

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 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 eleventh-generation PowerEdge portfolio specifications and features the same system design commonality and reliability as the entire portfolio. All eleventh-generation PowerEdge servers are designed to make the user experience easier. Dell puts all external ports, power supplies, LCD screens, and LED lights in the same location for familiar experience as well as easy installation and deployment.

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. The R410 incorporates Energy Smart design using low-flow fans and logical component layout of the internal components, which aid with airflow direction. These design elements, along with policy-driven power and thermal management help 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 management 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.

1.5 Comparison to Other Dell Servers

Table 1. Comparison of R410 to R310 and R510

Feature	R310	R410	R510
Processor	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	Quad-core or six-core Intel® Xeon® processors 5500 and 5600 series
Front Side Bus	Intel Direct Media Interface (DMI)	Intel QuickPath Interconnect (QPI)	Intel QuickPath Interconnect (QPI)
Processors	1	1 to 2	1 to 2
Cores	2/4	2/4/6	2/4/6
L2/L3 Cache	Intel Xeon: 8MB Intel Core: 4MB Intel Pentium: 3M Intel Celeron: 2M	4MB, 8MB, or 12MB	4MB, 8MB, or 12MB
Chipset	Intel® 3420	Intel® 5500	Intel® 5500
DIMMs	6 RDIMMs or 4 UDIMMs DDR3	4+4 UDIMM or RDIMM DDR3	4+4 UDIMM or RDIMM DDR3
Minimum/Maximum RAM	1GB/32GB	1GB/64GB	1GB/128GB
Hard Drive Bays	4 x 3.5" optional hot-swap or 2.5" SAS/SSD with hot-swap chassis	4 x 3.5" optional hot-swap 2.5" drives supported in hot-swap trays	4 x 3.5" or 8 x 3.5" or 2.5" or 12 x 3.5" or 2.5" + 2 x internal 2.5"
Hard Drive 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-drive chassis configuration
Embedded Hard Drive Controller	Chipset-based SATA	Chipset-based SATA	Chipset-based SATA for 4-drive chassis configuration PERC HBA required for 8- and 12-drive chassis configuration

Feature	R310	R410	R510
Optional Storage Controller	<p>Non-RAID: SAS 5/E LSI2032 (for tape backup unit) 6Gbps SAS HBA</p> <p>RAID: PERC 6/E SAS 5/E SAS 6/iR PERC S300 PERC H200 PERC H700 PERC H800</p>	<p>Non-RAID: SAS 5/E LSI2032 (for tape backup unit only) 6Gbps SAS HBA</p> <p>RAID: SAS 6/iR Modular PERC 6/i PERC 6/E PERC S100 (SW RAID) PERC S300 Modular (SW RAID) PERC H200 PERC H700 PERC H800</p>	<p>Non-RAID: SAS 5/E LSI2032 (for tape backup unit only) 6Gbps SAS HBA</p> <p>RAID: SAS 6/iR Integrated PERC 6/i Integrated PERC 6/E PERC S300 PERC H200 Integrated PERC H700 Integrated PERC H800</p>
Availability	ECC memory, hot-swap hard drives; redundant PSU; quad-pack LED diagnostic/LCD with hot-swap hard drive chassis, TPM	Hot-swap hard drives; redundant PSU; quad-pack LED diagnostic/LCD with hot-swap hard drive chassis; memory RAS	Hot-swap hard drives; redundant PSU; quad-pack LED diagnostic/LCD diagnostic (depends on chassis model); memory RAS
Server Management	BMC, IPMI 2.0 compliant; Full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media	BMC, IPMI 2.0 compliant; Full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media	BMC, IPMI 2.0 compliant; Full Dell OpenManage™ suite Optional: iDRAC6 Express, iDRAC6 Enterprise, vFlash media
I/O Slots	Riser 1: PCIe x16 (x8 routing), full-height, half-length, Gen2 Riser 2: PCIe x8 (x8 routing), full-height, half-length, Gen2 (embedded): PCIe x8 (x4 routing)	1 x PCIe x16 (true x16, Gen2); full-height, half-length	3 PCIe x 8 + 1 internal storage slot or 1 x 16 + 1 internal storage slot
NIC/LOM	2x GbE LOM	2x GbE LOM Optional: various NICs available	2x GbE LOM Optional: various NICs available
USB	Two front, two back, two internal	Two front, two back, two internal	Two front, two back, two internal

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Feature	R310	R410	R510
Power Supplies	Non-redundant, 350W (80+ Bronze) Optional redundant, 400W (80+ Silver) Auto-ranging (100V~240V)	Non-redundant, 480W (80+ Bronze) Optional redundant, 500W (80+ Gold) Auto-ranging (100V~240V)	R510-4: non-redundant R510-8 and R510-12: hot-swap, redundant
Fans	Non-redundant, non-hot-swappable	Non-redundant, non-hot-swappable	R510-12 supports redundant fan

2 System Overview

2.1 Overview

The Dell™ 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 with optional iDRAC Express or iDRAC Enterprise
- Security features with TPM, internal USB, and IPv6
- Industry leading storage expandability and cost/GB with four 3.5" or four 2.5" hard drives, 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

3 Product Features Summary

Table 2 lists a summary of features for the Dell™ PowerEdge™ R410. For the latest information on supported features, visit Dell.com.

Table 2. Features Summary

Feature	Technical Specification	
Form Factor	1U rack	
Processors	Quad-core or six-core Intel® Xeon® processors 5500 and 5600 series	
Processor Sockets	2	
Front Side Bus or HyperTransport	Intel® QuickPath Interconnect (QPI)	
Cache	Up to 12MB	
Chipset	Intel 5500	
Memory ¹	Up to 128GB (8 DIMM slots): 1GB/2GB/4GB/8GB/16GB DDR3 up to 1333MHz	
I/O Slots	1 PCIe G2 slot + 1 storage slot: One x16 slot One storage x4 slot	
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 PERC S100 (software based) PERC S300 Modular (software based)	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 SAS 5/E HBA LSI2032 PCIe SCSI HBA
Drive Bays	4 x 3.5" cabled hard drives or 4 x 3.5" hot-swap hard drives or 4 x 2.5" hot-swap hard drives One slim type drive bay for DVD-ROM or DVD+/-RW	
Maximum Internal Storage	Up to 12TB	

Feature	Technical Specification
Hard Drives ¹	<p>Hot-plug hard drive options: 2.5" SATA SSD, SAS (10K) 3.5" SAS (15K), nearline SAS (7.2K), SATA (7.2K)</p> <p>Cabled hard drive options: 3.5" SAS (15K, 10K), nearline SAS (7.2K), SATA (7.2K)</p>
Communications	<p>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 Emulex CNA iSCSI HBA stand up adapter OCE10102-FX-D</p>
Power Supply	<p>Non-redundant, 480W (80+ BRONZE) Optional redundant, 500W (80+ GOLD)</p>
Availability	<p>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; tool-less hot-swap hard drive chassis</p>
Video	<p>Integrated Matrox® G200</p>
Remote Management	<p>BMC, IPMI 2.0 compliant Optional iDRAC6 Enterprise, iDRAC6 Express</p>
Systems Management	<p>Dell OpenManage™ Microsoft® System Center Essential (SCE) 2010 v2</p>
Rack Support	<p>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</p>

Feature	Technical Specification
Operating Systems	<p>Microsoft® Windows Server® 2012 Microsoft Windows® Small Business Server 2011 Microsoft Windows Small Business Server 2008 Microsoft Windows Server 2008 SP2, x86/x64 (x64 includes Hyper-V®) Microsoft Windows Server 2008 R2 SP1, x64 (includes Hyper-V v2) Microsoft Windows HPC Server 2008 Novell® SUSE® Linux Enterprise Server Red Hat® Enterprise Linux®</p> <p>Virtualization Options: VMware® vSphere® including ESX™ and ESXi™ VMware® Virtual Infrastructure Version 3.5 Update 4 Red Hat Enterprise Virtualization®</p> <p>For more information on the specific versions and additions, visit http://www.Dell.com/OSsupport.</p>
Featured Database Applications	Microsoft® SQL Server® solutions (see Dell.com/SQL)
<p>¹GB means 1 billion bytes and TB equals 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.</p>	

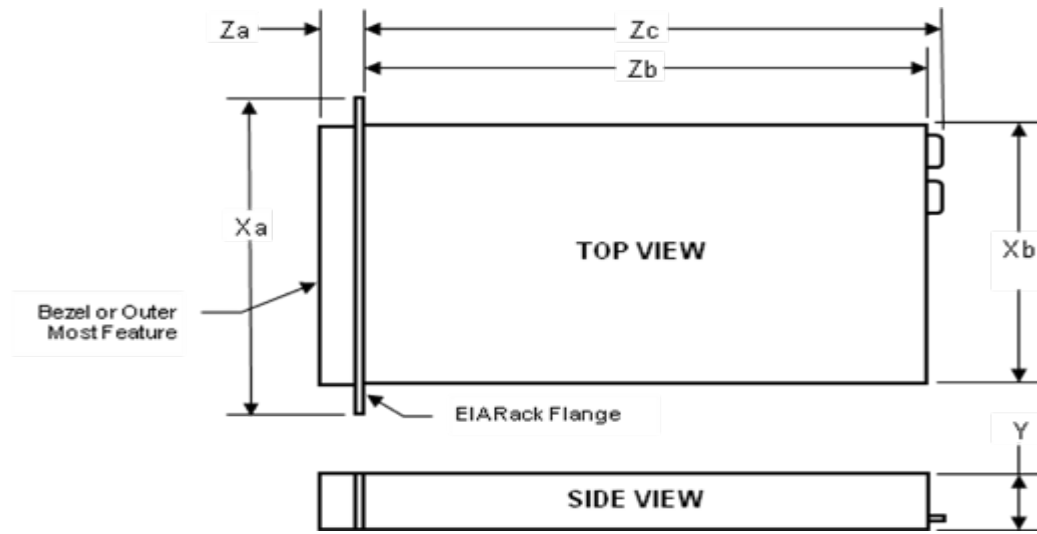
4 Mechanical

4.1 Chassis Description

The Dell™ 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 drives 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 eleventh generation slim static and slim sliding rails.

4.2 Dimensions and Weight

Figure 1 Details the dimensions of the PowerEdge R410 chassis. The maximum configuration weight is 15.9 kg (35.02 lb).



Xa (width with rack latches)	Xb (width without rack latches)	Y (Height)	Za (depth with bezel)	Za (depth without bezel)	Zb (depth without power supply and bezel)	Zc (depth with power supply)
482.4mm	434.0mm	43.0mm	35.0mm	20.1mm	606.0mm	641.9mm

Figure 1. System Dimensions

4.3 Front-Panel View and Features

For detailed 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/Manuals.



Figure 2. Front View Without Bezel



Figure 3. Front View With Bezel



Figure 4. Control Panel View

4.4 Back-Panel View and Features

For detailed information, see the Back-Panel Features and Indicators section in the About Your System chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals.



Figure 5. Back View With Redundant Power Supply



Figure 6. Back View With Non-redundant Power Supply

4.5 NIC Indicators

See the NIC Indicator Codes section in the About Your System chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals for more information.

4.6 Rails and Cable Management

4.6.1 ReadyRails Sliding Rails

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

- Tool-less installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks
- Toolled 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

4.6.2 ReadyRails Static Rails

ReadyRails™ Static Rails for 4-post and 2-post racks support:

- Tool-less installation in 19" EIA-310-E compliant square or unthreaded round hole 4-post racks including all generations of Dell racks
- Toolled 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

See Section 14, Rack Information, for more information.

4.7 Fans

The R410 has six fans with redundant power supply units and four fans with non-redundant power supply units.

4.8 Security

For additional information regarding the PowerEdge R410 security features, see the *Dell PowerEdge R410 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

4.8.1 Cover Latch

A tooled entry latch is provided on the top of the unit to secure the top cover to the chassis. For more information, see the Opening and Closing the System chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals.

4.8.2 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 as shown in the Removing and Replacing the Optional Front Bezel section in the Installing System Components chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals.

4.8.3 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.

For more information, see the Hard Drives section in the Installing System Components chapter of the *PowerEdge R410 Hardware Owner's Manual* for information on Support.Dell.com/Manuals.

4.8.4 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 enable the Microsoft® 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.

4.8.5 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.

4.8.6 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 Embedded System Management (ESM). When enabled, the software can provide notification to the customer that the cover has been opened. The PowerEdge R810 only supports up to 5 minutes of operation with the cover off.

4.8.7 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.

4.9 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.

4.10 Battery

A replaceable coin cell CR2032 3V battery is mounted on the planar to provide backup power for the Real-Time Clock and CMOS RAM on the ICH10 chip.

4.11 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

4.12 User Accessible Jumpers, Sockets, and Connectors

For information on user accessible jumpers, sockets, and connectors, see the Jumpers and Connectors chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals.

5 Power, Thermal, Acoustic

5.1 Power Supplies

The Dell™ PowerEdge™ R410 is powered by a non-redundant 480W power supply and redundant 500W power supply. The power supply has automatic input voltage detection. An auxiliary power-out receptacle is not provided.

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 480W 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.






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.

5.2 Power Supply Indicators

The PowerEdge R410 redundant power supplies have one status bi-color LED: green for AC power present and amber for a fault as detailed in Table 3.

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
	Redundant power supply mismatch (when hot-plugged/swapped)

See the Power Indicator Codes section in the About Your System chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals for more information.

5.3 Environmental Specifications

Table 4 details the environmental specifications for the R410.

Table 4. Environmental Specifications

Temperature	
Operating	10°C to 35°C (50°F 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°C to 65°C (-40°F 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 5Hz-350Hz in operational orientations
Storage	1.54 Grms at 10Hz-250Hz 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	-16m to 3048m (-50ft to 10,000ft) Note: For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 ft.
Storage	-16m to 10,600m (-50ft to 35,000ft)
Airborne contaminant level	
Class G1 or lower as defined by ISA-S71.04-1985 (G1 maximum corrosive contaminant levels measured at ≤ 50% relative humidity)	

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.

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

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.

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

5.4 Maximum Input Amps

The power supply is equipped with automatic input voltage detection.

Non-redundant power supply: 7.5A-3.8A at 100-240 VAC, 50/60 Hz

Redundant power supply: 7A-3.5A at 100-240 VAC, 50/60 Hz

5.5 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 5. Acoustical Performance

Configurations @ 23 ± 2 °C					Operating Mode	L _{WA} -UL (Bels)
Processor	DIMM	Hard Drives	Power Supplies	PCI Card		
1 x Intel® Xeon® 1.86GHz	1 x 2GB	1 x SATA (7.2K)	1 x 48 W non-redundant	None	Idle	5.8
					Stress	5.8
2 x Intel Xeon® 2.26GHz	8 x 1GB	2 x SATA (7.2K)	1 x 480W non-redundant	1 x SAS 6/iR	Idle	5.8
					Stress	5.8
2 x Intel® Xeon® 2.8GHz	8 x 8GB	4 x SAS (15K)	2 x 500W redundant	1 x SAS 6/iR 1 x PERC 6E	Idle	6.3
					Stress	6.4
2 x Intel® Xeon® 2.8GHz	8 x 8GB	4 x SAS (15K)	2 x 500W redundant	1 x 10Gb NIC 1 x PERC 6E 1 x SAS 6i/R	Idle	6.8
					Stress	6.9

6 Processors

6.1 Overview

The Dell™ PowerEdge™ R410 supports the Intel® Xeon® processors 5500 and 5600 series, which are detailed in Table 6.

Table 6. Supported Processors and Features

Processor Model and Features	DDR3 Memory Bus Speed	TDP Power
Intel® Xeon® X5560 2.8GHz, 8M cache, 6.4 GT/s QPI, Turbo, HT	1333MHz	95W
Intel Xeon E5530 2.40GHz, 8M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	80W
Intel Xeon L5520 2.26GHz, 8M cache, 5.86 GT/s QPI, Turbo, HT	1333MHz	60W
Intel Xeon E5506 2.13GHz, 4M cache, 4.8 GT/s QPI	800MHz	80W
Intel Xeon E5503 2.0GHz, 4M cache, 4.8 GT/s QPI	800MHz	80W
Intel Xeon X5670 2.93GHz, 12M cache, 6.4 GT/s QPI, Turbo, HT	1333MHz	95W
Intel Xeon X5667 3.06GHz, 12M cache, 6.4 GT/s QPI, Turbo, HT	1333MHz	95W
Intel Xeon X5660 2.8GHz, 12M cache, 6.4 GT/s QPI, Turbo, HT	1333MHz	95W
Intel Xeon X5650 2.66GHz, 12M cache, 6.4 GT/s QPI, Turbo, HT	1333MHz	95W
Intel Xeon E5640 2.66GHz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	80W
Intel Xeon L5640 2.26GHz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	60W
Intel Xeon E5630 2.53GHz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	80W
Intel Xeon L5609 1.86GHz, 12M cache, 4.80 GT/s QPI	1066MHz	40W
Intel Xeon E5620 2.4Ghz, 12M cache, 4.80 GT/s QPI, Turbo, HT	1066MHz	80W
Intel Xeon L5630 2.13Ghz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	40W
Intel Xeon E5607, 2.26GHz, 8M cache, 4.80 GT/s QPI	1066MHz	80W
Intel Xeon X5675 3.06GHz, 12M cache, 6.40 GT/s QPI, Turbo, HT	1066MHz	95W
Intel Xeon X5672 3.20GHz, 12M cache, 6.40 GT/s QPI, Turbo, HT	1066MHz	95W
Intel Xeon E5649 2.53GHz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	80W

Processor Model and Features	DDR3 Memory Bus Speed	TDP Power
Intel Xeon E5645 2.40GHz, 12M cache, 5.86 GT/s QPI, Turbo, HT	1066MHz	80W
Intel Xeon E5606 2.13GHz, 8M cache, 4.8 GT/s QPI	1066MHz	80W
Intel Xeon E5603 1.60GHz, 4M cache, 4.8 GT/s QPI	1066MHz	80W

The following describe the processor features:

- 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 Gigatransfers (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 processor is operating below power/thermal specifications
- DDR-3 Memory bus speed: 800 MHz, 1066 MHz, or 1333 MHz
- HT: Intel Hyper-threading technology

6.2 Processor Configurations

The 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, minimum 1 GB and maximum 32 GB. When two processors are installed in the system, it supports 8 DIMMs, minimum 2 GB and maximum 64 GB.

6.3 Additional Processor Information

Refer to the Processors section in the Installing System Components chapter of the *Dell PowerEdge R410 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals for additional processor information.

7 Memory

7.1 Overview

Features of the Dell™ PowerEdge™ R410 memory include:

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

7.2 DIMMs Supported

The following DIMMs are supported by the PowerEdge R410:

- 1 GB, DDR3 UDIMM, 1066 MHz with ECC
- 1 GB, DDR3 UDIMM, 1333 MHz with ECC
- 1 GB, DDR3 RDIMM, 1066 MHz with ECC
- 1 GB, DDR3 RDIMM, 1333 MHz with ECC
- 2 GB, DDR3 UDIMM, 1066 MHz with ECC
- 2 GB, DDR3 UDIMM, 1333 MHz with ECC
- 2 GB, DDR3 RDIMM, 1066 MHz with ECC
- 2 GB, DDR3 RDIMM, 1333 MHz with ECC
- 4 GB, DDR3 UDIMM, 1066 MHz with ECC
- 4 GB, DDR3 UDIMM, 1333 MHz with ECC
- 4 GB, DDR3 RDIMM, 1066 MHz with ECC
- 4 GB, DDR3 RDIMM, 1333 MHz with ECC
- 8 GB, DDR3 RDIMM, 1066 MHz with ECC
- 8 GB, DDR3 RDIMM, 1333 MHz with ECC
- 16 GB, DDR3 RDIMM, 1066 MHz with ECC

7.3 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.

7.4 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.

8 Chipset

8.1 Overview

The Dell™ PowerEdge™ R410 system board incorporates the Intel® 5500 series of chipsets for I/O and processor interfacing. These chipsets are designed to support QPI interconnect, DDR3 memory technology, and PCI Express Generation 2. The memory interface is optimized for 800/1066/1333 MHz DDR3 SDRAM memory with ECC when running with Intel Xeon processor 5600 series.

8.2 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

8.2.1 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

8.2.2 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 MHz supported
- 512 MB, 1 GB, 2 GB, and 4 GB densities supported
- No memory riser support

8.2.3 PCI Express Interfaces

PCI Express interfaces include:

- Intel 5500 chipset IOH provides multiple PCI Express Gen2 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

8.2.4 SMBus Interfaces

SMBus interfaces include:

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

8.2.5 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.

8.3 Intel ICH10R South Bridge

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

8.3.1 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.

8.3.2 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.

8.3.3 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.

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8.3.4 PCI Express interface

The ICH10R has six PCI Express 1.1 compliant root ports.

9 BIOS

9.1 Overview

The Dell™ 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 and 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)

9.2 Supported ACPI States

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

Table 7. 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

9.3 I²C (Inter-Integrated Circuit)

I²C is a simple bi-directional two-wire bus for efficient inter-integrated circuit control. All I²C -bus compatible devices incorporate an on-chip interface that allows them to communicate directly with each other via the I²C-bus. This solves the many interfacing problems encountered when designing digital control circuits. These I²C 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.

10 Embedded NICs/LAN on Motherboard (LOM)

The Dell™ PowerEdge™ R410 has a Broadcom® 5716 chip connected to the IOH through a PCIe Gen2 port. The 5716 chip provides a 2 GB-Ethernet port. The firmware for the LOM chip resides in a flash part. The PowerEdge R410 supports Wake-on-LAN (WOL) from either port.

11 PCI Slots

11.1 Overview

Dell™ PowerEdge™ R410 supports one x16 Gen1 or Gen2 PCIe expansion card. The expansion slot supports full-height, half-length cards that are not hot-swappable. 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.

For more information on installing expansion cards and expansion-card priority, see the Expansion Cards section in the Installing System Components chapter of the *Dell PowerEdge R410 Systems Hardware Owner's Manual* on Support.Dell.com/Manuals.

11.2 NICs and External Controller Cards

For information on supported NICs and external controller cards, see the Expansion Cards and Expansion-Card Risers chapter of the *PowerEdge R410 Hardware Owner's Manual* on Support.Dell.com/Manuals.

12 Storage

12.1 Overview with Description

The Dell™ PowerEdge™ R410 supports 4 hard drives in one of the following configurations:

- Four 3.5" cabled or hot-swap SAS or SATA
- Four 2.5" hot-swap SAS or SATA or SSD

The 2.5" hard drive option requires a hot-swap configuration with the 3.5" carrying tray and the retention kit.

12.2 RAID Configurations

Table 8 lists the factory RAID configurations for the R410.

Table 8. Factory RAID Configurations

Cabled/Hot-swap	Configuration Type	Configurations		Description	Min. Hard Drives	Max. Hard Drives
Cabled	No hard drive	C0A	NCZCBL	No hard drive, cabled hard drive chassis	0	0
Hot-swap	No hard drive	C0B	NCZ	No hard drive, hot-swap drive 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	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

Cabled/Hot-swap	Configuration Type	Configurations		Description	Min. Hard Drives	Max. Hard Drives
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)	2 x SAS + 1 x SATA	2 x SAS + 2 x SATA
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)	2 x SAS + 2 x SATA	2 x SAS + 2 x SATA

12.3 Storage Controllers

Refer to Table 2 for detailed information.

12.4 Optical Drives

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

Refer to Table 2 for detailed information.

12.5 Tape Drives

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

Refer to Table 2 for supported devices.

13 Video

The Dell™ PowerEdge™ R410 supports the Matrox® G200eW with 8 MB memory integrated in Winbond WPCM450 (Baseboard Management Controller).

The R410 system supports the following 2D graphics video modes:

Table 9. Supported 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

14 Rack Information

14.1 Overview

The ReadyRails™ sliding and static rail systems for the R410 provide tool-less 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.

14.2 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).

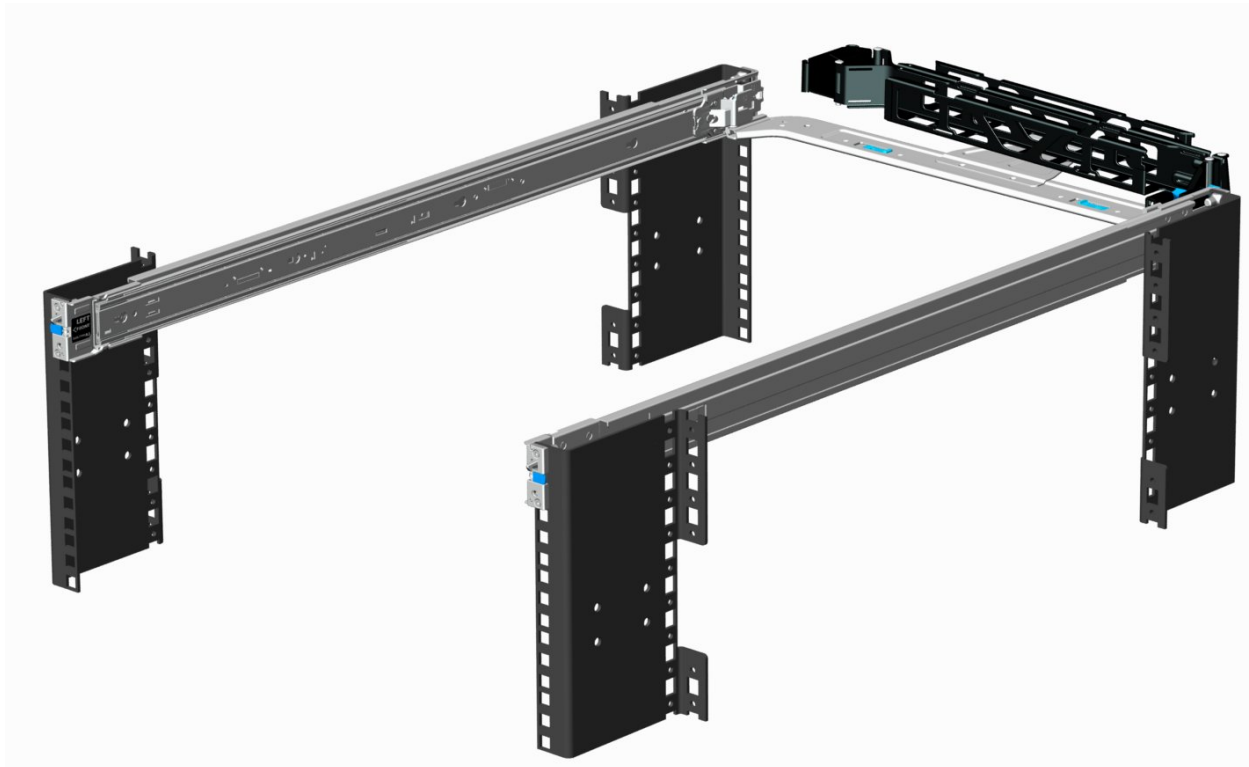


Figure 7. R410 Sliding Rails with Optional CMA

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.

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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 eleventh generation server bezel installed.

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.

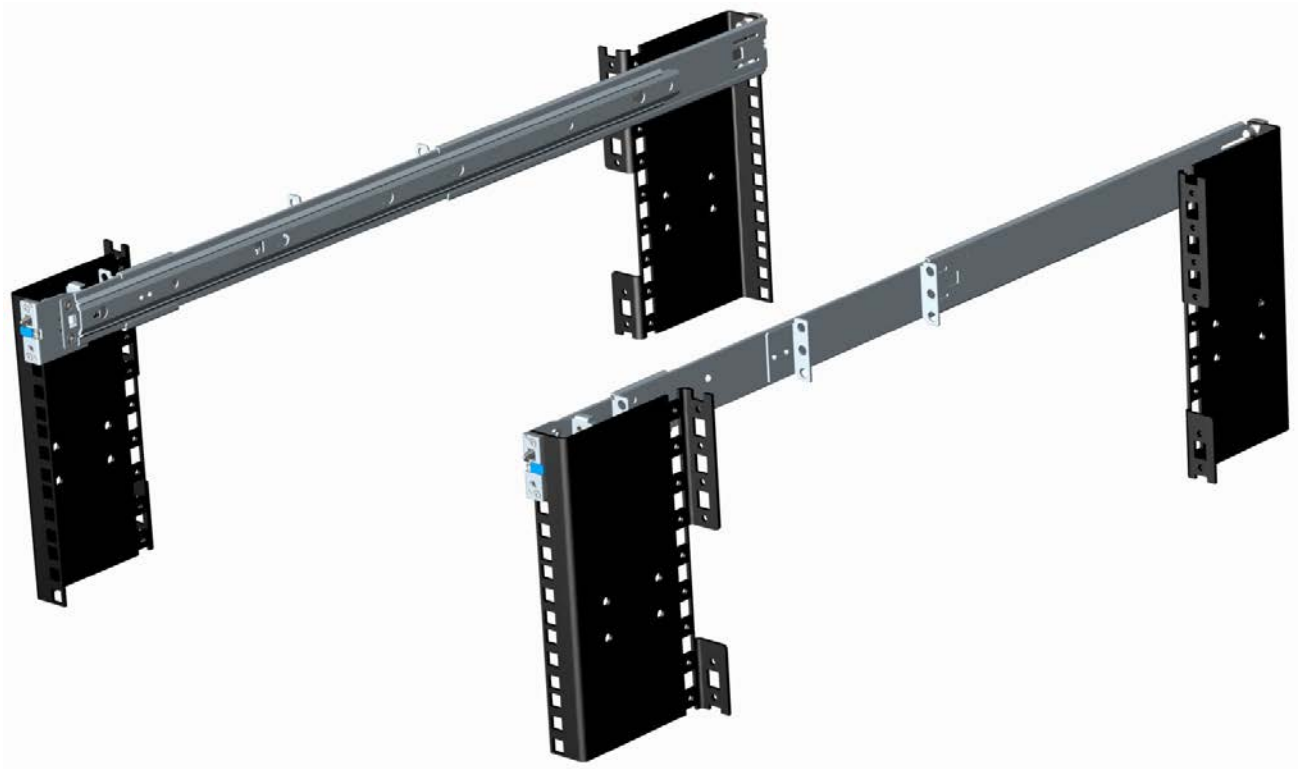


Figure 8. R410 Static Rails

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.

Table 10. Rack Types Supported

Rail Identifier	Mounting Interface	Rail Type	Rack Types Supported				
			4-Post			2-Post	
			Square	Round	Thread	Flush	Center
A3	ReadyRails™	Sliding	✓	✓	✓*	✗	✗
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 11. 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.

14.3 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
- Both the CMA and the tray mount without the use of tools via simple and intuitive snap-in designs

15 Operating Systems and Virtualization

For detailed information, see the following:

- [Operating System Support Matrix for Dell PowerEdge Systems](#) on Dell.com
- *Dell PowerEdge R410 Systems Getting Started Guide* on [Support.Dell.com/Manuals](#)

16 Systems Management

16.1 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 and sized appropriately and supported comprehensively.

16.2 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 (SBUU): Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.
- Server Update Utility (SUU): This DVD has an inventory tool for managing updates to firmware, BIOS, and drivers for either Linux or Windows varieties.
- OpenManage Server Administrator (OMSA): The OpenManage Server Administrator tool provides a comprehensive, one-to-one (one console to one server) systems management solution, designed for system administrators to manage systems locally and remotely over a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.
- Management Console: Dell IT Assistant (ITA) 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 Baseboard Management Controller (BMC) 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 peripherals, and Dell OpenManage™ software.

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- **Dell Management Console (DMC):** The Dell Management Console is a systems management console that enables systems administrators to discover and inventory devices on your network. It provides functions such as health and performance monitoring of networked devices and patch management capabilities for Dell systems. DMC differs from the IT Assistant management console (described above) in that with DMC, value-add plug-ins that enable advanced functionality can be purchased and added to the base DMC product.

16.3 Embedded Server Management

The Dell™ 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 power supplies, the storage backplane, the integrated SAS HBA or PERC 6/I (PERC H700), and the control panel with LCD 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.

16.4 Dell Lifecycle Controller and Unified Server Configurator

Embedded management is comprised of several interdependent pieces:

- Dell Lifecycle Controller
- Unified Server Configurator
- iDRAC6

Dell Lifecycle Controller powers the embedded management features. It includes integrated and tamper-proof storage for system-management tools and enablement utilities (firmware, drivers). For servers with iDRAC6 Express, the Lifecycle Controller offers pre-OS server deployment, OS installation, platform updates, platform configuration, and diagnostics capabilities. For servers without iDRAC6 Express, this utility has limited functionality and offers OS installation and diagnostics capabilities only.

Dell Unified Server Configurator (USC) is a graphical user interface (GUI) that aids in local server provisioning in a pre-OS environment. To access the Unified Server Configurator, press the <F10> key within 10 seconds of the Dell logo appearance during the system boot process. Table 12 details the current functionality enabled by the USC.

Table 12. 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.

Feature	Description
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.

16.5 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 a purchasable option and is available as three offerings: iDRAC6 Express, iDRAC6 Enterprise, and Virtual Flash (vFlash) media:

- iDRAC6 Express is most appropriate for small-to-medium business 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.

16.6 iDRAC6 Express

The optional iDRAC6 Express is the first tier of iDRAC6 upgrades. In addition to upgrading the system with a Lifecycle Controller, 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 13.

16.7 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

16.8 iDRAC6 Enterprise with Virtual Flash (vFlash) Media

The iDRAC6 Enterprise can be upgraded by adding the vFlash media card. This is an 8 GB 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 Express, iDRAC6 Enterprise, and vFlash media is shown in Table 13.

Table 13. Features List for Base Management Functionality, iDRAC6, and vFlash Media

Feature	Base Management Functionality	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	✓	✓	✓	✓
IPv4	✓	✓	✓	✓
VLAN Tagging	✓	✓	✓	✓
IPv6		✓	✓	✓
Dynamic DNS	✓	✓	✓	✓
Dedicated NIC			✓	✓
Security and Authentication				
Role-based Authority	✓	✓	✓	✓
Local Users	✓	✓	✓	✓
Active Directory		✓	✓	✓
SSL Encryption		✓	✓	✓

Feature	Base Management Functionality	iDRAC6 Express	iDRAC6 Enterprise	vFlash Media
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	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log			✓	✓

17 Peripherals

17.1 USB Peripherals

The Dell™ PowerEdge™ R410 supports the following USB devices:

- Optional USB DVD-ROM
- Optional USB 1.44 MB floppy drive

17.2 External Storage

See Dell.com/Storage for information on external storage.

Appendix A. Statement of Volatility

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 14 are present in the PowerEdge R410 server.

Table 14. System Volatility

Server BIOS Memory	Details
Size:	32 Mbit
Type [Flash PROM, EEPROM]:	Flash EEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [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: [Flash PROM, EEPROM]:	Battery backed NVRAM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [boot code]	RTC and 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: [Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	Yes, under software control.

Purpose? [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: [Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [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: [Flash PROM, EEPROM]:	SEEPROM
Can user programs or operating system write data to it during normal operation?	No
Purpose? [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: [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? [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: [Flash PROM, EEPROM]:	Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [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:	1GB
Type: [Flash PROM, EEPROM]:	SD card
Can user programs or operating system write data to it during normal operation?	Yes
Purpose? [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: [Flash PROM, EEPROM]:	SPI Flash
Can user programs or operating system write data to it during normal operation?	No
Purpose? [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.

Appendix B. Certifications

B 1. Regulatory Certifications

Regulatory compliance certificates can be located at the following sites:

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

B 2. Product Safety Certifications

The product has been certified and bears the Mark, as applicable, of the Product Safety authorities as indicated in Table 15.

Table 15. Product Safety Certifications

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

B 3. Electromagnetic Compatibility

The product has been certified and bears the Mark, as applicable, of the EMC authorities as indicated in Table 16.

Table 16. Electromagnetic Compatibility Certifications

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

B 4. Ergonomics, Acoustics and Hygienics

The product has been certified and bears the Mark, as applicable, of the Ergonomics, Acoustics and Hygienics authorities as indicated in Table 17.

Table 17. Ergonomics, Acoustics and Hygienics

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

Appendix C. Industry Standards

The Dell™ PowerEdge™ R410 system conforms to the industry standards detailed in Table 18.

Table 18. Industry Standards

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

Dell

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