

INFOBrief

Dell™ PowerEdge™ 1650



PowerEdge 1650 with bezel



PowerEdge 1650 without bezel

Key Points

The Dell PowerEdge 1650 builds on the success of the PowerEdge 1550 in the high performance, ultra rack-dense general purpose (GP) 1U server market by offering higher availability and remote management features, including hot-plug redundant power (optional) and cooling (standard), dual channel embedded RAID, and an embedded remote management option.

- The Dell™ PowerEdge™ 1650 is designed to address the needs of enterprise data center customers, Internet and application service providers (ISPs/ASPs), and high performance compute cluster (HPCC) environments seeking to maximize availability, manageability, and performance in the smallest space possible.
- The PowerEdge 1650 provides exceptional levels of availability, manageability, and performance in a 1U form factor, including hot-plug redundant power (optional), hot-plug redundant cooling, dual Pentium III processors (up to 1.4GHz), dual 64-bit/66MHz PCI slots, dual 10/100/1000 integrated NICs, dual channel RAID on motherboard (ROMB) option with battery backed cache, remote management functionality (including an embedded option), up to three hot-pluggable 1-inch SCSI hard drives, up to 4GB of RAM, and -48v DC power supply option.
- The PowerEdge 1650 is a general-purpose (GP), ultra rack-dense, 1U (1.75-inch) server targeted to support Internet and network infrastructure applications, including web servers, domain controllers, DNS servers, and DHCP servers. Additionally, because it supports

hot-plug redundant power and cooling, it is also attractive as a small application server or as a SAN compute node.

- The PowerEdge 1650 supports award-winning web server solutions based on Red Hat Linux and Microsoft Windows Powered as factory installed options. These web server solutions are ideal for enterprise Internet/Intranet sites, service providers, or any web-centric organization. Dell PowerEdge Web Server solutions provide rapid deployment and wizard-based tools to create and manage websites, ftp sites, user accounts, and services such as DNS, database, e-mail, and other services.

Product Description

The PowerEdge 1650 is a rack-dense, general-purpose server that is designed to deliver new levels of availability, manageability, and performance in a space-saving 1U form factor.

PowerEdge 1650 versus other 1U systems

Table 1 highlights the features of the PowerEdge 1650 versus its primary competitors. The key advantages of the PowerEdge 1650 are that it supports hot-plug redundant power (optional) and cooling (standard) and dual channel embedded RAID with 128MB of battery-backed cache. Other advantages, depending on the competitor, include dual embedded Gigabit NICs, up to three 1-inch hot-plug SCSI hard drives, and a chipset that supports high levels of I/O throughput.

Table 1
PowerEdge 1650 Feature Competitive Comparison
 (The information contained in this table was obtained from www.ibm.com and www.hp.com as of May 21, 2002)

Feature	Dell PowerEdge 1650	HP ProLiant™ DL360 G2	IBM eServer® X Series 330 MXT
Processors	Dual Intel® Pentium® III (up to 1.4GHz w/133MHz FSB)	Dual Intel Pentium III (up to 1.4GHz w/ 133MHz FSB)	Dual Intel Pentium III (up to 1.4GHz w/ 133MHz FSB)
Cache	512KB Level 2 ECC cache (full speed)	512KB Level 2 ECC cache (full speed)	512KB Level 2 ECC cache (full speed)
Chipset	ServerWorks HE SL	ServerWorks HE SL	Derivative of ServerWorks chipset

Feature	Dell PowerEdge 1650	HP ProLiant™ DL360 G2	IBM eServer® X Series 330 MXT
			chipset
Memory (min/max)	256MB/4GB ¹	256MB/4GB	256MB/4GB w/ MXT
I/O Slots	2 x 64-bit/ 66MHz (3.3V) OR 1 x 32-bit/33MHz (5V) and 1 x 64-bit/66MHz (3.3V)	2 x 64-bit/66MHz (3.3V)	2 x 64-bit/ 33MHz
Embedded NIC	Dual embedded 10/100/1000 NICs	Dual embedded 10/100/1000 NICs	Dual embedded 10/100 NICs
Embedded SCSI	Dual channel Adaptec 7899 (Ultra3 SCSI)	Single channel Ultra3	Single Ultra3 SCSI
Bays	5: 3 x 1" hot-plug SCSI HDs plus CD & floppy	4: 2 x 1" hot-plug SCSI HDs plus CD & floppy	4: 2 x 1" HDs plus optional CD & floppy
Max. Internal Storage	438GB (10K/15K) SCSI, or 240GB ¹ (7200) IDE	146GB	146GB
Video	On-board	On-board	On-board
RAID	Dual Channel ROMB (PERC 3/Di) with battery backup and 128MB cache; add-in for external storage (PERC 3/DC)	Single Channel ROMB w/ 32MB of cache (no battery backup)	Add-in
Hot-plug Drives	Yes (SCSI); No (IDE)	Yes	Yes
Remote Management	Yes via DRAC III or Embedded Remote Access Option (ERA/O)	Yes via integrated Lights Out (iLO) standard (free) and integrated Lights Out advanced (iLO/A)	Yes via integrated remote management and remote management card
DC Power	Yes (optional)	Yes (optional)	Yes (optional)

¹For hard drives, GB means 1 billion bytes; total accessible capacity varies depending on operating environment

PowerEdge 1650 Versus PowerEdge 2650

Table 2 compares the PowerEdge 1650 to the PowerEdge 2650. The PowerEdge 1650 is the ideal choice for customers who want to maximize availability (hot-plug redundant power/cooling, embedded RAID with battery backup) and scalability (three hard drives, 4GB of RAM) in a rack-dense, 1U form factor. The PowerEdge 2650 is the ideal choice for customers who require greater system performance and expandability in a rack-dense 2U package.

Whereas the PowerEdge 1650 and PowerEdge 2550 have many similarities (dual PIII processors, HE SL chipset, optional hot-plug redundant power, embedded RAID option, DRAC option), and are differentiated primarily by expandability (2550 supports more drives and PCI slots), the PowerEdge 2650 offers several key performance and scalability features that differentiate it from the PowerEdge 1650. Specifically, the PowerEdge 2650 uses a new chipset that supports the new Xeon processors and a faster front side bus (FSB) (400MHz), it supports more memory (6GB), and it supports higher performance PCI slots (PCI-X). These performance and scalability features position the PowerEdge 2650 as the server of choice for more processor, I/O, and memory intensive applications. Below is a feature set comparison of the PowerEdge 1650 and PowerEdge 2650.

Table 2
Product Comparison of the PE1650 and the PE2650

Features	PowerEdge 1650	PowerEdge 2650
Processors	Dual Intel® Pentium® III FC-PGA processors (1.13/512, 1.26/512, 1.40/512)	Dual Intel Xeon processors (1.8GHz, 2.0GHz, , 2.4GHz, 2.6GHz, 2.8GHz)
Chipset	ServerWorks ServerSet™ HE SL	ServerWorks Grand Champion LE (GC LE)
Front Side Bus	133MHz	400MHz
I/O Channels	5 total: 2 x 64-bit/66MHz PCI slots plus 2 x 10/100/1000 embedded NICs plus a dedicated management port (for ERA/O)	6 total: 3 x full length PCI-X slots (1x64-bit/133MHz and 2x64-bit/100MHz) plus 2 x 10/100/1000 embedded NICs plus a dedicated management port for ERA
Starting/	256MB/4GB	256MB/6GB
Maximum Memory	PC133 SDRAM	200MHz DDR SDRAM

Features	PowerEdge 1650	PowerEdge 2650
Availability	Hot-plug hard drives ECC memory Hot-plug, redundant power (optional); hot-plug redundant cooling; embedded RAID w/ battery backed cache (optional); Tool-less chassis; cluster support	Hot-plug hard drives ECC memory, Spare Row Memory, Chip Kill Hot-plug, redundant power (optional); hot-plug cooling; embedded RAID w/ battery backed cache (optional); Tool-less chassis, cluster support
Internal Storage Scalability	3 x 1-inch (18/36/73/146GB*) SCSI drives; Up to 438GB maximum internal storage; OR 2 x 1-inch (20/40/80/120GB*) IDE drives	Up to 5 x 1-inch SCSI drives Up to 730GB maximum internal storage
Internal Storage Performance	10K/15K RPM SCSI drives; 7200 RPM IDE drives	10/15K RPM SCSI drives
External Hard Drive Storage	PowerVault 2XXS PowerVault 6XX Dell EMC	PowerVault 2XXS PowerVault 6XX Dell EMC
Embedded SCSI	Dual channel Ultra3 (U160) SCSI	Dual channel Ultra3 (U160) SCSI
RAID support	Optional ROMB (PERC 3/Di), optional PERC 3/DC for external storage	Optional ROMB (PERC 3/Di), optional PERC 3/DC, PERC 3/QC
Tape Support	Internal: N/A External: PowerVault 120T DLT1 AutoLoader, PV 128T, PV 136T, PV 122T (2U) VS-80, PV 112T (1U)	Internal: N/A External: PowerVault 120T DLT 1 Autoloader, PV136T, PV128T, PV 122T (2U) VS-80, PV112T (1U)
Video	Embedded ATI Rage XL with 8MB memory	Embedded ATI Rage XL with 8MB memory
Networking	Dual embedded Intel PRO/1000 XT™, Intel PRO/1000 XT™ (copper), Broadcom NetXtreme Gigabit NIC (copper), Intel PRO/1000 F (optical); Intel PRO/100 S; Intel PRO/100+ dual port NIC	Dual embedded Broadcom NetXtremeGigabit NICs, Intel PRO/1000 XT™ (copper), Broadcom NetXtremeGigabit NIC (copper), Intel PRO/1000 F (optical); Intel PRO/100 S; Intel PRO/100+ dual port NIC
High Availability Clustering	Yes	Yes

Features	PowerEdge 1650	PowerEdge 2650
Chassis	Tool-less rack only	Tool-less rack only
Power Supply	2 X 275W redundant	2 X 500W redundant
Remote Management	DRAC III, Embedded Remote Access Option (ERA/O)	Embedded Remote Access (ERA)
Systems Management	OpenManage support	OpenManage support
Rack Support	4-post (Dell rack), 2-post center mount, and 2-post flush mount, & 3 rd party Versarails	4-post Dell and Compaq racks, 2-post flush mount, and 3 rd party Versarails

*For hard drives, GB means 1 billion bytes; total accessible capacity varies depending on operating environment.

To evaluate the feature deltas between the PowerEdge 1650 and the PowerEdge 2650, the appropriate questions to ask are as follows:

1. *Is rack density or performance and scalability more important? NOTE: The PowerEdge 1650 and PowerEdge 2650 offer similar levels of availability (optional hot-plug power, hot-plug SCSI drives) and remote management (Embedded Remote Access (ERA)).*

- If rack density is the most critical factor, the 1U PowerEdge 1650 is the ideal choice because it allows customers to place up to 42 in a single rack (depending on the system configuration and power routed to the rack) for the maximum in processor density per rack for traditional servers. Additionally, the PowerEdge 1650 offers an excellent mix of performance and features, including dual Pentium III processors, support for up to three hot-plug hard drives or two non hot-plug IDE hard drives, up to 4GB of RAM, dual embedded 10/100/1000 NICs, dual channel RAID on motherboard (ROMB) with battery backed cache, optional hot-plug redundant power, hot-plug redundant cooling, -48v DC power supply option, remote management functionality, and two 64-bit/66MHz PCI slots, enabling it to address a wide range of application needs.
- If total system performance and expandability are the most critical factors, the PowerEdge 2650 is the ideal choice because it offers the same level of availability as the PowerEdge 1650, as well as dual Xeon processors, support for up to five hot-plug SCSI hard drives, up to 6GB of DDR RAM, and three PCI-X slots (1 x 64-bit/133MHz and 2 x 64-bit/100MHz), all in a 2U rack dense form factor.

2. *What type of applications will the customer be running on the general-purpose server?*

- The PowerEdge 1650's combination of dual processors, 1U form factor, and availability features make it an ideal choice for Internet (1st tier of 3-tier architecture) and network infrastructure environments,

including domain controllers, DHCP servers, DNS servers, and web servers, as well as more mainstream applications, including file/print, HPCC environments, medium size 2nd tier applications, and SAN environments.

- The PowerEdge 2650's performance and expandability features, including support for dual Xeon processors, up to five hot-plug hard drives, and large memory make it the ideal choice for mainstream application servers and processor and memory-intensive applications, including file/print, messaging, collaboration, 2nd tier applications (e.g., commerce), and SAN environments.

The PowerEdge 1650 and PowerEdge 2650 are leading systems for rack-dense servers. Both systems offer an excellent mix of performance (dual processors), availability (optional hot-plug redundant power/cooling and embedded RAID with battery-backed cache), remote management (ERA), and scalability for 1U and 2U servers relative to other systems currently on the market.

Features and Benefits

PowerEdge 1650 is based on a new chassis. The features and benefits of the PowerEdge 1650 are shown in Table 3.

**Table 3
Features, Functions and Benefits of the PowerEdge 1650**

Feature	Benefit
Performance	
Dual Pentium III processors at 1.13GHz, 1.26GHz, and 1.40GHz with 133MHz FSB	The dual 1.40GHz processors with 133MHz front side bus (FSB) provide the highest performance available today from Tier 1 vendors in a 1U form factor ² and help improve system performance as the demands on the server grow.
ServerWorks HE SL chipset	Performs memory control and provides a PCI interface to the local processor bus. HE SL supports 3 PCI buses with one dedicated 64-bit/66MHz allocated to the dual channel ROMB and dual Gigabit NICs, and the other dedicated 64-bit/66MHz bus allocated to the two PCI slots. A third 32-bit/33MHz PCI bus is allocated for legacy support.
Read-ahead and Write-back cache	The write-back cache is designed to allow for faster access to data than read-through and write-through cache. This feature

² As of 5/21/02.

Feature	Benefit
support for embedded RAID	prevents a bottleneck from forming at the RAID processor by storing data in cache as soon as it is processed instead of waiting for the slower disk subsystem to complete its task before the RAID processor proceeds.
Embedded dual channel Ultra3 SCSI controller	Embedded dual channel Adaptec 7899 SCSI controller provides 160MB/s interface from system bus to hard drives. One channel is routed internally and one is routed externally. Internal controller allows the system to support up to three internal SCSI hard drives. External channel allows peripherals to be connected to the system without consuming a PCI slot.
Availability	
Hot-plug redundant power (1+1) and cooling, and hot-plug SCSI hard drives	Allows power supply, fans, and SCSI hard drive replacement without bringing the server down.
Optional dual channel RAID on motherboard (ROMB) with battery-backed cache	Innovative daughter card design includes all RAID components (processor, battery, cache), so customers only pay for RAID functionality if they need it, and it doesn't consume a PCI slot. Battery-backed cache preserves cache contents allowing data to be written to disk in the event of a power loss.
Dual embedded Gigabit NICs	Provides fail-over support and maximizes I/O throughput of embedded NICs. Embedded NICs are backward compatible to 10/100 speeds.
Expandability	
Up to 4GB of SDRAM	System supports minimum of 256MB of SDRAM, scalable to 4GB. The system requires 2:1 memory interleaving. Scalable memory allows customers to increase server memory as their application demands increase. Many Internet and network infrastructure applications primarily benefit from the processor and memory.
Up to 3 x 1" hot-plug SCSI hard drives	The 3 x 1" hot-plug SCSI hard drives allow for up to 438GB (3 x 146GB) of internal drive capacity at 10,000 RPM or 15,000 RPM for the maximum storage currently available in a 1U form factor. Additionally, the system supports up to 240GB (2 x 120GB) 1" IDE hard drives to provide a lower cost option for cost-conscious customers who still need maximum CPU performance.
OR	
Up to 2 x 1" non-hot-plug IDE hard drives	
Two open 64-bit/66MHz PCI I/O slots OR one 32-bit/33MHz and one 64-bit/66MHz PCI slots	The two I/O slots allow customers to expand the functionality of the system by adding PCI cards. With embedded Gigabit NICs, ROMB, and remote management, two PCI slots should meet the vast majority of customers' needs. Dell offers two options, including providing support for a 5V PCI card, to give users the most deployment flexibility.
Manageability	
Remote Management	The system supports DRAC III and the Embedded Remote Access Option (ERA/O). Both options provide remote and "out of band" management, including dead server management. DRAC III consumes a PCI slot, but offers a modem option. ERA/O is a daughter card that offers DRAC features without consuming a PCI

Feature	Benefit
	slot.
Embedded Systems Management	The embedded systems management (ESM3) detects fan failures, and temperature and voltage problems. It generates alerts and helps administrators to detect and remedy problems at local and remote locations.
Dell OpenManage Server Administrator (OMSA)	OMSA monitors the status of your systems via a web browser, including providing the ability to update firmware and BIOS and provide online diagnostics for troubleshooting.
Dell OpenManage IT Assistant (ITA)	Intuitive browser-based application helps to make management of clients easier than ever before on PowerEdge.
Dell Server Assistant (DSA)	DSA is designed to make OS installation quick and easy, and provide customers with “one stop shopping” for setting up a PowerEdge server, including providing the latest Dell drivers, RAID and NIC configurations, Dell diagnostics, and electronic documentation.
Serviceability	
Tool-less Chassis	The tool-less chassis allows easy access to internal system components, which makes it easy to service and maintain.
Cable-less design	The SCSI backplane blindmates to the motherboard eliminating the need for cables. Additionally, the ROMB daughter card utilizes the on-board SCSI controller to eliminate the need for a cable from the RAID card to the backplane. This not only improves serviceability of the system, but also improves airflow.
Active ID	The new bezel will display the Dell logo backlit in blue when the server is functioning properly. If the system encounters any type of failure, the Dell logo light will go off and an amber caution light will blink indicating a problem. Once the bezel is removed, LEDs will indicate where the problem has occurred (hard drive, power supply, fan, etc.), and alerts will also be generated via OpenManage. This feature enables administrators to quickly identify a server with a problem in a rack full of servers.
System Identification button on rear of chassis	The system contains an LED on the back of the server that mimics the functionality of the LED on the bezel. Additionally, the LED functions as a system locator from a service perspective. Simply press a button on the front of the chassis or generate a command via OpenManage and the LED will blink allowing system administrators to easily identify a system in a rack full of 1U servers. Once the system is identified, push a button and the light will stop blinking.
KVM ports on front of chassis	The PowerEdge 1650 has a single PS/2 connector and USB connector (for keyboard and mouse) and video port on the front of the chassis for customers who use keyboard/video/mouse (KVM) carts in their data centers. Front accessible KVM ports provide two benefits: 1) improves serviceability because customers do not need access to the rear of the rack, and 2) simplifies cable management by reducing the need for KVM cables on every system attached to switches (i.e., customers only have to plug into

Feature	Benefit
	the system being accessed).
Solutions	
High Performance Compute Cluster	The PowerEdge 1650 is one of the platforms available in Dell's High Performance Compute Cluster (HPCC) program.
Web Server Powered by Red Hat Linux	Based on Red Hat Linux 7.2, the Power Edge Web Server comes with all the features and applications that customers get with standard Red Hat installations plus a complete suite of tools that allow customers to manage all these services in an integrated and efficient approach, including the ability to manage web server, ftp, DNS, database and e-mail services through web-based wizards.
Web Server Microsoft Windows Powered	Based on Windows Powered Operating System and Microsoft Server Appliance Kit, Web-based wizards allow you to manage system settings, websites, users, ftp, database, and other services.
Web Caching Appliance	Inktomi Powered Web caching solutions are available as factory installed options on the PowerEdge 1650.

Target Markets/Applications

The feature set of the PowerEdge 1650, including dual Pentium III processors, optional hot-plug redundant power (including –48v DC power option), hot-plug redundant cooling, up to 4GB of RAM, dual embedded Gigabit NICs, dual channel embedded RAID (ROMB) with battery-backed cache, remote management functionality, and choice of either three hot-plug 1" SCSI hard drives or two non-hot-plug IDE hard drives, make it an extremely flexible server.

Specifically, traditional 1U server customers will purchase the PowerEdge 1650 for Internet (front-end of a 3-tier architecture), network infrastructure, and other applications that require high system performance, high I/O throughput, and limited internal storage, including:

- Domain Controllers (PDC/BDC)/Directory Services
- Gateway, Proxy, Firewall
- Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS)
- Web hosting (PowerEdge Web Server Solutions)
- Caching (Inktomi Powered web caching solutions) and load-balancing
- Front-end to a database server
- High Performance Computing Cluster (HPCC) environments

Additionally, the hot-plug redundant power option, combined with dual channel ROMB with battery-backed cache, dual 64-bit/66MHz PCI slots, and dual embedded Gigabit NICs, make the PowerEdge 1650 attractive for mainstream applications, including:

- File/Print
- Messaging
- Medium-sized second tier application server (supports RAID 5)
- Collaboration (may require external storage)
- SAN compute node

Key Customer Benefits

- ***Exceptional Levels of Availability and Performance in a 1U chassis***
The PowerEdge 1650 supports optional hot-plug redundant power (1+1), hot-plug redundant cooling, and optional dual channel embedded RAID with battery-backed cache for improved availability and performance. Dell is the first of the major system providers to incorporate these features in a 1U form factor.
- ***Vastly Improved Embedded Remote Management and Embedded RAID***
Unlike the PowerEdge 1550, the PowerEdge 1650 supports both DRAC III and the Embedded Remote Access Options (ERA/O), allowing for remote management, including true dead server management. Additionally, the PowerEdge 1650's dual channel embedded RAID solution with battery-backed cache not only improves hard drive performance, but also doesn't consume a PCI slot.
- ***Ultimate flexibility for diverse set of application***
The feature set of the PowerEdge 1650, including dual Pentium III processors with 512KB L2 cache, 4GB of RAM, dual 64-bit/66MHz PCI slots, dual embedded Gigabit NICs, optional hot-plug redundant power (including -48v DC power option), hot-plug redundant cooling, up to 3 x 1" hot-plug SCSI hard drives or 2 x 1" non hot-plug IDE hard drives, and remote management functionality, make the PowerEdge 1650 an ideal server for Internet (first tier of a 3-tier architecture), network infrastructure, high performance compute clustering (HPCC), SAN, and mainstream application environments.

Options

The PowerEdge 1650 can be enhanced in the following ways:

- Add microprocessor (up to two in a system)
- Increase memory (up to 4GB)
- Add internal HDD storage (up to 3 x 146 GB SCSI drives or 2 x 1" 120GB IDE drives)
- Add NICs (Intel PRO/100 S with or without encryption, Broadcom NetXtreme Gigabit NIC (copper), Intel PRO/1000 XT Gigabit NIC (copper), Intel PRO/1000 F (optical), and Intel PRO/100+™ Dual Port NIC)
- Add optional embedded PERC 3/Di for internal SCSI drives or PERC3/DC dual channel RAID controller for external storage (128MB RAM)
- Add optional DRAC III card or Embedded Remote Access Option (ERA/O)
- Add FC HBA adapter for attachment to external FC storage and SAN
- PowerVault 2XXS SCSI-based external storage enclosures
- PowerVault 6XXF Fibre Channel-based external storage enclosures
- Dell | EMC Fibre Channel-based external storage enclosures
- Add optional DVD
- Choose 5V riser card to support 5V PCI cards (must be selected with DRAC III option)
- Wide range of OS support, including Microsoft NT 4.0, Microsoft Windows 2000 Server, Microsoft Windows 2000 Advanced Server, Red Hat Linux 7.1 and 7.2, and Novell NetWare 5.1 and 6.0
- Full range of easy to deploy and configure appliance solutions, including web hosting solutions based on Red Hat Linux and Microsoft Windows Powered, and Inktomi Powered Web Caching Solutions, available as factory installed options
- Supports 2-post and 4-post rack environments
- Add external TBU support
- Add AC or -48v DC power supply option

Service and Support

Dell offers a broad portfolio of services that help optimize use of Dell technology, rapidly deploy systems, and maximize system uptime. Dell provides expert advice and technical assistance, and a single point of accountability, while striving to help achieve a lower total cost of ownership.

- **Dell Technology Consulting Group (DTC)**
 - Delivers valuable assistance for IT Infrastructure (Microsoft® Windows® 2000, Exchange, Thin Client, Systems Management), and storage consulting.
 - Offers consulting programs for planning, implementation, tuning, training, backup and recovery.
- **Technology Solutions Center**
 - Comprehensive testing facilities developed jointly by Dell and Intel.
 - Proof-of-concept validation and performance improvement through application tuning in a controlled setting.
 - Training for system administrators and operators.
- **Custom Integration**
 - High-quality, one-touch custom factory integration services.
 - Asset data services, hardware and software integration, and replacement parts program.
- **Installation Services**
 - Helps put new technology to work rapidly.
 - Includes implementation planning, on-site installation of server, storage, and clustering products, mounting Dell products into Dell-supported racks, and a suite of upgrade services.
- **Standard Support Services**
 - Limited warranty² and three years of Next Business Day (NBD) Parts Replacement and one year NBD On-Site³ Labor Service.
 - Pre-Failure Alert Program⁴ for Dell hard disk drive and DIMM components.
 - 30-Day Getting Started Program Helpline⁵ for Dell servers.
 - 24/7 toll-free hardware technical phone support for as long as you own your Dell server.

- 24/7 on-line support featuring extensive on-line tools at support.dell.com and Resolution Assistant on PowerEdge servers.
- **Other Optional Support Services**
 - Extended NBD service or parts delivery for up to five years.
 - Same day on-site support services including 4-hour response,⁶ 2-hour response and 6-hour repair.⁷
 - DirectLine™ toll-free telephone support for Microsoft® Windows® 2000, Windows NT®, Novell® operating systems.
 - DirectLine Plus toll-free 24/7 telephone support for select Microsoft BackOffice applications, Red Hat Linux® (annual contract required for 24/7 support), and enhanced operating system support.

²For a complete copy of our guarantees or limited warranties, please write to Dell USA L. P., One Dell Way, Round Rock, Texas 78682, Attn: Warranty.

³Service may be provided by third-party. Technician will be dispatched if necessary following phone-based troubleshooting. To receive next business day service, Dell must notify the service provider before 5:00 pm (depending on service contract) customer time. Availability varies.

⁴The Pre-Failure Alert program is available only in the United States on selected Dell PowerEdge servers (1xx0, 2xx0, 4x00, 6xx0, 8450) and select PowerVault products. PowerEdge 300 is not included. Your system must be monitored by Dell-recognized system management applications in order to participate in the Pre-Failure Alert Program. The Pre-Failure Alert Program covers Dell products utilizing applications that can acquire information from the HIP and OpenManage Server Agent."

⁵30-day telephone support program is at no additional charge to help customers with installation optimization and configuration questions during the critical 30-day period after shipment of your PowerEdge. This program is available to customers who purchase Novell NetWare or Microsoft Windows NT Server or Windows 2000 with their PowerEdge server from Dell. Support provided after the 30-day Getting Started Program will be for only the Dell hardware. Beyond 30 days from the invoice date, Dell's DirectLine telephone support service is available for purchase for NOS support.

⁶Service may be provided by a third party following phone-based troubleshooting. Available within a 125-mile radius of over 80 metropolitan areas. Customers not located within a 125-mile radius of the stocking locations are not eligible for this offering. Not available with any other Dell systems. Available in the U. S. only. For 24/7 service, Dell will dispatch a service technician within 4 hours of determining the hardware problem. For 5/10 service, Dell will dispatch a technician to the customer site within 4 hours of determining the hardware problem. The service technician may not arrive until the following business day if dispatched after 4:00 pm local time.

⁷Available within a 25-mile radius of over 60 metropolitan areas. Customers not located within a 25-mile radius of the stocking locations are not eligible for this offering. Available on select Dell PowerEdge and PowerVault models in the U. S. only. Dell will, if necessary after phone-based troubleshooting, dispatch a technician to the customer site within 2 hours of determining the hardware problem. Service is subject to the terms and conditions of the service contract. See http://www.dell.com/us/en/biz/services/service_peservmain.htm for details.

Services vary by region. For more information on the available services in your area, please visit <http://www.dell.com>.

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