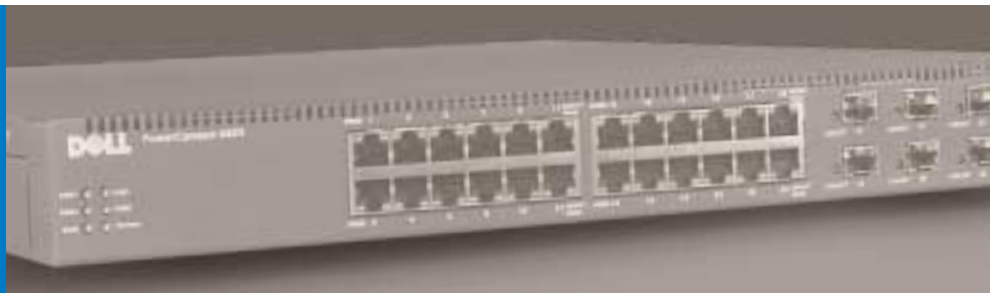


# Dell PowerConnect 6000 Series Routing Switches



## Dell™ PowerConnect™ 6024 and 6024F Gigabit

Ethernet routing switches are designed to address LAN routing needs in the enterprise.

These switches provide Layer 3 protocol support, high-availability features, and flexible copper and fiber connectivity options with advanced Quality of Service, security and management tools.

## Rack-Dense, Wire-Speed Layer 3 Performance

The PowerConnect 6024 and 6024F are rack-dense, fixed-port Gigabit Ethernet Layer 3 switches delivering wire-speed switching performance. Offering 24 Gigabit Ethernet ports in a 1U form factor, the PowerConnect 6024 and 6024F have a total switching capacity of 48 Gbps and a maximum forwarding rate of 35.6 Mpps. The PowerConnect 6024 has 24 copper Gigabit Ethernet ports and eight combo fiber SFP slots, while the PowerConnect 6024F has 24 Gigabit fiber SFP slots and eight combo copper ports. The SFP transceiver slots can be used interchangeably with the copper ports to yield exactly 24 usable ports of Gigabit Ethernet on either switch. Optional 1000 Base-SX transceiver modules support transmission distances up to 550m, while optional 1000 Base-LX transceiver modules support transmission distances up to 10km. Both distances are based on fiber type.

## Advanced Switching and Routing Features

The PowerConnect 6000 Series switches support a variety of advanced standards-based routing and switching features, allowing an administrator to optimize traffic flow in the network. Routing Information Protocol (RIP), Open Shortest Path First (OSPF), and Virtual Redundant Routing Protocol (VRRP) are supported, along with IP Multicast (IGMP) and Distance Vector Multicast Routing Protocol (DVMRP). The PowerConnect 6024 and 6024F can support up to 4063 VLANs, the addition of which enables limitation of broadcast domains in order to increase network security. GVRP (GARP VLAN Registration Protocol) provides for dynamic port-based VLAN configuration as per IEEE 802.1Q and helps reduce administrative tasks associated with static VLANs. Other advanced features include port mirroring, and static and dynamic link aggregation (LACP).

## Easy, Powerful Management

The PowerConnect 6024 and 6024F switches support a number of management interfaces, including an easy-to-use embedded Web interface as well as an industry-standard Command Line Interface (CLI) which allows network administrators to utilize existing switch configuration skills. Out-of-Band management access is enabled via a dedicated Fast Ethernet port or a serial RS-232 connection. The switches can also be managed via Dell OpenManage™ IT Assistant and Dell OpenManage Network Manager, as well as third party SNMP-based management console applications. The PowerConnect 6024 and 6024F support a comprehensive Management Information Base (MIB) and four RMON groups (history, statistics, alarms and events). To assist with centralized management of the network infrastructure, the switches also support remote logging via syslog.

## Multi-Layer Quality of Service

Network traffic prioritization is a key requirement for deploying emerging applications like videoconferencing and voice-over-IP. The PowerConnect 6024 and 6024F provide eight priority queues per port. Packets can be classified based on the Layer 2 IEEE 802.1p standard, the Layer 3 IP Precedence or IP Differentiated Services Code Point (DSCP) standard, or Layer 4 utilizing TCP/IP ports. Advanced flow-based policies enable the network administrator to implement rate limiting, metering and bandwidth guarantees to ports, link aggregation groups and VLANs.

## Robust Security

The security features of the PowerConnect 6000 Series help protect the network from accidental or malicious interference. MAC-based port security is designed to prevent unauthorized MAC addresses from accessing the network. This feature can send an SNMP trap to alert select administrators whenever an unknown MAC address attempts to access the network, and can shut down the port if desired. Access Control Lists (ACLs) deliver even tighter control over the network by limiting what types and volumes of traffic are allowed based upon the flow's source or destination MAC address, source or destination IP address, source or destination TCP/UDP port, DSCP value or IP Precedence. SSL and SSH encryption offer the added security of encrypting switch management traffic. RADIUS support enables centralized, remote authentication of administrative access to the switch. SNMP access filtering provides a mechanism to limit network hosts that have SNMP access to the switches.

## High Availability

The PowerConnect 6000 Series offers several high availability features to meet demanding enterprise networking needs. Hot-swappable power supplies and cooling fans on the switches help minimize network downtime. The PowerConnect 6024 and 6024F support Virtual Redundant Routing Protocol (VRRP) to dynamically replicate routing information across the LAN. Dual configuration files and firmware images are also available for rollback purposes if the switch setup has a problem for any reason. In addition, the switches also support an Integrated Cable Tester feature that can identify and locate a variety of potential cable problems.



PowerConnect 6024



PowerConnect 6024F



Rear view of PowerConnect 6024 and 6024F

Simplicity and Performance. Easy as **DELL™**

Visit [www.dell.com/networking](http://www.dell.com/networking) for more information.

## NETWORK MANAGEMENT

Dell OpenManage Network Manager offers comprehensive, centralized network management that helps lower total cost of ownership and increase network security and efficiency. It automates labor-intensive tasks and routine operations to help free up your time. The graphical interface, along with wizard-based tools, can minimize training time further making the most of your resources. Network Manager also allows you to easily monitor, maintain and troubleshoot your network. It provides visibility into potential network problems, sometimes even before they occur, so you can keep your network switches dependably healthy.

OpenManage Network Manager provides the following advanced capabilities making it ideal for large, complex networks:

- **Equipment Discovery Wizard** allows for the discovery of IP-based network elements
- **Equipment Manager** delivers a powerful and easy way to configure PowerConnect switches
- **Equipment Group Manager** delivers one-to-many functionality of PowerConnect switches so that configuration changes and firmware deployments can be made to many switches through a single operation
- **Inventory Reporting** provides inventory reporting capabilities
- **Advanced Scheduling** schedules network management operations, such as backup and configuration changes, so that activities can take place according to a managed and pre-determined schedule
- **Event Management** offers advanced event management through the capturing, filtering and forwarding of events and traps
- **Profile Manager** affords users the ability to capture statistics from PowerConnect switches and graph these statistics for troubleshooting and network optimization



### Additional Information

Dell OpenManage Network Manager is available for download at no additional charge from <http://support.dell.com> or as a Media Kit (with CD and printed documentation) for a small fee. For more information, visit <http://www.dell.com/networkmanager>.

## Key Customer Benefits

### Scalability

The PowerConnect 6024 and 6024 F provide a variety of Layer 3 features that allow them to be deployed in applications such as routing at the network edge, aggregation of network traffic to the backbone, and core routing in small to medium networks or branch office applications.

### Standards-based advanced switching features and remote management

The PowerConnect 6000 Series switches support open standards-based advanced features that help optimize overall network performance, availability and security. Remote management is supported via a web browser-based interface as well as Telnet access to the CLI. SNMP-based remote management is accomplished with a broad variety of management tools like the Dell OpenManage Network Manager.

### Advanced security capabilities

With MAC-based port security, multi-layer Access Control Lists (ACL), SSL/SSH management traffic encryption, management authentication (including RADIUS) and SNMP access filtering, the PowerConnect 6024/6024F switches deliver advanced user-customizable network security capabilities.

### Enhanced availability

Integrated dual hot-swappable power supplies and cooling fans improve system uptime and minimize the potential for an inoperable switch. The dual hot-swappable power supplies can also help save on infrastructure costs during deployment by providing the integrated function of an external redundant power supply. Additionally, the PowerConnect 6024 and 6024F switches support Virtual Redundant Routing Protocol (VRRP) to enhance availability at the router level.

## Typical Implementations

Diagram 1. Cost-Effective Gigabit Datacenter Solution

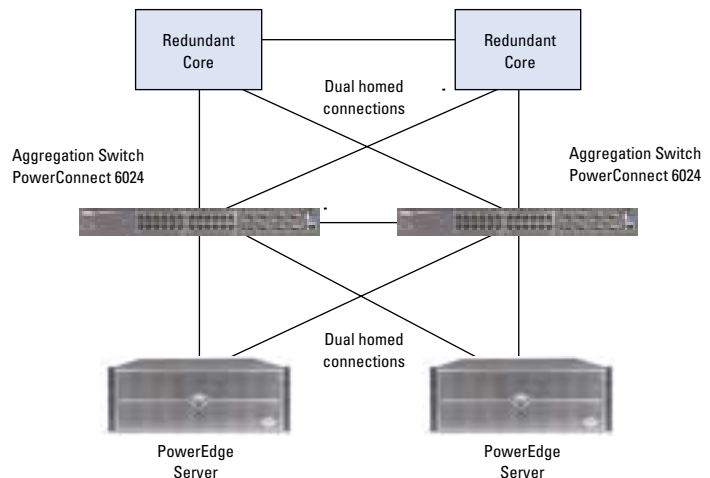


Diagram 1 is an example of a resilient datacenter center designed using PowerConnect 6024 switches. This solution provides high availability wire-speed Gigabit routing capabilities to access a large number of servers. Servers can be connected to the switches using either copper or fiber cabling. Each switch is capable of supporting up to 21 servers while providing resilient Gigabit Ethernet uplinks to the network core. Additionally, the two PowerConnect 6024 switches can be connected to each other to provide higher availability. In the event of an uplink from either switch losing communication with the core, traffic can still be routed via the failover links. With the Virtual Redundant Routing Protocol (VRRP), the routing tables are replicated between the two switches. To ensure high availability, the PowerConnect 6024's integrated redundant hot-swappable power supplies and cooling fans maximize the uptime of the network.

**Diagram 2. Aggregation Solution**

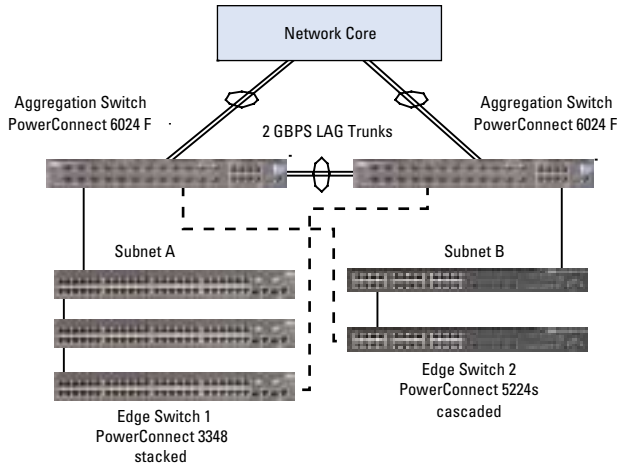


Diagram 2 is an example of a traffic aggregation solution designed using PowerConnect 3348, 5224 and 6024F switches. This solution can provide high availability and fail-over protection for a large number of desktop clients.

In this example, the PowerConnect 6024F switches connect different subnets or VLANs to the network core using multiple fiber SFP ports as a single IEEE 802.3ad aggregated link. The aggregation switch provides Layer 3 capabilities which enable it to route traffic without having to switch all packets to the core. Data leaving the stack of Edge Switch 1 with a destination address at Edge Switch 2 would not have to take the additional hops of going to the core of the network and then back out to Edge Switch 2.

In this scenario, the aggregation switch can actually run multiple links to the network core and to the edge switches to provide faster connectivity. Edge Switch 1 consists of three stacked PowerConnect 3348s that are linked together via their stacking modules. One uplink is connected to the first PowerConnect 6024F at the top of the stack, while a second uplink is connected to the redundant PowerConnect 6024 F. This creates multiple data paths to the core, providing high availability of the network data. Edge Switch 2 is similar except the switches are cascaded to each other via their Gigabit ports. Multiple Spanning Tree protocol on the PowerConnect 6024 switches is enabled to help prevent a broadcast storm. RIP or OSPF routing can be enabled to route data between these subnets.

**Diagram 3. Mini-Core or Remote Office Solution**

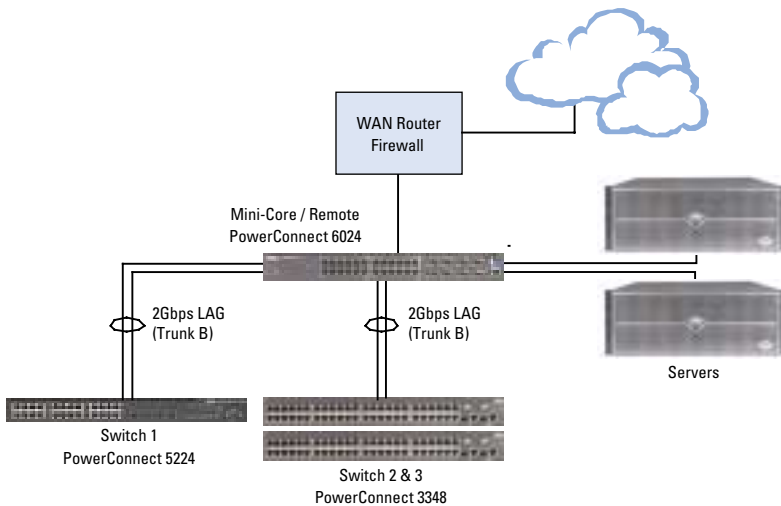


Diagram 3 is an example of a Gigabit Ethernet mini-core or remote office solution designed using the PowerConnect 6024. This solution provides Gigabit Ethernet connectivity to the local servers and WAN/firewall devices. Uplink trunks from switches 1, 2 and 3 are aggregated to the PowerConnect 6024, thus providing a high speed connection from the edge switches. This solution provides both high-performance and high reliability while offering Layer 3 routing functionality in a mini-core application. The solution can easily scale by adding additional PowerConnect 6024 switches to create a redundant mini-core network. With the Virtual Redundant Routing Protocol (VRRP), the PowerConnect 6024 switches will synchronize their routing tables with one another to ensure fail-over support in the event of a switch or link failure. Additionally, the PowerConnect 6024 can be configured with up to seven trunk groups (with a maximum) of seven ports in a trunk group to provide high performance link aggregation.

## DELL TRAINING & CERTIFICATION

The new Dell Certification Program includes three focus areas: servers, storage, and networking. As part of the Dell Certified Networking Professional (DCNP) track, the course Building Dell Multilayer Networks provides you the skills necessary to configure and manage PowerConnect switches in various network environments. But it is more than just a switch course. Hands-on labs prepare you for the management and planning of your growing network infrastructure. You will perform various switch configurations, analyze network traffic, and build high-performance and resilient data networks with Dell's latest networking products.

### You will learn to:

- Manage PowerConnect switches using both the Web interface and the CLI
- Extend a data network by implementing VLANs
- Implement Spanning Tree and Rapid Spanning Tree to eliminate loops and provide resiliency
- Deploy Quality of Service for optimum performance of delay-sensitive applications
- Enhance network security using Access Control Lists
- Implement Layer 3 functionality using the RIP and OSPF routing protocols
- Locate and correct various network problems
- Use OpenManage Network Manager to monitor and optimize network performance

To learn about Dell Training & Certification or to register for the Building Dell Multilayer Networks course, go to any of the following:

Register: [www.dell.com/register4training](http://www.dell.com/register4training)

Info: [www.dell.com/training/lookingtoyou](http://www.dell.com/training/lookingtoyou)

Email: [US\\_Training@Dell.com](mailto:US_Training@Dell.com)

Phone: 1.866.360.3506 (US & Canada only)

# Dell PowerConnect 6000 Series

## DELL SERVICES

By leveraging the proven advantages of our direct model, including tailored service and support, low cost and a single point of accountability, Dell Services can provide you with fast, effective, affordable service offerings at any point in your IT process. Whether you need support, installation, deployment, training and certification programs, or professional consulting services, individually or bundled as a total package, Dell promises to be your single point of accountability at all times.

### Standard Warranty and Service Plan

- Three-year limited warranty<sup>1</sup> supplemented with three years of Next Business Day Advanced Exchange Service<sup>2</sup>
- 7-day/24-hour Telephone Technical Support for troubleshooting and diagnosis of Dell hardware
- 7-day/24-hour Online Support Services
- Lifetime firmware upgrades (available for download via support.dell.com)

### Warranty and Service Upgrades

You can upgrade to three years of Advanced Exchange Service with Same Day response, or five years of Advanced Exchange Service, with either Same Day or Next Business Day response. You may also choose three or five years of On-Site Hardware Support Service<sup>2</sup>, with either Same Day or Next Business Day response.

## ENTERPRISE SUPPORT SERVICES

Technology is a significant investment, and it pays to have a partner who can help you minimize costly downtime. Through our Enterprise Support Services offerings, Dell provides tiered support service packages with the flexibility to customize the offering to meet your specific needs across a wide range of computing environments. With proactive and reactive support options which include hardware and software support with varied response levels, account management, and remote resolution, Dell provides support solutions that meet your needs cost effectively.

### Silver Enterprise Services

Enhanced, prompt hardware and software support services. Includes:

- 4-Hour Same Day On-Site<sup>2</sup> response service with advance exchange hardware replacement
- 7x24 Remote Hardware Support by the Silver Queue
- Remote Software and Storage Support

### Gold Enterprise Services

Rapid, expert support services for critical systems. Includes:

- 4-Hour Same Day On-Site<sup>2</sup> response service with advance exchange hardware replacement
- Engineer-to-Engineer Telephone Support with direct access to Dell's senior-level Gold Queue
- Technical Account Management Team for attentive support and escalation management
- Customer-Defined Call Priority so that you maintain control of your case
- On-Demand Engineer Dispatch for select Severity 1 incidents to quickly receive on-site service
- Software Support Resolution Pack
- Web-Based Remote Troubleshooting to quickly mobilize experts

## FEATURES

### Port Configuration

- 24 10/100/1000BASE-T ports
- 8 Gigabit Ethernet SFP slots (combo) for fiber support
- Out-of-band RS-232 and 10/100BASE-T management console ports

### Performance

- Switching Capacity 48.0 Gbps
- Forwarding Rate 35.6 Mpps
- Up to 14,000 MAC Addresses
- 256 MB of CPU SDRAM
- 64 MB of packet buffer memory, 32 MB of flash memory

### Management

- Web-based management interface
- Industry-standard command line interface
- SNMPv1 and SNMP v2c supported
- 4 RMON groups (history, statistics, alarms and events)
- BootP/DHCP IP address management; DHCP Helper/Relay
- Syslog remote logging

### Quality of Service

- 8 priority queues per port, adjustable WRR and Strict Priority scheduling
- Layer 2/3/4 Trusted Mode (IEEE 802.1p tagging, DSCP, TCP/UDP)
- Advanced Mode using Layer 2/3/4 flow-based policies, including metering/rate limiting, marking and bandwidth guarantees

### Security

- Port-based MAC Address alert and lock-down
- Layer 2/3/4-based Access Control Lists (ACLs); ACLs can be bound to ports, VLANs or link aggregation groups; up to 1024 ACLs supported, up to 1024 Access Control Entries (ACEs) per ACL, up to 1024 ACEs per switch
- RADIUS support for switch management access
- SSL/SSH encryption for switch management traffic
- SNMP access filtering

### VLAN

- IEEE 802.1Q tagging, port-based and protocol-based, up to 4063 VLANs
- Dynamic VLANs with GVRP support

### Multicast

- Static IP Multicast
- Dynamic Multicast – IGMP, IGMP snooping

### Switching Features

- Link Aggregation, up to 7 ports per aggregated link (IEEE 802.3ad) and up to 7 aggregated links, LACP support
- Broadcast storm control
- Port mirroring with one-to-many support
- Jumbo frame support up to 9018 bytes

### Routing Features

- Static routes
- RIP v1/v2, up to 128 routing interfaces
- OSPF v1/v2, up to 128 routing interfaces
- VRRP (Virtual Router Redundancy Protocol)
- DVMRP (Distance Vector Multicast Routing Protocol)
- Up to 24,000 unicast routes
- Up to 8,000 multicast routes
- Up to 128 routing interfaces per VLAN
- Up to 256 multicast routing groups

### Availability

- Spanning Tree and Rapid Spanning Tree with Fast Link support
- Dual firmware images
- Configuration file upload and download via TFTP
- Dual internal redundant hot-pluggable power supplies
- Dual internal redundant hot-pluggable cooling fans
- Integrated Cable Tester

### Chassis

- 440 x 460 x 44mm (17.5 x 18.1 x 1.7 inches)
- 1U, rack-mounting kit included
- Approximate weight: 23.3 lbs.

Simplicity and Performance. Easy as 

Visit [www.dell.com/networking](http://www.dell.com/networking) for more information.

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<sup>1</sup>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 [www.dell.com/us/en/gen/services/service\\_service\\_plans.htm](http://www.dell.com/us/en/gen/services/service_service_plans.htm). <sup>2</sup>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.

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