUI</li> <li>• DTK</li> <li>• SBUU</li> </ul>	<ul style="list-style-type: none"> <li>• Symantec Deployment Server</li> <li>• Dell Management Plug-in for VMware vCenter</li> <li>• KACE K1000 Appliance</li> <li>• Lifecycle Controller Remote Services</li> <li>• BMC BladeLogic integration with Lifecycle Controller</li> </ul>
<b>Update</b>	<ul style="list-style-type: none"> <li>• iDRAC7 with LifeCycle Controller</li> <li>• Lifecycle Controller GUI</li> <li>• Repository Manager</li> <li>• DUP</li> <li>• SUU</li> <li>• SBUU</li> <li>• Dell Management Plug-in for VMware vCenter</li> </ul>	<ul style="list-style-type: none"> <li>• Dell Update Catalogs for Microsoft System Center Configuration Manager</li> <li>• Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager</li> </ul>



Operation	One-to-one	One-to-many	
<b>Monitor</b>	<ul style="list-style-type: none"> <li>• iDRAC7</li> <li>• OMSA</li> </ul>	<ul style="list-style-type: none"> <li>• Dell OpenManage Essentials</li> <li>• Dell OpenManage ITA</li> <li>• BMC ProactiveNet Performance Management</li> <li>• Dell OpenManage Power Center</li> <li>• Dell Management Console</li> </ul>	<ul style="list-style-type: none"> <li>• Dell Management Plug-in for VMware vCenter</li> <li>• BMC ProactiveNet</li> <li>• Dell Server Management Pack Suite for Microsoft System Center Operations Manager (SCOM)</li> </ul>
	<ul style="list-style-type: none"> <li>• IPMI</li> <li>• iDRAC7</li> <li>• Lifecycle Controller GUI</li> </ul>	<ul style="list-style-type: none"> <li>• Lifecycle Controller Remote Services</li> </ul>	<p><b>Remediate:</b></p> <ul style="list-style-type: none"> <li>• Dell Server PRO Management Pack for Microsoft System Center Virtual Machine Manager (SCVMM)</li> </ul> <p><b>Replace parts:</b></p> <ul style="list-style-type: none"> <li>• Dell Lifecycle Controller Integration (DLCI) for Microsoft System Center Configuration Manager</li> </ul>
<b>Maintain</b>			

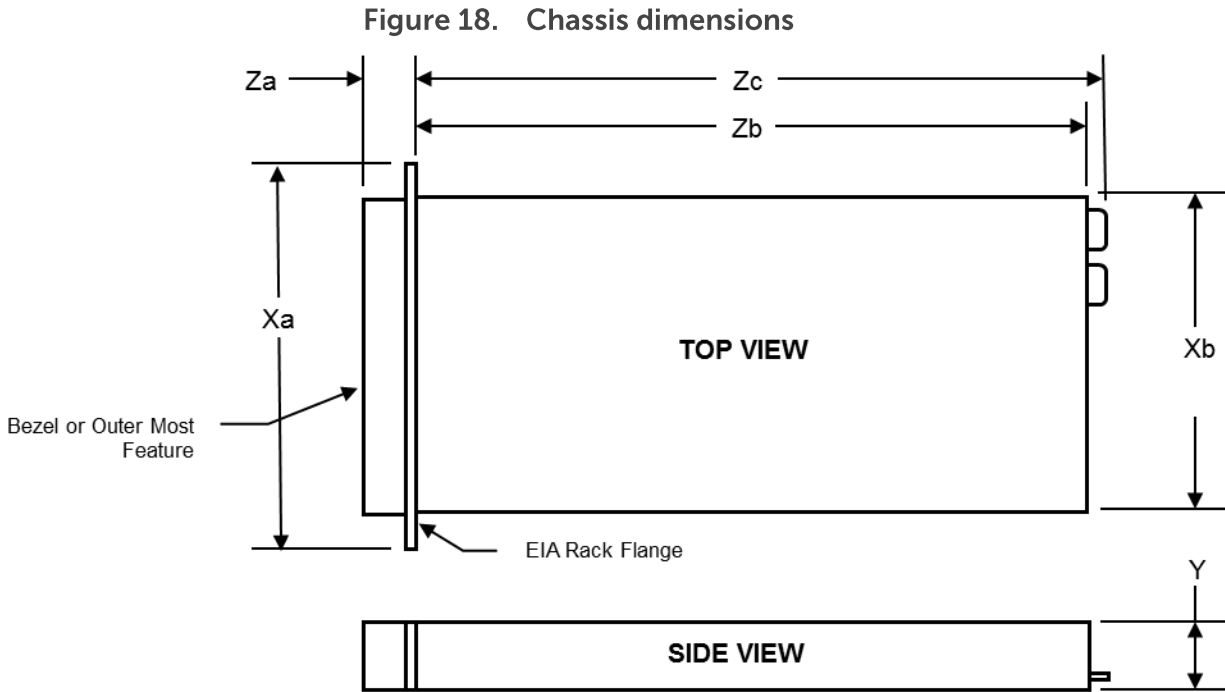
For additional detailed information on Dell's systems management portfolio, see the *Dell Systems Management Overview Guide* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals).



# Appendix A. Additional specifications

## Chassis dimensions

Figure 18 details the dimensions of the Dell™ PowerEdge™ R720 and R720xd chassis.



Xa	Xb	Y	Za (with bezel)	Za (without bezel)	Zb	Zc
482.4mm	444.0mm	87.3mm	32.0mm	18.0mm	684.0mm	723.0mm

## Chassis weight

Table 30 lists the weight of the R720 and R720xd chassis at maximum configuration as well as empty of any hardware.

**Table 30. Chassis weight**

Configuration	R720 (2.5" chassis)	R720 (3.5" chassis)	R720xd (2.5" chassis)	R720xd (3.5" chassis)
<b>Maximum</b>	29.5kg (64.9lbs)	29.2kg (64.3lbs)	29.5kg (64.9lbs)	32.5kg (71.5lbs)
<b>Empty chassis</b>	11.7kg (25.7lbs)	10.3kg (22.7lbs)	11.7kg (25.7 lbs)	10.3kg (22.7lbs)



## Power supply specifications

Table 31 lists power supply specifications for the PowerEdge R720 and R720xd.

**Table 31. Power supply specifications**

Specification	1100W DC	1100W AC	750W AC	495W AC
<b>Current consumption</b>	32A (X2)	12A–6.5A	10A–5A	6.5A–3A
<b>Supply voltage</b>	-48V to -60V de CC	100–240VAC <sup>1</sup>	100–240VAC <sup>1</sup>	100–240VAC <sup>1</sup>
<b>Frequency</b>	-48V to -60V de CC	50/60Hz	50/60Hz	50/60Hz
<b>Heat dissipation (BTU/hr max.)</b>	4416	4100	2891	1908

<sup>1</sup>Auto-ranging

## Environmental specifications

Table 32 details the environmental specifications for the R720 and R720xd. For the most up-to-date information, see the *PowerEdge R720 and R720xd Systems Owner's Manual* and the *PowerEdge R720 and R720xd Getting Started Guide* on [Support.Dell.com/Manuals](http://Support.Dell.com/Manuals). For additional information about environmental measurements for specific system configurations, see [Dell.com/environmental\\_datasheets](http://Dell.com/environmental_datasheets).

**Table 32. Environmental specifications**

Temperature and humidity	
<b>Continuous operation</b>	10°C to 35°C at 10% to 80% relative humidity (RH), with 26°C max dew point. De-rate maximum allowable dry bulb temperature at 1 °C per 300m above 900 m (1 °F per 550 ft). When using the PowerEdge R720 with internal GPU card(s), the continuous operation range is 10°C to 30°C at 10% to 80% RH, with 26 °C max dew point.
<b>Expanded operation</b>	<p>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 (R720 only) and in the System Event Log.</p> <p><b>&lt; 10% of annual operating hours:</b> 5 °C to 40 °C at 5% to 85% 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 175 m above 950m (1°F per 319 ft).</p> <p><b>&lt; 1% of annual operating hours:</b> -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 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 950m (1°F per 228ft).</p> <p><b>Expanded operating temperature restrictions:</b></p> <ul style="list-style-type: none"> <li>Do not perform a cold startup below 5°C</li> <li>The operating temperature specified is for a maximum altitude of 3050m (10,000ft)</li> <li>Express Flash PCIe SSDs, GPUs, and LRDIMMs are not supported</li> <li>130W (4 core) processors are not supported</li> <li>Redundant power supplies are required</li> <li>Non Dell qualified peripheral cards and/or peripheral cards greater than 25W are not supported</li> </ul>



## Temperature and humidity

For the PowerEdge R720, a maximum 130W processor is supported in either the 8 hard drive or 16 hard drive chassis.

The following additional restrictions apply to PowerEdge R720xd:

- Maximum 95W processor is supported on 3.5-inch hard drive chassis
- Maximum 115 W processor is supported on 2.5-inch hard drive chassis

Only SSDs are allowed in the hard drive slots at the back of the 3.5-inch hard drive chassis.

<b>Storage</b>	-40 °C to 65 °C (-40° to 149° F) with a maximum temperature gradation of 20 °C per hour
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## Maximum vibration

<b>Operating</b>	0.26Grms at 5-350Hz in all orientations
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<b>Storage</b>	1.87Grms at 10-500Hz for 15 minutes (all six sides tested)
----------------	--

## Maximum shock

<b>Operating</b>	One shock pulse in the positive z axis (one pulse on each side of the system) of 31G for 2.6ms in the operational orientation
------------------	---

<b>Storage</b>	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 Six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 32G faired square wave pulse with velocity change at 270in/s (685cm/s)
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## Altitude

<b>Operating</b>	-15.2m to 3048m (-50ft to 10,000ft) Note: For altitudes above 2950ft, the maximum operating temperature is derated 1°F/550ft
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<b>Storage</b>	-15.2ft to 10,668m (-50ft to 35,000ft)
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## Airborne contaminant level

G1 as defined by ISA-S71.04-1985

## Video specifications

The Dell PowerEdge R720 and R720xd integrated Dell remote access controller (iDRAC) incorporates an integrated video subsystem. The graphics controller is the 2D Matrox® G200. The video frame buffer (16MB) is contained within the iDRACRAM (256MB) device.

The R720 and R720xd systems support the 2D graphics video modes listed in Table 33.

**Table 33. Supported video modes**

Resolution	Refresh rate (Hz)	Color depth (bit)
640 x 480	60, 70	8, 16, 32
800 x 600	60, 75, 85	8, 16, 32
1024 x 768	60, 75, 85	8, 16, 32
1152 x 864	60, 75, 85	8, 16, 32
1280 x 800 (UI)	—	—
1280 x 1024	60, 75	8, 16, 32
1440 x 900	60	8, 16, 32



## Rack rail specifications

The rack rail adjustability ranges are listed in Table 34.

**Table 34. Rail adjustability ranges**

Server	Rail identifier	Rail type	Rail adjustability range (mm)						Rail depth (mm)	
			Square		Round		Threaded		without CMA	with CMA
			Min	Max	Min	Max	Min	Max		
<b>R720/R720xd</b>	B6	Sliding	676	868	662	861	676	883	714	845
	B4	Static	608	879	594	872	604	890	622	—

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

## USB peripherals

USB peripherals are supported through the front, back, and internal USB ports. They are USB 2.0 compliant.



## Appendix B. Standards compliance

The R720 and R720xd systems conform to the industry standards in Table 35.

**Table 35. Industry standard documents**

Standard	URL for information and specifications
<b>ACPI</b> Advance Configuration and Power Interface Specification, v2.0c	<a href="http://www.acpi.info/">http://www.acpi.info/</a>
<b>Ethernet</b> IEEE 802.3-2005	<a href="http://standards.ieee.org/getieee802/802.3.html">http://standards.ieee.org/getieee802/802.3.html</a>
<b>HDG</b> Hardware Design Guide Version 3.0 for Microsoft Windows Server	<a href="http://www.microsoft.com/whdc/system/platform/pcdesign/designguide/serverdg.mspx">http://www.microsoft.com/whdc/system/platform/pcdesign/designguide/serverdg.mspx</a>
<b>IPMI</b> Intelligent Platform Management Interface, v2.0	<a href="http://www.intel.com/design/servers/ipmi/">http://www.intel.com/design/servers/ipmi/</a>
<b>DDR3 Memory</b> DDR3 SDRAM Specification, Rev. 3A	<a href="http://www.jedec.org/download/search/JESD79-3C.pdf">http://www.jedec.org/download/search/JESD79-3C.pdf</a>
<b>LPC</b> Low Pin Count Interface Specification, Rev. 1.1	<a href="http://developer.intel.com/design/chipsets/industry/lpc.htm">http://developer.intel.com/design/chipsets/industry/lpc.htm</a>
<b>PCI Express</b> PCI Express Base Specification Rev. 2.0 and 3.0	<a href="http://www.pcisig.com/specifications/pciexpress/">http://www.pcisig.com/specifications/pciexpress/</a>
<b>PMBus</b> Power System Management Protocol Specification, v1.2	<a href="http://pmbus.info/specs.html">http://pmbus.info/specs.html</a>
<b>SAS</b> Serial Attached SCSI, v1.1	<a href="http://www.t10.org/ftp/t10/drafts/sas1/sas1r10.pdf">http://www.t10.org/ftp/t10/drafts/sas1/sas1r10.pdf</a>
<b>SATA</b> Serial ATA Rev. 2.6; SATA II, SATA 1.0a Extensions, Rev. 1.2	<a href="https://www.sata-io.org/secure/spec_download.asp">https://www.sata-io.org/secure/spec_download.asp</a> <a href="http://www.sata-io.org/docs/S2Ext_1_2_Gold.pdf">http://www.sata-io.org/docs/S2Ext_1_2_Gold.pdf</a>
<b>SMBIOS</b> System Management BIOS Reference Specification, v2.7	<a href="http://www.dmtf.org/standards/smbios/">http://www.dmtf.org/standards/smbios/</a>
<b>TPM</b> Trusted Platform Module Specification, v1.2	<a href="https://www.trustedcomputinggroup.org/downloads/specifications/tpm/tpm">https://www.trustedcomputinggroup.org/downloads/specifications/tpm/tpm</a>
<b>UEFI</b> Unified Extensible Firmware Interface Specification, v2.1	<a href="http://www.uefi.org/specs/">http://www.uefi.org/specs/</a>
<b>USB</b> Universal Serial Bus Specification, Rev. 2.0	<a href="http://www.usb.org/developers/docs/">http://www.usb.org/developers/docs/</a>
<b>Windows Logo</b> Windows Logo Program System and Device Requirements, v3.10	<a href="http://www.microsoft.com/whdc/winlogo/hwrequirements.mspx">http://www.microsoft.com/whdc/winlogo/hwrequirements.mspx</a>





## Appendix C. Additional resources

Table 36 provides a list of documents and websites that provide for more information on the Dell™ PowerEdge™ R720 and R720xd.

**Table 36. Additional resources**

Resource	Description of contents	Location
<b>PowerEdge R720 and R720xd Systems Owner's Manual</b>	This manual is provided in HTML format on the CD provided with the R720 or R720xd systems, and also in HTML and PDF format at the Dell support site. A printed version is available in Asian languages as a customer-orderable option. This manual provides information on the following: <ul style="list-style-type: none"> <li>• Chassis features</li> <li>• System Setup program</li> <li>• System messages</li> <li>• System codes and indicators</li> <li>• System BIOS</li> <li>• Remove and replace procedures</li> <li>• Troubleshooting</li> <li>• Diagnostics</li> <li>• Jumpers and connectors</li> </ul>	<a href="http://Support.Dell.com/Manuals">Support.Dell.com/Manuals</a>
<b>PowerEdge R720 and R720xd Getting Started Guide</b>	This guide is printed and shipped with the system, and is also available in PDF format on the Dell support site. This guide provides information on the following: <ul style="list-style-type: none"> <li>• Initial setup steps</li> <li>• Key system features</li> <li>• Technical specifications</li> </ul>	<a href="http://Support.Dell.com/Manuals">Support.Dell.com/Manuals</a>
<b>Rack Installation Instructions</b>	This printed document is provided with the rack kits. The document provides the instructions for installing the server in a rack.	<a href="http://Support.Dell.com/Manuals">Support.Dell.com/Manuals</a>
<b>Cable Management Arm Installation Instructions</b>	This printed document is provided with the rack kits. The document provides the instructions for installing the cable management arm on the rack.	<a href="http://Support.Dell.com/Manuals">Support.Dell.com/Manuals</a>
<b>System Information Label</b>	The system information label documents the system board layout and system jumper settings.	Inside the system chassis
<b>Quick Resource Locator (QRL) code</b>	This code 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
<b>Information Update</b>	This document provides updated system information and is printed and shipped with the system. It is also available in PDF format on the Dell support site.	<a href="http://Support.Dell.com/Manuals">Support.Dell.com/Manuals</a>



Resource	Description of contents	Location
<b>Dell Energy Smart Data Center Assessment</b>	uses infrastructure and thermal analysis to help maximize system efficiency	<a href="http://Dell.com/EnergySmart">Dell.com/EnergySmart</a>
<b>Energy Smart Solution Advisor (ESSA)</b>	The Dell online advisor console enables easier and more meaningful estimates to help you determine the most efficient configuration possible. With Dell's, you can calculate the power consumption of your hardware, power infrastructure, and storage.	<a href="http://Dell.com/ESSA">Dell.com/ESSA</a>
<b>Power and cooling technologies</b>	Provides details for improving energy efficiency in the data center.	<a href="http://Dell.com/PNC">Dell.com/PNC</a>
<b>Energy management</b>	Provides information on Dell's fresh air solutions.	<a href="http://Dell.com/FreshAir">Dell.com/FreshAir</a>
<b>Operating system matrix for Dell PowerEdge systems</b>	Provides updated information on which operating systems are available on which PowerEdge systems.	<a href="http://Dell.com/OSsupport">Dell.com/OSsupport</a>
<b>Processor and chipset</b>	Provides more information about the R620 processors and chipset.	<a href="http://Intel.com">Intel.com</a>
<b>Dell PowerEdge RAID controllers</b>	Provides more information on Dell PowerEdge RAID controllers (PERC).	<a href="http://Dell.com/PERC">Dell.com/PERC</a>
<b>Power distribution unit (PDU)</b>	Provides help selecting a power distribution unit (PDU).	<a href="http://DellPDU.com">DellPDU.com</a>
<b>Uninterruptible power supply (UPS)</b>	Provides help selecting an uninterruptible power supply (UPS) model.	<a href="http://DellUPS.com">DellUPS.com</a>
<b>Dell Enterprise Acoustics</b>	White paper that explores the mechanisms of, people's reaction to, language of, and Dell's work to control noise from Enterprise products.	<a href="http://www.dell.com/downloads/global/products/pedge/en/acoustical-education-dell-enterprise-white-paper.pdf">www.dell.com/downloads/global/products/pedge/en/acoustical-education-dell-enterprise-white-paper.pdf</a>
<b>Volatility information</b>	Contact your Dell Sales Representative.	

