# Dell | PowerConnect

# INFOBrief

## PowerConnect™ 5324

*As highly-available, managed networks continue to grow, the need for interoperable, industry-standard network devices become even more important. Enterprise class switches must interoperate with existing network equipment and leverage established networking knowledge, such as CLI. Networking equipment should maximize currently deployed tools, such as SNMP-based software applications and provide the network administrator the ability to secure the network, manage VLANs, and prioritize traffic.*

*Front view of PowerConnect 5324*

## Key Points

- The PowerConnect 5324 is a high-performance, Gigabit Ethernet switching solution with advanced security and enterprise management features delivering full wire-speed switching across all ports.[1]
- The PowerConnect 5324 is flexibly designed to address the connectivity needs of organizations of all sizes. For switch management, smaller organizations will appreciate the web interface's visual management capabilities. For larger organizations, the CLI will be an effective tool for quickly and easily setting management parameters.
- The maximum switching capacity across the 24 Gigabit Ethernet ports is 48 Gbps while the maximum forwarding rate is 35.6 Mpps. With 24 ports of built-in Gigabit copper, the PowerConnect 5324

provides flexibility with its four SFP transceiver slots. The four SFP transceiver slots can be used in lieu of up to four copper Gigabit ports (any copper/SFP configuration will yield exactly 24 usable ports of Gigabit Ethernet). The SFP slots provide the option of inserting different types of fiber media using small form-factor pluggable (SFP) modules.

- The PowerConnect 5324 supports a variety of standards-based security features, such as edge authentication via 802.1x, remote management authentication using RADIUS and TACACS+ servers, and management access profiles that allow or deny management access based upon several criteria. Other advanced security features include MAC-based port security that helps prevent unauthorized MAC addresses from accessing the network, SSL and SSH encryption that offers the added security of encrypting network management traffic, and SNMP access filtering which provides a mechanism to limit network hosts that those hosts that should have SNMP access to the switch.
- Enterprise switching features include multi-layer quality of service that can support VoIP capable infrastructures (QoS), multicast support, link aggregation, and dynamic VLAN configuration, allowing the network administrator to optimize traffic flow in the network.
- The PowerConnect 5324 can be managed via an industry-standard command line interface (CLI), embedded Web server, third party SNMP-based management console applications, Telnet or serial connections. Dell OpenManage Network Manager provides a free console application for managing PowerConnect switches via SNMP (for more information on Network Manager, visit www.dell.com/networkmanager).
- The PowerConnect 5324 provides a high level of availability through its optional redundant power supply. The redundant power supply provides power if the primary power supply fails.

## Product Description

The PowerConnect 5324 is a 24 port Gigabit Ethernet switch. The switch provides four SFP transceiver slots in a rack-dense 1U form factor. The PowerConnect 5324 is designed for customers who need a secure networking solution, full management capabilities, configuration file upload and download capabilities, and quality of service. Additionally, the switches are ideal for customers who need maximum uptime. The optional redundant power supply provides fail-over protection for the primary power supply.

### PowerConnect 5324 Versus Competitive Gigabit Ethernet Switches

Table 1 highlights the features of the PowerConnect 5324 versus its primary competitors. The key advantages of the PowerConnect 5324 are its adherence to industry standards and the myriad of security features offered.

**Table 1**
**PowerConnect 5324 Feature Comparison to Competitive Systems**
Competitive data was obtained from competitors' websites on August 3, 2004. See respective websites for most current data.

| Feature | Dell PowerConnect 5324 | 3Com SuperStack 3 3824 | Cisco Catalyst 2970G-24T |
|---|---|---|---|
| Total Switching Capacity | 48 Gbps | 48 Gbps | 48 Gbps |
| Maximum Forwarding Rate | 35.7 Mpps | 35.7 Mpps | 35.7 Mpps |
| Built-In Gigabit Ethernet Ports | 24 Copper GbE ports (10/100/ 1000BaseT) | 24 Copper GbE ports (10/100/ 1000BaseT) | 24 Copper GbE ports (10/100/ 1000BaseT) |
| Fiber-Capable Gigabit Ethernet Ports | Using up to 4 optional SFP transceivers (disables Copper GbE port) | Using up to 4 optional SFP transceivers (disables Copper GbE port) | None |
| MAC Addresses | Up to 8,000 | Up to 16,000 | Up to 8,000 |
| Edge Authentication via 802.1x | Yes | No | Yes |
| 802.1Q VLAN | Up to 247 | Up to 254 | Up to 1,024 |
| 802.1p Priority | Yes | Yes | Yes |
| QoS | 4 queues; WRR, Strict Priority scheduling | 8 queues | 4 queues; SRR, Strict Priority scheduling |
| Link Aggregation | Yes, IEEE 802.3ad and LACP | Yes, IEEE 802.3ad and LACP | Yes IEEE 802.3ad and LACP |
| Multicast Support | IGMP snooping | IGMP snooping | IGMP snooping |
| Spanning Tree Support | Yes, Spanning Tree and Rapid Spanning Tree | Yes, Spanning Tree and Rapid Spanning Tree | Yes, Spanning Tree, Rapid Spanning Tree, and MSTP |
| Management | Embedded Web Server, Serial & Telnet, SNMP & RMON, CLI | Web-based management, CLI, SNMP | CLI, CWSI, CiscoView, SNMP, Telnet, RMON, CMS |
| Authentication Support | RADIUS and TACACS+ | RADIUS | RADIUS and TACACS+ |
| IP Address Management | DHCP, Static | DHCP, Static | DHCP, Static |
| Redundant | Optional, RPS- | Not specified | Optional, RPS |

| Feature | Dell PowerConnect 5324 | 3Com SuperStack 3 3824 | Cisco Catalyst 2970G-24T |
|---|---|---|---|
| Power Supply | 600 | | 675 |
| Form Factor | 1U, Rack mountable | 1U, Rack mountable | 1U, Rack mountable |

PowerConnect 5324 Versus PowerConnect 5224

Table 2 compares the PowerConnect 5324 to the PowerConnect 5224. The PowerConnect 5324 is the ideal switch for customers who need a secure, high-performance Gigabit Ethernet solution offering.

Table 2
**Product Comparison of the PowerConnect 5324 and the PowerConnect 5224**

| Features | PowerConnect 5324 | PowerConnect 5224 |
|---|---|---|
| **Total Switching Capacity** | 48 Gbps | 48 Gbps |
| **Maximum Forwarding Rate** | 35.6 Mpps | 35.6 Mpps |
| **Gigabit Ethernet Ports** | 24 Copper GbE ports OR 4 optional Fiber GbE via SFP transceivers | 24 Copper GbE ports OR 4 optional Fiber GbE via SFP transceivers |
| **Edge Authentication via 802.1x** | Supports single and multiple host access | Supports single host access |
| **Management Access Profiles** | Yes | Not supported |
| **802.1Q VLAN** | Up to 247 VLANs | Yes |
| **GVRP** | Yes | Yes |
| **Quality of Service** | Yes, L2/L3-aware | Yes, L2/L3-aware |
| **Priority Queues** | 4 | 4 |
| **Link Aggregation** | Yes, LACP and manual (IEEE 802.3ad) | Yes, LACP and manual (IEEE 802.3ad) |
| **Multicast Support** | IGMP Snooping | IGMP Snooping |
| **Spanning Tree Support** | Spanning Tree and Rapid Spanning Tree w/ FastLink | Spanning Tree and Rapid Spanning Tree w/ FastLink |
| **Remote Management** | Yes | Yes |
| **Authentication Support** | RADIUS and TACACS+ | RADIUS and TACACS+ |
| **MAC-based Port Security** | Yes | Yes |
| **Management Traffic Encryption** | SSLv3 and SSHv2 | SSL and SSH |

| | | |
|---|---|---|
| **Dual Firmware Image Support** | Yes | Yes |
| **Configuration File Management** | File upload and download | File upload and download |
| **SNMP Support** | SNMPv2c | SNMPv2c |
| **Remote Logging** | Syslog | Syslog |
| **Industry-standard CLI** | Yes | Yes |
| **Cable and Transceiver Diagnostics** | Virtual Cable Tester (VCT) and Optical Transceiver Analysis | None |
| **Redundant Power Supply** | Optional RPS-600 | Optional RPS-600 |
| **Form Factor** | 1U, rack mountable | 1U, rack mountable |

## Target Markets/Applications

The PowerConnect 5324 is designed for customers who require high-performance connectivity to centralized resources like servers or high-speed network backbones. Also, the switches are ideal for customers with growing networks because of their support of Copper and fiber Gigabit Ethernet media.

- Gigabit Ethernet Wiring Closet: Up to 23 Gigabit-enabled desktop clients can be connected to the 5324 at the wiring closet and uplinked to an aggregation switch or network core at Gigabit speeds. Alternatively, any combination of desktop connections and uplinks can be utilized to optimize network performance (i.e., 20 desktops and 4 uplinks or 22 desktops and 2 uplinks on the 5324).
- Cost-Effective GbE Datacenter Switch: Up to 23 Gigabit-enabled servers can be connected to the 5324 in the datacenter to provide Gigabit connectivity between datacenter servers and the network core. Alternatively, 20 servers can be connected to the 5324 while a 4 Gbps trunk can be established as the uplink to the core.
- Traffic Aggregation to Network Backbone: The PowerConnect 5324 can be connected to a Gigabit Ethernet backbone via any of its Gigabit Ethernet ports. Specifically, up to eight Gigabit Ethernet ports can be combined in a link aggregation group providing an aggregated bandwidth of 8 Gbps and delivering automatic failover in the case of a downed link within the aggregation group.

## Features and Benefits

The features and benefits of the PowerConnect 5324 are shown in Table 3.

Table 3
**Features, Functions and Benefits of the PowerConnect 5324**

| Feature | Function | Benefit |
|---|---|---|
| **Total Switching Capacity** | Enables full wire-speed switching across all ports, including Gigabit Ethernet ports/slots | Maximizes the available bandwidth of your network |
| **Maximum Forwarding Rate** | Enables full wire-speed switching/routing across all ports, including Gigabit Ethernet ports and SFP slots | Takes full advantage of the speed of the devices connected to the switch |
| **Built-in Copper Gigabit Ethernet Ports** | Provide up to 10-times higher bandwidth than Fast Ethernet ports | Helps eliminate performance bottleneck at critical traffic aggregation points; can use Gigabit Ethernet with standard Cat5 cabling, but Cat5e cabling is recommended |
| **Fiber-Capable Gigabit Ethernet Ports** | Accommodate various types of Fiber interface modules (e.g., 1000SX, 1000LX; modules sold separately) | Flexibility to use fiber media if large distances have to be covered by the network |
| **Edge Authentication via 802.1x** | Provides advanced security through edge authentication (802.1x) | Delivers a mechanism that helps prevent unauthorized users from accessing the network |
| **Management Access Profiles** | Allows the user to limit access to the switch via management interface connection, the interface the user is connected to and the IP address of the user | Provides greater control in limiting management access to the switch |

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|---|---|---|
| **802.1Q VLAN** | Virtual LANs combine a number of ports into distinct, separated sub-networks. GVRP allows for dynamic port-based VLAN configuration as per IEEE 802.1Q. | Allows for limitation of broadcast domains as well as improved security. GVRP provides dynamic VLAN configurations and helps reduce administrative tasks associated with static VLANs. |
| **GVRP** | VLANs can be dynamically propagated throughout the network | Automatically provides learning of VLANs so that less user intervention is needed to establish a VLAN-based network |
| **Quality of Service (QoS)** | Prioritizes traffic based upon user-defined criteria, including L2 and L3 information. | Helps ensure time-critical network traffic is delivered as per network administrator's prioritization needs. Expedites traffic based upon L2 or L3 information, such as DSCP, and provides greater control over traffic flow within the network. |
| **Priority Queues** | Utilizes separate transmission queues according to IEEE 802.1p for low and high priority traffic | Helps ensure low-latency delivery of time critical network traffic, e.g., traffic associated with voice or video communication |

| | | |
|---|---|---|
| **Link Aggregation (802.3ad)** | Groups up to eight ports together into a single, high-bandwidth trunk. LACP provides automatic detection of link aggregation groups. | Increases bandwidth for critical network links (e.g., uplinks to a network backbone) and creates link redundancy. LACP provides easier to deploy and more resilient link aggregation groups. |
| **Multicast Support** | Detects ports that are participating in IP Multicast communication, e.g., multimedia streams | Limits broadcast traffic to those switches that are actually participating in the communication |
| **Spanning Tree Support** | Automatically configures ports for speed, duplex mode, flow control and cabling used. Rapid spanning tree improves the time to reconfigure the topology as compared to standard spanning tree. | Helps reduce network set-up time and improve network availability by automatically activating standby links when current link goes down |
| **Remote Management** | Enables remote configuration and monitoring of the switch via a Web-browser or a SNMP-based management console application. Industry standard CLI provides command line interface for switch configuration. | Allows a network administrator to detect and remedy problems at local and remote locations. Industry standard CLI leverages network administrator's knowledge of industry-standard CLI and provides a common platform for switch configurations. |

| | | |
|---|---|---|
| **Authentication Support** | SSL provides encryption of management traffic when accessing the switch via the embedded web server. SSH provides encryption of management traffic when accessing the switch via CLI. | Enhances the security of the network by encrypting network management traffic |
| **MAC-Based Port Security** | Port locking feature | Network security based on MAC addresses associated with a specific port on the switch |
| **Management Traffic Encryption** | Encrypts management traffic through either SSL or SSH encryption | Encrypts management traffic so that malicious network "listeners" cannot decipher the management traffic |
| **Dual Firmware Files** | Two firmware files can be stored on the switch | Provides two firmware files so that the user can easily reload a known-and-good firmware file in the unlikely event one of the firmware images becomes corrupted |
| **Configuration File Management** | Enables the uploading and downloading of configuration files, as well as copying configuration files (running, startup, backup). | Provides the network administrator an easy and expedient mechanism to configure a switch or multiple switches; administrator can leverage one switch configuration for multiple switches |
| **SNMP** | Industry-standard protocol that provides the ability to monitor and manage the switch | Provides the ability to effectively control the network using SNMP-based applications |

| | | |
|---|---|---|
| **Remote Management** | Enables remote configuration and monitoring of the switch via a Web-browser or a SNMP-based management console application. Industry standard CLI provides command line interface for switch configuration. | Allows a network administrator to detect and remedy problems at local and remote locations. Industry standard CLI leverages network administrator's knowledge of industry-standard CLI and provides a common platform for switch configurations. |
| **Industry-Standard CLI** | Common industry-standard commands can be used to manage the switch | Reduces training time for experienced users who already know CLI commands |
| **Cable and Transceiver Diagnostics** | VCT tests copper infrastructure for shorts and opens. Optical Transceiver Analysis tests for transceiver problems in a fiber environment. | Minimizes troubleshooting efforts by efficiently diagnosing cable or transceiver problems via the management console |
| **Optional Redundant Power Supply** | Provides continuous power in the event the primary power supply fails | Helps increase system availability and reduce system down-time |
| **Form Factor** | Height of switch is only 1U | Conserves rack space |

## Key Customer Benefits

- ***Support for advanced security features***

The PowerConnect 5324 supports numerous security features to provide a secure networking solution. Edge authentication via 802.1x allows network administrators to allow or deny users access to the network based upon their credentials in a RADIUS server database. Additionally, management access profiles provide administrators flexibility to allow or deny management access to the switch using criteria such as interface connection (port, link aggregation group or VLAN) and IP address. With MAC-based port security, SSL and SSH traffic management encryption,

additional management authentication including RADIUS and TACACS+ as well as SNMP access filtering, the PowerConnect 5324 delivers user-customizable network security capabilities.

- ***Support for standards-based advanced switching features as well as standards-based remote management***

The PowerConnect 5324 supports a variety of open standards to ensure flexibility in optimizing your overall network performance (e.g., IEEE 802.1p Class-of-Service or IGMP snooping), availability (link aggregation) and security. Also, an industry-standard CLI, web browser-based switch management and SNMP-based management support a broad variety of management needs.

- ***Easy, cost effective transition to Gigabit Ethernet to the desktop***

Due to the built-in Copper Gigabit Ethernet ports, the PowerConnect 5324 provides cost effective ways to significantly improve your network performance where Gigabit-enabled devices are implemented (as compared to Fast Ethernet-enabled devices) – no additional modules have to be purchased for the switch to enable Gigabit Ethernet performance.

- ***Ideal solution for customers with growing datacenters***

The PowerConnect 5324 provides a high-performance, rack-dense solution that delivers an all Gigabit Ethernet switch. The 1U form-factor allows you to grow your datacenter while minimizing the amount of rack space required. When the network has to cover large distances, the PowerConnect 5324 can accommodate Fiber Gigabit Ethernet modules via its SFP slots.

- ***Redundant power supply for enhanced availability***

The optional redundant power supply helps improve system uptime and reduce the potential for an inoperable switch.

## Typical Implementations

**Diagram 1**
**Gigabit Ethernet Wiring Closet Solution**

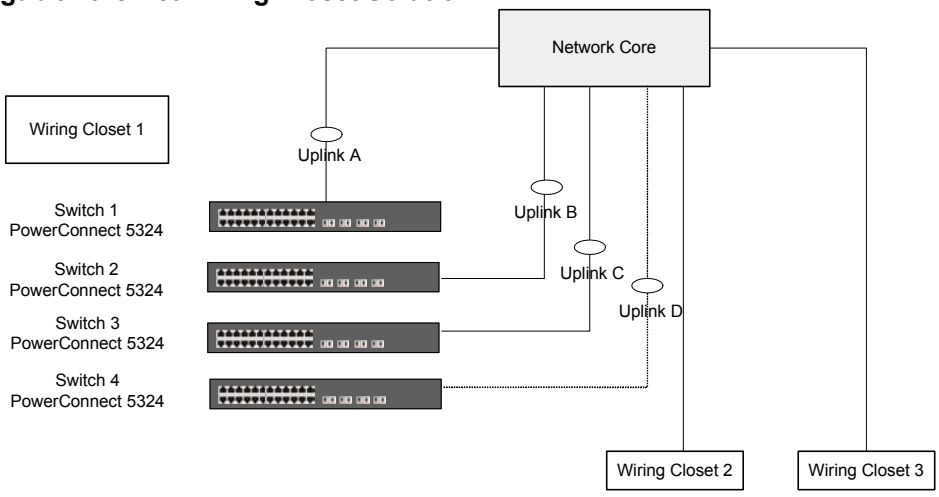

Diagram 1 is a Gigabit Ethernet wiring closet solution designed using the PowerConnect 5324 switch. This solution provides Gigabit Ethernet connectivity to desktop clients and uplink trunks to the Network Core. This solution provides both a high-performance and reliable wiring closet solution.

The solution can easily scale by adding additional 5324s into the array and connecting them to the Network Core. The uplink trunks can be configured from two to four Gigabit ports trunked to the Network Core and resultantly provides a high performance wiring closet solution as each desktop client is connected at Gbps speed and each switch is connected to the Network Core at speeds ranging from 2 – 4 Gbps.

The solution provides high availability and reliability as it provides fail-over support. Redundant power supplies can be added to the 5324s to decrease the potential for downtime due to a power supply failure. Additionally, should any one port at the Network Core stop communicating, the trunks will still communicate to the Network Core via the other established trunk links.

Additional wiring closets can be similarly configured and are represented by Wiring Closets 2 and 3.

If the need for an even higher availability solution is required and there is at least one port available on each of the switches, an even higher availability solution can be developed. Switch 1 can be connected to Switch 2 using copper cabling and Switch 3 can be connected to Switch 4 using copper cabling. In this scenario should the cables between the Network Core and one of the switches become severed or should the GbE ports fail at the Network Core, the connectivity between the switch pairs (Switch Pair 1/2 and Switch Pair 3/4) and spanning tree protocol (STP) will provide fail-over so that clients will not lose network connectivity.

When this configuration is initially set up, STP will automatically disable the connection between each switch pair and will enable the uplink trunk between each switch and the Network Core (Uplinks A, B, C and D). Assume the cables on Uplink D are severed or that the GbE ports at the Network Core fail. STP will enable the connection between Switch 3 and 4. All of Switch 4's traffic needing to flow to the Network Core will flow through Switch 3's uplink trunk (Uplink C).

In the event of an individual switch fail, there will be no impact to the other switches in the wiring closet.

Typical implementation needs include:

- High availability, resilient GbE wiring closet
- High-performance connectivity to desktop clients

**Diagram 2**
**Cost-Effective GbE Datacenter Switch**

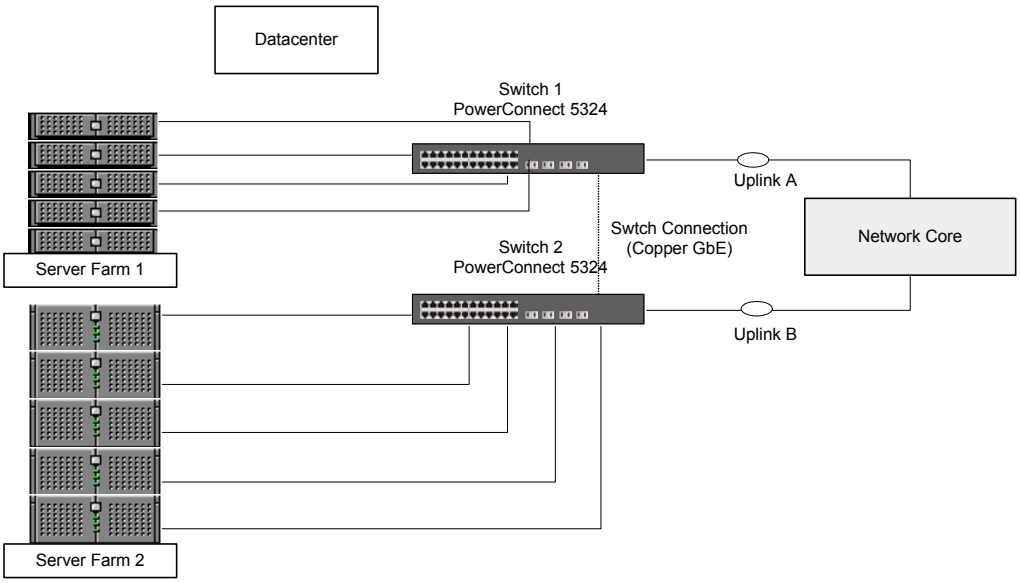


Diagram 2 is a high-performance datacenter switch solution designed using the PowerConnect 5324. This solution provides wire-speed GbE capabilities for a large number of servers or networked storage devices.

Switches 1 and 2 are each capable of supporting up to 23 servers while still providing a GbE uplink to the Network Core. Servers or storage hosts can be connected to either of the switches using copper or fiber cabling. Typically, 20 servers will be connected to a single 5324 so that four ports can be trunked to the Network Core. The uplink GbE ports can be trunked together using the 802.3ad trunking capabilities of the PowerConnect switches. This will effectively yield a single multi-Gigabit connection to the Network Core. Additionally, a connection can be established between the two switches to provide higher availability if either Uplink A or Uplink B loses communication capabilities with the Network Core. This solution provides a high-availability solution, while keeping deployment challenges to a minimum with a simple implementation strategy.

Typical implementation needs include:

- High-performance server connectivity

- High-availability server connectivity
- Cost-effective server connectivity

**Diagram 3**
**Traffic Aggregation to Network Backbone**

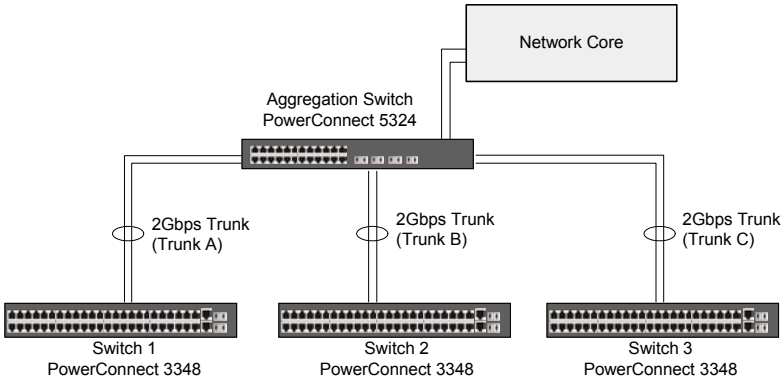


Diagram 3 is a traffic aggregation solution designed using the PowerConnect 3348 and 5324. This solution provides high availability and fail-over protection for a large number of desktop clients.

Using IEEE 802.3ad trunking, the PowerConnect 3348s connect to the 5324, or Aggregation Switch, using their integrated GbE ports as a single trunk. The Aggregation Switch provides Layer 2 aggregation capabilities. The Aggregation Switch can also be trunked to the Network Core. In this scenario, the Aggregation Switch can actually run multiple trunks to the Network Core to provide maximum bandwidth between the desktop clients and the Network Core.

Typical implementation needs include:

- High bandwidth network from the desktop to the core
- Resilient and cost-effective wiring closet solution
- Cost-effective aggregation solution

* NOTE – Link costs may need to be manipulated to ensure the appropriate Gigabit Ethernet links are disabled.

## *Limited Warranty, Service and Support*

Dell PowerConnect switches come with the following:

- Three-year Limited Warranty[2] and three years of Next Business Day Advanced Exchange Service[3]

- Telephone support 24 hours a day, 7 days a week, 365 days a year for the lifetime of the switch
- Advanced Software Support network configuration upgrades available
- On-site Labor Service upgrades (Next Business Day or Same Day)[3] available
- Four-hour response Advanced Exchange Service[3] upgrades available
- On-site Installation Service upgrades (Standard and Advanced) available

Dell cannot be responsible for errors in typography or photography.

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[1] This device has not been approved by the Federal Communications Commission for use in a residential environment. This device is not, and may not be, offered for sale or lease, or sold or leased for use in a residential environment until the approval of the FCC has been obtained

[2] For a copy of our guarantees or limited warranties, please write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. For more information, visit http://www.dell.com/us/en/gen/misc/policy_010_policy.htm

[3] Technician, replacement part or unit (depending on service contract) will be dispatched if necessary following phone-based troubleshooting in advance of receipt of returned defective unit. Service may be provided by third-party provider. Subject to parts availability, geographical restrictions and terms of service contract. Service timing dependent upon time of day call placed to Dell. Defective unit must be returned. Replacements may be refurbished. U.S. only.