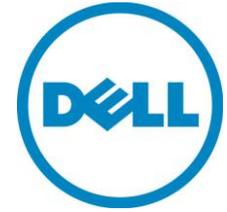# PowerEdge R410

Technical Guide

Energy efficient and compact, the PowerEdge R410 is designed with the performance and reliability needed for High-Performance Computing.

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1 Product Comparison

1.1 Overview

The Dell™ PowerEdge™ R410 is ideal for compute-intensive applications in space-constrained environments. It is a powerful, ultra-dense 2-socket 1U server that offers the performance of Intel® Xeon® processor 5500 and 5600 series, DDR3 memory, and the availability of up to four hard drives (3.5" or 2.5"), and is an exceptional value.

The PowerEdge R410 features include an available "open" HPCC (High Performance Computing Cluster) software stack, excellent diagnostics with an interactive LCD, and an optimum chassis depth of 24" for space-constrained data centers and HPCC environments.

The Dell PowerEdge R410 was developed with a customer-inspired design, energy-optimized technology, advanced virtualization capabilities, and simplified systems management.

1.2 Design for Usability

The PowerEdge R410 follows the 11th generation PowerEdge portfolio specifications and features the same system design commonality and reliability true to the entire portfolio. All 11th generation servers are designed to make the user experience easier. We put all external ports, power supplies, LCD screens, and LED lights in the same location for familiar experience as well as easy installation and deployment.

Robust, metal hard drive carriers and organized cabling are designed to help improve component access and airflow across the server. The PowerEdge R410 provides reduced complexity, showcasing clutter-free cable routing for more efficient airflow and easier maintenance. An LCD screen positioned by the front of the bezel provides aisle-level access to deploy the server.

1.3 Energy Efficient

The PowerEdge R410 features energy-tuned technologies that reduce power consumption while increasing performance capacity so you can compute more while consuming less. It incorporates Energy Smart design using low-flow fans and logical component layout of the internal components which aids with airflow direction and policy-driven power and thermal management, helping to keep the server cool and reduce noise as much as possible. A robust fan cage design with hot-plug, single-pull fan modules provides efficient airflow and eases maintenance. Energy efficient and compact, the PowerEdge R410 is designed with value and reliability for HPCC environments.

1.4 Easy to Manage

With the optional advanced embedded systems management capabilities of Lifecycle Controller, Dell provides comprehensive enterprise class manageability already on the motherboard. Lifecycle Controller is delivered as part of the optional iDRAC Express or iDRAC Enterprise in the PowerEdge R410. The Lifecycle Controller helps to simplify administrator tasks by performing a comprehensive set of provisioning functions such as system deployment, system updates, hardware configuration and diagnostics from a single intuitive interface called Unified Server Configurator (USC) in a pre-OS environment. This helps eliminate the need to use and maintain multiple pieces of disparate CD/DVD media.

Also part of the Dell OpenManage™ portfolio is the Dell Management Console which is included with every Dell server and provides IT administrators with a consolidated console view of their IT infrastructure. This console delivers a single view and a common data source into the entire infrastructure management. It has an easily extensible, modular foundation that can provide basic hardware management or more advanced functions, such as asset and security management. Dell Management Console is designed to reduce or eliminate manual processes, enabling you to save time and money for more strategic technology usage.

1.5 Comparison to Other Dell Servers

Table 1.   Comparison of R410 to R310 and R510

Feature	R410	R310	R510
Processor	Quad-core or six-Core Intel® Xeon® processors 5500 and 5600 series	Quad-Core Intel® Xeon® processors 3400 series Intel® Core™ i3-540 Intel® Core™ i3-530 Intel® Pentium® G6950 Intel® Celeron® G1101	Quad-core or six-Core Intel® Xeon® processors 5500 and 5600 series
Front Side Bus	Intel® QuickPath Interconnect (QPI)	®Intel® Direct Media Interface (DMI)	Intel® QuickPath Interconnect (QPI)
# Processors	1 to 2	1	1 to 2
# Cores	2/4/6	Intel® Xeon®: Quad DT proc: Dual	2/4/6
L2/L3 Cache	4MB, 8MB or 12MB	Intel® Xeon®: 8MB DT proc: 4, 3 or 2M	4MB, 8MB or 12MB
Chipset	Intel® 5500 chipset	Intel® 3420	Intel® 5500 chipset
DIMMs	4+4 DDR3 Unbuffered with ECC or Registered with ECC 1333/1066/800M Hz	DDR3 6 R-DIMMs or 4 U-DIMMs	4+4 DDR3 Unbuffered with ECC or Registered with ECC 1333/1066/800M Hz
Minimum/Maximum RAM	1 GB/64 GB	1GB/32GB	
HD Bays	4 x 3.5" Optional Hot-Swap Support 2.5" HDDs via Hot-Swap tray	4 x 3.5" Optional hot-swap Or 2.5" SAS/ SSD via hot swap chassis	4x 3.5" or 8x 3.5" or 2.5" or 12x 3.5" or 2.5" + 2x internal 2.5"
HD Types	SATA/SAS/SSD	SATA/SAS/SSD	SATA/SAS/SSD
External Drive Bay(s)	1 for slim ODD	1 for slim ODD	1 for slim ODD for 4 and 8-HDD chassis configuration
Embedded HD Controller	Chipset-based SATA	Chipset-based SATA	Chipset-based SATA for 4-HDD chassis configuration. PERC HBA

Feature	R410	R310	R510
			required for 8 and 12-HDD chassis configuration.
Optional Storage Controller	NON-RAID: SAS 5/E LSI2032 (For TBU only) 6Gbps SAS HBA RAID: SAS 6/iR Modular PERC 6/i PERC 6/E PERC S300 Modular PERC H200 PERC H700 PERC H800	NON-RAID: SAS 5/E (Field Support Only – No Factory Install) LSI2032 (For TBU) 6Gbps SAS HBA RAID: PERC6/E (Field Support Only) SAS 5/E (Field Support Only) SAS 6/iR PERC S300 H200 H700 H800	NON-RAID: SAS 5/E LSI2032 (For TBU only) 6Gbps SAS HBA RAID: SAS 6/iR Integrated PERC 6/i Integrated PERC 6/E PERC S300 PERC H200 Integrated PERC H700 Integrated PERC H800 Support varies by model. See the *PowerEdge R510 Technical Guide* for detailed information.
Availability	Hot-swap HDD; Redundant PSU; Quad-pack LED diagnostic/LCD with Hot-swap HDD chassis; Memory RAS	ECC Memory, Hot-swap HDD; Redundant PSU; Quad-pack LED diagnostic/LCD with Hot-swap HDD chassis, TPM	Hot-swap HDD; Redundant PSU; Quad-pack LED diagnostic/LCD diagnostic (depends on chassis model); Memory RAS
Server Mgt.	BMC, IPMI 2.0 compliant; Full OpenManage™ suite Optional; iDRAC6 Express, iDRAC6 Enterprise, vFlash	BMC, IPMI 2.0 compliant; Full OpenManage™ suite Optional; iDRAC6 Express, iDRAC6 Enterprise, vFlash	BMC, IPMI 2.0 compliant; Full OpenManage™ suite Optional; iDRAC6 Express, iDRAC6 Enterprise, vFlash
I/O Slots	1 x PCIe x16 (True x16, Gen2); full height, half length	Riser 1: PCIe x16 (x8 routing), Full Height/ Half Length, Gen 2 Riser 2: PCIe x8 (x8 routing), Full Height/Half Length, Gen 2 (embedded): PCIe x8 (x4 routing)	3 PCIe x 8 + 1 Internal Storage Slot or 1 x 16 + 1 Internal Storage Slot
RAID	See Optional Storage Controller	PERC S100: RAID 0, 1, 5, 10 (SATA only) PERC S300: RAID 5, 10 (SATA & SAS) SAS 6i/R: RAID 0, 1 (SATA & SAS) PERC H200: RAID 0, 1, 10 (SATA, SAS & SSD) PERC H700: RAID 0, 1, 5,	See Optional Storage Controller

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Feature	R410	R310	R510
		6, 10 (SATA, SAS & SSD) PERC H800: RAID 0, 1, 5, 6, 10 (SATA, SAS & SSD)	
NIC/LOM	2x GbE LOM Optional: various NIC available	2x GbE LOM	2x GbE LOM Optional: various NIC available
USB	Two front/two rear/two internal	2 rear/2 front/2 internal	Two front/two rear/two internal
Power Supplies	Non-Redundant, 480 W (80+ SILVER) Optional Redundant, 500 W (80+ GOLD) Auto Ranging (100V~240V)	Non-Redundant, 350W (80+ Bronze) Optional Redundant, 400W (80+ Silver) Auto Ranging (100V~240V)	R510-4: Non-Redundant R510-8 and 12: Hot-swap, Redundant
Fans	Non-redundant, non-hot swappable	Non-redundant, non-hot-swappable	R510-12 supports redundant fan
Dimension (HxWxD)	43.0 x 434.0 x 627.1 (mm) (without ear, without bezel) 1.69 x 17.09 x 24.69 (in)	42.4 x 434.0 x 610 (mm) (w/o bezel) 1.67 x 17.10 x 24.00 (in)	Varies by model. See the *PowerEdge R510 Technical Guide* for detailed information.
Weight	Max: 35.02lbs (15.9Kg)	Max: 33.02 lbs (15Kg)	Varies by model. See the *PowerEdge R510 Technical Guide* for detailed information.

2 System Overview

2.1 Overview

The PowerEdge R410 delivers the right combination of computing power and redundancy in an ultra-dense chassis. The PowerEdge R410 provides:

* Outstanding price and feature set combination
* Industry leading features configurability without burdening the entry configuration price
* Industry leading server management with LifeCycle Controller available via optional iDRAC Express or iDRAC Enterprise
* Security features with TPM, internal USB, and IPv6
* Industry leading storage expandability and cost/GB with 4 x 3.5"/2.5" HDD, cabled and hot-swap
* Industry leading serviceability and diagnostics with optional interactive LCD
* Industry leading chassis depth of only 24" in its class for SMB closets, shallow racks, mobile server enclosures, wall server enclosures, A/V racks and legacy server racks

2.2 Product Features Summary

Table 2.   PowerEdge R410 Features and Descriptions

Feature	Technical Specification	
Form Factor	1U rack	
Processors	Latest quad-core or six-core Intel® Xeon® processor 5500 and 5600 series	
Processor Sockets	2	
Front Side Bus or HyperTransport	Intel® QuickPath Interconnect (QPI)	
Cache	4MB and 8MB	
Chipset	Intel 5500 Chipset	
Memory[1]	Up to 64GB (8 DIMM slots): 1GB/2GB/4GB/8GB DDR3 800MHz, 1066MHz or 1333MHz 16GB Quad-Ranked 1066MHz DIMMs	
I/O Slots	1 PCIe x 16 (True x16, Gen2), 1 Proprietary for SAS 6/iR Modular card only	
RAID Controller	**Internal:** PERC H200 (6Gb/s) PERC H700 (6Gb/s) with 512MB battery-backed cache; 512MB, 1GB Non-Volatile battery-backed cache SAS 6/iR PERC 6/i with 256MB battery-backed cache	**External:** PERC H800 (6Gb/s) with 512MB of battery-backed cache; 512MB, 1GB Non-Volatile battery cache PERC 6/E with 256MB or 512MB of battery-backed cache **External HBAs (non–RAID):** 6Gbps SAS HBA

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	PERC S100 (software based) PERC S300 (software based)	SAS 5/E HBA LSI2032 PCIe SCSI HBA
Drive Bays	4 x 3.5" Cabled Hard Drive Or 4 x 3.5" Hot-swap Hard Drive Or 4x 2.5" Hot-swap hard Drive And one slim type drive bay for DVD-ROM or DVD+/-RW	
Maximum Internal Storage	Up to 4 TB SATA or Near Line SAS	
Hard Drives[1]	3.5" SATA (7.2K rpm) 160GB, 250GB, 500GB, 1TB, 2TB 3.5" Near Line SAS (7.2K rpm) 500GB, 1TB, 2TB 3.5" SAS (15K rpm) 146GB, 300GB, 450GB, 600GB 3.5" SAS (10K rpm) 600GB 2.5" SAS (10K rpm) 146GB, 300GB 2.5" SATA SSD 25GB, 50GB, 100GB	
Communications	Embedded Dual-port Broadcom® NetXtreme™ II 5716 Gigabit Ethernet Intel® Gigabit ET Dual Port Server Adapter and Intel® Gigabit ET Quad Port Server Adapter Intel® 10GbE NIC Intel® Single Port 1GbE NIC	Intel® Dual Port 1GbE NIC Intel® Quad Port 1GbE NIC Broadcom® 10GbE NIC Broadcom® Dual Port 1GbE NIC Brocade® CNA Dual-port adapter Brocade® FC4 and 8 GB HBAs
	Emulex® CNA iSCSI HBA stand up adapter OCE10102-IX-D	
Power Supply	Non-Redundant, 480W (80+ BRONZE) Optional Redundant, 500W (80+ GOLD)	
Availability	Quad-pack LED Diagnostic or LCD diagnostic with hot-swap HDD chassis; TPM; optional hot-swap hard drives; optional hot-swap redundant power supply; optional PERC 6/i RAID controller with battery-backed cache; toolless hot-swap hard drive chassis	
Video	Integrated Matrox® G200	
Remote Management	BMC, IPMI2.0 compliant Optional iDRAC6 Enterprise, iDRAC6 Express	
Systems Management	Dell™ OpenManage™	
Rack Support	ReadyRails™ sliding rails with optional cable management arm for 4-post racks (optional adapter brackets required for threaded hole racks); ReadyRails™ static rails for 2-post and 4-post racks	
Operating Systems	Microsoft® Windows® Small Business Server 2008 Microsoft® Windows® Essential Business Server 2008 Microsoft® Windows Server® 2008 SP2, x86/x64 (x64 includes Hyper-V™)	

	Microsoft® Windows Server® 2008 R2, x64 (includes Hyper-V™ v2)
	Microsoft® Windows® HPC Server 2008
	Novell® SUSE® Linux® Enterprise Server
	Red Hat® Enterprise Linux®
	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.

OEM Ready Models Available

OEM Ready platforms are grab-and-go products for OEM customers delivering a fast and simple
path to a custom-branded solution. For more information, please visit dell.com/OEM.

3 Mechanical

3.1 Chassis Description

The PowerEdge R410 chassis design provides customers low-cost compute power with some hardware redundancy ability. It is a new chassis design for two incoming chassis offering cabled hard drive with LED module, and high-availability features such as hot-plug hard drives and LCD module. Features include four 3.5" SATA or SAS hard drives (cabled or hot-swap), power supply (non-redundant or redundant), dual Gigabit LOMs without TOE acceleration, four DIMM slots support each CPU, TPM, one riser card for optional PCIe expansion card, optional iDRAC6 Enterprise and iDRAC6 Express card mounted on planar without PCI slot occupied, and support 11G slim static and slim sliding rails.

3.2 Dimensions and Weight

Table 3 provides the overall dimensions and weight for the PowerEdge R410 server.

Table 3. R410 Overall Dimensions and Weight

Dimension (HxWxD) (without ear, without bezel)	43.0 x 434.0 x 627.1 (mm) 1.69 x 17.09 x 24.69 (in)
Maximum Weight	15.9Kg/35.02lbs

Figure 1 details the dimensions of the PowerEdge R410 server.
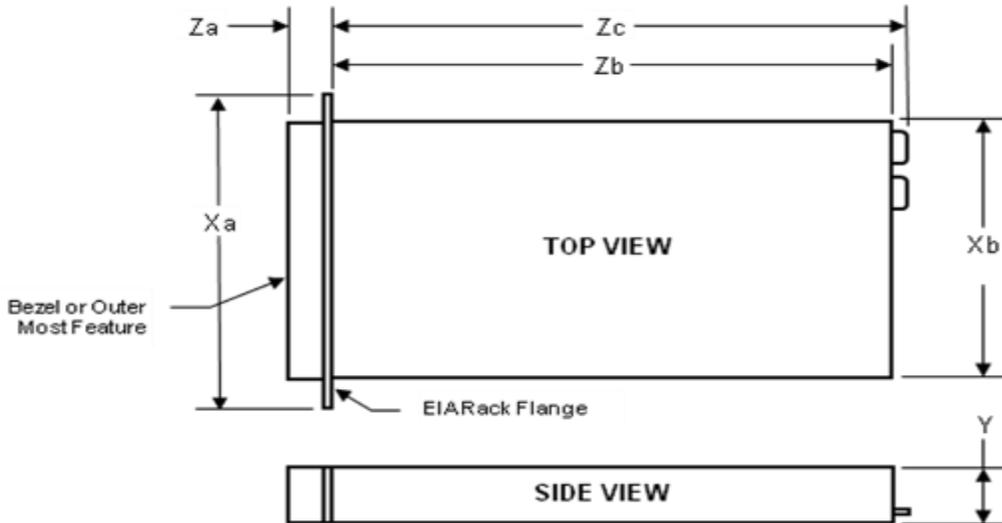
Zb goes to the nominal rear wall external surface where the motherboard I/O connectors reside.

Dimensions (mm)						
Xa	Xb	Y	Za with bezel	Za without bezel	Zb*	Zc
482.4	434.0	43.0	35.0	20.1	606.0	641.9

Figure 1. R410 Detailed Dimensions

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3.3 Front Panel View and Features

The front panel includes the following features:

- Front KVM (2x USB, 1x Video)
- Diagnostic indicator (quad-pack LED with cabled HDD configuration; 11G LCD with hot-swap HDD configuration)
- System ID button
- Power button
- HDD activity LED
- NMI button
- Asset Tag

Detailed views of the front panel are shown in the following figures. For more information, see the Front-Panel Features and Indicators section in the About Your System Chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com.

Figure 2.   Front Without Bezel

Figure 3.   With Bezel View

Figure 4.   Front Panel Controller

3.4 Back Panel View and Features

Back panel features include:
- Active ID CMA Jack

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- System ID button
- Bi-color system ID LED
- (2) Gigabit NIC ports
- (2) USB ports
- Video
- Serial port
- RJ45 Connector on iDRAC6 Enterprise (optional)

The following figures show the back panel of the R410 server. For more information, see the Back-Panel Features and Indicators in the About Your System Chapter of the *PowerEdge R410 Hardware Owner's Manual*.

Figure 5.   With Redundant Power Supply

Figure 6.   With Non-redundant Power Supply

3.5 Power Supply Indicators

Figure 7 shows the R410's redundant Power Supply Unit (PSUs)

Figure 7.   Redundant Power Supply Units

Indicator lights show the status of the PSU as follows:

Not lit — AC power is not connected.

Green — In standby mode, a green light indicates a valid AC source is connected to the power supply and the power supply is operational. When the system is on, a green light also indicates that the power supply is providing DC power to the system.

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Amber — Indicates a problem with the power supply.

Alternating green and amber — When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (for example, a High-Output 500W power supply and a 400W power supply are installed in the same system). Capacity of the installed power supplies must match.

3.6 NIC Indicators

Figure 8 shows the RJ45 connectors.
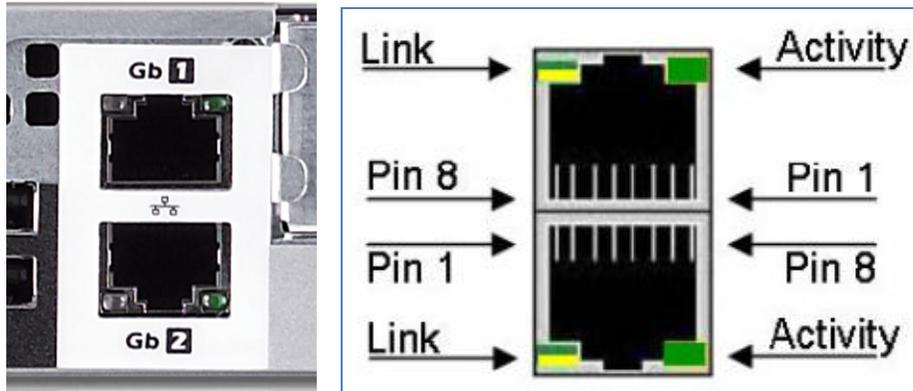
Figure 8.   Dual-Stacked RJ45 Connectors with NIC Indicators

Table 4 details the NIC indicator LED states.

Table 4.   NIC Indicator LED States

State		Link LED (Green/Yellow)	Activity LED (Green)
No link		Off	Off
D0uninitalized (out of box), D3cold, S4 (hibernation)	WOL disabled	Off	Off
	WOL enabled, link, no activity	Green if the port is operating at maximum port speed; Yellow otherwise Green if the port is operating at maximum port speed; Yellow otherwise	Off
	WOL enabled, link, activity		On (blinking at speed related to packet density)
Pre-OS POST or OS without driver	Link, no activity		Off
	Link, activity		On (blinking at speed related to packet density)
OS with driver	Link, no activity		Off
	Link, activity		On (blinking at speed related to packet density)

3.7 Side Views

Side views are shown in Figure 9 and Figure 10.

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Figure 9.   Left Side View

Figure 10.   Right Side View

3.8 Rails and Cable Management

3.8.1   ReadyRails Sliding Rails

ReadyRails^{TM} Sliding Rails for 4-post racks support includes:

- Toolless installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks
- Tooled installation in 19" EIA-310-E compliant threaded hole 4-post racks (requires the 1U Threaded Rack Adapter Brackets Kit)
- Full extension of the system out of the rack to allow serviceability of key internal components
- Optional cable management arm (CMA)

Rail depth and adjustment ranges are as follows:
- Rail depth without the CMA: 714 mm
- Rail depth with the CMA: 835 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

3.8.2   ReadyRails Static Rails

ReadyRails^{TM} Static Rails for 4-post & 2-post Racks support:

- Toolless installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks
- Tooled installation in 19" EIA-310-E compliant threaded hole 4-post and 2-post racks

Rail depth and adjustment ranges are as follows:

- Rail depth: 622 mm
- Square-hole rack adjustment range: 608-879 mm
- Round-hole rack adjustment range: 594-872 mm
- Threaded-hole rack adjustment range: 604-890 mm

3.9 Fans

There are total of six fans with redundant PSU in the system and four fans with non-redundant PSU.

Figure 11 shows the R410 fans. The four fans at right are the fans for the system, especially for the CPUs and memories. The two fans at left are there when the system is configured with redundant PSU. They cool down the redundant PSU.

Figure 11.   R410 Fans

3.10 Control Panel/LCD

Figure 12 shows the front controller board with LCD.

Internal USB Connectors

LCD Module and Cable/Connector

LCD module and cable/connector
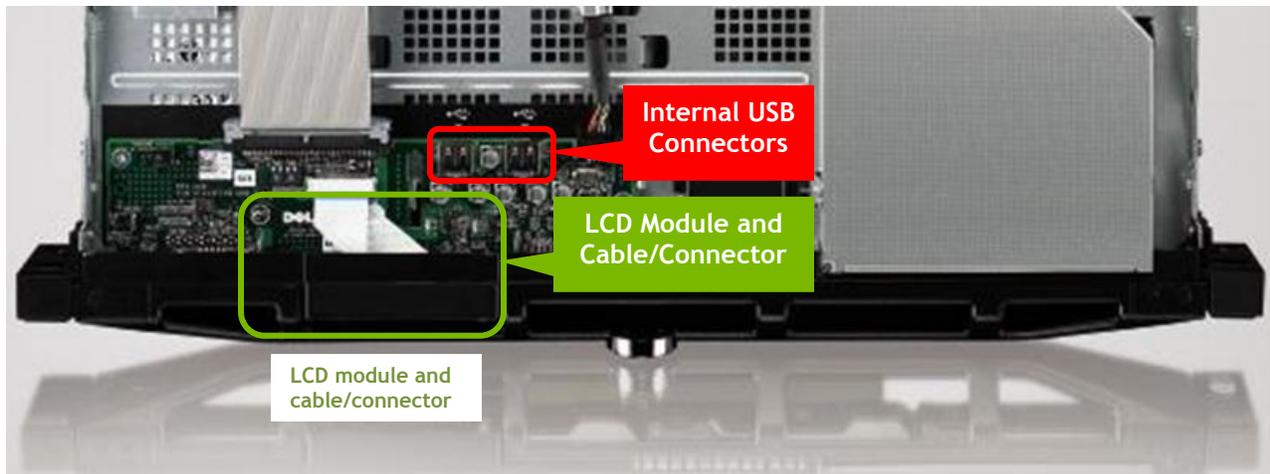
Figure 12.   Front Controller Board with LCD

Figure 13 shows the front controller board with the LED.

Figure 13.   Front Controller Board with Diagnostic LED

3.10.1   Cover Latch

The PowerEdge R410 comes with a coin lock entry latch on the top cover of the unit and provides security for the entire system. Also, the lock provides for toolless access to the chassis. For specific information regarding the opening and closing of the system, see the Opening and Closing the System section in the Installing System Components chapter of the *PowerEdge R410 Hardware Owner's Manual*.

3.10.2   Bezel

A metal bezel is an available option and is mounted to the chassis front to provide the Dell ID. A lock on the bezel prevents un-authorized access to system peripherals and the control panel. System status (via the LCD) remains viewable with the bezel is installed. For specific instructions regarding the operation of the bezel, see the Removing and Replacing the Optional Front Bezel in the Installing System Components chapter of the *PowerEdge R410 Hardware Owner's Manual*.

3.10.3   Hard Drive

Hot-Plug Hard drives are only accessible by opening the bezel, thus locking the bezel secures the hard drives. Cabled Hard drives are only accessible by opening the top cover, thus locking the top cover will secure the hard drives.

See the Hard Drives section in the Installing System Components chapter of the *PowerEdge R410 Hardware Owner's Manual* for information.

3.10.4   Trusted Platform Management (TPM)

The TPM is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM can also be used to store the BitLocker keys for hard drive encryption feature in Microsoft® Windows Server® 2008. TPM is enabled through a BIOS option and uses HMAC-SHA1-160 for binding. In China, S-TPM (Socket TPM) is used.

3.10.5   Power-Off Security

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

3.10.6   Intrusion Alert

Chassis intrusion switch is located on the front panel board as shown in Figure 14. The switch detects when the top cover is opened.

Figure 14.   Chassis Intrusion Switch

3.10.7   Secure Mode

BIOS can 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.

3.11 USB Key

Dell does not offer USB keys for factory installation.

3.12 Battery

Battery for the motherboard: CR2032
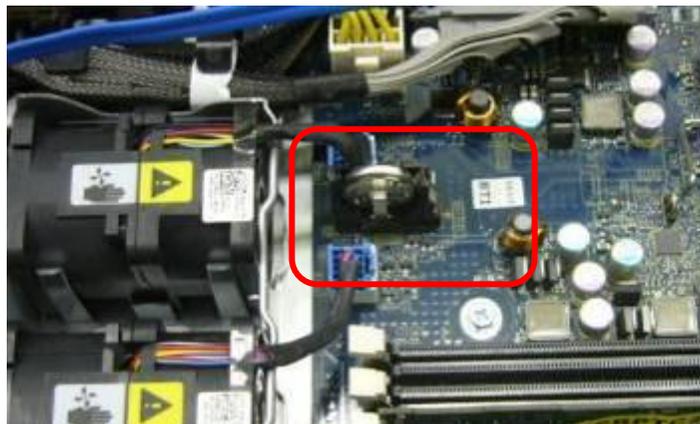
Figure 15.   Battery Holder for PERC 6/i
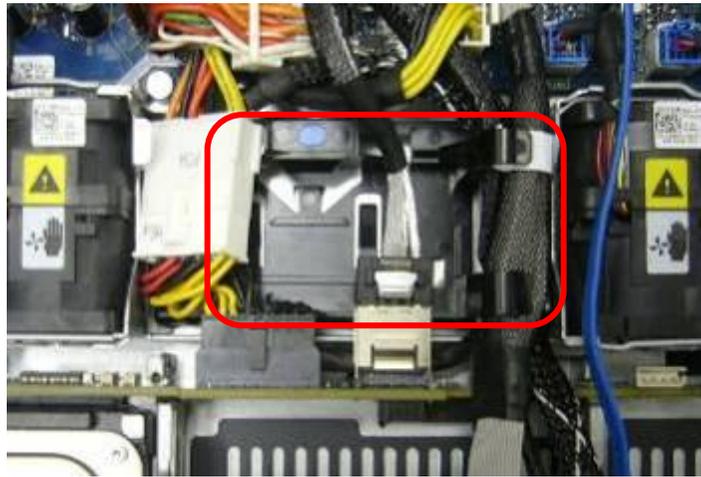
Figure 16.   Battery Holder for PERC

3.13 Field Replaceable Units (FRU)

Parts available for field replacement include:

- Backplane
- CMOS battery
- Expansion card
- Front bezel
- HDD
- I/O panel
- Memory
- ODD
- PDB
- Power supply
- Processor
- Processor shroud
- System board
- System cover
- System fan

4 Power, Thermal, Acoustic

4.1 Power Supplies

The R410 is powered by a non-redundant 480 W power supply (Dell P/N F238K) and redundant 500 W power supply (Dell P/N F649J).

The power supply has automatic input voltage detection. An auxiliary power-out receptacle is not provided on this unit.

The power supply in the chassis has been rated as 82%, efficient at 20%, and 100% load, and 85% efficient at 50% load under 115V AC input line. Redundant power efficiency is 88% at 20% load, 100% load, 92% efficiency at 50% load under 230V AC input line.

The base system includes a single 480 W power supply. This unit provides power to the PowerEdge R410 planar, the four internal hard drive bays, and one slim optical disk drive bay. Power is soft-switched allowing power cycling via a switch on the front of the system enclosure or via software control (through server management functions). The power system is compatible with industry standards, such as ACPI and Server 2000.

The VRD is integrated onto the planar and is not field upgradeable. The VRD follows Intel's VRD11.1 specification. The PowerEdge R410 uses a four-phase design.

4.2 Power Supply Specifications

Single – 480 W power supply

Redundant – 500 W power supply

There are two separate power supply connectors on the planar: an ATX connector (2x12) and a 2x4 connector to provide an additional two pins for +12V. (The ATX connector pin definition is not standard, and it defined by power rating calculation).

The 2x12 ATX connector provides 3.3V, 5V, 12V, and 12V standby to the system. The 5V standby is provided to the system via a charge pump from 3.3V standby.
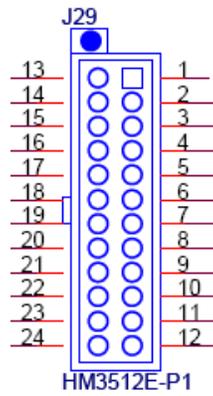
Figure 17.   Power Supply Connector (24 pins)

Table 5.   Power Supply Connector (24 pins) Signals

Pin	Signal	Pin	Signal
1	P5V	13	P3V3
2	P3V3	14	P3V3
3	P12VC	15	P12VC
4	P12VC	16	PS_ENABLE_CPLD_N
5	P12VE	17	P12VE
6	GND	18	GND
7	GND	19	GND
8	PS_PWROK	20	GND
9	SINGLE_PS_PRES_N	21	GND
10	GND	22	GND
11	GND	23	P12VD
12	P5V_AUX	24	P12VD
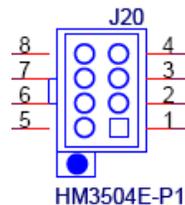
Figure 18.   Power Supply Connector (8 pins)

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Table 6.   Power Supply Connector (8 pins) Signals

Pin	Signal	Pin	Signal
1	GND	5	P12VA
2	GND	6	P12VA
3	GND	7	P12VB
4	GND	8	P12VB

4.3 Environmental Specifications

Table 7.   Operating/Non-Operating Storage Requirements

	Operating Requirements	Non-Operating Requirements
Temperature Ranges (For Altitude ≤900 m or 2952.75 ft)	10 to 35 ˚C (50 to 95 ˚F)	-40 to 65 ˚C (-40 to 149 ˚F)
Temperature Ranges (For Altitude > 900 m or 2952.75 ft)	10 to Note[1] ˚C (50 to Note[2] ˚F)	
Temperature Gradient Maximum per 60 Min.	10 ˚C	20 ˚C
Humidity Percent Ranges Non-condensing	20 to 80 %* (*Max Wet bulb temperature= 29 ˚C)	5 to 95 %+ (+Max Wet bulb temperature= 38 ˚C)
Humidity Gradient Maximum per 60 Min.	10 %	10 %
Altitude Ranges — Low Limits	-50 feet (-15.2 meters)	-50 feet (-15.2 meters)
Altitude Ranges — High Limits	10,000 feet (3048 meters)	35,000 feet (10,668 meters)

Use the following formulas to calculate the maximum operating temperature (in ˚C) for a given altitude. Use the first formula if the altitude is stated in meters and the second formula if the altitude is stated in feet.

$$35 - \frac{\text{Maximum Altitude(in meters)} - 900}{300}\,°C \ or \ 35 - \frac{\text{Maximum Altitude(in ft)} - 2952.75}{984.25}\,°C$$

Use the following formulas to calculate the maximum operating temperature (in ˚F) for a given altitude. Use the first formula if the altitude is stated in meters and the second formula if the altitude is stated in feet.

$$95 - \left(\frac{[\text{Maximum Altitude\{in meters\}} - 900]\ x\ 1.8}{300}\right)°F \ or \ 95 - \left(\frac{[\text{Maximum Altitude\{in ft\}} - 2952.75]\ x\ 1.8}{984.25} + 32\right)°F$$

4.4 Maximum Input Amps

The power supply is equipped with automatic input voltage detection.

Non-redundant power supply:

7.5 - 3.8 A at 100-240 VAC, 50/60 Hz

Redundant power supply:

7 - 3.5 A at 100-240 VAC, 50/60 Hz

4.5 Acoustics

The PowerEdge R410 has balanced acoustic and thermal performance to support a fully-configured system and meets the Dell Acoustic specification AC0142 Rev. A02 category II-D requirement.

The R410 has an aluminum-base passive heat sink with two embedded heat pipes for the processor cooling and four 40x56mm dual-rotor fans exhausting air through heat sink and out of the system. In SKU2 (RDN PSU SKU), there are two extra 40X56mm dual-rotor fans in the front of PDB for redundant power supply cooling.

The 40x56mm dual-rotor fan has an external PWM speed control, and it is integrated into motherboard and power distribution unit (PDU). The thermal sensor on the front control board senses the ambient temperature and adjusts the fan speed accordingly. In a normal office environment, the fans spin slower, resulting in low acoustics. The fan RPM begins to ramp up with ambient, CPU, IOH, and DIMM temperatures changes and in different system configurations (e.g., different CPU and RAID card installation) to meet cooling requirements at higher ambient temperatures.

Table 8.   R410 Acoustical Information

Configurations @ 23 ± 2 °C					Operating Mode	L_{WA}-UL (Bels)
CPU	DIMM	HDD	PSU	PCI Card		
1 x Intel 1.86 GHz CPU	1 x 2GB	1 x 160GB SATA 7.2krpm	1 x 480 W Non-redundant	None	Idle	5.8
					Stress	5.8
2 x Intel 2.26GHZ CPU	8 x 1GB	2 x 250GB SATA 7.2krpm	1 x 480 W Non-redundant	1 x SAS6/iR	Idle	5.8
					Stress	5.8
2 x Intel 2.8GHZ CPU	8 x 8GB	4 x 450GB SAS 15krpm	2 x 500 W Redundant	1 x SAS6/iR 1 x PERC 6E	Idle	6.3
					Stress	6.4
2 x Intel 2.8GHZ CPU	8 x 8GB	4 x 450GB SAS 15krpm	2 x 500 W Redundant	1 x 10GB NIC 1 x PERC 6E 1 x Embedded SAS6i/R	Idle	6.8
					Stress	6.9

5 Processors

5.1 Overview

The PowerEdge R410 supports the Intel® Xeon® 5500 series as shown in Table 9.

Table 9.   Supported Processor Descriptions and Features

On-Line Processor Descriptions	Additional Features	
Intel® Xeon® X5570 2.93G Hz, 8M cache, 6.4 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1333 MHz	95 W
Intel® Xeon® X5560 2.80G Hz, 8M cache, 6.4 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1333 MHz	95 W
Intel® Xeon® X5550 2.66G Hz, 8M cache, 6.4 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1333 MHz	95 W
Intel® Xeon® E5540 2.53G Hz, 8M cache, 5.86 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1066 MHz	80 W
Intel® Xeon® E5530 2.40G Hz, 8M cache, 5.86 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1066 MHz	80 W
Intel® Xeon® E5520 2.26G Hz, 8M cache, 5.86 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1066 MHz	80 W
Intel® Xeon® L5520 2.26G Hz, 8M cache, 5.86 GT/s QPI, Turbo, HT	DDR3 Memory bus speed: up to 1066 MHz	60 W
Intel® Xeon® E5506 2.13G Hz, 4M cache, 4.8 GT/s QPI	DDR3 Memory bus speed: 800 MHz	80 W
Intel® Xeon® L5506 2.13G Hz, 4M cache, 4.8 GT/s QPI	DDR3 Memory bus speed: 800 MHz	60 W
Intel® Xeon® E5504 2.00G Hz, 4M cache, 4.8 GT/s QPI	DDR3 Memory bus speed: 800 MHz	80 W
Intel® Xeon® E5502 1.86G Hz, 4M cache, 4.8 GT/s QPI	DDR3 Memory bus speed: 800 MHz	80 W

Notes:

- QPI: Quick Path Interconnect is a point-to-point processor interconnect developed by Intel to compete with AMD's Hyper Transport; it is defined using Gigatranfers (GT/s) per second referring to a number of data transfers or operations
- Turbo: Feature that increases the speed of the processor on demand (from OS) if the CPU is operating below power/thermal specifications
- DDR-3 Memory bus speed: 800 MHz, 1066 MHz, or 1333 MHz
- HT – Intel Hyper-threading technology

5.2 Processor Configurations

R410 operates with a single processor or dual processors. However, because the memory controller is embedded in the processor when only one processor is installed in the system, it supports 4 DIMMs, min. 1 GB and max 32 GB. When two processors are installed in the system, it supports 8 DIMMs, min. 2 GB and max 64 GB.

5.3 Processor Installation

See Processors in the *Hardware Owner's Manual* for more information.

6 Memory

6.1 Overview

Features of the PowerEdge R410 memory include:

- 3 channels per processor
- Support for registered ECC DDR3 DIMMs or Unbuffered ECC DDDR3 DIMMs.
- DDR3 speeds of 800/1066/1333 supported (Max memory clock speed support is pending on the processors used.)
- 8 (2/1/1) DIMM sockets (128GB Maximum capacity)
- Support for Single Rank, Dual Rank, and Quad Rank DIMMs
- Intel Xeon processor 5600 series also supports Low Voltage DIMMs and sparing feature

6.2 DIMMs Supported

The following DIMMs are supported by the PowerEdge R410:

- 1GB, DDR3 UDIMM, 1066 w/ECC
- 1GB, DDR3 UDIMM, 1333 w/ECC
- 1GB, DDR3 RDIMM, 1066 w/ECC
- 1GB, DDR3 RDIMM, 1333 w/ECC
- 2GB, DDR3 UDIMM, 1066 w/ECC
- 2GB, DDR3 UDIMM, 1333 w/ECC
- 2GB, DDR3 RDIMM, 1066 w/ECC
- 2GB, DDR3 RDIMM, 1333 w/ECC
- 4GB, DDR3 UDIMM, 1066 w/ECC
- 4GB, DDR3 UDIMM, 1333 w/ECC
- 4GB, DDR3 RDIMM, 1066 w/ECC
- 4GB, DDR3 RDIMM, 1333 w/ECC
- 8GB, DDR3 RDIMM, 1066 w/ECC
- 8GB, DDR3 RDIMM, 1333 w/ECC
- 16GB, DDR3 RDIMM, 1066 w/ECC

6.3 Mirroring

In mirroring mode, the PowerEdge R410 has identical memory configuration in Channel_0 and Channel_1; it does not have memory in Channel_3. When mirroring mode is enabled, usable memory capacity is half of the physical memory installed.

6.4 Sparing

Intel has added sparing back with Xeon processor 5600 series. In sparing mode, you must have identical memory in Channel_0, Channel_1 and Channel_2. For the R510, memories are installed in A1, A2 and A3 to enable the sparing mode. With sparing mode is enabled, usable memory capacity is 2/3 of the physical memory installed.

7 Chipset

7.1 Overview

Introduction of the new Intel® Xeon® processor 5600 series includes a stepping revision of the Intel 5520 and 5500 chipset, which is required to enable the full 5600 series feature set. Dell servers shipped with the new chipset revision have the symbol II in the System Revision Field visible through OpenManage™ Server Administrator (OMSA) and the iDRAC GUI. They are physically marked with a 12 x 6mm rectangular label containing the symbol II. The memory interface is optimized for 800/1066/1333 MHz DDR3 SDRAM memory with ECC when running with Intel Xeon processor 5600 series.

7.2 Intel 5500 Chipset Features

The following high-level features are supported by the Intel 5500 chipset:

- Package: FCBGA9
- Intel QuickPath interconnect: 2 ports
- ESI interface: x4 lanes
- Virtualization technology
- 24 PCIe Gen2 lanes
- Integrated Management Engine
- JTAG support

7.2.1   Intel QuickPath Interconnect

Intel QuickPath Interconnect features include:

- Point-to-point cache-coherent interconnect
- Fast/narrow unidirectional links
- Concurrent bi-directional traffic
- Error detection via CRC
- Error correction via Link level retry
- Intel® Interconnect BIST (Intel® IBIST) toolbox built-in
- Packet-based protocol

7.2.2   System Memory Interface

System memory interface features include:

- Memory controller integrated in CPU package
- 3 channels per processor (6 total)
- 3 DIMMs/channel supported (18 total)
- Max memory of 192-GB supported
- Single Rank, Dual Rank, and Quad Rank DIMMs supported
- Support UDIMM and RDIMM
- DDR3 speeds of 800/1066/1333 supported
- 512 Mb, 1 Gb, 2 Gb, and 4 Gb Technologies/Densities supported
- No memory riser support

7.2.3   PCI Express Interfaces

PCI Express Interfaces include:

- Intel 5500 chipset IOH provides multiple PCI Express* Gen 2 interfaces
- Point-to-point, serial bi-directional interconnect
- One x4 ESI link to ICH10
- Up to six x4 PCI Express Gen 2 ports
- x4 link pairs can be combined to form x8 links and or x16 links
- Each signal is 8b/10b encoded with an embedded clock
- Signaling bit rate of 5 Gbit/sec/lane/direction; for an x4 link, bandwidth is 2 GB/sec in each direction
- Hot Insertion and Removal supported with the addition of Hot-Plug control circuitry

7.2.4   SMBus Interfaces

- Connected globally to CPUs, IOHs, and ICH through a common shared bus hierarchy.
- Low pin count, low speed management interface
- Provides access to configuration status registers (CSR's)
- Mastered by the baseboard management controller (BMC)

7.2.5   ESI interface

The ESI interface connects the Intel 5500 chipset MCH to the ICH10R. The ESI interface runs at 2 GB/s with a 100 MHz reference clock.

7.3 Intel ICH10R South Bridge

The PowerEdge R510 planar incorporates the Intel ICH10R chip. The ICH10R is a highly integrated I/O controller.

7.3.1   DMI interface

The DMI interface connects the ICH10R to the IOH. The DMI interface runs at 2 GB/s with a 100 MHz reference clock.

7.3.2   SATA interface

The ICH10R contains 6 integrated Serial ATA host controllers capable of independent DMA operation on 6 ports.

The ICH10R SATA interface supports data transfers up to 300 MB/s. The ICH10R has an integrated AHCI controller.

7.3.3   USB interface

The ICH10R is USB 2.0 compliant. It has six UHCI host controllers to support twelve ports and two EHCI host controller to support twelve ports. An over-current condition can be detected on all twelve ports.

7.3.4   PCI Express interface

The ICH10R has 6 PCI Express 1.1 compliant root ports.

8   BIOS

8.1 Overview

The PowerEdge R410 BIOS is based on the Dell BIOS core and supports the following features:

- Intel® 5500-EP Two-Socket Support
- Simultaneous Multi-Threading (SMT) support
- CPU Turbo Mode support
- PCI 2.3 compliant
- Plug n' Play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Boot from hard drive, optical drive, iSCSI drive, and USB key
- ACPI support
- Direct Media Interface (DMI) support
- PXE and WOL support for on-board NICs
- Memory mirroring 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 (upgrade for MASER)
- Unified Server Configurator support
- Power management support including DBS, Power Inventory and multiple Power Profiles
- UEFI support

The R410 BIOS does not support the following:

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

8.2 Supported ACPI States

- ACPI compliance: OS, S4, S5 supported
- NO S1, S2, S3 (STR) support

Table 10.   Wake-Up States

Wake-Up Events	States Can Wake From
RTC	OS-S4
Power Button	S5
RI#	Not supported
PME#	S5
KB	Not supported
MOUSE	Not supported
USB	Not supported
WOL	OS-S4

8.3 I^{2}C (Inter-Integrated Circuit)

I^{2}C is a simple bi-directional two-wire bus for efficient inter-integrated circuit control. All I^{2}C -bus compatible devices incorporate an on-chip interface that allows them to communicate directly with each other via the I^{2}C-bus. This solves the many interfacing problems encountered when designing digital control circuits. These I^{2}C devices perform communication functions between intelligent control devices (e.g., microcontrollers), general-purpose circuits (e.g., LCD drivers, remote I/O ports, memories), and application-oriented circuits.

9 Embedded NICs/LAN on Motherboard (LOM)

9.1 Overview

There is Broadcom® 5716 chip on the PowerEdge R410 motherboard. The 5716 chip is connected to the IOH via a PCI Express x4 gen2 link. The chip provides a two-gigabit Ethernet port. There are two RJ-45 connectors on the rear of the system. The firmware for the LOM chip resides in a flash part. The PowerEdge R410 supports Wake-On-LAN (WOL) from either port.
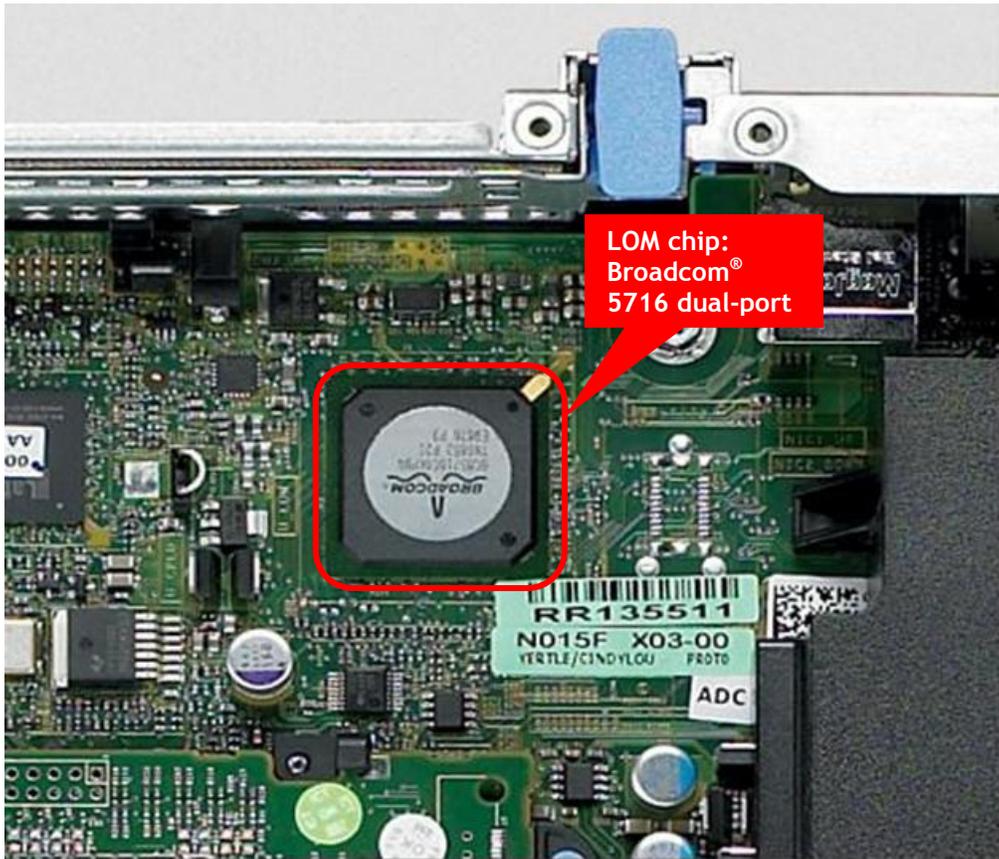
Figure 19.   Embedded NICs/LAN on Motherboard

10 I/O Slots

10.1 Overview

Table 11.   Insert I/O Slot information

PCI Slot #	Mechanical	Electrical	Height	Length
1 (Gen2)	PCIe x16	PCIe x16	Full Height	Half Length

There is a second slot on the riser card dedicated for SAS 6/iR modular. Other than SAS 6/iR modular, no other cards should be installed in this slot.

10.2 Quantities and Priorities

Table 12.   Descriptions of R410 Controllers

Category	Description	Bandwidth	Max Quantity	Slot Priority
Internal Controllers	PERC 6/i Adapter	x8	1	16
	SAS 6/iR	x8	2	4, 5
	SAS 5/iR	x4	2	4, 5
External Controllers	PERC 6/E 256	x8	2	5, 4
	PERC 6/E 512	x8	2	5, 4
	SAS 5/E	x8	2	4, 5
SCSI HBA	LSI2032 PCIe SCSI HBA	x4	2	4, 5
1G NICs	Intel® PRO/1000 PT Server Adapter	x1	4	2, 1, 3, 4
	Broadcom® NetXtreme™ II 5709 Dual-Port Ethernet PCIe Card with TOE	x4	4	2, 1, 3, 4
	Broadcom® NetXtreme™ II 5709 Dual-Port Ethernet PCIe Card with TOE and iSCSI Offload	x4	4	2, 1, 3, 4
	Intel® Gigabit VT Quad-Port Server Adapter	x4	4	2, 1, 3, 4

10.3 Boot Order

PCI express lane assignments and scan order in R410:

- IOH port 1, 2 (PCI Express Gen2 x4) – Broadcom BCM5716 Gigabit LOM
- IOH port 3 (PCI Express Gen1 x4) – Integrated PERC6i or SAS6i – Slot 2
- IOH port 7/8/9/10 (PCI Express Gen2 x16) – Slot 1

11 Storage

11.1 Overview with Description

R410 supports 4 HDDS in one of the following configurations:

- 4 x 3.5" cabled or hot-swap SAS or SATA
- 4 x 2.5" hot-swap SAS or SATA or SSD

The 2.5" HDD requires hot-swap configuration with the 3.5" carrying tray and the retention kit.

You must choose between cabled or hot-swap configuration at point of purchase. This is not an upgrade option.
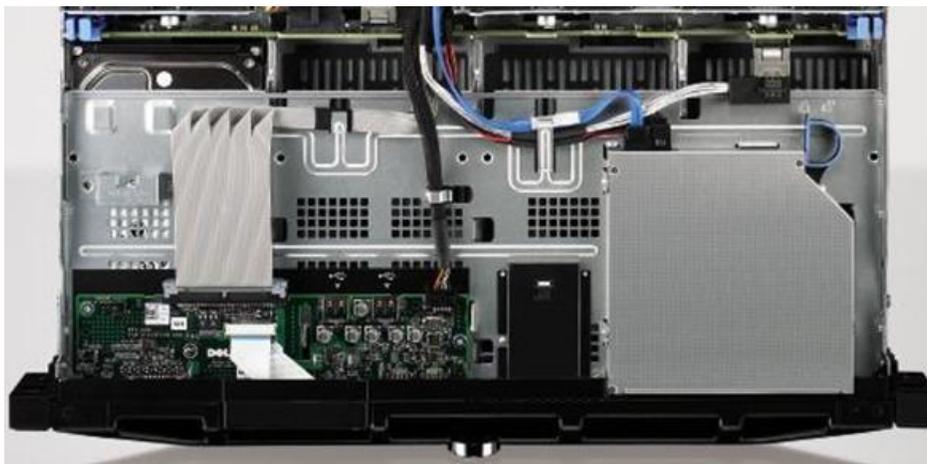
Figure 20.   Hot-Swap HDD Configuration with Backplane
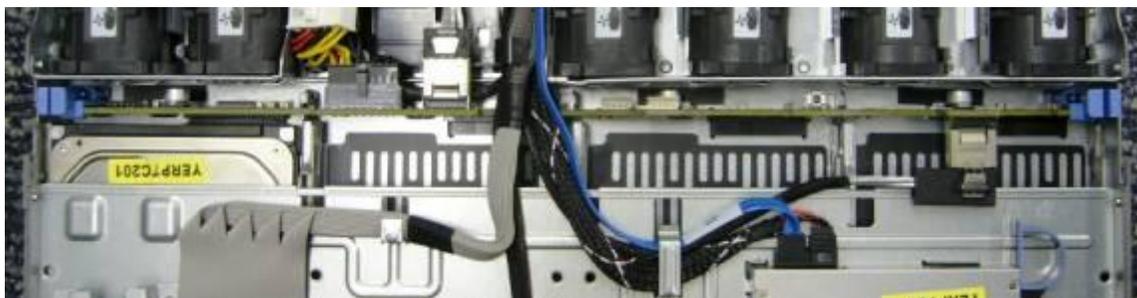
Figure 21.   Top-View for Hot-Swap HDD Connection

Figure 22.   Top-View for Cabled HDD Connection
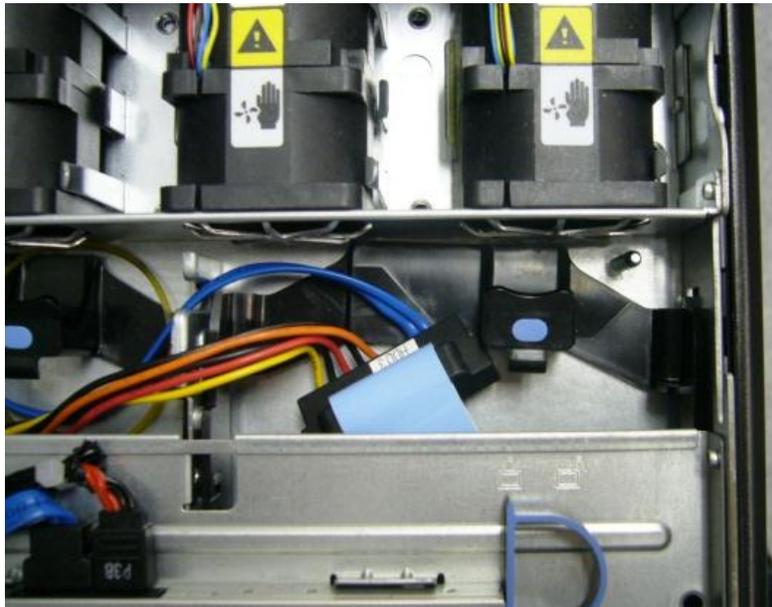
Figure 23.   Cabled HDD Connectors

11.2 Drives

Refer to Table 2 for supported type and capacities.

11.3 RAID Configurations

Table 13.   RAID Configurations

Cabled/Hot Swap	Configuration Type	Configurations		Description	Min HDD	Max HDD
Cabled	NO HDD	C0A	NCZCBL	No HDD, Cabled HDD Chassis	0	0
Hot-Swap	NO HDD	C0B	NCZ	No HDD, Hot-Swap HDD Chassis	0	0
Cabled	Embedded SATA	C1	MSTCBL	On-board SATA Controller (ICH10R)	1	4
Cabled	SAS/SATA – NO RAID	C2	ASSCBL	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR)	1	4
Cabled	SAS/SATA – RAID0	C3	ASSR0CBL	Add-in SAS/SATA RAID card, RAID 0 (SAS 6/iR or PERC 6/i)	1	4
Cabled	SAS/SATA – RAID1	C4	ASSR1CBL	Add-in SAS/SATA RAID card, RAID 1 (SAS 6/iR or PERC 6/i)	2	2

Cabled/Hot Swap	Configuration Type	Configurations		Description	Min HDD	Max HDD
Cabled	SAS/SATA – RAID5	C5	ASSR5CBL	Add-in SAS/SATA RAID card, RAID 5 (PERC 6/i)	3	4
Cabled	SAS/SATA – RAID6	C6	ASSR6CBL	Add-in SAS/SATA RAID card, RAID 6 (PERC 6/i)	4	4
Hot-Swap	SAS/SATA/SSD – NO RAID	C7	ASS	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR)	1	4
Hot-Swap	SAS/SATA/SSD – RAID0	C8	ASSR0	Add-in SAS/SATA RAID card, RAID 0 (SAS 6/iR or PERC 6/i)	1	4
Hot-Swap	SAS/SATA/SSD – RAID1	C9	ASSR1	Add-in SAS/SATA RAID card, RAID 1 (SAS 6/iR or PERC 6/i)	2	2
Hot-Swap	SAS/SATA/SSD – RAID5	C10	ASSR5	Add-in SAS/SATA RAID card, RAID 5 (PERC 6/i)	3	4
Hot-Swap	SAS/SATA/SSD – RAID6	C11	ASSR6	Add-in SAS/SATA RAID card, RAID 6 (PERC 6/i)	4	4
Hot-Swap	SAS/SATA/SSD – RAID10	C12	ASSR10	Add-in SAS/SATA RAID card, RAID 10 (PERC 6/i)	4	4
Hot-Swap	SAS/SATA/SSD – RAID1+ RAID1	C13	ASSR1R1	Add-in SAS/SATA RAID card, RAID 1 + RAID 1 (SAS 6/iR or PERC 6/i)	2+2	2+2
Hot-Swap	Mix SAS and SATA – No RAID	C14	ASS-X	Add-in SAS/SATA RAID card, No RAID (SAS 6/iR)	2xSAS + 1xSATA	2xSAS + 2xSATA
Hot-Swap	Mix SAS and SATA – RAID1 + RAID1	C15	ASSR1R1-X	Add-in SAS/SATA RAID card, RAID 1 + RAID 1 (SAS 6/iR or PERC 6/i)	2xSAS + 2xSATA	2xSAS + 2xSATA

11.4 Storage Controllers

Refer to Table 2 and Section 10.2 for detailed information.

Dell
11.5 LED Indicators

Figure 24. LED Indicators

A green LED located on the system control panel in the front of the enclosure indicates when activity occurs on any integrated SATA device connected to the on board SATA ports. Using an add-in SAS 6/iR card, the HDD LED is also activated.

11.6 Optical Drives

R410 supports a SATA interface DVD-ROM or DVD+/-RW.

Refer to Table 2.

11.7 Tape Drives

R410 does not support an internal backup device. Only external backup device is supported.

Refer to Table 2 for the supported devices.

12 Video

Matrox® G200eW with 8 MB memory integrated in Winbond WPCM450 (Baseboard Management Controller).

- 1280x1024 at 85 Hz for KVM and 1600x1200 at 60 Hz for video out
  - o 640x480 (60/72/75/85 Hz; 8/16/32-bit color)
  - o 800x600 (60/72/75/85 Hz; 8/16/32-bit color)
  - o 1024x768 (60/72/75/85 Hz; 8/16/32-bit color)
  - o 1152x864 (75 Hz; 8/16/32-bit color)
  - o 1280x1024 (60/75/85 Hz; 8/16-bit color)
  - o 1280x1024 (60 Hz, 32-bit color) (32 bit color is only supported at 60 Hz for this resolution)

13 Rack Information

13.1 Overview

The ReadyRails™ sliding and static rail systems for the R410 provide toolless support for 4-post racks with square or unthreaded round mounting holes including all generations of Dell racks. Both support tooled mounting in 4-post threaded racks (an optional adapter brackets kit is required for the sliding rails), with the static rails also providing tooled mounting support for 2-post (Telco) racks for added versatility. 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.

NOTE: The R410 is not compatible with any other Dell rails including previous generation rails, but it does use the same sliding rails as the R310 and uses the same static rails as the R210 and R310.

13.2 Rails

The rail offerings for the R410 consist of two types: **sliding** and **static**.

The **sliding rails** allow the system to be fully extended out of the rack for service and are available with or without the optional cable management arm (CMA).
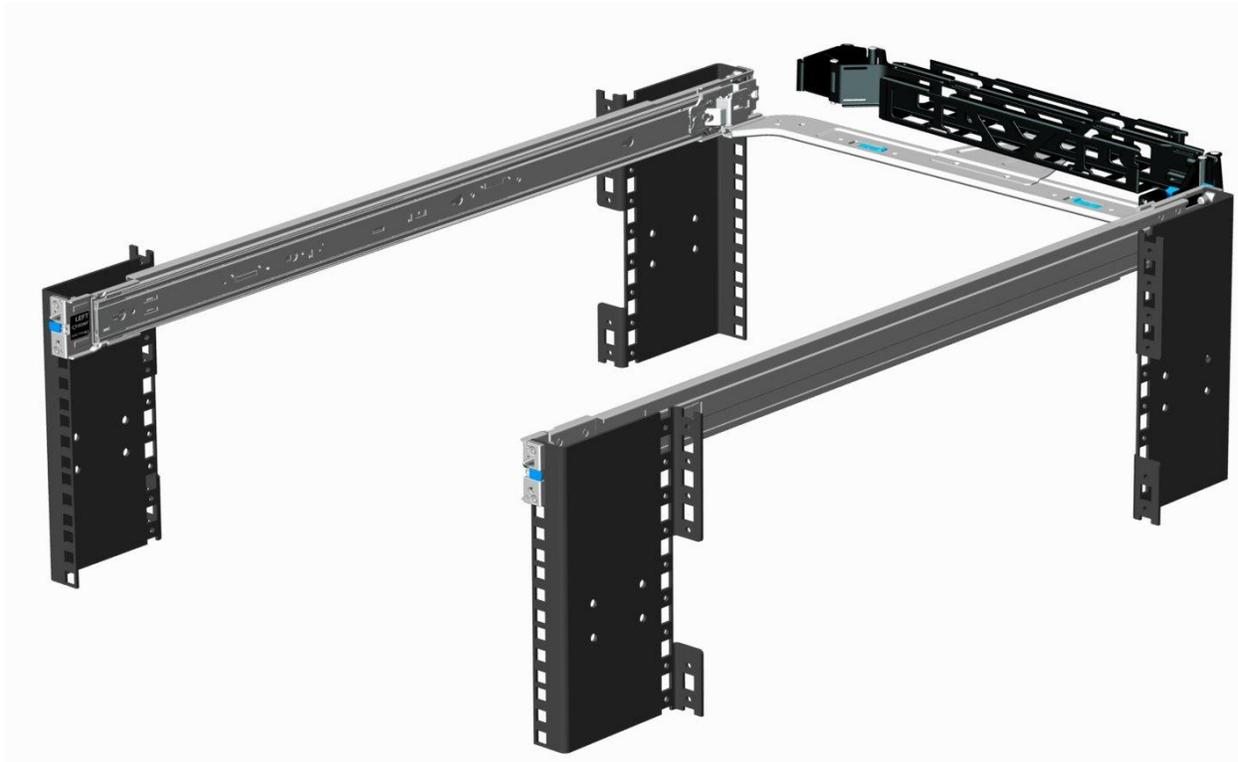
Figure 25.   R410 Sliding Rails with Optional CMA

Sliding rail kits 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 sliding 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.

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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 26.   1U Threaded Rack Adapter Brackets Kit

The **static rails** support a wider variety of racks than the sliding rails but do not support serviceability in the rack and are thus not compatible with the CMA.
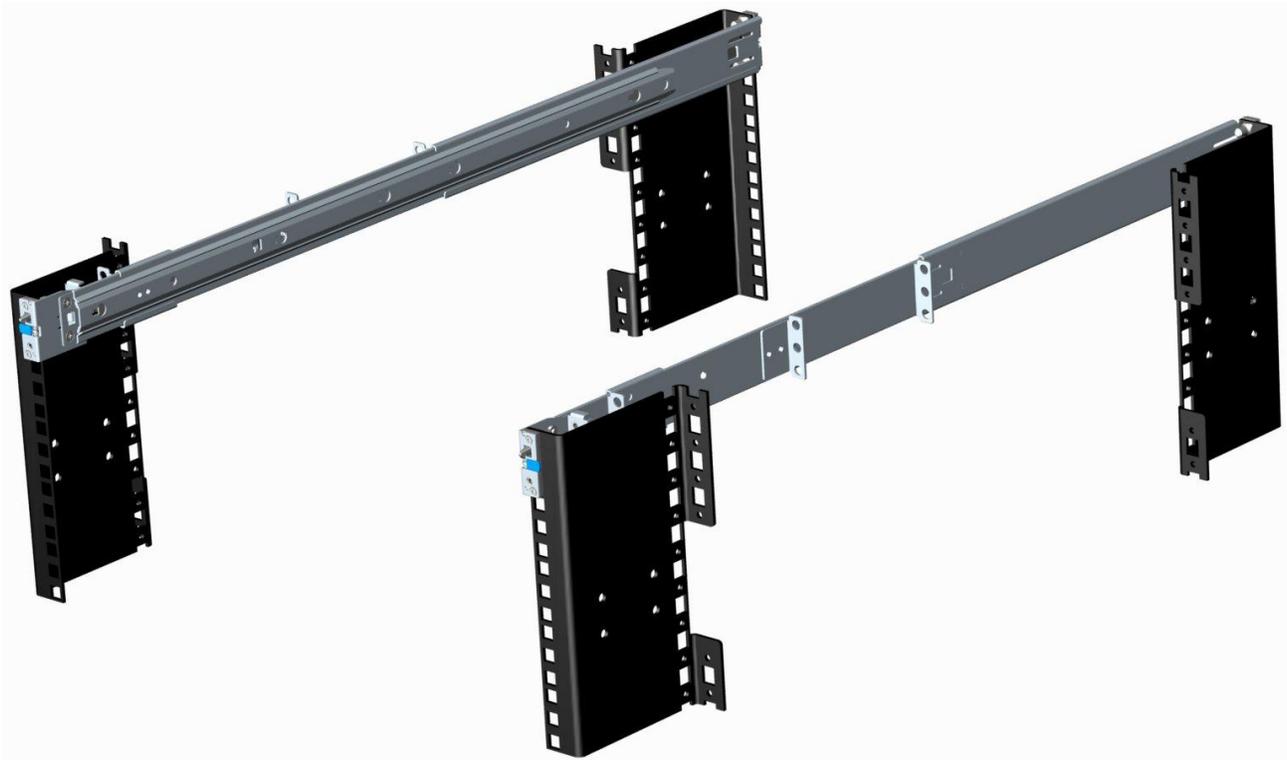

Figure 27.   R410 Static Rails

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

Dell

Table 14. **Rack Types Supported**

Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
			4-Post			2-Post	
			Square	Round	Thread	Flush	Center
A3	ReadyRails™	Sliding	√	√	√*	X	X
A4	ReadyRails/Generic	Static	√	√	√	√	√

Requires the 1U Threaded Rack Adapter Brackets Kit (Dell PN 8Y19G)

Screws are **not** included in the static rail kit due to the fact that threaded racks are offered with a variety of thread designations. Users must therefore provide their own screws when mounting the **static rails** in threaded or 2-post racks.

Other key factors governing proper rail selection 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. Due to their reduced complexity and lack of need for CMA support, the **static rails** offer a greater adjustability range and an overall smaller footprint than the **sliding rails**.

Table 15. **Rail Adjustability Range and Rail Depth**

Rail ID	Rail Adjustability Range (mm)						Rail Depth (mm)	
	Square		Round		Threaded		without CMA	with CMA
	Min	Max	Min	Max	Min	Max		
A3	686	883	672	876	651	897	714	835
A4	608	879	594	872	604	890	622	—

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 R410 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 R410 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

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- Both the CMA and the tray mount without the use of tools via simple and intuitive snap-in designs

13.4 Rack View

The R410 sliding rails are a "stab-in" design, meaning that the inner (chassis) rail members must first be attached to the sides of the system prior to inserting them into the middle (intermediate) and outer (cabinet) rail members installed in the rack. The 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.

Figure 28.   R410 Mounted in the A3 Sliding Rails with the CMA

The R410 static rails are also a "stab-in" design, but unlike the sliding rails, they do not include middle (intermediate) rail members. After the inner (chassis) rail members have been attached to the sides of the chassis, they are inserted directly into the outer (cabinet) rail members installed in the rack.

Figure 29.   R410 Mounted in the A4 Static Rails in 2-post Center Mount Configuration

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/Description

Dell aims on delivering open, flexible, and integrated solutions that help you reduce the complexity of managing disparate IT assets by building comprehensive IT management solutions. Combining Dell PowerEdge Servers with a wide selection of Dell-developed management solutions gives you choice and flexibility, so you can simplify and save in environments of any size. To help you meet your server performance 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 R410 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The optional 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. These periphery devices consist of the PSUs, the storage backplane, integrated SAS HBA or PERC 6/I, and control panel with display.

The optional upgrade to 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. For servers with iDRAC Express, the Lifecycle Controller offers OS install, platform updates, platform configuration, and diagnostics capabilities. For servers without iDRAC Express, this utility has limited functionality and offers OS install and diagnostics capabilities only.

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:

Table 16. 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 iDRAC Express

The optional iDRAC Express is the first tier of iDRAC6 upgrades. In addition to upgrading the system with 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 below.

15.6 iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the R410 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

Additionally, the iDRAC6 Enterprise can be upgraded by adding the vFlash Media card. This is a 1 GB Dell branded SD card that enables a persistent 256 MB virtual flash partition. In the future, vFlash will be expanded to include additional features.

A more detailed feature list for iDRAC6 Enterprise and vFlash is included in Table 17.

Table 17. Features List for BMC, iDRAC, and vFlash

Feature	BMC	iDRAC6 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	✓	✓	✓	✓

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

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Feature	BMC	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
RAC Log		✓	✓	✓
Trace Log			✓	✓

16 Peripherals

16.1 USB Peripherals

Optional USB 1.44 MB floppy drive

Optional USB DVD-ROM

16.2 External Storage

Refer to Table 2.

17 Packaging Options

- Options for single pack and multipack are available.
- Multipack will support four units in one pack.
- Single Pack Dimensions and Weights:
  - o Inside Dimensions:
    - Length: 892 mm/35.13"
    - Width: 594 mm/23.38"
    - Depth: 232 mm 9.13"
  - o Outside Dimensions:
    - Length: 908 mm/35.75"
    - Width: 610 mm/24.00"
    - Depth: 264 mm/10.38"
  - o Weights:
    - System packed out weight: 58 lbs
    - Cushion weight: 2 lbs
    - Corrugated box weight: 8.5 lbs

Appendix A. R410 Volatility Chart

The Dell PowerEdge R410 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. The NV components detailed in Table 18 are present in the PowerEdge R410 server.

Table 18.   R410 Volatility Table

Server BIOS Memory	Details
Size:	32 Mbit
Type [e.g., Flash PROM, EEPROM]:	Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Boot Code and Configuration Information
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
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
Purpose? [e.g., boot code]	RTC & 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

LOM (LAN [Network Interface] on Motherboard) Memory	Details
Size:	4Mb (1MB)
Type: [e.g., Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	Yes, under software control.
Purpose? [e.g., boot code]	Contains LOM boot code and config data
How is data input to this memory?	Requires vendor provided firmware file and loader program used during factory assembly or possible field update. A system loaded with arbitrary data in firmware memory would not operate.
How is this memory write protected?	Software control.
Server System Event Log Memory/FRU	**Details**
Size:	16 KB
Type: [e.g., Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Store System Events
How is data input to this memory?	BMC controller write
How is this memory write protected?	Not write protected
Power Supply FRU	**Details**
Size:	256 Bytes
Type: [e.g., Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Store power supply information
How is data input to this memory?	Programmed by the power supply manufacturer.
How is this memory write protected?	Not write protected

TPM (Trusted Platform Module for boards shipped outside of China; Boards sold to destinations in China do not have TPM at this time)	Details
Size:	Unspecified size of user ROM, RAM, EEPROM; 128 bytes of OTP memory included
Type: [e.g., Flash PROM, EEPROM]:	ROM, RAM, EEPROM
Can user programs or operating system write data to it during normal operation?	Yes, operating systems and applications that conform to the TCG standard can write data to the TPM during normal operation. Access to the NV Storage is controlled by the TPM owner.
Purpose? [e.g., boot code]	Trusted Platform Module NV storage. May be used to securely storage of encryption keys.
How is data input to this memory?	TCG TPM Specification defined command interface or Using TPM Enabled operating systems
How is this memory write protected?	As defined by the TCG TPM Specification, protection of this NV memory area is configurable by the TPM owner.
Backplane Firmware and FRU	**Details**
Size:	32 KB
Type: [e.g., Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g., boot code]	Backplane Firmware and FRU data storage
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.
Embedded Bootable Memory Device	**Details**
Size:	1 GB
Type: [e.g., Flash PROM, EEPROM]:	SD card
Can user programs or operating system write data to it during normal operation?	Yes
Purpose? [e.g., boot code]	Optional embedded boot device
How is data input to this memory?	Factory installed or via USB bus.
How is this memory write protected?	Not write protected

Server BMC (Baseboard Management Controller) Firmware Flash Memory	Details
Size:	16MB Flash
Type: [e.g.,Flash PROM, EEPROM]:	SPI Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [e.g.,boot code]	Stores the BMC Firmware
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

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.