PowerEdge R715

Technical Guide

The PowerEdge R715 provides an excellent balance of processor density, redundancy, memory capacity and value in a 2-socket, 2U form factor.

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1.1 Overview

The Dell™ PowerEdge™ R715 is a 2-socket rack server offering the latest AMD Opteron™ processors, designed to handle your most demanding workloads with superior stability, efficiency and long-term value.

Dell aims to bring value to your business by including the features and technology you need for your specific IT environment. Our goal is to deliver performance-driven, intelligent platforms based on industry standards and purposeful, innovative design.

1.1.1   Superior Reliability Inspired by You

We've designed the PowerEdge R715 for optimal reliability and ease of use, incorporating customer-inspired features that range from robust metal hard-drive carriers and industrial-quality materials to embedded diagnostics and an interactive LCD screen. The PowerEdge R715 also includes an internal dual SD module to provide failover at the hypervisor level.

1.1.2   Technology and Design that goes the Distance

We have listened to our customers and built servers endowed with reliability, availability, and quality. Dell's reliability promise is simple: Deliver quality products that stand the test of time.

To help meet your needs in the data center and beyond, we're dedicated to improving server reliability processes by:

- Utilizing robust, durable industrial materials to enable longer product lifecycles
- Introducing a Unified Server Configurator (USC), which helps to minimize downtime by offering embedded and persistent diagnostics with no media required
- Improving redundancy generation over generation with features such as an internal dual SD module that provide failover at the hypervisor level
- Implementing a one-touch quality-control process to ensure that one person is responsible for the entire server build
- Ensuring that every fully configured Dell server is tested—and re-tested—before it leaves the factory

1.1.3   Efficient for your Environment

PowerEdge servers drive energy efficiency as a design standard without compromising the performance you need to meet cost and environmental goals. Built with Energy Smart technologies, Dell servers can better help manage power in your specific environment.

The PowerEdge R715 features highly efficient fans that help to conserve energy by spinning in accordance with server workload demands. In addition, the internal shrouding and logical layout of internal components aid with airflow direction, helping to cool the server.

The PowerEdge R715 also includes power-management features such as programmable voltage regulators, power-regulating processors and an interactive LCD screen for easy access to power-consumption information.

1.1.4   Intelligent, Connected Systems Management

The Dell Lifecycle Controller (an integrated chip) is the engine for advanced embedded management that is delivered as part of the iDRAC6 Express or optional iDRAC6 Enterprise in the PowerEdge R715. It is accessed through a single console called the Unified Server Configurator. Administrators can simplify tasks by performing a complete set of provisioning functions such as system deployment, system updates, hardware configuration, and diagnostics in the pre-OS environment. This avoids the need to use and maintain multiple pieces of disparate CD/DVD media. The PowerEdge R715 also features an interactive LCD screen positioned on the front of the server for ease of monitoring.

1.2 Comparison

Table 1.   Feature Comparison to 2970 and R815

	PowerEdge 2970	R715	R815
Architecture	AMD	AMD	AMD
Branding	PE 2970	PE R715	PE R815
# Sockets	2S	2S	4S
# DIMMs	8 x DDR2	16 x DDR3	32 x DDR3
# PCI	3 PCIe Gen 1	6 PCIe Gen 2	6 PCIe Gen 2
# HDs	8 x 2.5 or 6 x 3.5	6 x 2.5	6 x 2.5
HDDs	Hot plug	Hot plug	Hot plug
Power Supply	Hot-plug redundant 1+1 (optional)	Hot-plug redundant 1+1 (optional)	Hot-plug redundant 1+1 (optional)
Cooling	Hot-plug redundant	Hot-plug redundant	Hot-plug redundant
LOM	2 x 1GBe	4 x 1GbE TOE	4 x 1GbE TOE
Diagnostic	LCD	LCD	LCD
Remote Management	9G DRAC	11G iDRAC6 Express + Optional iDRAC6 Enterprise	11G iDRAC6 Express + Optional iDRAC6 Enterprise
Security	TPM	TPM, TCM for China	TPM, TCM for China
Persistent storage	No	Yes, Managed (Lifecycle Controller)	Yes, Managed (Lifecycle Controller)
ID	9G PE	11G PE	11G PE
Overall Length	29.25"	29.7"	28.4"
Rackable	Yes	Yes	Yes
Acoustic	Category IID	Category II-D for 2S configurations	Category II-D for 2S configurations (up to 16 x 4GB DIMMs) Category I-B for 4S configurations

2 System Overview

For the latest information on supported features for the PowerEdge R715, visit Dell.com.

Table 2.   Product Features Summary

Feature	Technical Specification	
Form Factor	2U rack	
Processors	AMD Opteron™ 6100 series processors	
Processor Sockets	2	
Front Side Bus or HyperTransport	Hyper-Transport Links	
Cache	L2: 512K/core L3: 12MB (shared)	
Chipset	AMD SR5650, SR5670 and SP5100	
Memory[1]	Up to 256GB (16 DIMM slots) 1GB/2GB/4GB/8GB/16GB DDR3 (up to 1333MHz)	
I/O Slots	6 PCIe G2 slots + 1 Storage Slot: Five x8 slots (Three with x16 connectors) One x4 slot (with x8 connector) One x4 storage slot (with x8 connector)	
RAID Controller	Internal Controllers: PERC H200 PERC H700	External Controllers: PERC H800 SAS 5/E with 512MB battery- backed cache PERC 6/E with 512MB battery- backed cache 6GBs SAS HBA
Drive Bays	Up to six 2.5" hot-swappable SAS, SATA, or SSD drives	
Maximum Internal Storage	3TB	
Hard Drives[1]	2.5" SATA (7.2K RPM): 160GB, 250GB, 500GB 2.5" Near Line SAS (7.2K RPM): 500GB	2.5" SAS (10K RPM): 146GB, 300GB 2.5" SAS (15K RPM): 73GB, 146GB 2.5" SATA SSD: 50GB, 100GB

Feature	Technical Specification	
Communications	**Optional add-in NICs :** Broadcom® BMC57710 10Base-T Cooper Single-Port NIC, PCIe x8 Broadcom® 5709 IPV6 Dual-Port Gigabit Ethernet NIC, Copper, w/TOE PCIe x4 Broadcom® 5709 IPV6 Dual-Port Gigabit Ethernet NIC, Copper, TOE/iSCSI PCIe x4 Broadcom® NetXtreme™ II 57711 Dual Port 10Gb Ethernet SFP+ Broadcom® NetXtreme™ II 5709 Gigabit Copper Quad- Port NIC w/TOE and iSCSI offload, PCIe x4 Intel® 10GBase-T Copper Single-Port NIC, PCIe x8 Intel® 10GB, Dual-Port SFP+,PCIe x8 NIC Intel® Gigabit ET Dual-Port Server Adapter Intel® Gigabit ET Quad-Port Server Adapter Brocade® CNA BR1020	**Optional add-in HBAs:** Qlogic® QLE 2462 FC4 Dual-Port 4 Gbps Fiber Channel HBA Qlogic® QLE 220 FC4 Single-Port 4 Gbps Fiber Channel HBA Qlogic® QLE 2460 FC4 Single-Port 4 Gbps Fiber Channel HBA Qlogic® QLE2562 FC8 Dual-channel HBA, PCIe Gen 2 x4 Qlogic® QLE2560 FC8 Single-channel HBA, PCIe Gen 2 x4 Qlogic® QLE8152 Dual-Port 10 Gbps FCoE Converged Network Adapter Emulex® LPe-1150 FC4 Single-Port 4 Gbps Fiber Channel HBA, PCIe x4 Emulex® LPe-11002 FC4 Dual-Port 4 Gbps Fiber Channel HBA, PCIe x4 Emulex® LPe-12000 FC8 Single-Port 4 Gbps Fiber Channel HBA, PCIe Gen 2 x4 Emulex® LPe-12002 FC8 Dual-Port 4 Gbps Fiber Channel HBA, PCIe Gen 2 x4
Power Supply	One hot-pluggable non-redundant 750W power supply or One hot-pluggable non-redundant 1100W power supply	Two hot-pluggable redundant 750W power supplies or Two hot-pluggable redundant 1100W power supplies
Availability	Hot-pluggable hard drives, hot-pluggable redundant power supply, internal dual SD module, ECC memory, interactive LCD screen	
Video	Matrox® G200eW w/ 8MB memory	
Remote Management	iDRAC6 Express (standard), iDRAC6 Enterprise and vFlash (upgrade optional)	
Systems Management	BMC, IPMI 2.0 compliant Dell OpenManage™ featuring Dell Management Console Unified Server Configurator Lifecycle Controller enabled: iDRAC6 Express, optional iDRAC6 Enterprise and vFlash	
Rack Support	ReadyRails™ sliding rails with optional cable management arm for 4-post racks (optional adapter brackets required for threaded hole racks)	

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Feature	Technical Specification
Operating Systems	Microsoft® Windows Server® 2003 R2 SP2, x86/x64 Microsoft® Windows Server® 2008 SP2, x86/x64 (x64 includes Hyper-V™) Microsoft® Windows Server® 2008 R2, x64 (includes Hyper-V™ v2) Windows® HPC Server 2008 R2 Novell® SUSE® Linux® Enterprise Server Red Hat® Enterprise Linux® Sun® Solaris™ **Optional Embedded Hypervisors:** Citrix® XenServer™ VMware® vSphere™ 4.1 (including VMware ESX® 4.1 or VMware ESXi™ 4.1) For more information on the specific versions and additions, visit www.dell.com/OSsupport.
Featured Database Applications	Microsoft® SQL Server® solutions (see Dell.com/SQL) Oracle® database solutions (see Dell.com/Oracle)
[1] GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.	

3 Mechanical

3.1 Chassis Description

The PowerEdge R715 chassis is a 2U rack-mount design that provides the following features:

- Slide-out drive bay section to allow servicing of DIMMs below drives
- Updated industrial design including a new LCD, bezel, and hard drive carriers
- Toolless rack latches
- Pull-out tray for Express Service Tag and customer labels
- Support for persistent storage (internal USB and SD card slots and external SD card slot)
- Updated power supply removal process

3.2 Dimensions and Weight
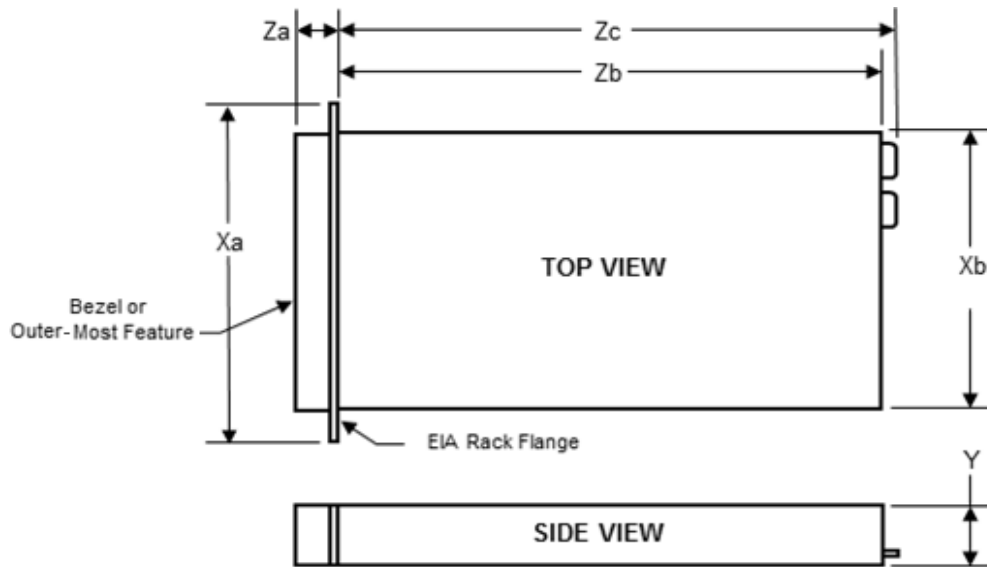
Xa	Xb	Y	Za w/ bezel	Za w/o bezel	Zb	Zc
482.4 mm	440.6 mm	86.3 mm	35.0 mm	20.4 mm	720.6 mm	757.5 mm

Figure 1.   R715 Chassis Dimensions

Maximum configuration weight is 26.1 kg.

3.3 Front Panel View and Features

Figure 2.   Front View (without Bezel)

Figure 3.   Front View (with Bezel)

See the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com for more information.

3.4 Back Panel View and Features

Figure 4.   Back View

See the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com for more information.

3.5 Power Supply Indicators

The PowerEdge R715 power supplies have one status bi-color LED: green for AC power present and amber for a fault.

Table 3. Power Supply Status

LED	Power Supply Status
⚪	AC Power is not present
🟢	AC Power is present
🟠	Fault of any kind is detected
🟢	DC Power is applied to the system
🟢↔🟠	PSU mismatch (when hot-plugged/swapped)

See the Power Indicator Codes section in the About Your System chapter of the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com for more information.

3.6 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com for more information.

3.7 Side View

Figure 5. Side View

3.8 Internal Chassis View

Figure 6.   Internal Chassis View

3.9 Rails and Cable Management

Sliding ReadyRails™ for 4-post Racks support the following:

- Toolless installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all Dell 42xx and 24xx racks (threaded 4-post racks require the static ReadyRails™ kit or third-party conversion kits available through Dell Software and Peripherals).
- Full extension of the system out of the rack to allow serviceability of key internal components
- Optional cable management arm (CMA)

Measurements and adjustment ranges for the rack:

- Rail depth without the CMA: 755 mm (with outer CMA brackets removed)
- Rail depth with the CMA: 883 mm
- Square-hole rack adjustment range: 686–883 mm
- Round-hole rack adjustment range: 672–876 mm
- Threaded-hole rack adjustment range: 651-897 mm

3.10 Fans

Six hot-swappable fans are mounted in a fan gantry that is located in the chassis behind the processors. Each fan has a blind mate 2x2 connector that plugs directly into the CPU Board. There is an additional fan integrated in each power supply to cool the power supply subsystem and also provide additional cooling for the whole system.

The Embedded Server Management logic in the system monitors the speed of the fans. A fan failure or over-temperature in the system results in a notification by iDRAC6. All system fans are pulse width modulated fans. Redundant cooling is supported with one fan failing at a time.

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3.11 Cabling

Cabling includes:

- 2x30 Control Panel cable
  - VGA, LCD, I2C, misc. (e.g., power and NMI buttons)
- 2x6 IO power cable
  - Distributes +12V to IO planar from power distribution board
- SATA data cable
- SAS Interface cables
  - SAS0 and SAS1 cables connect SAS adapter to backplane
- 2x10 bundled cables
  - 2-wire SATA device power cable
  - 5-wire USB data cable
  - 2x7 Backplane power cable
- ZIF-connected LCD cable
- Optional cable for Internal Dual SD module

Figure 7 shows a cabling diagram for the PowerEdge R715.
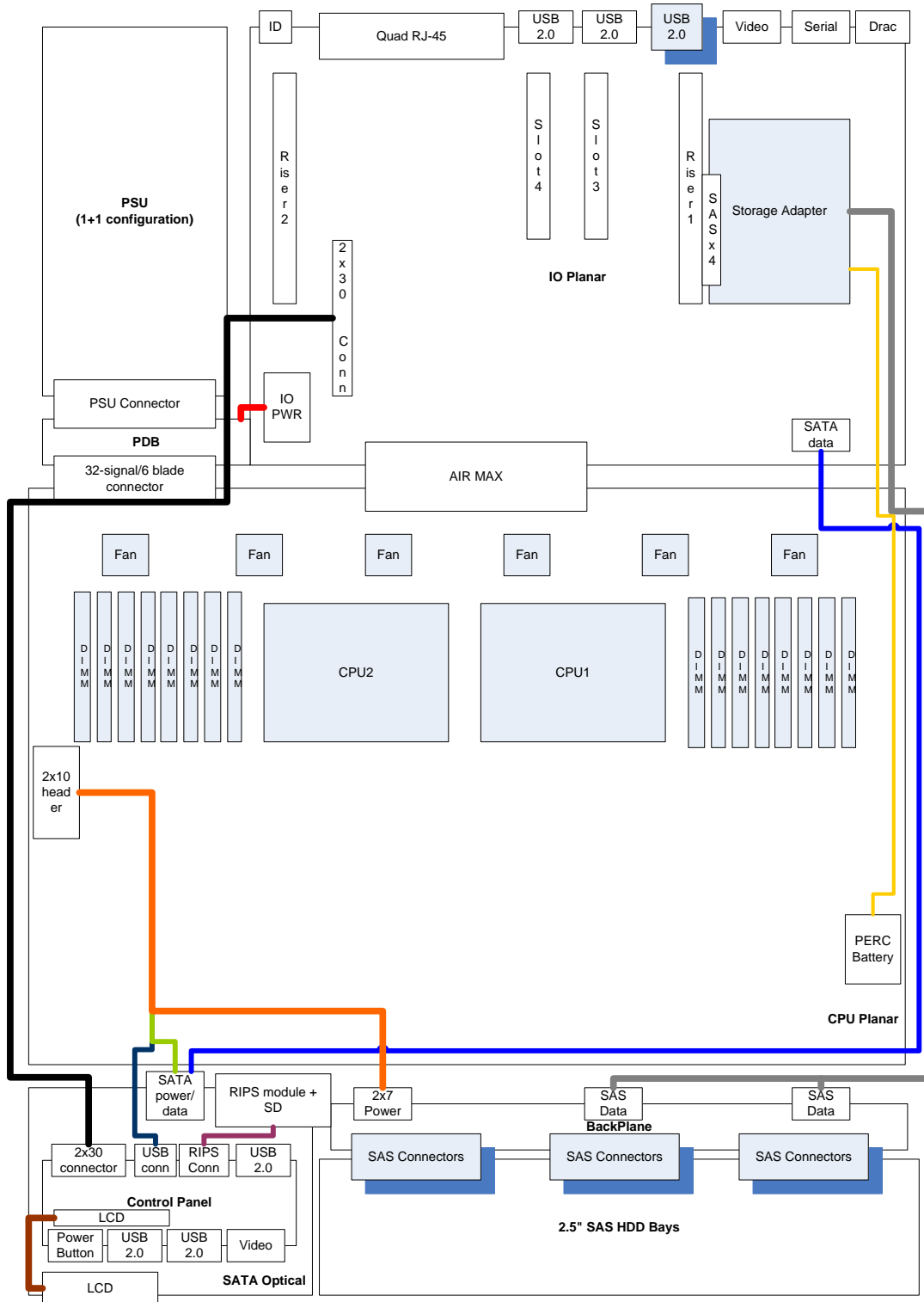
Figure 7. Cabling Diagram

3.12 Control Panel/LCD

The system control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces. Features of the system control panel include:

- ACPI-compliant power button with an integrated green power LED (controlled by iDRAC6)
- 128x20 pixel LCD panel with controls
    - o Two navigation buttons
    - o One select button
    - o One system ID button
- Non-Maskable Interrupt (NMI) button (recessed)
- Ambient temperature sensor
- Two external USB 2.0 connectors (with an internal USB connector and Optional Internal SD Module)
- 15-pin VGA connector

The LCD panel is a graphics display controlled by iDRAC6. Error codes can be sent to the display by either iDRAC6 or BIOS.

BIOS has the ability to enter a Secure Mode through Setup, which will lock the Power and NMI buttons. When in this mode, pressing either button has no effect but does not mask other sources of NMI and power control.

Figure 8.   LCD Panel

For more information on LCD Panel Features, see the LCD Panel Features section in the About Your System chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

3.13 Security

3.13.1 Cover Latch

A tooled entry latch is provided on the top of the unit to secure the top cover to the chassis. See the Opening and Closing the System section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com for more information.

3.13.2 Bezel

A 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 system peripherals and the control panel. System status on the LCD is viewable even when the bezel is installed.

The bezel is optional for PowerEdge R715 systems. For more information, see the Front Bezel (Optional) section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

3.13.3 Hard Drive

The optional front bezel of the system contains a lock. A locked bezel secures the system hard drives. For more information, see the Hard Drives section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

3.13.4 TPM

The TPM is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM can also be used to enable the BitLocker™ hard drive encryption feature in Windows Server 2008.

TPM is enabled through a BIOS option and uses HMAC-SHA1-160 for binding. A Trusted Computing Module (TCM) version of the planar is available for use where TCM is the standard, for example, in China.

3.13.5 Power Off Security

The control panel is designed such that the power switch cannot be accidentally activated. The lock on the bezel secures the switch behind the bezel. In addition, there is a setting in the CMOS setup that disables the power button function.

3.13.6 Intrusion Alert

A switch mounted on the left riser board is used to detect chassis intrusion. When the cover is opened, the switch circuit closes to indicate intrusion to ESM. When enabled, the software can provide notification to the customer that the cover has been opened. R715 only supports up to five minutes of operation with the cover off.

3.13.7 Secure Mode

BIOS has the ability to enter a secure boot mode via Setup. This mode includes the option to lock out the power and NMI switches on the Control Panel or set up a system password.

3.14 USB Key

An optional USB memory key installed inside your system can be used as a boot device, security key, or mass storage device. The USB connector must be enabled by the Internal USB Port option in the Integrated Devices screen of the System Setup program.

3.15 Battery

A replaceable coin cell CR2032 3V battery is mounted on the planar to provide backup power for the Real-Time Clock and CMOS RAM on the SP5100 chip. An optional 3.7V lithium ion RAID battery is available.

3.16 Field Replaceable Units (FRU)

Both planars contain a serial EEPROM to contain FRU information including Dell part number, part revision level, and serial number. The iDRAC6 Enterprise contains a FRU EEPROM. The backplane SEP and the power supply microcontroller are also used to store FRU data.

3.17 User Accessible Jumpers, Sockets, and Connectors

See the Jumpers and Connectors chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

4 Power, Thermal, Acoustic

4.1 Power Supply Subsystem

The power supply subsystem supports up to two AC-DC power supplies (1+1 redundant configuration) connected indirectly to the CPU planar through a Power Distribution Board (PDB). The power supply only provides +12V and +12Vaux. There are several voltage regulators in the system to supply different voltage levels needed by different logic devices.

4.1.1   Power Distribution Board

The Power Distribution Board (PDB) distributes power from the Power Supply Unit (PSU) to the CPU and IO planars. The Power Management bus enables power supply monitoring and load balancing. The CPU planar connects directly to the PDB through a 32-pin and 6-blade connector. The IO planar connects to the PDB through a 12-conductor (2x6) cable. The standby power is routed through the CPU planar and IO planar via Air-max connector.

4.1.2   Main Power Supply

The base redundant system consists of two hot-plug 1100W or two hot-plug 750W power supplies in a 1+1 configuration.

FRU data is stored in the memory of the power supply microcontroller. Additionally, the power supply firmware can be updated by the BMC over the PMBus.

Power is soft-switched, allowing you to cycle using a switch on the front of the system enclosure, or by software control (through server management functions).

In a single power supply configuration, the power supply is installed in the PS1 location and a blank module (metal cover) is installed in the PS2 location for factory consistency. Electrically, the system can operate with a single power supply in either bay.

Figure 9.   Power Supply

4.2 Power Efficiency

One of the main features of the 11G family of servers is enhanced power efficiency. The R715 achieves higher power efficiency by implementing the following features:

- User-selectable power cap (subsystems will throttle to maintain the specified power cap)
- Improved power budgeting
- Accurate inlet temperature
- Power-supply and VR efficiency improvements
- Use of switching regulators instead of linear regulators
- Closed-loop thermal throttling
- Increased rear venting and 3D venting
- PWM fans with an increased number of fan zones and configuration-dependent fan speeds
- Use of DDR3 memory (lower voltage compared to DDR2, UDIMM support)
- Processor VR dynamic phase shedding
- Memory VR static phase shedding
- Ability to configure a random time interval for system start after an AC power failure
- Ability for an entire rack to power on without exceeding the available power
- BIOS Power/Performance options page
- Active Power Controller (BIOS-based processor P-state manager)
- Ability to power down or throttle memory
- Ability to disable a processor core
- Ability to turn off embedded NICs or PCI-e lanes when not being used
- Option to run PCI-e at Gen1 speeds instead of Gen2

4.3 Power Supply Specifications Summary

4.3.1   Standard 1100W Power Supply

The PowerEdge R715 1100W power supply is offered for standard configurations. See the following table for specifications.

Table 4.   Standard 1100W Power Supply Specifications

AC Power Supply (per power supply)	
Wattage	1100 (1023, low line)
Voltage	90-264 VAC, auto-ranging, 47-63 Hz
Maximum inrush current	Under typical line conditions and over the entire system ambient operating range, the inrush current may reach 55A per power supply for 10ms or less

The R715 1100W Power Supply is certified Gold (80 Plus) and Climate Savers 3. It is certified UL approved and incorporates PFC logic.

4.3.2   Energy Smart 750W Power Supply

The PowerEdge R715 Energy Smart 750W power supply is offered for configurations which do not require maximum power headroom. See the following table for specifications.

Table 5.   Energy Smart 750W Power Supply Specifications

AC Power Supply (per power supply)	
Wattage	750
Voltage	90-264 VAC, auto-ranging, 47-63 Hz
Maximum inrush current	Under typical line conditions and over the entire system ambient operating range, the inrush current may reach 55A per power supply for 10ms or less

The R715 Energy Smart 750W Power Supply is certified Gold (80 Plus) and Climate Savers 3. It is certified UL approved and incorporates PFC logic.

4.4 Environmental Specifications

Table 6 lists the environmental specifications for the R715.

Table 6.   Environmental Specifications

Temperature	
Operating	10° to 35°C (50° to 95°F) with a maximum temperature gradation of 10°C per hour Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-40° to 65°C (-40° to 149°F) with a maximum temperature gradation of 20°C per hour
Relative humidity	
Operating	20% to 80% (noncondensing) with a maximum humidity gradation of 10% per hour
Storage	5% to 95% (noncondensing) with a maximum humidity gradation of 10% per hour
Maximum vibration	
Operating	0.26 Grms at 5-350 Hz in operational orientations
Storage	1.54 Grms at 10-250 Hz in all orientations
Maximum shock	
Operating	Half sine shock in all operational orientations of 31 G +/- 5% with a pulse duration of 2.6 ms +/-10%
Storage	Half sine shock on all six sides of 71 G +/- 5% with a pulse duration of 2 ms +/-10% Square wave shock on all six sides of 27 G with velocity change @ 235 in/sec or greater
Altitude	
Operating	-16 to 3048 m (-50 to 10,000 ft) Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-16 to 10,600 m (-50 to 35,000 ft)

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4.5 ENERGY STAR Compliance

ENERGY STAR® qualified configurations can be accessed from the [ENERGY STAR Compliance results](#) landing page on Dell.com.

4.6 Thermal

The PowerEdge R715 thermal solution includes:

- Energy efficient fans with lower power consumption per fan than previous 2U products
- Custom air baffling directs airflow through the components to maintain proper cooling while improved chassis ventilation ensures sufficient airflow to allow the AMD G34 feature set to be deployed in a 2U chassis
- Custom designed heat sinks:
  - Heat sinks maintain processor and IOB chip temperatures within thermal design targets
  - All CPU options (85W, 115W, or 140W) use the same processor heat sink
- Highly Optimized Fan Control Algorithm:
  - Component algorithms are used for CPU PID, DIMM PID, HW configuration, IOB, DIMM throttling for processors, and ambient.
    - The highest fan speed request from the component algorithms is used to set the appropriate fan speed for the blade.
    - Ambient and HW Configuration sets the minimum; other algorithms increase fan speed to maintain proper cooling.
  - Base fan speeds are a function of hardware configuration and ambient temperature to minimize airflow for a given environment. Variables that affect base fan speed include:
    - DIMM size installed (if a single DIMM module [not total system memory] of 16 GB or larger is detected, fans run faster).
    - Number of power supplies (two power supplies run system fans slower at high ambient temperatures; single power supply runs faster due to a required lower ambient temperature at the power supply).
  - DIMM and CPU algorithms use PID Control algorithm to maintain fan speeds for adequate DIMM and CPU cooling
    - Because the DIMMs are located at the front of the system and always receive fresh inlet air, DIMM throttling is extremely rare.
    - The DIMM thermal algorithm has the ability to switch DIMMs to Double Refresh mode in real time. This behavior is enabled, but is unlikely to be seen under normal circumstances.
    - In single refresh mode (typical) the DIMM thermal specification is 85°C.
    - Under Double Refresh mode the DIMM thermal specification increases to 95°C.
    - If the DIMM temperature approaches the 85°C limit the thermal algorithm will put the DIMMs into Double Refresh mode to allow for 10°C of additional thermal headroom.
    - Double Refresh mode allows the hardware to continue operation at maximum performance—thus no throttling will occur up to 95°C.

The maximum heat dissipation for the R715 is 2694 BTU/hr with the 1100W power supply.

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4.7 Acoustics

The acoustical design of the PowerEdge R715 reflects 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, hums, etc. One of the sound quality metrics in the Dell specification is prominence ratio of a tone as shown in Table 7.

Table 7.   Acoustical Performance for Typical Configuration

2-Socket Configuration @ 23 ± 2 ˚C				Operating Mode	L_{WA}-UL (Bels)	L_{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
2 x 6400 MT	4 x SAS 10k rpm	PERC H700	16 x 4GB	Idle	5.5	42	None
				Stressed (SP 50%)	5.5	42	None

Definitions

Idle: Reference ISO7779 (1999) definition 3.1.7; system is running in its OS but no other specific activity.

Stressed Processor: An operating mode per ISO7779 (1999) definition 3.1.6. The software SPECPower_ssj2008 is utilized to stress the processors. SPECPower is set to 50% loading.

LwA – UL: The upper limit sound power level (LwA) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance to ISO 7779 (1999).

LpA: Average bystander A-Weighted sound pressure level. The system is placed in a rack with its bottom at 25 cm from the floor. The acoustic transducers are at the four bystander positions, ref ISO7779 (1999) Section 8.6.2.

Prominent tone: Criteria of D.5 and D.8 of ECMA-74 9th ed. (2005) are followed to determine if discrete tones are prominent. The system is placed in a rack with its bottom at 75 cm from the floor. The acoustic transducer is at front bystander position, ref ISO7779 (1999) Section 8.6.2.

5 Processors

5.1 Overview

The AMD G34 processor is designed specifically for high-end server applications. The processor features up to twelve-core processing to maximize performance and performance/watt for datacenter infrastructures and highly dense deployments. The G34 processor also features AMD's Opteron micro-architecture and AMD64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The G34 processor utilizes a 1944-contact Organic Land Grid Array (OLGA) package that plugs into a surface mount socket (Socket-G34). R715 provides support for up to two G34 processors. See Table 8.

Table 8.   G34 Processor Features

G34 Processor	Features
Cache size	L1 128K/core
	L1 128K/core
	L2 512K/core
	L3 12MB
Multi-processor support	2 CPUs
Package	OLGA 1944

5.2 Features

Key features of the G34 processor include:

- Up to twelve cores per processor (two dies per processor package)
- Four point-to-point HyperTransport3 (HT3) x16 links at 6.4 GT/s (3.2 GHz)
- 1944-pin OLGA (Organic Land Grid Array) package
- 45 nm process technology
- No termination required for non-populated CPUs (must populate CPU socket 1 first)
- Two integrated DDR3 memory controllers
- Compatible with existing x86 code base
- Instruction sets like MMX, SSE, SSE2, SSE3, AMD 3DNow!™, AMD64
- Simultaneous Multi-Threading (SMT) capability
  - Support for HT Assist
- Enhanced AMD-V™ and IOMMU technology for virtualization support
- Enhanced AMD power efficiency features:
  - Enhanced AMD PowerNow!™
  - CoolCore™ Technology
  - Hardware Thermal Control (HTC)
- Demand-based switching for active CPU power management as well as support for ACPI P-States and C-States
  - C1E support
  - Cool Speed

BIOS allows the user to disable or enable processor cores. The cores will remain as defined after a reboot.

5.3 Supported Processors

For the latest information on supported processors for the PowerEdge R715, visit Dell.com.

Table 9.   Supported Processors

Model	Speed	Power	Cache	Cores
6180SE	2.5GHz	140W	6MB L2 12MB L3	12
6176	2.3GHz	115W	6MB L2 12MB L3	12
6174*	2.2GHz	115W	6MB L2 12MB L3	12
6172	2.1GHz	115W	6MB L2 12MB L3	12
6168*	1.9GHz	115W	6MB L2 12MB L3	12
6140	2.6GHz	115W	4MB L2 12MB L3	8
6136	2.4GHz	115W	4MB L2 12MB L3	8
6134	2.3GHz	115W	4MB L2 12MB L3	8
6128*	2.0GHz	115W	4MB L2 12MB L3	8
6166HE	1.8GHz	85W	6MB L2 12MB L3	12
6164HE	1.7GHz	85W	6MB L2 12MB L3	12
6132HE	2.2GHz	85W	4MB L2 12MB L3	8
6128HE	2.0GHz	85W	4MB L2 12MB L3	8
6124HE*	1.8GHz	85W	4MB L2 12MB L3	8

*Global Standard Platform

5.4 Processor Configurations

The PowerEdge R715 supports two G34 processor configurations (85W, 115W, 140W) and AMD SR5650, SR5670, and SP5100 chipsets. The R715 requires two processors.

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5.5 Processor Installation

See the Processors section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

5.6 Additional Processor Information

Voltage regulation to the G34 processor is provided by EVRD (Enterprise Voltage Regulator-Down). EVRDs are embedded on the planar. CPU core voltage is not shared between processors. EVRDs support dynamic phase shedding, controlled by the CPUs in response to CPU utilization and power state. The core regulators will operate with four phases normally and will drop to two phases when the CPU indicates lower power requirement.

6   Memory

6.1 Overview

The PowerEdge R715 utilizes DDR3 memory providing a high performance, high-speed memory interface capable of low latency response and high throughput.

Key features of the R715 memory system include:

- Support for up to 256 GB of memory (16 x 16 GB RDIMMs)
- Support for Registered ECC DDR3 DIMMs (RDIMM) and Unbuffered DDR3 DIMMs (UDIMM)
- Support ODT (On Die Termination)
- Clock gating (CKE) to conserve power when DIMMs are not accessed (DIMMs enter a low power self-refresh mode)
- I^2C access to SPD EEPROM for access to RDIMM thermal sensors
- Support for Closed Loop Thermal Management on RDIMMs
- Single Bit Error Correction
- Multi Bit Error Detection
- Support for Advanced ECC (Chipkill) Code
  - SSC (Single Symbol Correcting for x4 devices)
  - DSD (Double Symbol Detecting for x4 devices)
- Support for Memory Sparing in limited configurations
- 1.5V and 1.35V LV DDR3 support

6.2 DIMMs Supported

The PowerEdge R715 supports DDR3 RDIMMs and UDIMMs. The memory interface uses 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB RDIMMs and 1 GB and 2 GB UDIMMs.

6.3 DIMM Slots

The DDR3 memory interface consists of four memory channels per processor socket. Each channel supports up to two RDIMMs for single/dual/quad rank or two UDIMMs. Population order is identified by the silkscreen designator and the System Information Label (SIL) located on the chassis cover.

The following DIMM population rules apply:

- If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency.
- If online sparing is enabled, identical DIMMs must be installed in the same slots across each channel.
- Symmetrical DIMM population is not required. Mixing of memory sizes and ranks are allowed for flexibility.
- Identical population of memory channels (same speed, size, and type) allows support for additional features, depending on the memory population:

  - Two channels per CPU:
    - Performance feature CS (chipselect) memory interleaving
    - Online sparing with ranks of either 2R-2R or 1R-2R
  - Four channels per CPU: Performance feature channel memory interleaving
  - All memory channels: Performance feature node memory interleaving

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DIMM slots have the following characteristics:

- The first DIMM slot in each channel is color-coded with white ejection tabs for ease of installation.
- The DIMM sockets are placed 440 mils (11.12 mm) apart, center-to-center in order to provide enough space for sufficient airflow to cool stacked DIMMs.
- Each memory channel carries 64 data and 8 ECC bits.

For more information on memory, see the System Memory section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

6.4 Speed

Each processor has 4 DDR3 channels capable of supporting speeds up to 1333 MHz.

Single-, dual-, and mixed- (single and dual) rank DIMM types can support speeds up to 1333 MHz.

Quad-rank DIMMs can support speeds up to 1066 MHz.

6.5 Sparing

Memory sparing is supported. Sparing requires a fully populated memory configuration (16 DIMMs). See the Supported Configurations table below.

6.6 Mirroring

No mirroring support.

6.7 Memory Scrubbing

The R715 memory interface supports memory scrubbing (sequential or redirection) and patrol scrubbing, single-bit correction and multi-bit error detection. The failure of an x4 DRAM device results in errors to one ECC symbol and can be corrected (chipkill). The failure of an x8 DRAM device results in errors to two ECC symbols, and can be detected but cannot be corrected.

6.8 RAID

No RAID memory support.

6.9 Supported Configurations

Table 10.   Supported Configurations

			DIMM Type 1		DIMM Type 2			
System Capacity	# of CPUs	DIMM Type	DIMM Capacity	# of DIMMs	DIMM Capacity	# of DIMMs	1Gb or 2Gb based	Data width
4 GB	2	RDIMM	1	4	—	—	1	x8
8 GB	2	RDIMM	1	8	—	—	1	x8
16 GB	2	UDIMM	2	8	—	—	1	x8
16 GB	2	RDIMM	2	8	—	—	1	x8
32 GB	2	UDIMM	2	16	—	—	1	x8

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			DIMM Type 1		DIMM Type 2			
System Capacity	# of CPUs	DIMM Type	DIMM Capacity	# of DIMMs	DIMM Capacity	# of DIMMs	1Gb or 2Gb based	Data width
32 GB	2	RDIMM	2	16	—	—	1	x8
64 GB	2	RDIMM	4	16	—	—	1	x4
64 GB	2	RDIMM	8	8	—	—	2	x4
96 GB	2	RDIMM	8	8	4	8	1/2	x4
128 GB	2	RDIMM	8	16	—	—	2	x4
128 GB	2	RDIMM	16	8	—	—	2	x4
160 GB	2	RDIMM	16	8	4	8	1/2	x4
256 GB	2	RDIMM	16	16	—	—	2	x4

7 Chipset

7.1 Overview

The PowerEdge R715 planar incorporates a dual I/O Bridge (IOB) configuration, using the AMD SR5650 and SR5670 I/O bridges with the SP5100 Southbridge. SR5650 and SR5670 are designed to support AMD's G34 processor family, HyperTransport 3 Interface (@ 2.6 GHz), DDR3 memory technology, and PCI Express Generation 2. The chipset consists of the SR5650, SR5670, and SP5100.

7.2 AMD I/O Bridges

The PowerEdge R715 I/O Board uses the AMD SR5650 and SR5670 IOBs to provide links between the G34 processor(s) and I/O components. The main components of the I/O controllers are configured to use two x16 HyperTransport 3 links (to CPU1 and CPU2), up to 46 lanes of PCI Express Gen 2, an x4 PCIe Gen 1 Southbridge Interface (SB Link), and an integrated IOAPIC. AMD SR5650 is IOB1 (primary) and AMD SR5750 is IOB2. CPU1 has direct HT3 link to IOB1 and CPU2 has direct HT3 link to IOB2. IOB1 has the Southbridge interface.

7.3 HyperTransport 3 (HT3)

The HyperTransport 3 consists of serial point-to-point interconnects for the processors and the I/O bridges. The PowerEdge R715 has a total of four HyperTransport (HT3) x16 links per processor, which allow each processor to be interconnected with each other with options for I/O Bridges. Each I/O Bridge has a single x16 HT3 link. A full Link consists of 16 lanes (full-width + ganged) in each direction with a link speed of 6.4 GT/s. The HT3 clocking for CPU HT3 and IOB HT3 are 3.2 GHz and 2.6 GHz, respectively. Therefore, the IOB HT3 link is capable of 5.2 GT/s. For routing, the HT3 links are grouped by x8 Command Address (CAD), x1 Control (CTL), and x1 Clock (CLK) for each RX and TX directions. Half links consist of 8 lanes in each direction with a link speed of 6.4 GT/s, and are considered unganged. There is throughput benefit with ganged links.

7.4 PCI Express Expansion

PCI Express is a serial point-to-point interconnect for I/O devices. PCIe Generation 2 doubles the signaling bit rate of Generation 1 from 2.5 Gb/s to 5 Gb/s. Each of the PCIe Gen2 ports is backward-compatible with Gen1 transfer rates.

The combined IOBs yield 46 PCI Express lanes. IOB1 has a x8 port that interfaces with Riser 1 PLX PCIe Gen 2 Bridge. The lanes are partitioned as follows:

- 1 PCI Express Gen2 x8 port from IOB1 to Riser1 PLX
  - o 1 PCI Express Gen2 x8 port (slot 1)
  - o 1 PCI Express Gen2 x4 port (slot 2)
  - o 1 PCI Express Gen2 x4 port dedicated to storage adapter (storage)
- 2 PCI Express Gen2 ports for LOM (x4 for LOM1 and x2 for LOM2)
- 1 PCI Express Gen2 x8 port from IOB1 (slot 4)
- 1 PCI Express Gen2 x8 port from IOB2 (slot 3)
- 2 PCI Express Gen2 x8 ports from IOB2 Riser2 (slots 5 and 6)

7.5 Southbridge Link Interface

The Southbridge (SB) Link connects the SR5650 IOB with the AMD Southbridge SP5100. The SB Link (A-Link Express) is equivalent to an x4 PCIe Gen 1 link with a transfer rate of 1 GB/s in each direction.

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The SP5100 is a highly integrated Southbridge controller, supporting the following functions:
- PCI Bus 32-bit Interface Rev 2.3 running at 33 MHz
- Serial ATA (SATA) ports with transfer rates up to 300 MB/s (PowerEdge R715 supports one SATA port for optical devices)
- Five OHC (full-speed 1.1) and two EHCI (high-speed 2.0) USB host controllers, with up to 12 USB general purpose ports and 2 USB embedded ports. (PowerEdge R715 uses six of these ports for internal and external use from the general purpose ports)
- Power management interface (ACPI 3.0b compliant)
- Integrated Micro Controller (IMC) and thermal management (iDRAC interfaces the Hardware Thermal Control (HTC) on PowerEdge R715)
- I/O interrupt controller
- SMBus 2.0 controller
- Low Pin Count (LPC) interface to Super I/O, Trusted Platform Module (TPM), and SPI-VU
- Serial Peripheral Interface (SPI) support for up to two devices (4MB BIOS flash is connected to the SP5100 using SPI interface)

7.6 Super I/O Controller

The PowerEdge R715 system planar uses an SMSC LPC47M534 Super I/O controller to provide support for the serial port and the keyboard controller. The LPC47M534 is a Plug and Play compatible device that interfaces directly to the SP5100 through the LPC bus.

8 BIOS

8.1 Overview

The PowerEdge R715 BIOS is based on the Dell BIOS core, and supports the following features:

- G34 Support
- Simultaneous Multi-Threading (SMT) support
- PCI 2.3 compliant
- Plug and play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Boot from hard drive, optical drive, iSCSI drive, USB key, and SD card
- ACPI support
- PXE and WOL support for on-board NICs
- Memory sparing support
- SETUP access through <F2> key at end of POST
- USB 2.0 (USB boot code is 1.1 compliant)
- F1/F2 error logging in CMOS
- Virtual keyboard, video, mouse (KVM), CD, and floppy support
- Unified Server Configurator (UEFI 2.1) support
- Power management support including DBS, Power Inventory, and multiple Power Profiles

The R715 BIOS does not support the following:

- Embedded Diagnostics (embedded in Life Cycle Controller)
- BIOS language localization
- BIOS recovery after bad flash (but can be recovered from iDRAC6 Express)

8.2 Supported ACPI States

Supported system ACPI states: S0, S4 (OS), and S5

Supported CPU ACPI states: C1E

Processor power states: P0 (highest – runtime) to P4 (lowest)

8.3 Factory BIOS Default Settings

See the System Setup Options section in the Using the System Setup Program and UEFI Boot Manager chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

8.4 Power Management Modes

8.4.1 OS Control

AMD processors support Enhanced AMD PowerNow!™ which enables the processor to dynamically change its operating frequency in response to workload changes. The industry standard implementation of this power management feature is in the Operating System (OS). The OS monitors process/thread level utilization of the processor and uses processor controls to change the processor's operating frequency. For heavy workloads, the OS will run the processor at higher frequencies for additional performance. Lighter workloads do not need high performance, thus the OS will run the processor at lower frequencies.

8.4.2 Active Power Controller

The Dell Active Power Controller (DAPC) is a Dell proprietary implementation that provides improved performance/watt over the OS implementation of AMD PowerNow!. DAPC was first released with the 11G server platforms. DAPC is implemented in system BIOS and uses hardware level counters, etc. to determine hardware utilization. BIOS uses this information to determine when to change the processor's operating frequency.

DAPC is OS independent. The OS no longer has control. This provides a consistent power management solution regardless of the installed OS. Some OS(s), particularly hypervisors, do not support power management, thus DAPC provides a solution when there otherwise would not be one.

8.4.3 Maximum Performance

The Maximum Performance Mode disables power management. In this mode, the processor frequency is statically set to the highest supported frequency.

9 Embedded NICs/LAN on Motherboard (LOM)

Two embedded Broadcom 5709C dual-port LAN controllers are on the PowerEdge R715 planar as independent Gigabit Ethernet interface devices. The following information details the features of the LAN devices include:

- x4 PCI Express Gen2 capable interface
- Controller operated at x2Gen2 speed
- Integrated MAC and PHY
- 3072x18 byte context memory
- 64 KB receive buffer
- TOE (TCP Offload Engine)
- iSCSI Offload Engine (enabled as standard)
- NC-SI (Network Controller-Sideband Interface) connection for manageability
- Wake-On-LAN (WOL)
- PXE 2.0 remote boot
- iSCSI boot
- IPv4 and IPv6 support
- Bare-metal deployment support
- Embedded LAN devices also support teaming with NIC adapters across multiple ports

10 I/O Slots

10.1 Overview

The PowerEdge R715 includes a total of six PCIe slots and one dedicated internal storage card slot. All slots are PCI Express Gen 2. See Table 11 for more information.

Table 11.   PCI Expansion Slots

PCI Slot #	Mechanical	Electrical	Height	Length	Bracket	Max Power
1	x16	x8	4.376"	9.5"	FH	
2	x8	x4	4.376"	9.5"	FH	System can support 2x 25W + 4x 15W cards
3	x8	x8	4.376"	9.5"	LP	
4	x8	x8	4.376"	9.5"	LP	
5	x16	x8	4.376"	9.5"	FH	
6	x16	x8	4.376"	9.5"	FH	
Internal	x8	x4	—	—	—	—

Two low-profile PCI Express slots are provided on the IO planar as follows:

- Slot3
- Slot4 (NC-SI cable header for NC-SI supported NICs)

The two PCI Express risers provide up to four expansion slots and one internal slot as follows:

- Riser1 (center riser; all slots are controlled from the PEX8642 PCIe Gen2 arbiter):
  - o Slot1 (top)
  - o Slot2 (bottom)
  - o Storage adapter (internal slot; accommodates internal RAID controllers with no sled)
- Riser2 (left riser; both slots are controlled from the IOB PCIe Gen2 arbiter [port GPP]):
  - o Slot5 (top)
  - o Slot6 (bottom)

The PowerEdge R715 supports 25W maximum power for the 1st and 2nd cards and 15W for the 3rd through 6th cards. The lower power support on the 3rd through 6th cards is due to system thermal limitations.

For more information about the PCI expansion slots, see the Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

10.2 PCI Risers

The PowerEdge R715 requires two PCI Express risers: Riser1 and Riser2. Both risers must be connected for the system to power up. Each riser connects to the planar through a physical x16 PCI Express connector with a Dell custom pin-out. There is no support for hot-plug or hot-removal for the risers.

10.3 Boot Order

The boot order can be customized based on bootable devices detected by the BIOS.

10.4 NIC and LOM Enumeration

LOMs will enumerate first in order to have consistent Ethernet assignment (i.e., eth0). NIC enumeration varies depending on configuration.

10.5 PCI Card Dimensions

For information about PCIe slots and card dimensions, see the Back-Panel Features and Indicators section in the About Your System chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

11 Storage

11.1 Overview

Table 12 lists the hard drives supported by the R715. Table 13 lists the supported RAID configurations.

Table 12.   Supported Hard Drives

Form Factor	Capacity	Speed	Type
2.5"	50, 100 GB		SSD (SATA)
2.5"	160, 250, 500 GB	7.2K	3Gb SATA
2.5"	500 GB	7.2K	6Gb Near-line SAS
2.5"	146, 300 GB	10K	6Gb SAS
2.5"	73, 146 GB	15K	6Gb SAS

Table 13.   RAID Configurations

				Non-Mixed drives all SATA or all SAS or all SSD	
Config Type	Configs		Description	Min HDD	Max HDD
No HDD	0	NZC	No controller/No hard drive	2.5" = 0	2.5" = 0
SAS or SATA HDDs, SAS or SATA SSDs—No RAID	1	MSS	Integrated SAS/SATA: PERC H200, No RAID	2.5" = 1	2.5" = 6
SAS or SATA HDDs, SAS or SATA SSDs—RAID	2	MSSR0	Integrated SAS/SATA RAID 0 (PERC H700,PERC H200)	2.5" = 2	2.5" = 6
	3	MSSR1	Integrated SAS/SATA RAID 1 (PERC H700,PERC H200)	2.5" = 2	2.5" = 2
	4	MSSR5	Integrated SAS/SATA RAID 5 (PERC H700)	2.5" = 3	2.5" = 6
	5	MSSR1/R5	Integrated SAS/SATA RAID 1/RAID 5 (PERC H700)	2.5" = 2+3	2.5" = 2+4
	6	MSSR10	Integrated SAS/SATA RAID 10 (PERC H700, PERC H200)	2.5" = 4	2.5" = 6

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Config Type	Configs		Description	Mixed SSD + SAS Min 2xSSD+2xSAS Max 2xSSD + 4xSAS	
				Min HDD	Max HDD
SAS or SATA SSD + SAS RAID	7	MSSR1/R1-X	Integrated SSD/SAS RAID 1/RAID 1 (PERC H700)	2.5" = 2+2	2.5" = 2+2
	8	MSSR1/R5-X	Integrated SSD/SAS RAID 1/RAID 5 (PERC H700)	2.5" = 2+3	2.5" = 2+4
	9	MSSR1/R10-X	Integrated SSD/SAS RAID 1/RAID 10 (PERC H700)	2.5" = 2+4	2.5" = 2+4

11.2 Persistent Storage

The PowerEdge R715 offers two types of persistent storage, unmanaged and managed. The following options are available for persistent storage:

- Unmanaged internal SD module
- Managed iDRAC6 Express or Enterprise (optional)

11.2.1 iDRAC6 Express (Lifecycle Controller)

The iDRAC6 Express is a managed persistent storage space for server provisioning data. iDRAC6 Express consists of 1 GB flash and vFlash (an optional external SD card on the optional iDRAC6 Enterprise). vFlash offers the hot-plug portability and increased storage capacity benefits of SD while still being managed by the system.

iDRAC6 Express is currently partitioned to support the following applications:

- Unified Server Configurator Browser and System Services Module (SSM) (25 MB): the Unified Server Configurator browser provides a consistent graphical user interface for bare metal deployment and is ideal for 1 to 1 deployment. The SSM supports automatic 1 to N deployment.
- Service Diagnostics (15 MB): Formerly on the hard drive as the Utility Partition, this is a bootable FAT16 partition for Service Diagnostics.
- Deployment OS Embedded Linux (100 MB): Storage space to hold Embedded Linux
- Deployment OS WinPE (200 MB): Storage space to hold Windows Pre-installation Environment
- Driver Store (150 MB): Holds all files required for OS deployment
- iDRAC6 firmware (120 MB): Holds the two most recent versions of iDRAC6 firmware
- Firmware Images (160 MB): Holds the two most recent versions of BIOS, RAID, embedded NIC, power supplies and hard drive firmware. This partition also holds the BIOS and option ROM configuration data.
- Lifecycle Log (2 MB): Stores initial factory configuration as well as all detectable hardware and firmware changes to the server since its deployment. The Life Cycle Log is stored on the BMC SPI flash.

Approximately 20% of the flash space is reserved for wear leveling on the NAND flash. Wear leveling is a method designed to extend the life of the NAND flash by balancing the use cycles on the flash's blocks.

11.2.2 Unmanaged Persistent Storage

The unmanaged persistent storage consists of two options:

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- An internal USB standard connector (located on the control panel board)
- An optional cabled internal dual SD module (The port on the control panel is for an optional USB key and is located inside the chassis.)

Some of the possible applications of the internal USB key are:

- User custom boot and pre-boot OS for ease of deployment or diskless environments

- USB license keys for software applications like eToken™ or Sentinel Hardware Keys

- Storage of custom logs or scratch pad for portable user defined information (not hot-pluggable)

11.2.3 Internal Dual SD Module

The internal dual SD module is a fully redundant module which uses two SD cards in a fully mirrored mode. If one card fails, the module issues an alert (no longer redundant) and continues to function with the surviving SD card. This allows you to gracefully bring down the hardware node to restore redundancy without any interruption to the supported VMs.

The Internal SD Module is dedicated for an SD flash card with embedded Hypervisor for virtualization. The SD flash card contains a bootable OS image for virtualized platforms. The microcontroller has a USB 2.0 interface to the control panel (through 1x12 cable) and SD card controller that interfaces the SD flash cards. When two SD flash cards are used, the controller can use the two flash cards as a redundant configuration. The controller can detect power loss and quickly housekeep before powering off to minimize chances for data corruption. Only the primary (SD0) is detected and bootable. SD1 is for mirror use only.

11.2.4 Flash BIOS memory

A flash EEPROM resides on the SPI Bus for BIOS and configuration storage. A 4 MB device is utilized for this function. The flash memory permits the BIOS to be upgraded in the field. The flash BIOS may be write-protected by software.

11.3 Storage Controllers

11.3.1 PERC H200

The H200 SAS HBA is an expansion card that plugs into the dedicated internal SAS slot on Riser1. It incorporates two four-channel 6 Gb/s SAS IOCs for connection to SAS hard disk drives. It is designed in a form factor that allows the same card to be used in other 11G 2U rack-form factor platforms.

11.3.2 PERC H700

Customers who want an internal RAID solution should select the H700. This card has its own processor with a PCI Express Gen2 host interface and DDR2 memory and installs into the dedicated internal SAS slot on Riser1. A battery is also available for backup. It supports the internal 6 Gb/s backplane interface for internal storage options (SAS, SATA, or SSD HDD). The PowerEdge R715 supports both 256MB and 512MB cache options on the internal H700.

11.3.3 PERC H800

The PowerEdge R715 can support up to two PERC H800 adapter cards for access to external SAS direct-attach storage. Features of the PERC H800 include:

- LSI 2108 (Liberator) ROC
- 6 Gb/s SAS
- PCIe Gen2 x8
- 800 MHz Core PPC
- DDR2 800 mini-DIMM
- Dual mini-SAS connectors
- Supports connection to 6 Gb/s enclosures only

A maximum of 2 external storage controllers (PERC H800) are allowed in the system in addition to the integrated storage controller.

For more information on storage controllers, see Table 14.

Table 14.   Storage Card Support Matrix

	Product	Usage	PowerEdge R715 Support	Slot	PCI Con	PCI Bracket	IO Con	RAID	Battery Back Up
PERC SAS/ SATA	PERC H700 Integrated	Internal Backplane Storage RAID (HDD, SSD)	Yes—Max 1	Storage Slot	x8	No	x4 int x2 int	0, 1, 5, 6, 10, 50, 60	Yes
	PERC H800 Adapter	External SAS/SATA Storage	Yes—Max 2 (Red Devil and Blue Devil 6 Gb/s enclosures)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 6, 10, 50, 60	TBBU
SAS HBA SAS/ SATA	H200	Internal Backplane Storage (No tape nor SSD support)	Yes—Max 1	Storage Slot	x8	No	x4 int x2 int	0, 1	No
SP5100 SATA	On Planar via chipset	Internal slim-line SATA Optical (No HDD)	Yes—1 port for Optical	n/a	n/a	n/a	x1 int	n/a	n/a
LSI 2032 SCSI	LSI 2032 Adapter	External SCSI Tape/Legacy External Storage	Yes—Max 2	PCIe slot	x8	Yes	SCSI ext	n/a	n/a

11.4 LED Indicators

Each disk drive carrier has two LED indicators visible from the front of the system. One is a green LED for disk activity and the other is a bicolor (green/amber) LED for status information. The activity LED is driven by the disk drive during normal operation. The bicolor LED is controlled by the SEP device

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on the backplane. Both LEDs are used to indicate certain conditions under direction of a storage controller.

For more information, see the Hard-Drive Indicator Patterns section in the About Your System chapter in the *PowerEdge R715 Hardware Owner's Manual* on Support.Dell.com.

11.5 Optical Drives

Optical drives are optional in all PowerEdge R715 systems and connect to the planar via the SATA interface. The following internal slim-line drives are available on the PowerEdge R715: DVD-ROM and DVD+RW.

If an optical drive is not ordered with the system, a blank is installed in its place.

11.6 Tape Drives

External tape drives and tape libraries are supported. For more information on supported tape drives and tape libraries, see http://www.dell.com/storage.

11.7 External Storage Support

External storage devices are supported. For more information, see http://www.dell.com/storage.

12 Video

The R715 Integrated Dell Remote Access Controller 6 (iDRAC6) incorporates an integrated video subsystem, connected to the 32-bit PCI interface of the SP5100. This logic is based on the Matrox® G200. The device only supports 2D graphics.

The video device outputs are multiplexed between the front and rear video ports. If a monitor is connected to the front video connector, it will take precedence over the rear connection, thereby removing the display from the rear connection.

The integrated video core shares its video memory with the iDRAC6's 128 MB DDR2 application space memory. This memory is also used for the KVM buffer.

The R715 system supports the following 2D graphics video modes shown in Table 15:

Table 15.   2D Graphics Video Modes

Resolution	Refresh Rate (Hz)	Color Depth (bit)
640 x 480	60, 72, 75, 85	8, 16, 32
800 x 600	56, 60, 72, 75, 85	8, 16, 32
1024 x 768	60, 72, 75, 85	8, 16, 32
1152 x 864	75	8, 16, 32
1280 x 1024*	60, 75, 85	8, 16
1280 x 1024*	60	32

*These resolutions are supported through the rear video connector only.

13 Rack Information

13.1 Overview

The ReadyRails™ sliding rail system for the PowerEdge R715 provides toolless support for racks with square or unthreaded round mounting holes including all generations of Dell racks. They also support tooled mounting in 4-post threaded racks using an optional adapter brackets kit. 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. Compatibility is as follows:

- The R715 is not compatible with any other Dell rails including previous generation rails, but it does use the same rails as the R810, R815, and R910.
- The R715 supports sliding rails only. Static rails are not supported.
- Mounting in 2-post racks is not supported.
- The CMA is not supported on racks that are less than 1m in depth including Dell's 4200 and 2400 racks.

13.2 Rails

The ReadyRails sliding rails for the R715 support toolless mounting in 19"-wide, EIA-310-E compliant square hole and unthreaded round hole racks and are available with or without the optional cable management arm (CMA). See Figure 10.
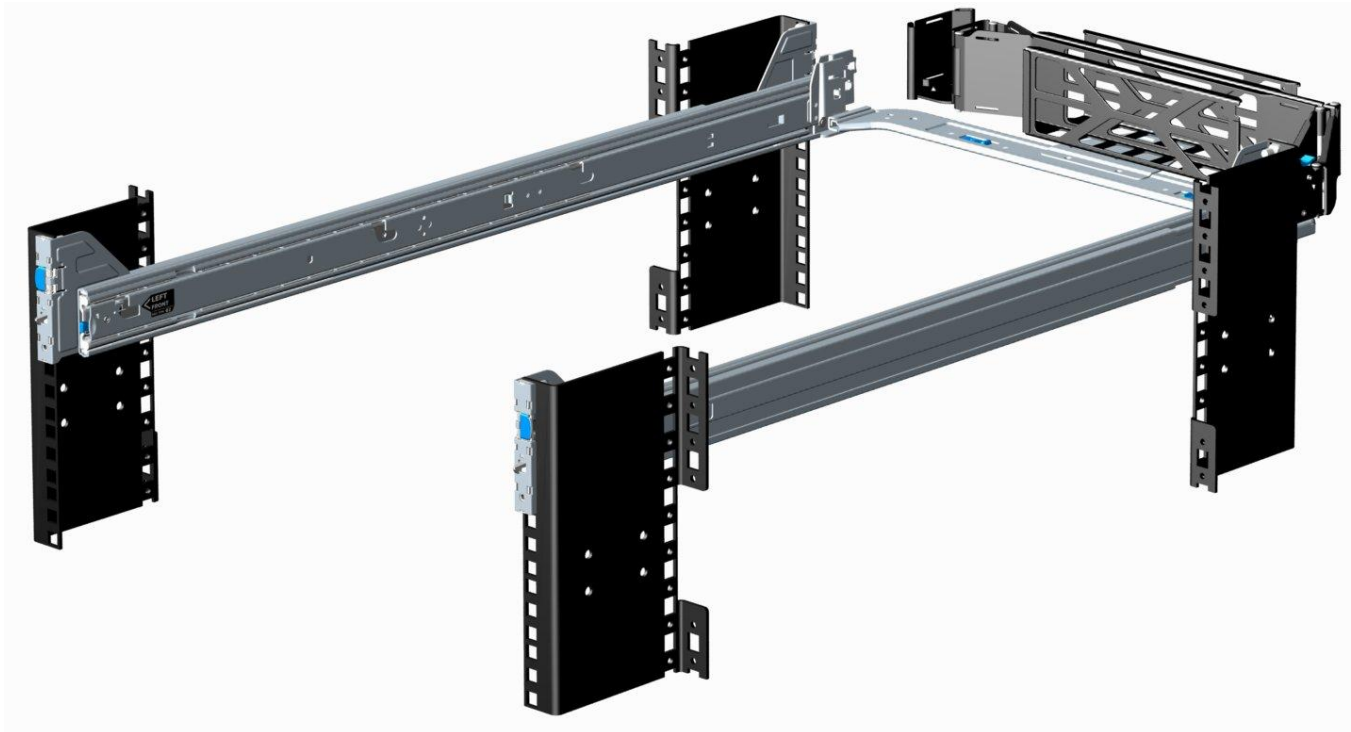
Figure 10.   R715 ReadyRails Sliding Rails with Optional CMA

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The rails can be used in a threaded hole rack only if threaded rack adapter brackets are installed. The threaded rack adapter brackets are first mounted to the EIA flanges in the rack, and then the rails are mounted into the brackets. The design of the brackets has been optimized to limit the forward shift of the system in the rack to only 17.3 mm.

The adapter brackets kit includes 6 brackets to accommodate different rail lengths, plus 4 sets of custom screws in common thread sizes. A detailed Getting Started Guide is included in the kit along with directions for installing the brackets and mounting the rails into the brackets.

Depending on the depth of the rack used, it may be necessary to remove the server's bezel in order to close the door of the rack. A minimum of 58 mm will be needed between the back surface of the door panel and the front face of the EIA flange for the front door to close with the 11G server bezel installed.
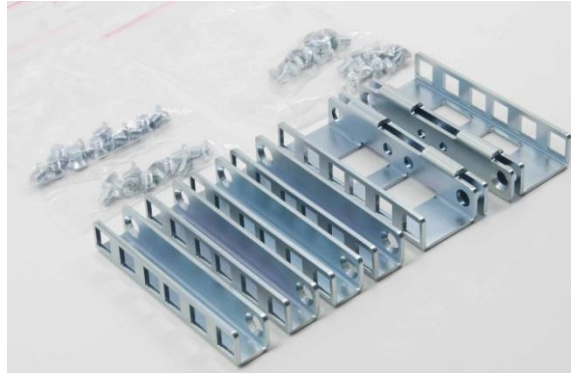
Figure 11.   2U Threaded Rack Adapter Brackets Kit

Table 16 provides a summary of the rack types supported by the R715 rails. Mounting in 2-post racks is not supported.

Table 16.   Supported Racks

Product	Rail ID	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
R715	B2	ReadyRails	Sliding	√	√	√*	X	X

*Requires the 2U Threaded Rack Adapter Brackets Kit (Dell PN PKCR1)

Other factors to consider when deploying the R715 include the spacing between the front and rear mounting flanges of the rack, the type and location of any equipment mounted in the back of the rack such as power distribution units (PDUs), and the overall depth of the rack. See Table 17. For example, use of the CMA requires racks that are a minimum of 1m in depth with the PDUs or other rack accessories positioned on the sides or rear of the rack away from the CMA.

Table 17. Rail Adjustability Ranges and Depth

Rail Adjustability Range (mm)						Rail Depth (mm)	
Square		Round		Threaded		without CMA	with CMA
Min	Max	Min	Max	Min	Max		
686	883	672	876	651	897	755	883

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 represents the minimum depth of the rail as measured from the rack front mounting flanges when the rail rear bracket is positioned all the way forward.

13.3 Cable Management Arm (CMA)

The optional cable management arm (CMA) for the R715 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 R715 CMA include:

- Large U-shaped baskets support dense cable loads.
- An open-vent pattern allows optimal airflow.
- The CMA mounting is fully-reversible (can be mounted on either side) with no conversion required.
- Hook-and-loop straps are used (rather than plastic tie wraps) to eliminate the risk of cable damage during cycling.
- A low-profile fixed tray is included to support and retain the CMA in its fully-closed position.
- The CMA and the tray can be mounted without the use of tools using simple and intuitive snap-in designs.

13.4 Rack View

The R715 ReadyRails sliding rails are a drop-in design, meaning that the system is installed vertically into the rails by inserting the shoulder nuts on the sides of the system into the J-slots in the inner rail members with the rails in the fully extended position. See Figure 12.

Figure 12. R715 Mounted in the B2 Sliding Rails

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The R715 CMA can be mounted to either side of the rails without the use of tools or the need for conversion, but it is recommended that it be mounted on the side opposite the power supplies to allow easier access to the power supplies for service or replacement as shown in Figure 13.

Figure 13.   R715 CMA Mounted on the Side Opposite the Power Supplies (Recommended)

14 Operating Systems and Virtualization

For detailed information, see the following:

- [Operating System Support Matrix for Dell PowerEdge Systems](#) on www.Dell.com
- *Dell PowerEdge R715 Systems Getting Started With Your System* guide on [Support.Dell.com](#)

15 Systems Management

15.1 Overview

Dell delivers open, comprehensive, and integrated solutions that help you reduce the complexity of managing disparate IT assets. Combining Dell PowerEdge Servers with a wide selection of Dell developed systems management solutions gives you choice and flexibility, so you can simplify and save in IT environments of any size. To help you meet your server management demands, Dell offers Dell OpenManage™ systems management solutions for:

- Deployment of one or many servers from a single console
- Monitoring of server and storage health and maintenance
- Update of system, operating system, and application software

Dell offers IT management solutions for organizations of all sizes—priced, sized, and supported right.

15.2 Server Management

A Dell Systems Management and Documentation DVD and a Dell Management Console DVD are included with the product. ISO images are also available. A brief description of available content:

- Dell Systems Build and Update Utility: Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.

- OpenManage Server Administrator: The OpenManage Server Administrator (OMSA) tool provides a comprehensive, one-to-one systems management solution, designed for system administrators to manage systems locally and remotely on a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.

- Management Console: Our legacy IT Assistant console is also included, as well as tools to allow access to our remote management products. These tools are Remote Access Service, for iDRAC, and the BMC Management Utility.

- Active Directory Snap-in Utility: The Active Directory Snap-in Utility provides an extension snap-in to the Microsoft Active Directory. This allows you to manage Dell specific Active Directory objects. The Dell-specific schema class definitions and their installation are also included on the DVD.

- Dell Systems Service Diagnostics Tools: Dell Systems Service and Diagnostics tools deliver the latest Dell optimized drivers, utilities, and operating system-based diagnostics that you can use to update your system.

- eDocs: The section includes PDF files for PowerEdge systems, storage peripheral, and OpenManage software.

- Dell Management Console DVD: The Dell Management Console is a Web-based systems management software that enables you to discover and inventory devices on your network. It also provides advanced functions, such as health and performance monitoring of networked devices and patch management capabilities for Dell systems.

- Server Update Utility: In addition to the Systems Management Tools and Documentation and Dell Management Console DVDs, customers have the option to obtain Server Update Utility DVD. This DVD has an inventory tool for managing updates to firmware, BIOS and drivers for either Linux or Windows varieties.

15.3 Embedded Server Management

The PowerEdge R715 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The iDRAC (Integrated Dell Remote Access Controller) is responsible for acting as an interface between the host system and its management software and the periphery devices.

iDRAC6 provides features for managing the server remotely or in data center lights-out environments.

Advanced iDRAC features require the installation of the optional iDRAC6 Enterprise card.

15.4 Lifecycle Controller and Unified Server Configurator

Embedded management is comprised of several interdependent pieces:

- Lifecycle Controller
- Unified Server Configurator
- iDRAC6
- vFlash

Lifecycle controller powers the embedded management features. It is integrated and tamperproof storage for system-management tools and enablement utilities (firmware, drivers, etc.). It is flash partitioned to support multiple, future-use cases.

Dell Unified Server Configurator (USC) is a local 1:1 graphical user interface embedded on Lifecycle Controller that aids in local server provisioning in a pre-OS environment. Lifecycle Controller offers OS install, platform updates, platform configuration, and diagnostics capabilities.

To access the Unified Server Configurator, press the <F10> key within 10 seconds of the Dell logo's appearance during the system boot process. Current functionality enabled by the Unified Server Configurator includes those shown in Table 18.

Table 18.   Unified Server Configurator Features and Description

Feature	Description
Faster O/S Installation	Drivers and the installation utility are embedded on system, so no need to scour Dell.com
Faster System Updates	Integration with Dell support automatically directed to latest versions of the Unified Server Configurator, iDRAC, RAID, BIOS, NIC, and Power Supply
Update Rollback	Ability to recover to previous "known good state" for all updatable components
More Comprehensive Diagnostics	Diagnostic utilities are embedded on system
Simplified Hardware Configuration	Detects RAID controller and allows user to configure virtual disk and choose virtual disk as boot device, eliminating the need to launch a separate utility. Also provides configuration for iDRAC, BIOS, and NIC/LOM.

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15.5 Integrated Dell Remote Access Controller

The integrated Dell Remote Access Controller (iDRAC6) provides IT Administrators comprehensive yet straightforward management of remote servers, by delivering "as if you are there" presence and control. iDRAC6 helps users to save time and money by eliminating travel to the remote server(s), whether that server is located in a different room, a different building, a different city, or in a different country. iDRAC6 is available as three offerings: iDRAC6 Express, Enterprise, and Virtual Flash (vFlash) media:

- iDRAC6 Express is most appropriate for SMB customers with limited remote management needs.
- iDRAC6 Enterprise is appropriate for large, data center customers with distributed servers.
- iDRAC6 with vFlash Media is provided for large enterprise customers with requirements for system management automation.

15.6 iDRAC Express

The iDRAC Express is standard on the PowerEdge R715. In addition to providing a Lifecycle Controller, the iDRAC6 Express offers the following key features:

- Graphical web interface

- Standard-based interfaces

- Server Sensor monitoring and fault alerting

- Secure operation of remote access functions including authentication, authorization, and encryption

- Power control and management with the ability to limit server power consumption and remotely control server power states

- Advanced troubleshooting capabilities

For more information on iDRAC6 Express features see Table 19.

15.7 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the R715 planar and is mounted parallel to the planar with stand-offs.

Key features for the iDRAC6 Enterprise include:

- Scripting capability with Dell's Racadm command-line

- Remote video, keyboard, and mouse control with Virtual Console

- Remote media access with Virtual Media

- Dedicated network interface

15.8 iDRAC6 Enterprise with Virtual Flash (vFlash) Media

The iDRAC6 Enterprise can be upgraded by adding the vFlash Media card. This is an 8GB Dell branded SD card that enables a persistent 256 MB virtual flash partition. The vFlash Media delivers the following key features:

- Support for 8GB SD storage media
- Can be used as a repository for a pre-OS image, eliminating the need to maintain a network infrastructure for OS deployment

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- Can also be used for permanent diagnostics image for use after system failures, or permanent failsafe image for periodic configuration changes

A more detailed feature list for iDRAC6 Enterprise and vFlash Media is included in Table 19.

Table 19. Features List for BMC, iDRAC and vFlash

Feature	BMC	iDRAC 6 Express	iDRAC6 Enterprise	vFlash Media
Interface and Standards Support				
IPMI 2.0	✓	✓	✓	✓
Web-based GUI		✓	✓	✓
SNMP		✓	✓	✓
WSMAN		✓	✓	✓
SMASH-CLP		✓	✓	✓
Racadm command-line			✓	✓
Conductivity				
Shared/Failover Network Modes	✓	✓	✓	✓
IPv4	✓	✓	✓	✓
VLAN Tagging	✓	✓	✓	✓
IPv6		✓	✓	✓
Dynamic DNS		✓	✓	✓
Dedicated NIC			✓	✓
Security and Authentication				
Role-based Authority	✓	✓	✓	✓
Local Users	✓	✓	✓	✓
Active Directory		✓	✓	✓
SSL Encryption		✓	✓	✓
Remote Management and Remediation				
Remote Firmware Update	✓	✓	✓	✓
Server power control	✓	✓	✓	✓
Serial-over-LAN (with proxy)	✓	✓	✓	✓
Serial-over-LAN (no proxy)		✓	✓	✓
Power capping		✓	✓	✓
Last crash screen capture		✓	✓	✓

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Feature	BMC	iDRAC 6 Express	iDRAC6 Enterprise	vFlash Media
Boot capture		✓	✓	✓
Serial-over-LAN		✓	✓	✓
Virtual media			✓	✓
Virtual console			✓	✓
Virtual console sharing			✓	✓
Virtual flash				✓
Monitoring				
Sensor Monitoring and Alerting	✓	✓	✓	✓
Real-time Power Monitoring		✓	✓	✓
Real-time Power Graphing		✓	✓	✓
Historical Power Counters		✓	✓	✓
Logging Features				
System Event Log	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log			✓	✓

16 USB Peripherals

The PowerEdge R715 supports the following USB devices:

- DVD (bootable; requires two USB ports)
- USB Key (bootable)
- Keyboard (only one USB keyboard is supported)
- Mouse (only one USB mouse is supported)

Appendix A.   Certifications

A.1 Regulatory Certifications

Regulatory compliance certificates can be located at the following sites:

http://ausreactorprd01/reactor/xCertSearch.asp

http://www.dell.com/content/topics/global.aspx/about_dell/values/regulatory_compliance/dec_conform?c=us&l=en&s=corp

A.2 Product Safety Certifications

The product has been certified and bears the Mark, as applicable, of the Product Safety authorities as indicated in Table 20.

Table 20.   Product Safety Certifications

Country/Region	Authority or Mark
Argentina	IRAM
Belarus	BELLIS
Canada	SCC
China	CNCA or CCC
Croatia	KONCAR
European Union	CE
Germany	TUV
IECEE	IECEE CB
Israel	SII
Kazakhstan	OTAN – CKT
Kenya	KEBS
Kuwait	KUCAS
Mexico	NYCE or NOM
Moldova	INSM
Nigeria	SONCAP
Norway	NEMKO
Russia	GOST
Saudi Arabia	KSA ICCP
South Africa	NRCS
Taiwan	BSMI
Ukraine	UKRTEST or UKRSERTCOMPUTER
United States	NRTL
Uzbekistan	STZ

A.3 Electromagnetic Compatibility

The product has been certified and bears the Mark, as applicable, of the EMC authorities as indicated in Table 21.

Table 21.   Electromagnetic Compatibility Certifications

Country/Region	Authority or Mark	Class
Australia/New Zealand	ACMA or C-Tick	Class A
Belarus	BELLIS	Class A
Bosnia & Herzegovina, Montenegro, Serbia	KVALITET	Class A
Canada	ICES	Class A
China	CNCA or CCC	Class A
Croatia	KONCAR	Class A
European Union	CE	Class A
Israel	SII	Class A
Japan	VCCI	Class A
Kazakhstan	OTAN – CKT	Class A
Moldova	INSM	Class A
Norway	NEMKO	Class A
Russia	GOST	Class A
South Africa	SABS	Class A
South Korea	KCC	Class A
Taiwan	BSMI	Class A
Ukraine	UKRTEST or UKRSERTCOMPUTER	Class A
United States	FCC	Class A
Uzbekistan	STZ	Class A
Vietnam	ICT	Class A

A.4 Ergonomics, Acoustics and Hygienics

The product has been certified and bears the Mark, as applicable, of the Ergonomics, Acoustics and Hygienics authorities as indicated in Table 22.

Table 22.   Ergonomics, Acoustics and Hygienics

Country/Region	Authority or Mark
Belarus	BELLIS
Germany	GS
Russia	GOST

Appendix B.   Additional Information and Options

PowerEdge R715 systems conform to the industry standards detailed in Table 23.

Table 23.   Industry Standards

Standard	URL for information and specifications
ACPI Advance Configuration and Power Interface Specification, v2.0c	http://www.acpi.info/
Energy Star EPA Version 1.0 of the Computer Server specification	http://www.energystar.gov/index.cfm?c=archives.enterprise_servers
Ethernet IEEE 802.3-2005	http://standards.ieee.org/getieee802/802.3.html
IPMI Intelligent Platform Management Interface, v2.0	http://www.intel.com/design/servers/ipmi/
DDR3 Memory DDR3 SDRAM Specification, Rev. 3A	http://www.jedec.org/download/search/JESD79-3A.pdf
LPC Low Pin Count Interface Specification, Rev. 1.1	http://developer.AMD.com/design/chipsets/industry/lpc.htm
PCI Express PCI Express Base Specification Rev. 2.0	http://www.pcisig.com/specifications/pciexpress/
PMBus Power System Management Protocol Specification, v1.1	http://pmbus.info/specs.html
SAS Serial Attached SCSI, v1.1	http://www.t10.org/cgi-bin/ac.pl?t=f&f=sas1r10.pdf
SATA Serial ATA Rev. 2.6; SATA II, Extensions to SATA 1.0a, Rev. 1.2	http://sata-io.org/
SMBIOS System Management BIOS Reference Specification, v2.6	http://www.dmtf.org/standards/smbios/
TPM Trusted Platform Module Specification, v1.2	http://www.trustedcomputinggroup.org/resources/tpm_main_specification

UEFI Unified Extensible Firmware Interface Specification, v2.1	http://www.uefi.org/specs/
USB Universal Serial Bus Specification, Rev. 2.0	http://www.usb.org/developers/docs/
Windows Logo Windows Logo Program System and Device Requirements, v3.10	http://www.microsoft.com/whdc/winlogo/hwrequirements.mspx

Appendix C.   Statement of Volatility

The Dell PowerEdge R715 contains both volatile and non-volatile (NV) components. Volatile components lose their data immediately upon removal of power from the component. Non-volatile components continue to retain their data even after the power has been removed from the component. Components chosen as user-definable configuration options (those not soldered to the motherboard) are not included in the Statement of Volatility. Configuration option information (pertinent to options such as microprocessors, system memory, remote access controllers, and storage controllers) is available by component separately.

Table 24 shows which NV components are present in the PowerEdge R715 server.

Table 24.   Statement of Volatility

Server BIOS Memory (SPI Flash, IC)	Details
Size:	4 MB
Type: [e.g., Flash PROM, EEPROM]:	Flash EEPROM (Serial Peripheral Interface)
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Boot Code, Configuration Information, EUFI environment
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Remarks	This flash resides on I/O board
Server CMOS (Complementary Metal-Oxide Semiconductor) Memory	**Details**
Size:	512 Bytes
Type: [e.g., Flash PROM, EEPROM]:	Battery backed NVRAM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	RTC & storing system configuration settings
How is data input to this memory?	F2 Setup Menu during POST
How is this memory write protected?	N/A
Remarks	Jumper on motherboard can be used to clear to factory default settings. Removing CMOS battery will clear to factory defaults settings as well. This NVRAM resides on I/O board.

Server BMC (Baseboard Management Controller) also known as "iDRAC Express" boot block flash	Details
Size:	2 MB
Type: [e.g., Flash PROM, EEPROM]:	Serial Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	iDRAC boot loader and configuration (i.e. MAC address), Lifecycle log.
How is data input to this memory?	Data pre-programmed or update using Dell utility which is a DOS or Windows or Linux based executable containing firmware file and loader
How is this memory write protected?	Software write protected
Remarks	Bad contents yield the iDRAC inoperable and is unrecoverable in the customer environment. Note the lifecycle log is automatically updated by the iDRAC as various system component FW, HW and SW versions are changed. This flash resides on I/O board
Server BMC (Baseboard Management Controller) also known as "iDRAC Express" Internal Flash	Details
Size:	1 GB
Type: [e.g., Flash PROM, EEPROM]:	NAND Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	iDRAC Operating System plus Managed System Services Repository (i.e. Unified Server Configurator, OS drivers, diagnostics, rollback versions of various programmables)
How is data input to this memory?	iDRAC OS: Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded without a good iDRAC firmware image yields a non-functional iDRAC. Managed Services Repository: Various partitions are loaded via vendor provided firmware file and loader program just like iDRAC OS.
How is this memory write protected?	Software write protected
Remarks	This flash resides on I/O board

System Event Log (SEL) memory and I/O Board FRU	Details
Size:	4 KB
Type: [e.g., Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Store system events from BMC and BIOS. FRU information for board such as PPID, MAC addresses etc.
How is data input to this memory?	For SEL, BMC writes to it. For FRU, data is pre-programmed or using Dell utility at ICT/Functional Tester during board assembly
How is this memory write protected?	Software write protected.
FRU (Field Replacement Unit) for CPU board	**Details**
Size:	256 Bytes
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	FRU information for boards such as board name, PPID, manufacturing date etc.
How is data input to this memory?	Data pre-programmed or using Dell utility at ICT/Functional Tester during board assembly
How is this memory write protected?	Not write protected
DIMM modules SPD (Serial Presence Detect) EEPROM (up to 64 depending on the number of DIMM modules present)	**Details**
Size:	256 Bytes
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	DIMM information and temperature settings.
How is data input to this memory?	Data preprogrammed by the DIMM vendors (lower 128 bytes). Also during boot sequence, data is written to SPD EEPROM (upper 128 Bytes).
How is this memory write protected?	Not write protected

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TPM (Trusted Platform Module)	Details
Size:	128 Bytes
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Stores encryption keys for TPM functionality
How is data input to this memory?	Data is pre-programmed by vendor. Keys are updated using TPM enabled operating systems.
How is this memory write protected?	Software write protected
Remarks	F2 BIOS setup option to enable/activate/clear
TPM Alternative Plug-in module	**Details**
Size:	256 Bytes
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Stores encryption keys for TPM functionality
How is data input to this memory?	Data is pre-programmed by vendor. Keys are updated using TPM enabled operating systems.
How is this memory write protected?	Software write protected
Remarks	F2 BIOS setup option to enable/activate/clear
Server CPLD Devices (2 total)	**Details**
Size:	2280 macro-cells and 1200 macro-cells
Type: [e.g., Flash PROM, EEPROM]:	Internal Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	System power sequence control, error/config detection, and BIOS-BMC interaction.
How is data input to this memory?	Programming CPLD(s) requires a vendor provided logic file and loader program which is executed by booting up the system from a floppy or OS based executable containing the logic file and the loader. System loaded with arbitrary data in CPLD(s) would not operate.
How is this memory write protected?	Software write protected
Remarks	Need AC cycle after updating CPLD 2 CPLD with 2280 on I/O board (CPLD1 – master) & 1200 on CPU board (CPLD2 – slave)

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Broadcom 5709C LAN On Motherboard (2 controllers on I/O board)	Details
Size:	1MB
Type: [e.g., Flash PROM, EEPROM]:	Serial Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Embedded Network Controller FW & config data
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not have the network ports operational.
How is this memory write protected?	Software write protected
Remarks	There is a quantity of "2" SPI flash on the IO board
Server (6-drive SAS) Backplane Storage Controller Memory	Details
Size:	32KB
Type: [e.g., Flash PROM, EEPROM]:	Embedded Microcontroller Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Stores the server storage backplane FW and FRU
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program which is executed by booting up the system from a floppy or OS based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Power Supply Firmware and FRU (Field Replacement Unit) memory.	Details
Size:	4KB–16KB FLASH with 256–1024 bytes RAM
Type: [e.g., Flash PROM, EEPROM]:	FLASH and SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes

Purpose? [e.g., boot code]	Stores PSU controller firmware. FRU information for boards such as name, manufacturing date etc.
How is data input to this memory?	FRU data pre-programmed by the PSU vendors. PSU firmware can be updated by Dell provided update package
How is this memory write protected?	Software write protected
Remarks	
Dell Internal Dual SD Module (IDSM) microcontroller flash (if present)	**Details**
Size:	256 KB
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Store firmware for IDSM functionality
How is data input to this memory?	Loading flash memory requires a vendor provided firmware file and loader program. IDSDM module loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software write protected
Remarks	IDSM is an option
Dell Internal Dual SD Module (IDSM) write journal flash (if present)	**Details**
Size:	8 MB
Type: [e.g., Flash PROM, EEPROM]:	EEPROM
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Store write journal for shutdown recovery
How is data input to this memory?	IDSM microcontroller writes to and read from these memory via SPI interface during operation
How is this memory write protected?	Software write protected
Remarks	IDSM is an option
SD card(s) (if present) for IDSM (one or two SD cards depending on the redundancy mode ordered with it)	**Details**
Size:	Multiple
Type: [e.g., Flash PROM, EEPROM]:	Secure Digital NAND Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes

Purpose? [e.g., boot code]	Normal usage is embedded Hypervisor OS but not limited
How is data input to this memory?	Factory load, OS run time usage and OS updates and configuration changes.
How is this memory write protected?	Media write protection or Software write protected
Remarks	IDSM is an option
vFlash for iDRAC Enterprise	**Details**
Size:	Multiple
Type: [e.g., Flash PROM, EEPROM]:	Secure Digital NAND Flash
Can user programs or operating system write data to it during normal operation?	No
Does it retain data when powered off?	Yes
Purpose? [e.g., boot code]	Storage of logs, user images like files, drivers, OS's etc.
How is data input to this memory?	Preloaded media before installation, or remote out of band upload of user data (i.e. ISO images, files) or local server read/write capability to use it like a hard disk
How is this memory write protected?	Media write protection or Software write protected
Remarks	iDRAC Enterprise and vFlash is optional

In addition to these, there are four external ports and one internal USB port on the R715 where a user can install a USB flash memory.

To obtain optional component information, please refer to the Dell Statement of Volatility for the individual components. Please direct any questions to your Dell Marketing contact.