DATA CENTER WORKHORSES: NEW DELL POWEREDGE RACK AND BLADE SERVERS

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New 11th-generation Dell™ PowerEdge™ rack and blade servers are designed from the ground up for high performance, energy efficiency, and simplified management—offering a host of advantages in enterprise IT environments to help optimize resources and reduce total cost of ownership.

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In enterprise IT environments, success often depends not only on maximizing performance, but also on controlling costs by reducing power consumption, cooling requirements, and administrative complexity. To help meet these needs, the new 11th-generation Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 rack-mountable servers and PowerEdge M610 and PowerEdge M710 blade servers are designed from the ground up for high performance, energy efficiency, and simplified management. These general-purpose, two-socket servers are designed for use in a wide range of environments, including mainstream enterprises, medium-sized data centers, remote offices, and growing small organizations. Their flexible design provides a variety of options for internal storage and I/O expansion and incorporates the latest advances in virtualization, performance, power and cooling, systems management, and usability. These technologies are packed into highly available rack-mountable chassis that can fit into standard Dell and third-party 1,000 mm depth racks.

Key enhancements in 11th-generation PowerEdge servers range from the new dual- and quad-core Intel® Xeon® processor 5500 series with QuickPath Interconnect (QPI) technology, high-speed PCI Express (PCIe) 2.0 I/O interconnects, and embedded Gigabit Ethernet network controllers to flexible chassis options, energy-efficient power supplies, and intelligent cooling. (For more details on enhancements specific to PowerEdge M610 and PowerEdge M710 blade servers, see the "Dell PowerEdge M Series modular evolution" sidebar in this article.) In addition, a breakthrough systems management design incorporates advanced power management, system monitoring, hardware configuration, deployment, and updates. These enhancements can provide a variety of benefits in enterprise IT environments—helping simplify management, control power and cooling requirements, optimize hardware resources, and reduce total cost of ownership.

NEXT-GENERATION SYSTEM ARCHITECTURE

The 11th-generation PowerEdge server architecture is designed for high performance and optimized energy efficiency. Key components of PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers include the processors and integrated memory controller, I/O chipset, and embedded network controllers.

Processors and integrated memory controller

Optimized for performance with the power efficiencies of a low-power micro-architecture and based on 45 nm process technology, the Intel Xeon processor 5500 series incorporates the new Intel QuickPath integrated memory controller and point-to-point link interface using QPI technology. PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers

New 11th-generation Dell PowerEdge servers help simplify management, control power and cooling requirements, optimize hardware resources, and reduce total cost of ownership

support up to two of these dual- or quad-core processors, including support for 60 W, 80 W, and 95 W models. These powerful, efficient multi-core processors help maximize performance and performance per watt for data center infrastructures and dense deployments.

The Intel Xeon processor 5500 series features two Intel QPI links capable of up to 6.4 GT/sec, up to 8 MB of shared cache, and the Intel QuickPath integrated memory controller. It also supports several advanced Intel technologies, including Execute Disable Bit functionality, the Intel 64 architecture for flexibility in 32- and 64-bit applications and operating systems, Enhanced Intel SpeedStep® Technology, Intel Virtualization Technology, and simultaneous multi-threading. Selected processors also support Intel Turbo Boost Technology, an OS-controlled operation that can automatically allow the processor to run faster than the marked frequency if the processor is operating below power, temperature, and specified current limits. The Intel Xeon processor 5500 series also supports deeper C-states than previous-generation processors to enhance power conservation.

The integrated memory controllers support Double Data Rate 3 (DDR3) technology, which is designed to provide a high-performance memory interface capable of low-latency response and high throughput.[1]

I/O chipset

PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers use the Intel 5500 and Intel 5520 I/O hub (IOH) chipsets and I/O controller hub 9 (ICH9) to connect the I/O devices and processors. The PowerEdge R610 server uses the Intel 5500 IOH 24D chipset, while PowerEdge R710 and PowerEdge T610 servers use the Intel 5520 IOH 36D chipset. These chipsets support the Intel Xeon processor 5500 series, QPI, DDR3 memory, and PCIe 2.0. The primary components of the IOH are two full-width QuickPath Interconnect links (one to each processor), 24 or 36 lanes of PCIe 2.0, an x4 Direct Media Interface (DMI), and an integrated I/O advanced programmable interrupt controller (APIC).

The QPI architecture consists of serial point-to-point interconnects for the processors and IOH. The system has a total of three QPI links: one connecting the processors to each other and two connecting the processors to the IOH. The QPI link is designed to support up to 6.4 GT/sec, depending on the processor.

PCIe provides the serial point-to-point interconnect for I/O devices. PCIe 2.0 is designed to double the signaling bit rate of PCIe 1.0, from 2.5 Gbps to 5 Gbps. PCIe 2.0 ports are backward-compatible with the PCIe 1.0 transfer rate.

"The 11th-generation PowerEdge server architecture is designed for high performance and optimized energy efficiency."

[1] For more information on DDR3 memory in 11th-generation PowerEdge servers, see "Optimizing DDR3 Memory Settings in New 11th-Generation Dell PowerEdge Servers," by Paul Benson, in *Dell Power Solutions*, June 2009, DELL.COM/Downloads/Global/Power/ps2q09-20080414-Benson.pdf.

Dell PowerEdge M610 and PowerEdge M710 blade servers (left) offer 11th-generation performance and efficiency advantages in a rack-dense blade form factor

THE DELL POWEREDGE M SERIES MODULAR EVOLUTION

The launch of 11th-generation Dell PowerEdge servers includes two new blade servers: the PowerEdge M610 and PowerEdge M710. These new blades can work side by side with any previous PowerEdge M Series blades without restrictions on power, cooling, or management within the PowerEdge M1000e modular blade enclosure.

New 11th-generation PowerEdge servers are designed to utilize similar features and technologies across the entire line to give organizations the choice of server form factor best fitting their data centers. Organizations typically begin considering blade servers when needing more than six servers and when trying to overcome challenges related to power and cooling, cable management, rapid deployment, or server space. In comparison with Dell rack-mount servers, Dell blade servers typically use approximately 30 percent less power per server, require up to 94 percent less cabling, and have 60 percent higher density, all while allowing much faster physical deployment.

Both the PowerEdge M610 and PowerEdge M710 are designed with the same server architecture and features as the 11th-generation rack and tower servers. Physically, the major difference between the blades and the other form factors is that the blades do not handle standard PCI cards and typically hold fewer hard drives, all while using 208/240 V power for the chassis. Although limitations exist in a few areas when achieving high server density, both blades were designed from scratch to help solve two major enterprise challenges: power and cooling, and server consolidation through virtualization.

The PowerEdge M610 is the direct successor to the previous two-socket PowerEdge M600 blade server, and includes enhancements such as new processors and chipsets, 50 percent more dual in-line memory module (DIMM) slots, an internal Secure Digital (SD) card for embedded virtualization, and enhanced server management. It uses one slot in a PowerEdge M1000e enclosure, and 16 can fit into this enclosure in total. The PowerEdge M610 is well suited for standard applications requiring high processor performance in a small space, high-performance computing clusters, virtualization, and other typical applications. The PowerEdge M610 is also designed to be more energy-efficient than the previous-generation PowerEdge M600; combined with the PowerEdge M1000e already leading the industry in power consumption per blade,* Dell expects the PowerEdge M610 to be a compelling new blade server.

The PowerEdge M710 is a two-socket blade server that uses two slots in the PowerEdge M1000e enclosure and incorporates the same features as the PowerEdge M610, but with 18 DIMM slots and twice the I/O connectivity. Designed for virtualization, databases, or other applications needing large amounts of RAM or I/O throughput, the PowerEdge M710 allows organizations that have previously used a four-socket server to use a two-socket server while helping eliminate the typical two-socket server bottlenecks of limited RAM and I/O. Because many applications charge per socket for licensing, for example, using a two-socket server can potentially help limit application costs. The PowerEdge M710 is also designed to be highly power efficient.

Both the PowerEdge M610 and PowerEdge M710 can fit into any new or existing PowerEdge M1000e enclosure. For existing PowerEdge M1000e enclosures, administrators must upgrade their Chassis Management Controller (CMC) firmware (an upgrade that does not affect servers), after which the new servers can work alongside any other M Series blades. Both servers can handle high-speed, fully redundant I/O throughput such as end-to-end 8 Gbps Fibre Channel, 10 Gigabit Ethernet, and 40 Gbps quad data rate InfiniBand when paired with the integrated switches for each of those technologies. Both servers also support FlexAddress software, which maintains the I/O connections when switching out blades and can help reduce downtime in many environments.

The PowerEdge M610 and PowerEdge M710 are powerful new entries into the Dell M Series portfolio. For more information, visit DELL.COM/Blades.

*For a competitive power comparison, see "SPECjbb2005 Performance and Power Consumption on Dell, HP, and IBM Blade Servers," by Principled Technologies, December 2007, DELL.COM/Downloads/Global/Products/PEdge/En/pe_blades_specjbb2005.pdf.

	PowerEdge R610	PowerEdge R710	PowerEdge T610
2.5-inch backplane	Six slots	Eight slots	Eight slots
3.5-inch backplane	N/A	Four slots (with optional tape drive) or six slots (without optional tape drive)	Eight slots

Figure 1. *Backplane types and number of slots in Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers*

Embedded network controllers

PowerEdge R610 and PowerEdge R710 servers provide embedded network interface support through two dual-port Broadcom BCM5709C Gigabit Ethernet network controllers; the PowerEdge T610 includes one of these controllers. An x4 PCIe 1.0 link connects the controller to the IOH chipset. The ports support TCP/IP Offload Engine (TOE), IPv4, and IPv6, with Internet SCSI (iSCSI) Offload Engine (iSOE) supported with an optional hardware key. Network Controller Sideband Interface (NC-SI) support enables the embedded network interfaces to be configured for management communication or to share the management traffic with the Integrated Dell Remote Access Card 6 (iDRAC 6) if one is installed in the system.

FLEXIBLE STORAGE CONFIGURATION

PowerEdge R710 and PowerEdge T610 servers have two chassis options that support either 2.5- or 3.5-inch hard drives; the PowerEdge R610 supports only 2.5-inch drives, which enables the server to include six hard drive bays for internal storage expansion. These chassis options support multiple hard drive configurations and a choice of integrated storage controllers: either the Dell Serial Attached SCSI (SAS) 6/iR or the Dell PowerEdge Expandable RAID Controller (PERC) 6/i. The integrated storage controller can be installed only in a dedicated PCIe storage slot.

The hard drives can be SAS, Serial ATA (SATA), or SATA solid-state drives designed for speeds of up to 3 Gbps. The system storage infrastructure is also designed to support speeds of up to 6 Gbps with appropriate cables, enabling administrators to convert the hard drive configuration to use 6 Gbps drives and the next generation of Dell storage controllers when they become available.

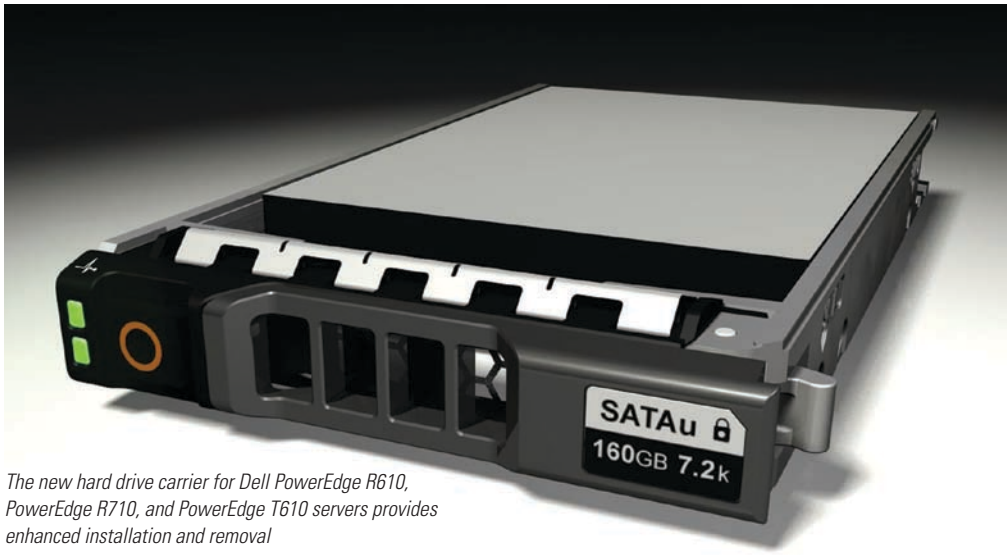
The SAS 6/iR is a 3 Gbps SAS controller that incorporates two four-channel SAS connections to SAS and SATA hard drives. It supports RAID levels 0 and 1. The PERC 6/i is a hardware RAID controller with an LSI 1078 RAID-on-a-chip (ROC) processor, a PCIe host interface designed to support up to 2.5 GT/sec, and 256 MB of error-correcting code (ECC) DDR2 memory at 667 MHz. A battery backup unit enables memory contents to be maintained for up to 24 hours if the system loses power. This controller supports RAID levels 0, 1, 5, 6, 10, 50, and 60.

Backplane

The backplane has two x4 mini-SAS connectors for cable connections to the storage controller as well as a power connector to connect to the system board (in PowerEdge R610 and PowerEdge R710 servers) or to the power distribution board (in PowerEdge T610 servers). Mini-SAS connectors are high-density, low-profile connectors designed to support data rates of up to 6 Gbps. Each hard drive slot has two LED indicators per drive slot: one for power and status and one for activity. Different servers can use different backplanes with different numbers of slots, depending on the system and chassis (see Figure 1).

Internal hard drives

PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers support SAS, SATA, and SATA solid-state hard drives. Mixing SAS and SATA drives in one server requires installing SAS drives as a pair in drive slots 0 and 1; the remaining drives must be SATA drives. Chassis options that support 3.5-inch drives can take 15,000 rpm SAS drives and 5,400 rpm or 7,200 rpm SATA drives; those that support 2.5-inch drives can take 10,000 rpm or 15,000 rpm SAS drives, 7,200 rpm SATA drives, and solid-state drives. Chassis options that support 3.5-inch drives also allow mixing 2.5- and 3.5-inch drives, enabling administrators to use a 3.5-inch hard drive carrier adapter to install a pair of 2.5-inch, 10,000 rpm SAS drives in drive slots 0 and 1. The remaining hard drives must be 3.5-inch drives and must all be either SAS or SATA drives.



The new hard drive carrier for Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers provides enhanced installation and removal

The new hard drive carrier is designed to match the new industrial design of the servers. A release button replaces the previous-generation release latch for enhanced drive installation and removal. Administrators should install hard drive carrier blanks in any empty drive slots to help maintain system cooling and to provide shielding against electromagnetic interference. Each hard drive carrier has two LED indicators visible from the front of the system, which function similarly to LEDs on previous-generation servers.

PowerEdge R610 and PowerEdge R710 servers also support a diskless configuration with no storage controller installed in the system. This configuration still includes a backplane, enabling administrators to later upgrade their systems with a storage controller and hard drives. Administrators can configure the servers to boot from an external storage controller in a Fibre Channel or iSCSI storage area network, or from an embedded VMware® ESXi hypervisor on the internal Secure Digital (SD) module.

Optical drive

An optional optical drive can connect to the system board through the SATA interface. PowerEdge R610 and PowerEdge R710 servers can support internal slim-line DVD and DVD±RW drives; the PowerEdge T610 server can support an optional 5.25-inch optical drive. Parallel ATA (PATA), or IDE, optical drives are not supported. If an optical drive is not ordered with the server, a blank is installed in its place.

Tape drives

The PowerEdge R610 server does not support internal tape drives. The PowerEdge R710 server can support 3.5-inch half-height internal tape drives in systems with the 3.5-inch, four-slot backplane configuration or 2.5-inch, eight-slot backplane configuration. The PowerEdge T610 server supports 5.25-inch half-height and full-height tape drives. Because the full-height tape drive occupies two drive bays, an optical drive cannot be installed if a full-height tape drive is used in this system. Internal SATA tape drives connect directly to the SATA connector on the system board, internal SCSI tape drives connect to the LSI 2032 PCIe SCSI adapter card, and internal SAS tape drives connect to the SAS 5/iR PCIe adapter card. Blanks are installed in any empty drive bays.

HIGH-SPEED EXPANSION SLOTS

The PCIe slots in PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers are connected to the Intel 5500 or Intel 5520 IOH. In PowerEdge R610 and PowerEdge R710 servers, the slots are on the expansion riser board, while in the PowerEdge T610 server, they are on the system board. The slots are PCIe 2.0 capable, designed to support speeds of up to 5 Gbps; with 8B/10B encoding, the effective data transfer rate is typically 4 Gbps.

	PowerEdge R610	PowerEdge R710	PowerEdge T610
x4 PCIe	None	Slot 1 (full height, full length) and slot 2 (three-fourths height, full length)	Slots 1, 4, and 5 (full height, half length)
x8 PCIe	Slots 1 and 2 (full height, half length)	Slots 3 and 4 (full height, full length)	Slots 2 and 3 (full height, full length)
x16 PCIe	None	Optional slot 3 (full height, full length)	None

Note: Full-length cards are 9.5 inches long, except for slot 1 in the PowerEdge R710 server and slots 2 and 3 in the PowerEdge T610 server, which can accept cards up to 12.2 inches long. Half-length cards are 6.6 inches long or less.

Figure 2. *Available PCIe expansion slots in Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers*

The PowerEdge R710 also supports an optional expansion board that combines slots 3 and 4 into an x16 PCIe slot, with power limited to 25 W. Administrators can use this slot to connect to external general-purpose graphics processing unit (GPGPU) devices.

Figure 2 lists the available expansion slots for each server. In addition to these expansion slots, each server includes one x4 PCIe 1.0 slot dedicated to the integrated storage controller.

COMPREHENSIVE SYSTEMS MANAGEMENT

The iDRAC 6 in PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers supports traditional hardware monitoring and power control previously handled by the baseboard management controller (BMC). It introduces several components to enhance systems management: the iDRAC 6 Express persistent storage device, an optional iDRAC 6 Enterprise card, and an optional unmanaged persistent storage device. A system control panel and LCD provide easy access to key system information and configuration options.

iDRAC 6 Express

The iDRAC 6 Express is an integrated persistent storage device serving as a managed system services repository. The Dell Unified Server Configurator in the iDRAC 6 Express can help administrators perform system deployment, management, updating, servicing, and diagnostics, helping reduce the number of tools required for media-based provisioning.[2]

Coupled with Dell OpenManage™ software, the iDRAC 6 Express can provide a comprehensive systems management solution. Dell OpenManage 6.0.1 introduces multiple enhancements and advanced features focused on simplifying systems management without compromising functionality, including features designed for system configuration,

[2] For more information, see "Simplify Management with the Dell Unified Server Configurator Enabled by the Lifecycle Controller," by Shelli Allgood, Anand Narayanan, Hai Phung, and Pritesh Prabhu, in *Dell Power Solutions*, June 2009, DELL.COM/Downloads/Global/Power/ps2q09-20090226-Phung.pdf.

deployment, and change management; hardware configuration and updating; backups; third-party toolkits; power and virtualization management; and standard instrumentation for interoperability with solutions from a variety of vendors.

iDRAC 6 Enterprise

The optional iDRAC 6 Enterprise card provides access to advanced features. The card contains an RJ-45 management 10/100 Mbps Ethernet connector and an externally accessible virtual flash media card slot. Its management features include remote access management through the racadm command-line interface, Intelligent Platform Management Interface (IPMI), Web server, Secure Shell (SSH), Telnet, and Serial Over LAN; graphical console redirection through remote vKVM (virtual keyboard, video, mouse); remote virtual floppy, CD, and disk (vMedia); and virtual flash with an SD card in the external SD slot. The RJ-45 connector provides out-of-band management and can be configured as a dedicated network interface port or as a shared interface with the embedded network controllers to support failover.

Unmanaged persistent storage device

The unmanaged persistent storage device consists of two ports: one internal USB port and one internal SD module port. The internal USB port is for an optional USB drive and is located inside the chassis. Administrators can use this drive for storage of custom logs or scratch pads for portable administrator-defined information (although the drives are not hot-pluggable), custom boot and preboot operating systems to help simplify deployment or to support diskless environments, and so on.

The internal SD card slot is dedicated for an embedded hypervisor located on the internal SD module. The internal SD card can contain a bootable OS image for virtualized platforms.

Control panel and LCD

The system control panel is located on the front of the system chassis to provide easy access to switches, the display, and I/O interfaces. Located on the control panel are two USB 2.0 connectors, a standard 15-pin VGA connector (not available in the PowerEdge T610), an Advanced Configuration and Power Interface (ACPI)–compliant power button with integrated green power LED controlled through the iDRAC firmware, and a 128-by-20-pixel LCD. To help reflect the true ambient temperature, a temperature sensor is located on the control panel board.

The system LCD is a graphical display controlled by the iDRAC firmware; both the iDRAC firmware and BIOS can send error codes and messages to this display. The LCD also has two navigation buttons, a select button, and a system ID button, which administrators can use to set up the embedded network controller IP address, Media Access Control (MAC) address, system power information, system tag, and so on to identify the system.

The system BIOS and iDRAC Configuration Utility can enter a secure mode that locks the LCD navigation and select buttons as well as the system power and non-maskable interrupt (NMI) buttons. In this mode, for example, the power button cannot be used to turn off the system.

POWERFUL, VERSATILE SECURITY

In addition to providing a system BIOS setup password and system bezel lock, PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers provide enhanced security through a Trusted Platform Module (TPM). The TPM is a microcontroller designed to protect confidential information against external software attacks or physical theft—including generating and storing keys, protecting and authenticating passwords, and creating and storing digital certificates. The TPM is affixed to the motherboard and is compliant with the Trusted Computing Group TPM 1.2 specification. Administrators can enable and activate it through a BIOS setup option.

In addition to protected storage, the TPM also provides digital signature and attestation functionality. The attestation functionality allows the digital signature and protected storage features to function only if the server is in a known good software state. Administrators can also use the TPM to store the encryption keys for the Microsoft® BitLocker™ hard drive encryption feature in the Microsoft Windows Server® 2008 OS.

ENERGY-EFFICIENT POWER SUPPLIES

PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers are designed for energy efficiency. The power supply subsystem supports up to two high-efficiency AC/DC power supply units (PSUs) in a 1 + 1 redundant configuration.

PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers introduce the ability to customize server power capacity. The base system consists of one Dell Energy Smart PSU designed to optimize efficiency for typical configurations. Energy Smart PSUs can enable administrators to replace legacy servers without needing to upgrade their data center power systems. Because most system configurations can use the Energy Smart PSUs, these PSUs also help avoid the need to sacrifice performance or features.

During the boot process, the system determines whether the PSUs can generate enough power for the installed hardware. If they cannot, the LCD panel and screen display a warning at the end of the power-on self-test (POST) before booting the OS. The system then runs using the current configuration after reducing the speed of components such as the processor and memory.

Optional High Output PSUs are available for use with high-end configurations that exceed the power usage supported by the Energy Smart PSUs. These High Output PSUs use the same form factor as the Energy Smart PSUs; because no system modifications are necessary to switch

	PowerEdge R710 and PowerEdge T610		PowerEdge R610	
	Energy Smart PSU	High Output PSU	Energy Smart PSU	High Output PSU
Dimensions (length × width × height)	206.4 mm × 67.5 mm × 76.5 mm		249 mm × 65.5 mm × 38.2 mm	
Status indicators	One two-color LED			
Integrated fans	One 60 mm fan		None	
Fixed input plug	IEC C14			
AC cord rating	15 A at 120 VAC, 10 A at 240 VAC			
Input voltage	90–264 VAC			
Auto-ranging	Yes			
Line frequency	47–63 Hz			
Maximum inrush current	55 A per PSU for 10 ms or less			
Hot-swap and hot-add capability	Yes			
Output power	570 W	870 W	502 W	717 W
Maximum heat dissipation	1,944.9 BTU/hour	2,968.6 BTU/hour	1,712.9 BTU/hour	2,446.5 BTU/hour
Efficiency	86.9%–90.5% at 115 VAC, 88%–92% at 230 VAC	85%–89% at 115 VAC, 87%–90% at 230 VAC	86.5%–90% at 115 VAC, 88%–92% at 230 VAC	85%–88.5% at 115 VAC, 86.5%–90.5% at 230 VAC

Note: All figures based on product specifications; results will vary based on configuration, usage, and manufacturing variability. Dimensions do not include the power supply handle or ejection tab.

Figure 3. *Power supply specifications for Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers*

between these types, administrators that upgrade their servers to a high-end configuration can simply replace the PSUs on their own. The servers can detect a PSU mismatch in which both an Energy Smart PSU and a High Output PSU are installed, resulting in a nonredundant configuration. If a mismatch is detected during the boot process, the LCD panel and screen display a warning at the end of the POST. The system then continues to boot after an administrator has acknowledged the mismatch. If a mismatch occurs when hot swapping or hot adding a PSU, the LCD panel displays a message and the status LED on the PSU shows alternating green and yellow colors.

Figure 3 details the specifications for both types of PSUs in each server model. Both types can offer significant efficiency enhancements over previous-generation PSUs, especially at low loads, and both types are 80 PLUS certified and compliant with Climate Savers Computing requirements.[3]

INTELLIGENT COOLING

PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers are designed for intelligent and efficient cooling, with system chassis that offer increased outflow venting and pulse-width modulation (PWM) fans. Fans in the PowerEdge R710 server are hot swappable. In PowerEdge R610 and PowerEdge R710 servers, a dual-processor system requires all system fans, while a single-processor system can be operated with one fewer fan. The PowerEdge T610 server uses two fans mounted in a cooling shroud for the processor and memory, and can support two additional fans to add redundancy. PSUs in PowerEdge R710 and PowerEdge T610 servers also include an integrated fan. A cooling shroud installed over the processors and memory directs airflow over those components and allows for cover-off operation for short periods of time.

The system fans in PowerEdge R710 and PowerEdge T610 servers have blind-mate connectors and are mounted in a bracket and in a shroud, respectively; in the PowerEdge R710, administrators can insert and remove individual fans without having to remove the bracket. For ease of access to the system board, the entire fan bracket can be removed without having to remove the individual fans. Figure 4 lists the system fan configurations for each server model.

Fan speed is controlled by the iDRAC firmware, which can intelligently determine the fan speed based on the system configuration and ambient temperature. New power management features offer different fan profiles, allowing administrators to operate the fans in minimum-power or maximum-performance modes. The minimum-power

[3] For more information on 80 PLUS and Climate Savers Computing, visit www.80plus.org and www.climatesaverscomputing.org.

mode allows the fans to operate at reduced speeds, with reduced power consumption and noise, while still maintaining sufficient airflow for system cooling.

ENHANCED CHASSIS DESIGN

PowerEdge R610, PowerEdge R710, and PowerEdge T610 server chassis designs introduce several enhancements, including the following:

- Updated industrial design including a new LCD, bezel, and hard drive carrier
- Tool-less rack latches
- Pull-out tray for the Dell Service Tag and other labels in PowerEdge R610 and PowerEdge R710 servers
- Support for persistent storage (internal USB drive, internal SD module, and external virtual flash media slot)
- Updated PSU removal process
- Updated cable management arm
- Support for multiple types of rails, including static, sliding, and two-post
- Two PowerEdge R710 and PowerEdge T610 chassis options for 2.5- and 3.5-inch hard drives

The PowerEdge R610 has a 1U rack-mount form factor and supports only 2.5-inch hard drives. The PowerEdge R710 has a 2U rack-mount form factor. The PowerEdge T610 uses a tower-optimized chassis that can be converted to fit a rack-mount 5U form factor.

NEXT-GENERATION SERVER DESIGN

Optimized for high performance and energy efficiency, the new 11th-generation Dell PowerEdge servers are designed to take advantage of the latest advances in performance, power and cooling, and systems management. With versatile rack-mountable chassis options and support for multiple types of peripheral devices, these servers are designed to support virtually any type of data center application and can help simplify management, control power and cooling requirements, optimize hardware resources, and reduce total cost of ownership for organizations of all sizes.

New 11th-generation Dell PowerEdge servers feature an enhanced chassis design for flexible data center deployment

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	PowerEdge R610	PowerEdge R710	PowerEdge T610
Single-processor configuration	Fans 1–5	Fans 1–4	Fans 3 and 4 (with optional fans 1 and 2 for redundant cooling)
Dual-processor configuration	Fans 1–6	Fans 1–5	Fans 3 and 4 (with optional fans 1 and 2 for redundant cooling)

Figure 4. *System fan configurations for Dell PowerEdge R610, PowerEdge R710, and PowerEdge T610 servers*

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