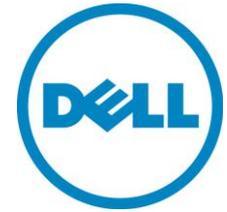


PowerEdge R815



Technical Guide



Ideal for virtualization, medium-sized databases, high-performance computing, and other highly threaded application implementations.

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Table of Contents

1	Product Comparison	5
1.1	Overview	5
1.1.1	Performance-Driven Technology	5
1.1.2	Purpose-Built for Reliability	5
1.1.3	Efficient Infrastructure	6
1.1.4	Intelligent, Connected Systems Management	6
1.2	Comparison	6
2	System Overview	8
3	Mechanical	11
3.1	Chassis Description	11
3.2	Dimensions and Weight	11
3.3	Front Panel View and Features	12
3.4	Back Panel View and Features	12
3.5	Power Supply Indicators	13
3.6	NIC Indicators	13
3.7	Side Views	13
3.8	Internal Chassis View	14
3.9	Rails and Cable Management	14
3.10	Fans	15
3.11	Cabling	15
3.12	Control Panel/LCD	17
3.13	Security	17
3.13.1	Cover Latch	17
3.13.2	Bezel	18
3.13.3	Hard Drive	18
3.13.4	TPM	18
3.13.5	Power Off Security	18
3.13.6	Intrusion Alert	18
3.13.7	Secure Mode	18
3.14	USB Key	18
3.15	Battery	19
3.16	Field Replaceable Units (FRU)	19
3.17	User Accessible Jumpers, Sockets, and Connectors	19
4	Power, Thermal, Acoustic	20
4.1	Power Supplies	20
4.2	Power Distribution Board	20
4.3	Power Efficiency	20
4.4	Power Supply Specifications	21
4.5	Environmental Specifications	21
4.6	ENERGY STAR® Compliance	22
4.7	Thermal	22
4.8	Acoustics	23
5	Processors	24
5.1	Overview	24
5.2	Features	24
5.3	Supported Processors	25
5.4	Processor Configurations	25
5.5	Processor Installation	25
5.6	Additional Processor Information	26

Dell

6	Memory	27
6.1	Overview	27
6.2	DIMMs Supported	27
6.3	Slots/Risers	27
6.4	Speed	27
6.5	Sparing.....	28
6.6	Mirroring.....	28
6.7	RAID	28
6.8	Supported Configurations	28
7	Chipset	30
7.1	Overview	30
7.2	AMD I/O Bridges	30
7.3	HyperTransport 3 (HT3)	30
7.4	PCI Express Expansion	30
7.5	SouthBridge Link Interface	31
8	BIOS	32
8.1	Overview	32
8.2	Supported ACPI States.....	32
9	Embedded NICs/ LAN on Motherboard (LOM)	33
9.1	Overview	33
10	I/O Slots	34
10.1	Overview	34
10.2	PCI Risers.....	34
10.3	Boot Order	35
10.4	NIC and LOM Enumeration	35
10.5	PCI Card Dimensions	35
11	Storage	36
11.1	Overview	36
11.2	Storage Controllers	37
11.2.1	PERC H200.....	37
11.2.2	PERC H700.....	37
11.2.3	PERC H800.....	37
11.3	LED Indicators	38
11.4	Optical Drives.....	38
11.5	Tape Drives	38
12	Video.....	39
12.1	Overview	39
13	Rack Information.....	40
13.1	Overview	40
13.2	Rails.....	40
13.3	Cable Management Arm (CMA)	42
13.4	Rack View	42
14	Operating Systems and Virtualization.....	44
15	Systems Management.....	45
15.1	Overview	45
15.2	Server Management.....	45
15.3	Embedded Server Management	46
15.4	Lifecycle Controller and Unified Server Configurator	46
15.5	Integrated Dell Remote Access Controller.....	47
15.6	iDRAC Express.....	47
15.7	iDRAC6 Enterprise.....	48
15.8	iDRAC6 Enterprise with Virtual Flash (vFlash) Media	48

16	Peripherals.....	51
16.1	USB peripherals.....	51
16.2	External Storage.....	51

Tables

Table 1.	Comparison of PowerEdge R815, R905, and R810 Servers.....	6
Table 2.	Product Features Summary	8
Table 3.	Power Supply Status	13
Table 4.	Power Supply Specifications.....	21
Table 5.	Environmental Specifications.....	21
Table 6.	Acoustical Performance for 4-Socket Configuration	23
Table 7.	G34 Processor Features	24
Table 8.	Supported Processors	25
Table 9.	Supported Configurations	28
Table 10.	PCI Risers.....	35
Table 11.	Drives	36
Table 12.	RAID Configurations.....	36
Table 13.	Storage Card Support Matrix.....	38
Table 14.	2D Graphics Video Modes	39
Table 15.	Supported Racks.....	41
Table 16.	Rail Adjustability Ranges and Depth	42
Table 17.	Unified Server Configurator Features and Description.....	47
Table 18.	Features List for BMC, iDRAC and vFlash	48
Table 19.	Statement of Volatility.....	52

Figures

Figure 1.	R815 Chassis Dimensions	11
Figure 2.	Front View (without Bezel)	12
Figure 3.	Front View (with Bezel)	12
Figure 4.	Rear View	12
Figure 5.	Side View	13
Figure 6.	Internal Chassis View	14
Figure 7.	Cabling Diagram	16
Figure 8.	LCD Panel	17
Figure 9.	USB Port	19
Figure 10.	R815 ReadyRails Sliding Rails with Optional CMA.....	40
Figure 11.	2U Threaded Rack Adapter Brackets Kit	41
Figure 12.	R815 Mounted in the B2 Sliding Rails.....	43
Figure 13.	R815 CMA Mounted on the Side Opposite the Power Supplies (Recommended).....	43

1 Product Comparison

1.1 Overview

The Dell™ PowerEdge™ R815 is a 4-socket rack server offering the latest AMD Opteron™ processors with up to 48 processor cores and an excellent balance of advanced manageability, memory scalability, I/O, and redundancy in a space-saving 2U form factor.

1.1.1 Performance-Driven Technology

Purpose-built to provide a reliable foundation and balanced with the latest AMD Opteron processor technology optimized for stability, consistency, and outstanding price for performance, the Dell PowerEdge R815 is designed from the ground up for value and performance. It is an ideal platform for customers looking to maximize data center space and budget.

1.1.2 Purpose-Built for Reliability

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.

From the robust, metal hard drive carriers and organized cabling to the interactive LCD screen, dual SD hypervisor modules, and embedded diagnostics, all components are purposefully designed and built to improve server reliability and usability. Dell has developed its reliability processes by:

- Employing robust validation and testing processes for durable product design
- Verifying each supplier meets stringent quality standards
- Implementing a “one-touch” build process to ensure that one person is responsible for the entire server build, resulting in greater quality control
- Ensuring that every fully configured Dell server is tested (and re-tested) before it leaves the factory
- Introducing Unified Server Configurator (USC) which offers embedded and persistent diagnostics with no media required to help minimize downtime
- Utilizing robust and durable industrial materials to enable long product lifecycles
- Improving redundancy generation over generation by adding features such as dual internal failsafe SD modules to provide failover at the hypervisor level.

In addition to these quality measures, all 11th Generation servers are designed with external ports, power supplies, and LED lights or LCD screens in the same location for a more efficient and familiar user experience, as well as easy installation and deployment.

1.1.3 Efficient Infrastructure

Limitations on space, power, and cooling capacity combined with rising energy costs present enormous challenges for IT. Our newest Dell PowerEdge servers are made to deliver energy efficiency as a design standard while helping to meet the performance and budget goals your infrastructure requires. Energy-efficient system design built with Energy Smart technologies such as power capping, power inventory, and power budgeting help to better manage power within your specific environment.

Included in the PowerEdge R815 chassis are efficient fans, which spin in accordance with server workload demands. In addition, the internal shrouding and logical layout of the internal components aids with airflow direction, helping to keep the server cool. The PowerEdge R815 also includes power-management features such as volt regulators, power-regulating processors, and an interactive LCD screen for 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 R815. 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 R815 also features an interactive LCD screen positioned on the front of the server for ease of monitoring.

1.2 Comparison

Table 1. Comparison of PowerEdge R815, R905, and R810 Servers

Feature	R815	R905 (predecessor)	R810
Processor	AMD Opteron™ 6100 series processors	AMD Opteron™ 8200 or 8300 series processors	Intel® Xeon® Processor 6500 and 7500 Series
# Sockets	4	4	2 or 4
# Cores	8 or 12	4 or 6	4, 6, or 8
L2/L3 Cache	L1 128K/core L2 512K/core L3 12 MB		12-24MB
Chipset	AMD SR5650, SR5670, & SP5100	HT1100	Intel® 7500
DIMMs	32 (1, 2, 4, 8, and 16GB DDR3)	32 (512MB and 1, 2, 4, and 8GB DDR2)	32 (1, 2, 4, 8, 16 GB)

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Feature	R815	R905 (predecessor)	R810
Min/Max RAM	8GB/512GB	4GB/256GB	Up to 512GB
HD Bays	6x 2.5"	5x 3.5" or 8x 2.5"	6x 2.5"
HD Types	SAS, SATA, SAS SSD	SAS	SAS, SATA, SAS SSD
Ext Drive Bay(s)	1	1	1
Int. HD Controller	H700	PERC6/I	H700
I/O Slots	6	7	6
RAID	H700	PERC6/I	H700
NIC/LOM	4x 1Gb LOMs	4x 1Gb LOMs or 2x 1Gb + 2x 10Gb LOMs	4x 1Gb LOMs
Power Supplies	Hot-swap redundant	Hot-swap redundant	Hot-swap redundant
Fans	6	4	6
Chassis	2U	4U	2U

2 System Overview

Table 2. Product Features Summary

Feature	Technical Specification	
Form Factor	2U rack	
Processors	AMD Opteron™ 6100 series processors	
Processor Sockets	4	
Front Side Bus or HyperTransport	Hyper-Transport Links	
Cache	L2: 512K/core L3: 12MB	
Chipset	AMD SR5650, SR5670 and SP5100	
Memory ¹	Up to 512GB (32 DIMM Slots): 1GB/2GB/4GB/8GB/16GB 1333MHz	
I/O Slots	6 PCIe 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 (6Gb/s) PERC H700 (6Gb/s) with 512MB battery-backed cache; 512MB, 1GB Non-Volatile battery-backed cache	External Controllers: SAS 5/E with 512MB battery-backed cache PERC H800 (6Gb/s) with 512MB of battery-backed cache; 512MB, 1GB Non-Volatile battery-backed cache PERC 6/E with 256MB or 512MB of battery-backed cache External HBAs (non-RAID): 6Gbps SAS HBA SAS 5/E HBA LSI2032 PCIe SCSI HBA
Drive Bays	Up to Six 2.5" hot-swappable SAS, SATA, or SSD drives	
Maximum Internal Storage	3TB	

Feature	Technical Specification	
Hard Drives ¹	2.5" SATA (7.2K RPM): 160GB, 250GB, 500GB 2.5" Near Line SAS (7.2K RPM): 500GB 2.5" 6Gbs SAS (10K): 300GB, 600GB	2.5" SAS (10K RPM): 146GB, 300GB 2.5" SAS (15K RPM): 73GB, 146GB 2.5" SATA SSD: 50GB, 100GB
Comm-unications	Optional add-in NICs : Intel® 10GBase-T Copper Single Port NIC, PCI-E x8 Intel® Single Port Server Adapter, 10Gigabit, SR Optical, PCI-E x8 Broadcom® BMC57710 10Base-T Copper Single Port NIC, PCI-E x8 Broadcom® 10GbE NIC, Broadcom Dual Port 10GbE SFP+ Intel® Gigabit ET Dual Port Server Adapter Intel® Gigabit ET Quad Port Server Adapter Brocade® CNA Dual port adapter Emulex® CNA Standup HBA adapter OCE10102-FX-D Emulex® CNA iSCSI HBA stand-up adapter OCE10102-IX-D	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, PCI-E Gen 2 x4 Qlogic® QLE2560 FC8 Single-channel HBA, PCI-E Gen 2 x4 Emulex® LPe-1150 FC4 Single Port 4 Gbps Fiber Channel HBA, PCI-E x4 Emulex® LPe-11002 FC4 Dual Port 4 Gbps Fiber Channel HBA, PCI-E x4 Emulex® LPe-12000 FC8 Single Port 4 Gbps Fiber Channel HBA, PCI-E Gen 2 x4 Emulex® LPe-12002 FC8 Dual Port 4 Gbps Fiber Channel HBA, PCI-E Gen 2 x4 Brocade® FC4 and 8GB HBAs
Power Supply	One hot-pluggable non-redundant 1100W power supply	Two hot-pluggable redundant 1100W power supplies
Availability	Hot-plug hard drives, hot-plug redundant power, dual SD modules, 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, IPMI2.0 compliant Dell™ OpenManage™ featuring Dell Management Console Unified Server Configurator Lifecycle Controller enabled: iDRAC6 Express, optional iDRAC6 Enterprise, and vFlash	

Feature	Technical Specification
Rack Support	ReadyRails™ sliding rails with optional cable management arm for 4-post racks (optional adapter brackets required for threaded hole racks)
Operating Systems	<p>Microsoft® Windows Server® 2008 SP2, x86/x64 (x64 includes Hyper-V™)</p> <p>Microsoft® Windows Server® 2008 R2, x64 (includes Hyper-V™ v2)</p> <p>Microsoft® Windows® HPC Server 2008</p> <p>Novell® SUSE® Linux® Enterprise Server</p> <p>Red Hat® Enterprise Linux®</p> <p>Sun® Solaris™</p> <p>Optional Embedded Hypervisors:</p> <p>Citrix® XenServer®</p> <p>VMware® vSphere™ 4.1 (including VMware ESX® 4.1 or VMware ESXi™ 4.1)</p> <p>For more information on the specific versions and additions, visit www.dell.com/OSsupport.</p>
Featured Database Applications	<p>Microsoft® SQL Server® solutions (see Dell.com/SQL)</p> <p>Oracle® database solutions (see Dell.com/Oracle)</p>
<p>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.</p>	

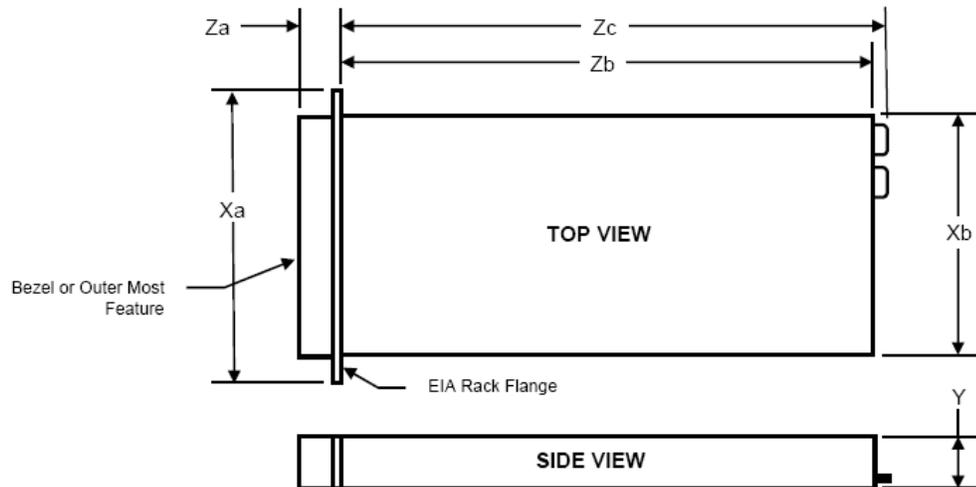
3 Mechanical

3.1 Chassis Description

The PowerEdge R815 is a rack mount 2U chassis 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	443.1 mm	86.4 mm	35.0 mm	23.5 mm	717.5 mm	720.6 mm

Figure 1. R815 Chassis Dimensions

Maximum configuration weight is 24.1 kg.

3.3 Front Panel View and Features

For more information, see the Front-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R815 Hardware Owner's Manual*.



Figure 2. Front View (without Bezel)



Figure 3. Front View (with Bezel)

3.4 Back Panel View and Features

For more information, see the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R815 Hardware Owner's Manual*.



Figure 4. Rear View

3.5 Power Supply Indicators

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

PowerEdge R815 power supplies have embedded cooling fans. The PSUs 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)

3.6 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter in the *PowerEdge R815 Hardware Owner's Manual*.

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 & 24xx racks
 - *NOTE: Threaded 4-post racks require the static ReadyRails™ kit or 3rd party conversion kits available through Dell Software & 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: 714 mm (with outer CMA brackets removed)
- Rail depth with the CMA: 845 mm
- Square-hole rack adjustment range: 686-883 mm
- Round-hole rack adjustment range: 672-876 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.

3.11 Cabling

Cabling includes:

- 2x30 Control Panel cable
 - VGA, LCD, I2C, miscellaneous like power and NMI buttons
- 2x6 IO power cable
 - Distributes +12V to IO planar from PDB
- 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 R815.

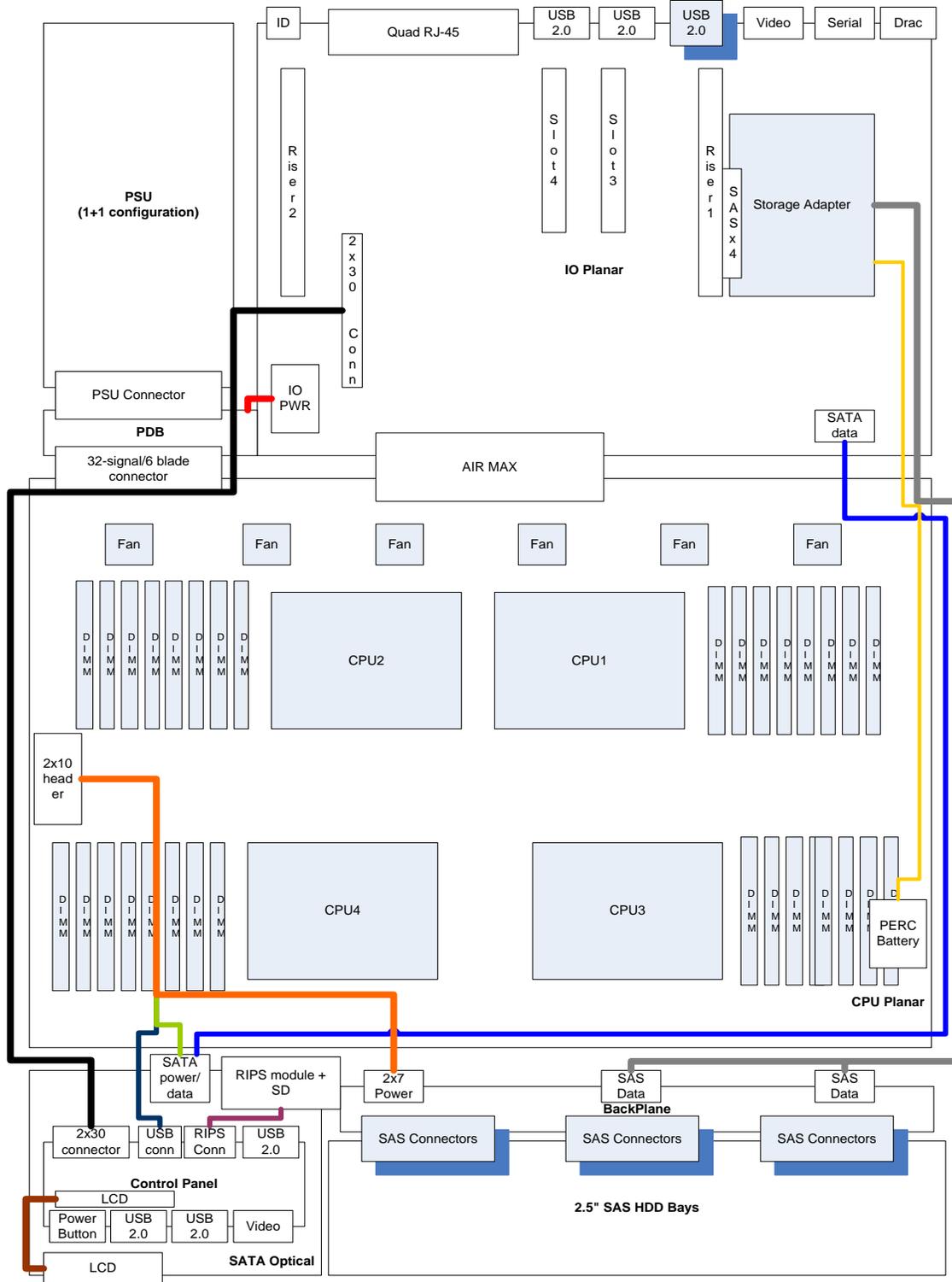


Figure 7. Cabling Diagram

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
 - Two navigation buttons
 - One select button
 - 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

For detailed information on the control panel, see Front-Panel Features and Indicators section in the About Your System chapter in the *PowerEdge R815 Hardware Owner's Manual*.

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 information on LCD Panel Features, see LCD Panel Features section in the About Your System chapter of the *PowerEdge R815 Hardware Owner's Manual*.

3.13 Security

3.13.1 Cover Latch

A toolled 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 of the *PowerEdge R815 Hardware Owner's Manual*.

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 via the LCD is viewable even when the bezel is installed.

The bezel is optional for PowerEdge R815 systems. For more information, see the Front Bezel (Optional) section in Installing System Components chapter of the *PowerEdge R815 Hardware Owner's Manual*.

3.13.3 Hard Drive

The optional front bezel of the system contains a lock. A locked bezel secures the system hard drives. See [Hard Drives](#) in the *Hardware Owner's Manual*.

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

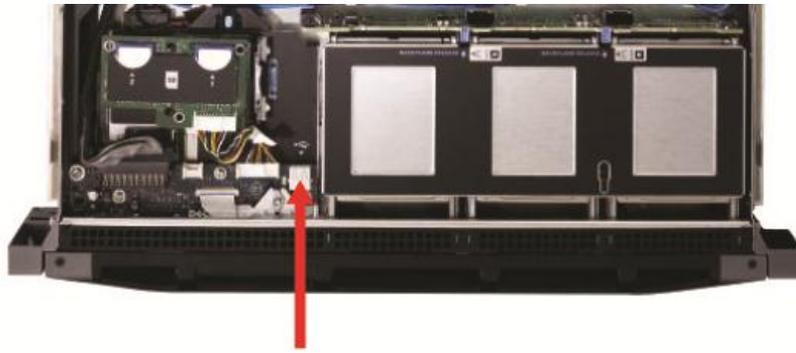
A switch mounted on the left riser board is used to detect chassis intrusion. When the cover is opened, the switch circuit closes to indicate intrusion to ESM. When enabled, the software can provide notification to the customer that the cover has been opened. PowerEdge R815 only supports up to five minutes 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.



Internal USB port
behind control panel

Figure 9. USB Port

3.15 Battery

A replaceable coin cell CR2032 3V lithium coin cell 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 R815 Hardware Owner's Manual*.

4 Power, Thermal, Acoustic

4.1 Power Supplies

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.

4.2 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.

4.3 Power Efficiency

One of the main features of the 11G family of servers is enhanced power efficiency. R815 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
- PSU/VR efficiency improvements
- Switching regulators instead of linear regulators
- Closed loop thermal throttling
- Increased rear venting/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)
- CPU VR dynamic phase shedding
- Memory VR static phase shedding
- Random time interval for system start (Allows an entire rack to power on without exceeding the available power)
- BIOS Power/Performance options page
- Active Power Controller (BIOS-based CPU P-state manager)
- Ability to power down or throttle memory

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- Ability to disable a CPU 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

4.4 Power Supply Specifications

Power Supply Specifications are detailed in Table 4.

Table 4. 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 55 A per power supply for 10 ms or less

The R815 Power Supply is certified Gold (80 Plus) and Climate Savers 3. It is certified UL approved and incorporates PFC logic.

4.5 Environmental Specifications

Environmental specifications are detailed in Table 5.

Table 5. 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)

4.6 ENERGY STAR® Compliance

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

4.7 Thermal

The R815 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 maintain CPU and IOB chip temperatures within thermal design targets.
- Highly Optimized Fan Control Algorithm:
 - Base fan speeds are a function of hardware configuration and ambient temperature to minimize airflow for a given environment.
 - Closed-loop PID control algorithms are used for both CPU and DIMMs to maintain appropriate thermal margin.
 - Double-refresh switching allows for DIMM temperature excursions up to 95°C while maintaining performance and thermal design targets as follows:
 - The R815 thermal algorithm monitors the thermal sensor on each DIMM to maintain DIMM temperatures below the typical 85°C specification in normal operating conditions.
 - Under extreme operating conditions the thermal algorithm can switch the DIMMs into Double-Refresh mode allowing an additional 10°C of thermal headroom. In Double-Refresh mode DIMMs are allowed to operate as high as 95°C.

4.8 Acoustics

The acoustical design of the PowerEdge R815 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 6.

Table 6. Acoustical Performance for 4-Socket Configuration

4-Socket Configuration @ 23 ± 2 °C				Operating Mode	L _{WA} -UL (Bels)	L _{pA} (dBA)	Prominent Tones
CPU	HDD	RAID	DIMM				
4x 6400 MT	4x 15 krpm SAS	PERC H700	32x 4GB DDR3	Idle	5.6	41	None
				SPEC 50%	5.6	41	None
				HDD active	5.6	41	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.

HDD Active: An operating mode per ISO7779 (1999) definition 3.1.6. The software IOMeter is utilized to stress the installed HDDs. IOMeter is running ECMA-74 active mode.

L_{WA} - UL: The upper limit sound power level (L_{WA}) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance to ISO 7779 (1999).

L_{pA}: 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 is designed specifically for high-end server applications. The processor features up to twelve-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. The G34 processor also features AMD 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). The PowerEdge R815 provides support for up to four G34 processors. See Table 7.

Table 7. G34 Processor Features

G34 Processor	Features
Cache size	L1 128K/core L1 128K/core L2 512K/core L3 12 MB
Multi-processor support	1-4 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 HyperTransport (HT3) 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, 3DNow!, and AMD64
- Simultaneous Multi-Threading (SMT) capability (Support for HT Assist)
- Enhanced AMD-V™ and IOMMU Technology for virtualization support
- Enhanced AMD power efficiency features:
 - 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

Table 8. Supported Processors

Model	Speed	Power	Cache	Cores
6176SE	2.3GHz	140W	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
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
6164HE	1.7GHz	85W	6MB L2 12MB L3	12
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 R815 supports 4x G34 sockets and AMD SR5650, SR5670, and SP5100 chipsets with the following configurations:

- 2P configurations of G34 processors (85W, 115W, 140W)
- 4P configuration of G34 processors up to 115W

4P configurations with 140W processors will halt on post. This is not a supported configuration.

5.5 Processor Installation

See the Processors section in the Installing System Components chapter of the *PowerEdge R815 Hardware Owner's Manual*.

5.6 Additional Processor Information

CPU Power Voltage Regulation Modules (EVRD 11.1): 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 4 phases normally; and drop to two phases when the CPU indicates lower power requirement.

6 Memory

6.1 Overview

The PowerEdge R815 utilizes DDR3 memory which provides a high-performance, high-speed memory interface capable of low latency response and high throughput. The platform supports Registered ECC DDR3 DIMMs (RDIMM) and Unbuffered DDR3 DIMMs (UDIMM).

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

- 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.
- 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.
- The R815 memory system supports up to 32 DIMMs. Population order is identified by the silkscreen designator and the System Information Label (SIL) located on the chassis cover.

6.2 DIMMs Supported

The interface uses 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB RDIMMs and 1 GB and 2 GB UDIMMs.

The memory interface supports memory demand and patrol scrubbing, single-bit correction and multi-bit error detection.

6.3 Slots/Risers

The DDR3 memory interface consists of 4 memory channels per processor socket. Each channel supports up to two RDIMMs for single/dual/quad rank or two UDIMMs. Each channel is capable of supporting up to two DDR3 memory modules. For more information, see the System Memory section in the Installing System Components chapter of the *PowerEdge R815 Hardware Owner's Manual*.

6.4 Speed

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

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

Quad-rank DIMMs will be available in 2011. Quad-rank DIMMs can support speeds up to 1066MHz.

If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency.

6.5 Sparring

Memory sparing is supported. Sparing will require a fully populated memory configuration (2P = 16 DIMMs, 4P = 32 DIMMs).

6.6 Mirroring

No mirroring support.

6.7 RAID

No RAID support.

6.8 Supported Configurations

Supported Configurations are detailed in Table 9.

Table 9. Supported Configurations

System Capacity	# of CPUs	DIMM Type	DIMM Capacity	# of DIMMs	DIMM Capacity	# of DIMMs	Ranks per DIMM	1Gb or 2Gb based	Data width
8 GB	2	RDIMM	1	8	—	—	1	1	x8
16 GB	2	UDIMM	2	8	—	—	2	1	x8
16 GB	2	RDIMM	2	8	—	—	2	1	x8
16 GB	2 & 4	UDIMM	1	16	—	—	1	1	x8
16 GB	4	RDIMM	1	16	—	—	1	1	x8
32 GB	2	UDIMM	2	16	—	—	2	1	x8
32 GB	2	RDIMM	2	16	—	—	2	1	x8
32 GB	4	UDIMM	2	16	—	—	2	1	x8
32 GB	4	RDIMM	2	16	—	—	2	1	x8
64 GB	2 & 4	RDIMM	4	16	—	—	2	1	x4
64 GB	2	RDIMM	8	8	—	—	2	2	x4
64 GB	4	UDIMM	2	32	—	—	2	1	x8
64 GB	4	RDIMM	2	32	—	—	2	1	x8
96 GB	2	RDIMM	8	8	4	8	2	2 & 1	x4
96 GB	4	RDIMM	4	16	2	16	2	1	x4
128 GB	2	RDIMM	8	16	—	—	2	2	x4

System Capacity	# of CPUs	DIMM Type	DIMM Capacity	# of DIMMs	DIMM Capacity	# of DIMMs	Ranks per DIMM	1Gb or 2Gb based	Data width
128 GB	4	RDIMM	4	32	—	—	2	1	x4
128 GB	2	RDIMM	16	8	—	—	4	2	x4
128 GB	2 & 4	RDIMM	8	16	—	—	2	2	x4
160 GB	2	RDIMM	16	8	4	8	4	2 & 1	x4
160 GB	4	RDIMM	8	16	2	16	2	2 & 1	x4
192 GB	4	RDIMM	8	16	4	16	2	2 & 1	x4
256 GB	2 & 4	RDIMM	16	16	—	—	4	2	x4
256 GB	4	RDIMM	8	32	—	—	2	2	x4
512 GB	4	RDIMM	16	32	—	—	4	2	x4

7 Chipset

7.1 Overview

The PowerEdge R815 planar incorporates the Maranello chipset with dual IOB configuration, using AMD SR5650 and SR5670 IO bridges and SP5100 Southbridge. SR5650 and SR5670 are designed to support AMD's G34 processor family, HyperTransport 3 Interface (@ 2.6GHz), 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 R815 I/O Board uses the AMD SR5650 and SR5670 I/O Bridges (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 link (to CPU1 and CPU2), up to 46 lanes of PCI Express Gen 2, a x4 PCI-E Gen 1 Southbridge Interface (SB Link) and an integrated IOAPIC. AMD SR5650 is IOB1 (primary) and AMD SR5670 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 IOBs. PowerEdge R815 has a total of four HyperTransport (HT3) links per processor which allows interconnecting each processor with each other and option for IO Bridge. Each IO Bridge has a single x16 HT3 link. A full link consists of 16 lanes (full-width) in each direction with a link speed of 6.4GT/s. The HT3 clocking for CPU HT3 and IOB HT3 are 3.2GHz and 2.6GHz, 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.

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 are backward-compatible with Gen1 transfer rates.

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

- 1 PCI Express Gen2 x8 port from IOB1—Riser1 PLX
 - 1 PCI Express Gen2 x8 port (slot 1)
 - 1 PCI Express Gen2 x4 port (slot 2)
 - 1 PCI Express Gen2 x4 port dedicated to storage adapter (SAS)
- 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 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.

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 R815 supports one SATA port for optical devices)
- Five OHCI (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 R815 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 (the iDRAC interfaces the Hardware Thermal Control (HTC) on PowerEdge R815)
- 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)

8 BIOS

8.1 Overview

The PowerEdge R815 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 KVM, CD, and floppy support
- Unified Server Configurator (UEFI 2.1) support
- Power management including DBS, Power Inventory, and multiple Power Profiles

8.2 Supported ACPI States

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

9 Embedded NICs/ LAN on Motherboard (LOM)

9.1 Overview

Two embedded Broadcom 5709C dual-port LAN controllers are on the PowerEdge R815 planar as independent Gigabit Ethernet interface devices. Features of the LAN devices include:

- x4 PCI Express Gen2 capable interface
- Integrated MAC and PHY
- 3072x18 Byte context memory
- 64 KB receive buffer
- TOE (TCP Offload Engine)
- iSCSI controller (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

10 I/O Slots

10.1 Overview

See Expansion Cards and Expansion-Card Risers section in the Installing System Components chapter of the *PowerEdge R815 Hardware Owner's Manual*.

The PowerEdge R815 includes a total of 6 PCI slots that reside on the IO planar and two riser cards.

Two low-profile PCI Express slots are provided on the IO planar.

- Slot3:
 - Physical x8 (x8 electrical) PCI Express Gen2 slot
- Slot4:
 - Physical x8 (x8 electrical) PCI Express Gen2 slot
 - NC-SI cable header for NC-SI supported NICs

The two PowerEdge R815 PCI Express risers provide up to four expansion slots and one internal slot as follows:

- Riser1 (Center; all slots are controlled from the PEX8642 PCIe Gen2 arbiter):
 - Slot1 (top)
 - Physical x16 (x8 electrical) PCI Express Gen2 slot
 - Slot2 (bottom)
 - Physical x8 (x4 electrical) PCI Express Gen2 slot
 - Storage Slot (internal, accommodates internal RAID controllers with no sled)
 - Physical x8 Storage adapter (x4 electrical) PCI Express Gen2 slot
- Riser2 (Left):
 - Slot5 (top)
 - Physical x16 (x8 electrical) PCI Express Gen2 slot
 - Slot6 (bottom)
 - Physical x16 (x8 electrical) PCI Express Gen2 slot
 - Both slots are controlled from the IOB PCIe Gen2 arbiter (port GPP)

The PowerEdge R815 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.

10.2 PCI Risers

The PowerEdge R815 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 Dell custom pin-out. See 0.

Table 10. PCI Risers

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

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 of the *PowerEdge R815 Hardware Owner's Manual*.

11 Storage

11.1 Overview

Table 11. 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 12. RAID Configurations

Config Type	Configs		Description	Non-Mixed drives all SATA or all SAS or all SSD	
				Min HDD	Max HDD
No HDD	0	NZC	No controller/No hard drive	2.5" = 0	2.5" = 0
SAS/SATA/SAS or SATA SSD—No Raid	1	MSS	Integrated SAS/SATA: PERC H200, No RAID	2.5" = 1	2.5" = 6
SAS/SATA/SAS or SATA SSD 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
				<u>Mixed SSD + SAS</u> Min 2xSSD+2xSAS Max 2xSSD + 4xSAS	
Config Type	Configs		Description	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 Storage Controllers

11.2.1 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.

11.2.2 PERC H700

Customers who want an internal RAID solution should select the H700. This H700 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). PowerEdge R815 supports 512MB cache on the internal H700.

11.2.3 PERC H800

PowerEdge R815 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
- PCI-E Gen2 x8
- 800MHz Core PPC
- DDR2 800 mini-DIMM
- Dual Mini-SAS Connectors
- Supports connection to 6 Gb/s enclosures only

See Table 13 for more information on storage card support.

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

Table 13. Storage Card Support Matrix

	Product	Usage	PowerEdge R815 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

11.3 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 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 in the About Your System chapter of the *PowerEdge R715 Hardware Owner's Manual*.

11.4 Optical Drives

Optical drives are optional in all PowerEdge R815 systems and connect to the planar via the SATA interface. The following internal slim-line drives are available on PowerEdge R815: DVD-ROM and DVD+RW. PATA (IDE) optical drives are not supported. If an optical drive is not ordered with the system, a blank is installed in its place.

11.5 Tape Drives

External tape drives are supported. No internal tape drive support available.

Dell PowerEdge R815 Technical Guide

12 Video

12.1 Overview

The PowerEdge R815 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 PowerEdge R815 system supports the 2D graphics video modes shown in Table 14

Table 14. 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 R815 provides tool-less support for racks with square or unthreaded round mounting holes including all generations of Dell racks. They also support toolled mounting in 4-post threaded racks via 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. It is important to note the following:

- The R815 is *not* compatible with any other Dell rails including previous generation rails, but it does use the same rails as the R715, R810, and R910.
- The R815 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 R815 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.

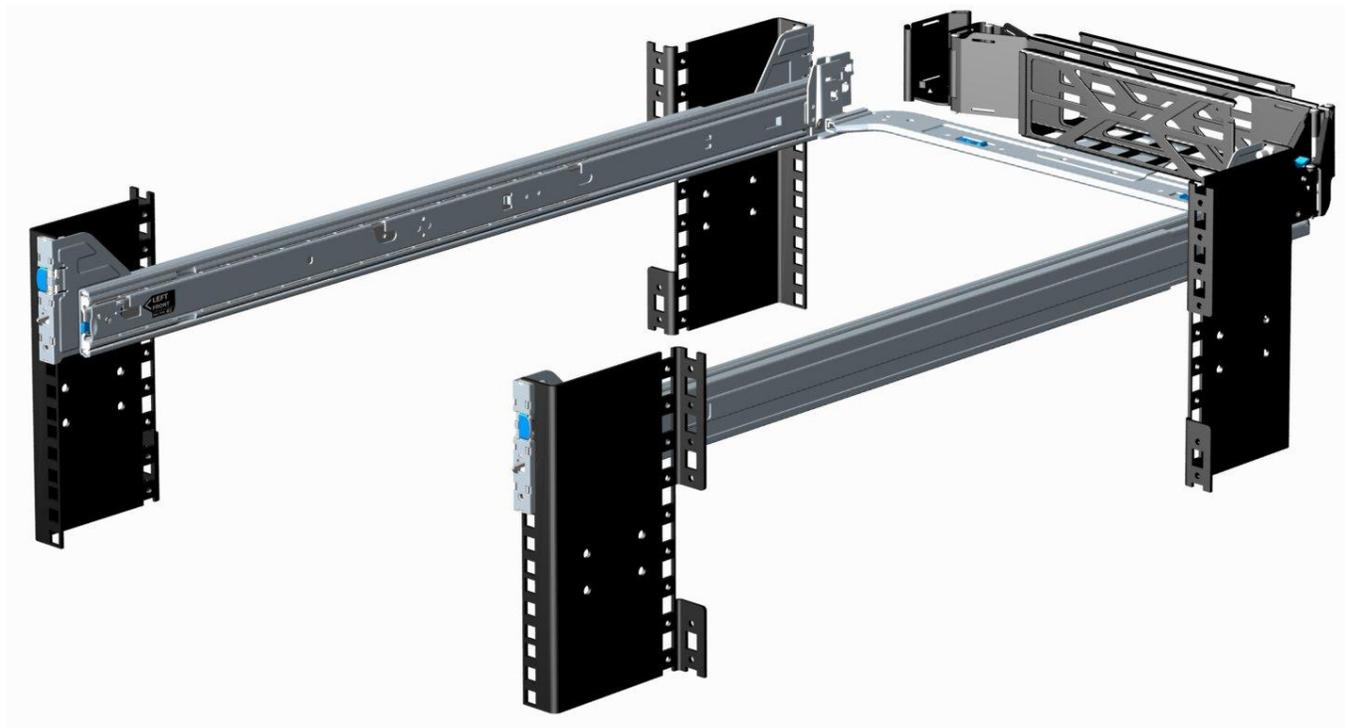


Figure 10. R815 ReadyRails Sliding Rails with Optional CMA

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.

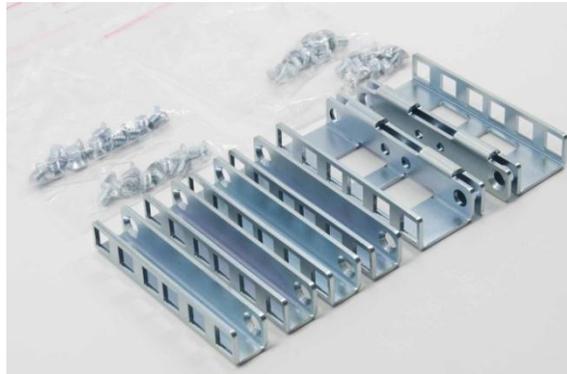


Figure 11. 2U Threaded Rack Adapter Brackets Kit

Table 15 provides a summary of the rack types supported by the R815 rails. Mounting in 2-post racks is not supported.

Table 15. Supported Racks

Product	Rail ID	Mounting Interface	Rail Type	Rack Types Supported				
				4-Post			2-Post	
				Square	Round	Thread	Flush	Center
R815	B2	ReadyRails	Sliding	✓	✓	✓*	✗	✗

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

Other factors to consider when deploying the R815 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 16. 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 16. 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

Note that 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 R815 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 R815 CMA include:

- Large U-shaped baskets to support dense cable loads
- Open vent pattern for optimal airflow
- Fully reversible (can be mounted on either side) with no conversion required
- Utilizes hook-and-loop straps rather than plastic tie wraps to eliminate the risk of cable damage during cycling
- Includes a low profile fixed tray to both support and retain the CMA in its fully closed position
- Both the CMA and the tray mount without the use of tools via simple and intuitive snap-in designs

13.4 Rack View

The R815 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. R815 Mounted in the B2 Sliding Rails

The R815 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. R815 CMA Mounted on the Side Opposite the Power Supplies (Recommended)

14 Operating Systems and Virtualization

For detailed information, see the [Operating System Support Matrix for Dell PowerEdge Systems](#) on 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. Following is 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 R815 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 the following table.

Table 17. 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.

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 R815. 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 18.

15.7 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the R815 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
- For more information on iDRAC6 Enterprise features see Table 18.

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 8 GB 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
- 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 the table below.

Table 18. 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	✓	✓	✓	✓

Feature	BMC	iDRAC 6 Express	iDRAC6 Enterprise	vFlash Media
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		✓	✓	✓
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		✓	✓	✓

Dell

Feature	BMC	iDRAC 6 Express	iDRAC6 Enterprise	vFlash Media
Historical Power Counters		✓	✓	✓
Logging Features				
System Event Log	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log			✓	✓

16 Peripherals

16.1 USB peripherals

PowerEdge R815 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)

16.2 External Storage

See [Data Storage & Backup](#) on Dell.com for information about external storage and tape drives available.

Appendix A. Statement of Volatility

The Dell PowerEdge R815 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 19 details the NV components present in the PowerEdge R815 server.

Table 19. 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

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:	1100W LiteOn: 4KB FLASH with 256 Bytes RAM 1100W Emerson: 8K and 16K FLASH with 384 and 1024 Bytes RAM respectively 750W Emerson: ?KB FLASH with ? Bytes RAM

	750W Delta: ?K with ?? Bytes RAM
Type: [e.g., Flash PROM, EEPROM]:	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 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)	Details

ordered with it)	
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 R815 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.