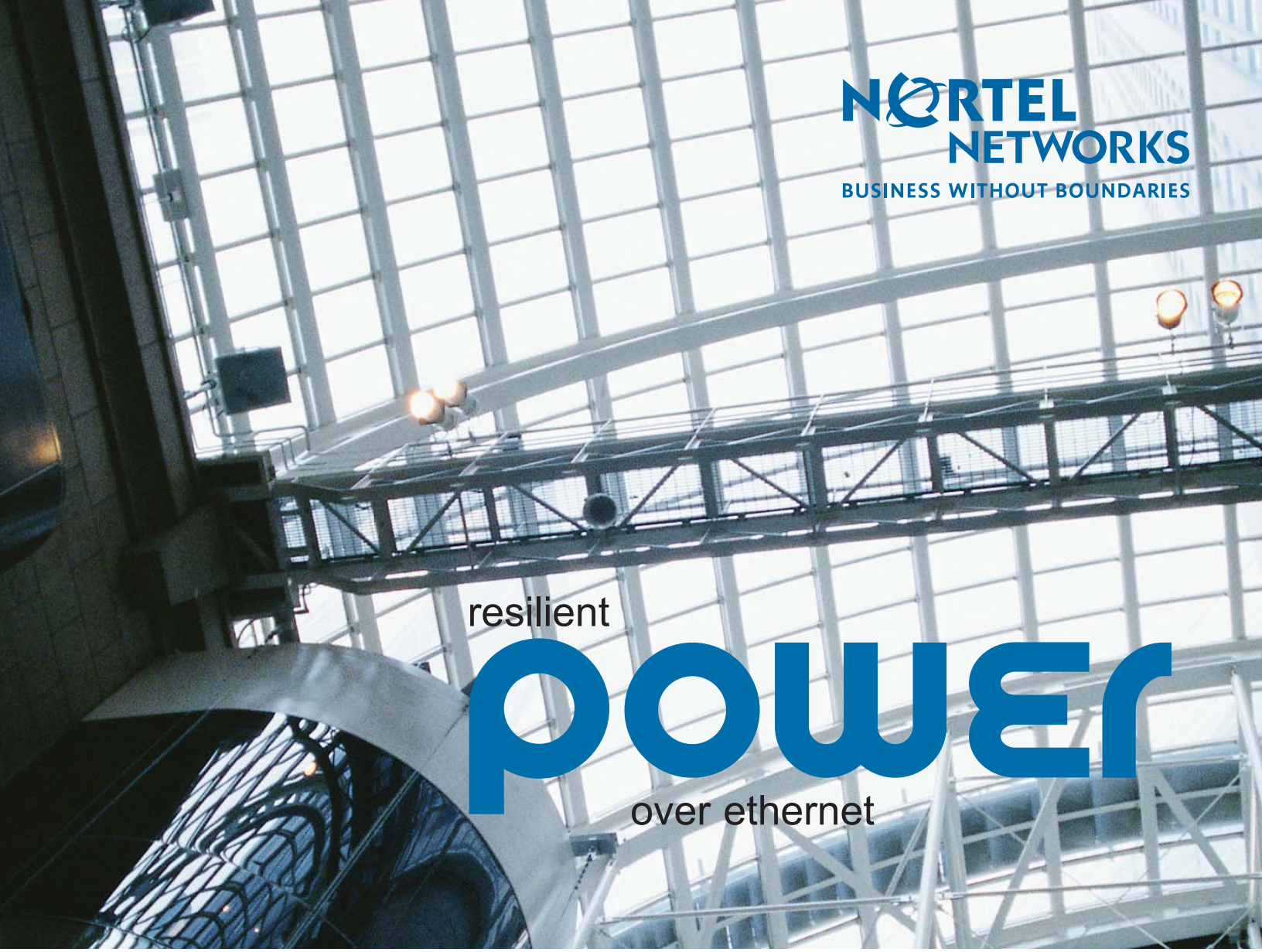


Product Brief

Nortel Networks BayStack 460-24T-PWR Power over Ethernet Switch

BayStack 460-24T-PWR Power over Ethernet Switch

Benefits

- Power to IP phones, wireless access points, network cameras, security and lighting devices, and access control devices
- Provides power to all 24 ports
- IEEE 802.3af compliant to power multiple vendors' equipment
- Automatically provides power to a detected device
- Enables data and power to be transmitted over a single cable without using power outlets
- Flexible stacking across different BayStack switches—a stack is managed as a single entity with a single IP address
- Simple software upgrades with single image for different switches
- Network availability with QoS features
- Fail-safe stacking design assures continuous uptime
- Resilient connectivity for minimal network downtime
- Secure access and data traffic protection

Part of the successful BayStack* family, the BayStack 460-24T-PWR Power over Ethernet Switch is a resilient, secure stackable switch with IEEE 802.3af Power over Ethernet (PoE) capabilities to power devices such as IP phones, wireless access points, network cameras, security and lighting devices, and access control devices (badge readers). The switch has advanced features such as advanced Quality of Service (QoS) and high resiliency, with the addition of Power over Ethernet capability. It enables enterprise customers to power devices while maintaining connectivity to standard 10/100 Mbps Ethernet devices such as PCs and servers. All 24 ports of the BayStack 460 Switch can be powered.

BoSS (BayStack operating system Switching Software) allows the BayStack 460 Switch to stack with other BayStack switches. BoSS also simplifies software upgrades with a single image for different BayStack switches.

Figure 1. The BayStack 460-24T-PWR Power over Ethernet Switch

High-density Power over Ethernet switch

The BayStack 460-24T-PWR Switch has 24 10/100 Mbps autosensing ports, one MDA (Media Dependent Adapter) slot for uplink connectivity, and one cascade module slot for stacking. Up to eight switches can be stacked to achieve up to 224 10/100 ports (using 4-port 10/100 Mbps MDA per switch) that can be easily managed as a single unit. The 2.5 Gbps cascading bandwidth offers dedicated bandwidth between switches without sacrificing any uplink ports. The uplink ports can be used for connections to backbone switches such as the Passport* 8600 Switch.

Full autosensing on every port

Every UTP port on the BayStack 460 Switch is equipped with autosensing technology to automatically detect and support the speed and mode of a connected device. The ports determine whether a connected device is operating at 10 Mbps or 100 Mbps, and automatically adjust to the optimal speed. Each of the switched ports also automatically detect and support full-duplex connections to servers, power-user end-stations or other switches, as well as half-duplex connections to legacy NICs or hubs.

IEEE 802.3af compliant

The BayStack 460-24T-PWR Switch is IEEE 802.3af compliant. It can provide Power over Ethernet to any IEEE 802.3af compliant device such as IP phones, wireless access points, network cameras, security and lighting devices, and access control devices. The benefit of being interoperable with standards-based equipment means that customers are not forced to tie themselves to any one vendor, as the switch has the flexibility to power multiple vendors' devices. It can supply power up to 15.4 Watts per port, which meets the IEEE 802.3af standard. This is more than sufficient to power most devices.

Auto discovery feature

The BayStack 460-24T-PWR Switch automatically recognizes the connection of a device and immediately sends power to it. This automatic capability ensures fast connectivity without manual intervention.

Dynamic power management

Each port can be configured to limit the power delivered to a device. Each port can also be configured for power priority level—low, high, and critical. On the switch, total available power is monitored. In the case where all available power is fully utilized, the switch may turn off lower priority ports and turn on higher priority ports.

Active circuit protection

The BayStack 460 Switch can automatically disable a port if there is a short. All the other ports on the switch will remain active and will not be affected by the disabled port.

Plug-n-play IP Telephony switching

The BayStack 460 Switch provides simplified Web-based configurations on data and power properties. The graphical user interfaces make it simple to set up data and power configurations.

Convenience of a single cable

With the BayStack 460 Switch, data and power can be transmitted over one cable without using a power outlet. There is no need for a separate cable connecting the device to a power outlet.

Significant space and cost savings

Traditionally, a mid-span patch panel device connects via a UTP cat 5 cable to a standard Ethernet switch and then the mid-span patch panel device sends power over another standard UTP cat 5 cable to the device such as an IP phone needing power. In essence, two units are needed for Power over Ethernet capability. In contrast, the BayStack 460 Switch integrates standard LAN switch functionality with the power over UTP cable capability of a mid-span patch panel into one unit. This results in significant cost and space savings.

BoSS (BayStack operating system Switching Software)

With BoSS, Nortel Networks becomes the first vendor to offer a single software image that can support four different switch types: BayStack 460-24T-PWR, BayStack Business Policy Switch, BayStack 470-48T, and BayStack 470-24T. BoSS simplifies network operations and provides the flexibility of stacking different switches in the same stack.

Simplified network operations

BoSS simplifies network operations by reducing the number of steps required for switch software updates. With BoSS, you need to download only a single image from Nortel Networks for four different switch types. Loading the image to different switches is also considerably simplified. The image is loaded only to the base unit of the stack which automatically loads it to other switches in the stack. Finally, keeping track of the version numbers is much easier as only one version number needs to be remembered.

Flexible stacking with other BayStack Switches

Using BoSS, the BayStack 460 Switch is able to stack with other BayStack switches.

BayStack 460-24T-PWR Switch can be stacked with any combination of BayStack 470-48T, BayStack 470-24T, BayStack Business Policy Switch, and BayStack 450.

It should be noted that the BayStack 470-48T cannot be stacked with the BayStack 450.

Using BoSS v3.0 or higher, a maximum of eight switches can be stacked in any valid combination *(Table 1)*.

Table 1. Stacking matrix

	BayStack 460-24T-PWR	BayStack 470-24T	BayStack 470-48T	BayStack Business Policy Switch	BayStack 450
BayStack 460-24T-PWR with BoSS v3.1	Yes	Yes	Yes	Yes	Yes
BayStack 470-24T with BoSS v3.1	Yes	Yes	Yes	Yes	Yes
BayStack 470-48T with BoSS v3.1	Yes	Yes	Yes	Yes	No
BayStack Business Policy Switch with BoSS v3.1	Yes	Yes	Yes	Yes	Yes
BayStack 450*	Yes	Yes	No	Yes	Yes

*Note: *BayStack 450 must have BayStack 450 software v4.2 or higher.*

BoSS v3.1 features

BoSS version 3.1 is currently downloadable from the Web for free and includes support for the following features:

- 802.3ad link aggregation
- Unit replacement feature
- User-based policies
- Copper GBIC and other GBIC support
- Custom Autonegotiation Advertisements (CANA)
- ASCII configuration generator
- Simple Network Time Protocol (SNTP)
- Enhanced message logging

These features are explained in detail later in this brief.

802.3ad link aggregation

IEEE 802.3ad provides an industry-standard method for bundling multiple links together to form a single trunk between two networking devices. BoSS 3.1 supports both Dynamic Link Aggregation Group (LAG) trunks and MLT trunks. Once configured, the Link Aggregation Group or trunk group is managed by the Link Aggregation Control Protocol (LACP). BayStack supports both Link Aggregation and MLT groups. Up to six LAG or MLT groups are supported. The maximum number of active links per group is four. The Link Aggregation allows more than four links to be configured in one Link Aggregation group (LAG). The first four high priority links will be active links and the lower priority link will be a standby link. When one of the active links goes down, the standby link will become active. This feature can be implemented by using Command Line Interface, Device Manager, or SNMP.

Unit replacement feature

In the unlikely event that a switch fails in a stack, the affected switch can easily be replaced without disrupting the stack. This feature provides the capability of upgrading a new unit with the configuration of the affected unit off-line, before adding the new unit to the stack. The configuration of the affected switch may be copied from the Trivial File Transfer Protocol (TFTP) server to the new switch. The new switch can then be inserted into the stack without requiring a reboot of the entire stack. This feature can be implemented by using menu, Web interface, or CLI commands.

User-based policies

This feature enables network services—i.e., QoS—to follow the user regardless of the PC logged into or the port connected to. The way this feature works is the switch asks a user to authenticate using EAP and passes username/password information to the RADIUS server. The RADIUS server provides the user's role/group attributes to the switch that allows user access to the port with the default configuration. The switch then passes role/group/port information to the Optivity* Policy Services (OPS) server that configures the user port based on the specific policy information.

Custom Autonegotiation Advertisements (CANA)

This feature enables the network manager to tune the capabilities that a particular Ethernet port can advertise via autonegotiation. The capabilities include half-duplex and full-duplex modes with speeds of 10, 100, and 1000 Mbps. Autonegotiated Ethernet ports

establish a connection based upon the highest common capabilities. This feature is implemented by using CLI commands and saves the network manager from having to go to each workstation and switch to configure a "fixed" speed.

ASCII configuration generator

The ASCII configuration generator allows the configuration settings of the switch to be displayed or saved to an external ASCII configuration file made up of a series of CLI commands. This editable ASCII configuration file can then be uploaded to a switch from an external file server.

The ASCII configuration file contains configuration settings for the following network management applications:

- Core applications (system information, topology, etc.)
- Internet Protocol
- Multi-Link Trunking
- Port configuration
- Partial Spanning Tree configuration, including configuration of port priority and path cost
- VLAN configuration
- Quality of Service (QoS)
- RMON

Simple Network Time Protocol (SNTP)

Simple Network Time Protocol allows the synchronization of the switch or stack's clock to the real-time clock on the SNTP server. If the system (switch or stack) uses SNTP, then SNTP time is used to time-stamp system log (Syslog) messages. If SNTP is not in use, then the system uses a time-stamp relative to boot time.

Enhanced message logging

Several new features have been added for enhanced message logging. Log entries can now be time-stamped with real time when the SNTP is in use. With the remote logging feature, the system has the ability to copy internal system log messages onto a remote Syslog server. Lastly, the Show Logging feature gives the administrator flexibility to view and sort the login entries in forward or reverse manner.

Fail-safe stacking and resiliency

A key differentiation for the BayStack 460 Switch is its resilient stacking feature. The BayStack 460 Switch can stack up to eight units with a cascade stacking design, assuring continuous uptime even if a switch in the stack should fail. A loop-back—or redundant cascade cable—is used to seamlessly connect the entire stack to eliminate any single point of failure *(Figure 2)*.

Multi-Link Trunking

Multi-Link Trunking (MLT) enables grouping of links between the BayStack 460 Switch and another switch or a server to provide greater bandwidth with active redundant links.

With Nortel Networks unique Distributed Multi-Link Trunking (DMLT) feature, trunked ports can span multiple units of the stack for fail-safe connectivity to mission-critical servers and the network center *(Figure 3)*. This can provide bandwidth of up to 800 Mbps (when used with 10/100 ports) or up to 8 Gbps (when used with Gigabit uplink ports) with active redundant links in one trunk. Up to six trunks are supported per switch or stack.

Figure 2. In the unlikely event of a switch failure, the stack integrity is maintained: cascade signals loop back at point of failure.

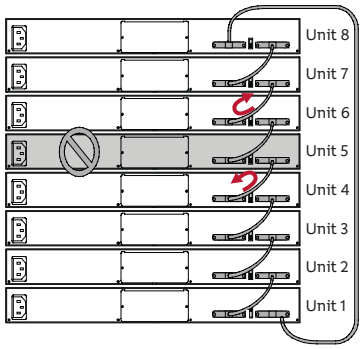


Figure 3. Distributed Multi-Link Trunking across stack for higher bandwidth and fault tolerance

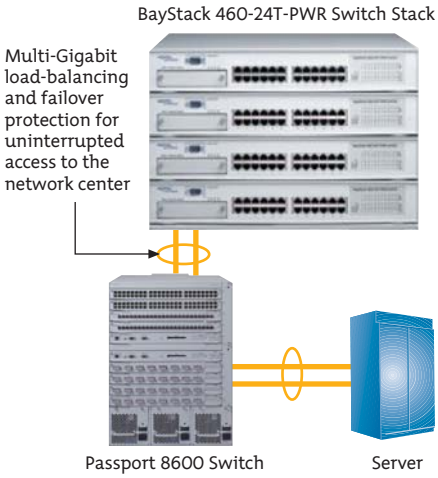
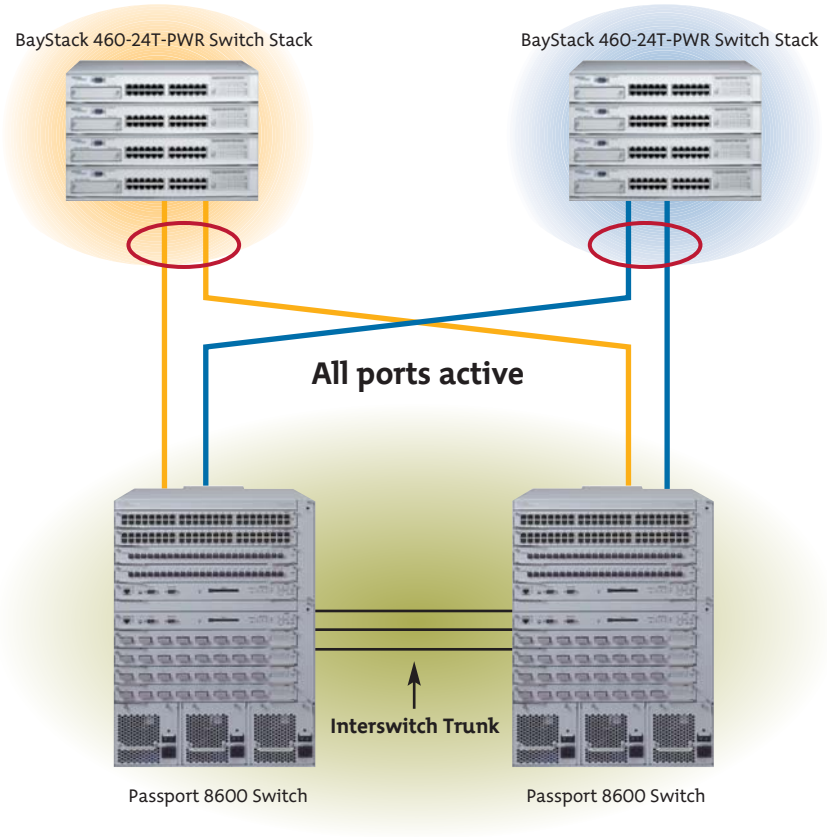


Figure 4. Split Multi-Link Trunking (SMLT)



The Split Multi-Link Trunking (SMLT) feature of Passport* 8000 Switches eliminates single points of failure and allows wiring closet switches, such as the BayStack 460, to have multiple active connections to the network core. The BayStack 460 Switch's ability to have multiple connections to a Passport 8600 network core allows customers to double network bandwidth with no extra investment. The Passport 8600 provides a self-healing network which delivers the reliability and availability required by today's mission-critical applications. By combining the reliability of the Passport 8600 with the resilient trunking features of the BayStack 460 (DMLT, MLT, etc.), Nortel Networks has created the next generation of flexible networking solutions *(Figure 4)*.

Common look and feel

All BayStack switches, including the BayStack 460 Switch, have a common "look and feel" which reduces training costs. This allows the switches to be managed in a similar fashion via a broad set of management tools. These tools include Web, Command Line Interface (CLI), Java™-based Device Manager (JDM), Optivity* Network Management System (NMS), Optivity Switch Manager (OSM), and Optivity Policy Services (OPS).

End-to-end IP Telephony

The BayStack 460 Switch provides enterprises with another option for end-to-end deployment of IP Telephony. Succession* 1000, Business Communications Manager, Meridian*, and BayStack all provide the choices that allow enterprises—from small and medium businesses to large campus infrastructures—to deploy the solution that is right for them and offers the flexibility to implement infrastructure changes at their own pace. Figure 5 depicts an example of a small- to mid-sized enterprise solution with the BayStack 460 Switch. Figure 6 shows an example of a large enterprise solution.

MAC addresses

BayStack 460 Switches support up to 16,000 MAC addresses per switch or stack for deployment of large-scale enterprise networks with many attached devices and workgroups, allowing for scalability and cost-effectiveness.

VLAN support

Up to 256 port-based VLANs can be configured per individual switch or per stack to extend the broadcast domain and segment network traffic. The 256 VLANs can be spread among port-based and MAC source address-based VLANs (up to a maximum of 48 MAC source address-based VLANs). The 256 VLANs can be on a standalone switch or across a stack. Protocol-based VLANs allow switch ports to be assigned to a broadcast domain based on the protocol information within the packet. These VLANs can localize broadcast traffic and assure that the specified protocol type packets are sent only to the protocol-based VLAN ports.

Shared VLAN (SVL) and individual VLAN (IVL) learning are supported. With SVL support, all VLANs in the switch share the same forwarding database. IVL allows individual VLANs to have separate forwarding databases within the switch, and it allows the switch to handle duplicate MAC addresses if the addresses are in different VLANs.

IGMP snooping

The BayStack 460 Switch features IP Multicast support by examining ('snooping') all Internet Group Multicast Protocol (IGMP) traffic in hardware at line rate, and filtering out (dropping) unwanted IGMP packets such as PING from disrupting network or end-station performance.

Multiple spanning tree protocol groups

The BayStack 460 Switch supports multiple Spanning Tree Groups (STGs). It supports a maximum of eight STGs, either all in one standalone switch or across a stack consisting solely of BayStack 460 Switches. Multiple STGs provide multiple data paths, which can be used for load balancing and redundancy.

Command Line Interface (CLI)

The CLI is used to automate general management and configuration of BayStack 460 Switches. The CLI is used through a Telnet session or through the serial port on the console.

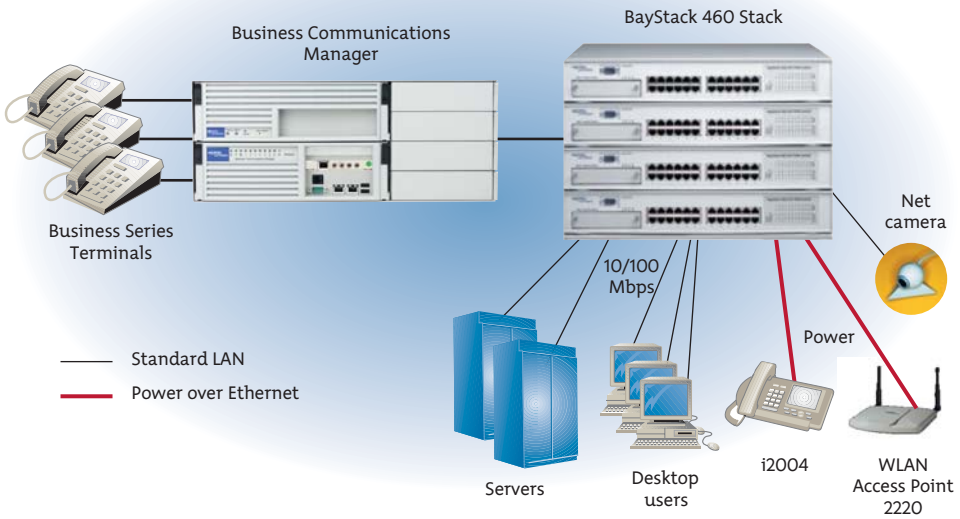
ASCII configuration file

The BayStack 460 Switch can download a user-editable ASCII configuration file from a Trivial File Transfer Protocol (TFTP) server. The ASCII configuration file can be loaded automatically at boot time or on demand using the management systems (console menus or CLI). Once downloaded, the configuration file automatically configures the switch or stack according to the CLI commands in the file. This feature allows the flexibility of creating command configuration files that can be used on several switches or stacks with minor modifications.

Supports Spanning Tree Protocol

Built-in support for Spanning Tree Protocol (IEEE 802.1D) detects and eliminates logical loops in the network. When multiple paths exist, the switch will automatically place some ports on standby to form a network with the most efficient traffic pathways, avoiding the continual looping of frames.

Figure 5. Small to medium enterprise solution



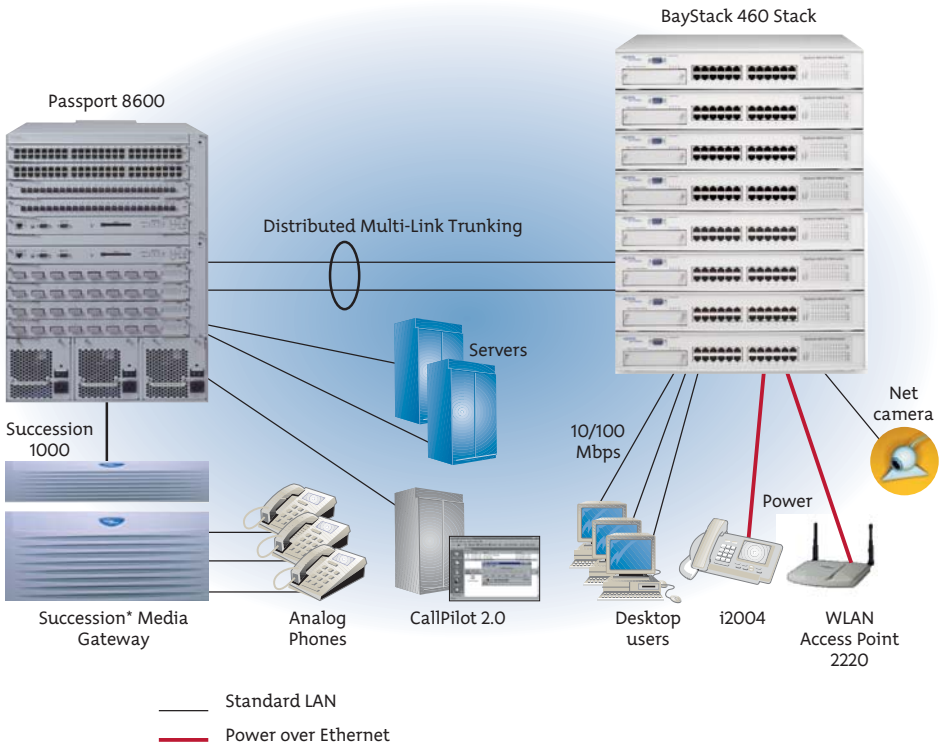
Port mirroring

The port mirroring feature (sometimes referred to as 'conversation steering') allows the network administrator to designate a single switch port as a traffic monitor for a specified port. Port mirroring copies packets flowing into a specified port and sends the replicated data to the mirrored port for in-depth analysis of switched traffic patterns to troubleshoot problems and optimize network configurations. Additionally, an external probe device can be attached to the designated monitor port.

Advanced management features

BootP and TFTP support allows centralized switch IP address assignment, software upgrades, and SNMP agent updates over the network. The RADIUS-based security feature uses the RADIUS (Remote Authentication Dial-In User Services) protocol to authenticate local console and TELNET logins.

Figure 6. Large enterprise solution



LED indicators

The LED indicators on the front panel make it easy to monitor the switch and port status and help in isolating and diagnosing switch problems.

Enhanced security

The BayStack 460 Switch offers the highest level of security with features including Secure Shell (SSH) version 2, IEEE 802.1x based security (also known as Extensible Authentication Protocol (EAP), assignment of proper VLAN and priority, Simple Network Management Protocol (SNMPv3), MAC-address based security, and RADIUS authentication.

SSHv2 supports strong authentication and encrypted communications. It allows you to log into the switch from an SSH client and perform a secure TELNET session using CLI commands. This feature is ideal for security-conscious customers such as federal governments.

For added security, BayStack 460 Switch supports the 802.1x-based security feature, EAP. Based on the IEEE 802.1x standard, EAP limits access to the network based on user credentials. A user is required to "login" to the network using a username/password; the user database is maintained on the authentication server (not the switch). EAP prevents network connectivity without password authorization for added security and control in physically non-secure areas. It is used where the network is not 100 percent physically secure or where physical security needs enhancement; for example, banks, trading rooms, or classroom training facilities. EAP supports client access to the network and interoperates with Microsoft Windows XP and other compliant 802.1x clients.

SNMPv3 provides user authentication and data encryption for higher security. It also offers secure configuration and monitoring.

IP Manager List limits access to the management features of the BayStack 460 Switch by a defined list of IP addresses or IP address ranges/subnets, providing greater network security and manageability.

BaySecure MAC-address based security allows authentication of all access, not only to the switches for management and configurations, but also access to the infrastructure through these switches. This software feature limits access to only network-authorized and trusted personnel, including full tracking of network connections. With BaySecure, network access is granted or denied via proper MAC-address identification (up to a maximum of 448).

The RADIUS-based security feature allows you to set up network access control using the RADIUS security protocol. The RADIUS-based security feature uses the RADIUS protocol to authenticate local console and Telnet logins.

Power sharing options

The BayStack 460 Switch can be used in conjunction with the BayStack 10 PSU or NES (Network Energy Source) DC Power System from Powerware (*http://www.powerware.com/DC_Power/Network_Energy_Source.asp* and *http://www.nortelnetworks.com/prd/select/powerware.html*) to create a load sharing, RPSU, or UPS solution.

Load sharing

The BayStack 460 Switch provides up to 200 watts to power the devices. With the addition of a BayStack 10 PSU, up to 235 watts of total power can be supplied to devices. A 2-pin cable is required to connect from the BayStack 460 to the BayStack 10 PSU (AL2018008). With the addition of an NES DC power system, up to 370 watts of total power can be supplied to devices.

Redundant power supply unit support

Using a BayStack 10 PSU will provide up to 75 watts of power to be supplied to devices in case the power supply of the BayStack 460 fails. A 2-pin cable is required to connect from the BayStack 460 to the BayStack 10 PSU (AL2018008). Using an NES DC power system, up to 200 watts of power can be supplied to devices in case the power supply of the BayStack 460 fails.

Uninterruptible power supply support

Using a BayStack 10 PSU will provide up to 75 watts of power to be supplied to devices in case there is an electrical outage. Up to 15 minutes of battery life is provided (this will vary depending on the amount of modules installed on the BayStack 10). Using an NES DC power system, up to 200 watts of power can be supplied to devices in case there is an electrical outage. With an NES system, up to four hours of battery life is provided (this will vary depending on the amount of modules on the NES unit).

NES ordering information

For information on how to purchase NES systems, please visit this location: *http://www.nortelnetworks.com/prd/select/powerware.html or e-mail Powerware at nes.quotes@powerware.com.*

Network management

Web-based management

Web-based network management makes managing the BayStack 460 Switch stack easy with a Web browser. Summary, configuration, fault, statistics, application, administration, and support pages can be provided for the entire stack. Traffic classification and prioritization can be set via the Web-based QoS Wizard and advanced configuration tool. Real-time sampling provides up-to-date LED statistical information for stacked units. The Web interface also allows for static configuration of numerous parameters of the device. Plus, the stack can be managed as a single entity with one IP address.

On-box management

Network management begins with the device. The BayStack 460 Switch supports four groups of Remote Monitoring (RMON) on all ports and is SNMPv3 compliant. The four groups of RMON are Alarms, Events, History, and Statistics. RMON2 support is achievable via port mirroring and the use of an external probe. The SNMP agent software resides in the switch and uses the information it collects to provide management for all ports in the stack providing comprehensive network monitoring capabilities. In addition, the agent also provides the ability to set up policy-based networks by supporting the Common Open Policy Support (COPS) protocol.

Configuration management

The process of configuration begins with a single device but finishes across multiple devices. Java Device Manager is the device configuration tool for those functions that require communicating with a single device. It uses a common user interface and workflow that supports many Nortel Networks Ethernet switches. This commonality allows the network manager to become familiar with one tool instead of multiple tools. Optivity Switch Manager (OSM) 4.0 is a Java-based, real-time, configuration management application for Nortel Networks Ethernet products including the BayStack 460 Switch. It enables network managers to discover, view, and configure more than 500 network devices and their physical links on a topology map. Configuration is stored in NVRAM (Non-Volatile Random Access Memory).

Fault management and resolution

With Optivity Network Management System (ONMS), the network manager has quick access to the information required to manage and isolate all network events on BayStack 460 Switches. Tools, such as Physical Topology View, inform the network manager how a particular event is affecting the physical connectivity within the network. The 'End Node Locate' tool provides the ability to locate a failing end node and, with one mouse click, have access to the RMON statistics for the failing Ethernet port supporting that end node. These solutions provide visual and statistical tools necessary to quickly resolve any network event or to manage performance in real-time. The BayStack 460 Switches support "syslog" capability that helps in troubleshooting network issues.

Quality of Service

The BayStack 460 Switch's QoS features allow you to not just utilize bandwidth more efficiently, optimizing existing network resources and capabilities, but also provide packet classification and marking at the edge of the network, simplifying the QoS deployment at the aggregation and core of the network. By classifying, prioritizing, policing, and marking (DiffServ Code Point) LAN traffic, networks can offer reliable connectivity and required bandwidth for mission-critical applications like IP Telephony and mission-critical data applications to specific groups and users, and to individual devices.

For each of these applications, advanced QoS features support Internet Engineering Task Force (IETF) standard DiffServ QoS architecture—a packet classification based on the content of IP packet header fields (voice, video, data), traffic policing, and remote sniffing.

Queuing function

BayStack 460 Switch provides network availability for mission-critical applications, devices, and users. This is performed by classifying, prioritizing, and marking LAN IP traffic using up to eight hardware-based queues on every port, including the stacking ports based on the following parameters:

- MAC address-based filtering
- IP ToS/DSCP marking

- IP source address/destination address or subnets
- TCP/UDP source/destination port/port range
- IEEE 802.1p user priority bits
- Ingress physical source port
- IP Protocol ID (e.g., TCP, UDP, IGMP)
- EtherType (e.g., IP, IPX)
- IEEE 802.1Q VLAN ID

The BayStack 460 Switch also has the ability to read packets that have been marked from other devices such as the Passport 8600 Switch. Additionally, weighted round robin prevents normal priority traffic from being starved by expedited traffic (on a per-packet basis).

QoS and policy management

DiffServ QoS provides the ability to read, alter, prioritize, tag, or mark IP packets based upon information embedded in the Type of Service (ToS) field. The level of service can be marked in the embedded information inside the ToS field of each IP packet. DiffServ is based on the ToS field. The BayStack 460 Switch has application-specific integrated circuits (ASICs) to enable the DiffServ Code Point (DSCP) to be mapped to the IEEE 802.1p user priority bits to provide consistent QoS at Layer 3 (IP) and Layer 2 (Ethernet). The QoS policies can be configured via the BayStack 460 Switch's built-in Web-based management tools to facilitate QoS or alternatively, Optivity Policy Services can be utilized for dynamic end-to-end enterprise-wide policy and QoS management, facilitated through the Common Open Policy Service (COPS) protocol.

Quality of Service provisioning

With Optivity Policy Services, policies can be created through a simple and intuitive drag-and-drop workflow. Optivity Policy Services is the Policy Decision Point in a DiffServ QoS implementation.

Further benefits include:

- Simple intuitive policy creation
- Ability to re-use common filter sets
- Provision of a network-wide view of policies currently in use
- Ability to avoid QoS provisioning errors
- Centrally managed DSCP and 802.1p queue mapping tables
- Saved time in provisioning the network—as thousands of CLI or Web transactions are reduced to a few simple actions

Simplified QoS

The BayStack 460 Switch supports Nortel Networks Service Classes (NNSCs) which provide simplified QoS provisioning. NNSCs provide factory-default QoS configurations, eliminating the complexities often associated with QoS-enabled network deployments.

NNSCs provide default settings such as:

- DSCP marking per class
- DiffServ forwarding behavior (PHB) per class
- DSCP to queue mapping
- DSCP to 802.1p mapping
- Default scheduler per class

By classifying the traffic and placing it into an NNSC, complex QoS configurations are eliminated. NNSCs simplify the deployment of a QoS-enabled network with Nortel Networks switching solutions. Using the Web-based interface, select the NNSC that best suits the type of traffic or application being classified on each Nortel Networks switching product and take advantage of the default QoS settings. This saves on provisioning time but most importantly, ensures that the QoS functions are provisioned consistently across the network.

NNSCs are also supported on the Passport 8600 Routing Switch, BayStack 470 Switches, and the BayStack Business Policy Switch.

Gigabit Ethernet MDAs

The BayStack 460 Switch supports the latest Gigabit MDAs. Each of these MDAs will support eight output queues and support traffic shaping. The three MDAs are:

- BPS2000-1GT 1-port 1000BASE-TX MDA
- BPS2000-2GT 2-port 1000BASE-TX MDA
- BPS2000-2GE 2-port Small Form Factor GBIC MDA

With the dual-port small form factor GBIC MDA, you can plug up to two small form factor pluggable GBICs. There are three types of small form factor pluggable GBICs to choose from:

- 1-port 1000BASE-SX Small Form Factor GBIC (LC connector)
- 1-port 1000BASE-SX Small Form Factor GBIC (MT-RJ connector)
- 1-port 1000BASE-LX Small Form Factor GBIC (LC connector)

CWDM small form factor pluggable GBICs can also be used with the two-port small form factor GBIC MDA. With CWDM, a customer can dramatically increase the bandwidth supported over a single fiber. Instead of 1 Gigabit per fiber connection with a CWDM GBIC, eight wavelengths can be supported per fiber. In other words, eight gigabits of traffic can be supported across one single mode fiber. There are eight different wavelength GBIC options for 40 km and eight different wavelength GBIC options for 70 km.

Traffic Policing

Traffic Policing enables provisioning of different levels of service by limiting traffic throughput at the ingress (incoming) port of the BayStack 460 Switch. For example, if a port is set to certain speeds such as 10 Mbps, all traffic under 10 Mbps on that port will pass, and traffic that exceeds 10 Mbps on that same port is dropped. Service providers will find this especially useful to control bandwidth to their customers.

IP traffic shaping

IP traffic shaping offers the ability to smooth IP classified traffic from the Gigabit uplink ports of a single BayStack 460 Switch. While traffic policing is needed to provide different levels of service to data streams on the ingress ports, traffic shaping is needed to smooth the traffic on the uplink connection from the BayStack 460 Switch to the network core, yielding the most efficient bandwidth utilization. Service providers or carriers utilize this feature when they are selling Ethernet in place of traditional Frame Relay, ISDN, or ATM WAN access solutions. Some enterprise customers use traffic shaping as a mechanism to limit bandwidth without having to swap out physical interfaces, leaving them room to grow.

Summary

With more than 100 years in telecommunications, Nortel Networks is uniquely positioned to help your business reduce costs by combining voice and data into an integrated system. Why take a chance on a vendor that only understands part of the equation? Let us show you how the BayStack 460 Switch—along with other Nortel Networks products—can increase your profitability, streamline your business operations, increase productivity, and help you gain the competitive edge.

Technical specifications

Table 1. BayStack 460-24T-PWR Power over Ethernet Switch technical specifications

Performance specifications	
Switch fabric	2.56 Gbps
Frame forward rate (64-byte packets)	Up to 3.2 million packets per second (pps) maximum, learned unicast traffic
Memory	16MB SDRAM
Port forwarding/filtering performance (64-byte packets)	For 10 Mbps: 14,880 pps maximum For 100 Mbps: 148,810 pps maximum
Address database size	16,000 entries at line rate (32,000 entries without flooding)
Addressing	48-bit MAC address
Frame length	64 to 1518 bytes (IEEE 802.1Q Untagged) 64 to 1522 bytes (IEEE 802.1Q Tagged)
Data rate	10 Mbps Manchester encoded or 100 Mbps 4B/5B encoded
Interface options	
10BASE-T/100BASE-TX	RJ-45 (8-pin modular) connectors for MDI-X interface
100BASE-FX	SC and MT-RJ connectors for switched 100 Mbps (100BASE-FX) connections over 50/125 and 62.5/125 micron multimode fiber optic cable (2 km/6562 ft. maximum distance)
1000BASE-SX (Shortwave Gigabit Fiber)	MDA SC connectors for shortwave 850 nm fiber optic connections over multimode (550 m/1805 ft.) fiber optic cable
1000BASE-LX (Longwave Gigabit Fiber)	MDA SC connectors for longwave 1300 nm fiber optic connections over single-mode (3km/9843 ft.) or multimode (550m/1805 ft.) fiber optic cable
1000BASE-CWDM (40km)	LC connectors for 1470-1610nm (in 20nm intervals)
1000BASE-CWDM (70km)	LC connectors for 1470-1610nm (in 20nm intervals)
The BayStack 450-1GBIC MDA supports the following GBICs:	
1000BASE-SX	Uses shortwave 850 nm fiber optic connectors to connect devices over multimode (550 m or 1,805 ft) fiber optic cable
1000BASE-LX	Uses longwave 1,300 nm fiber optic connectors to connect devices over single mode (5 km or 3.1 mi) or multimode (550 m or 1,805 ft) fiber optic cable
1000BASE-XD	Uses single mode fiber to connect devices over distances up to 40 km (or 31 mi), depending on the quality of the cable
1000BASE-ZX	Uses single mode fiber to connect devices over distances up to 70 km (or 43 mi), depending on the quality of the cable. The ports on this GBIC operate only in full-duplex mode
LED Indicators	
Per-port status LEDs	10 or 100 Mbps port speed, Power over Ethernet detection, link status
System status LEDs	power, system, RPSU, stack mode, base mode

Network protocol and standards compatibility

IEEE 802.3af compliant
IEEE 802.3 10BASE-T (ISO/IEC 8802 3, Clause 14)
IEEE 802.3u 100BASE-TX (ISO/IEC 8802-3, Clause 25)
IEEE 802.3u Autosensing (ISO/IEC 8802-3, Clause 28)
IEEE 802.1p (Prioritizing)
IEEE 802.1Q (VLAN Tagging)
IEEE 802.3z (Gigabit)
IEEE 802.1D (Spanning Tree Protocol)
IEEE 802.3ad (static/dynamic)
IEEE 802.1s *
IEEE 802.1w *
IETF DiffServ

RFC support

RFC 791 (IP); RFC 792 (ICMP); RFC 793 (TCP); RFC 783 (TFTP); RFC 826 (ARP); RFC 768 (UDP); RFC 854 (TELNET); RFC 951 (Bootp); RFC 2236 (IGMPv2); RFC 1112 (IGMPv1); RFC 1945 (HTTP v1.0); RFC 2138 (RADIUS); RFC 1573 (IF-MIB); RFC 894 (IP over Ethernet); RFC 2674 (Q MIB); RFC 2030 (Simple NTP); RFC 1213 (MIB-II); RFC 1493 (Bridge MIB); RFC 2863 (Interfaces Group MIB); RFC 2665 (Ethernet MIB); RFC 2737 (Entity MIBv2); RFC 2819 (RMON MIB); RFC 1757 (RMON); RFC 1271 (RMON); RFC 1157 (SNMP); RFC 2748 (COPS); RFC 2940 (COPS Clients); RFC 3084 (COPS Provisioning); RFC 2570 (SNMPv3); RFC 2571 (SNMP Frameworks); RFC 2572 (SNMP Message Processing); RFC 2573 (SNMPv3 Applications); RFC 2574 (SNMPv3 USM); RFC 2575 (SNMPv3 VACM)

Technical Specifications

Table 1. BayStack 460-24T-PWR Power over Ethernet Switch technical specifications (continued)

Electrical specifications
Input voltage: 100 to 240 VAC at 47 to 63 Hz
Input power consumption: 400 W maximum
Input volt amperes rating: 440 VA maximum
Input current: 4.5 A @ 100 VAC, 2.25 A @ 240 VAC
Maximum thermal rating: 575 BTU/hr

Physical specifications
Weight: 5.8 kg (12.76 lb)
Height: 7.04 cm (2.77 in.)
Width: 43.82 cm (17.25 in.)
Depth: 38.35 cm (15.1 in.)

Environmental specifications
Operating temperature: 0° to 40° C (32° to 104°F)
Storage temperature: –25° to 70° C (-13° to 158°F)
Operating humidity: 85% maximum relative humidity, non-condensing
Storage humidity: 95% maximum relative humidity, non-condensing
Operating altitude: Up to 3024 m (10,000 ft.)
Storage altitude: Up to 3024 m (10,000 ft.)

Safety agency approvals
UL listed (UL 60950)
CUL (CAN/CSA-22.2 No. 60950)
CB certificate and report with all national deviations (IEC 60950/EN60950)

Electromagnetic emissions summary
Meets the following standards:
United States: FCC CFR47 PART 15, SUBPART B, Class A
Canada: ICES-003, ISSUE-3, Class A
Australia/New Zealand: AS/NZ 3548: 1995/A1:1997/A2; 1997, Class A
Japan: VCCI-V-3/02.04/ Class A
Taiwan: CNS 13438, Class A
Europe: EN 55022-1998/A1:2000 Class A
EMC Directive: 89/336/EEC: Directly published in the EMC Directive of 89/336/EEC with Modification 92/31/EED, 93/13/EC
EN 61000-3-2: 2000
EN 61000-3-3: 1995/A1:2001
Global: CISPR 22-1997/A1:2000, Class A

Electromagnetic immunity
Global: CISPR 24:1997/A1:2001
Europe: EN55024:1998/A1:2001

* Future software release

Ordering information

Table 2: BayStack 460-24T-PWR Power over Ethernet Switch ordering information

Order No.	Description
AL2001x20**	BayStack 460-24T-PWR Power over Ethernet Switch (24 10/100BASE-TX plus 1 MDA slot and 1 cascade module slot).
AL2033011	BPS2000-4TX 4-port 10/100 MDA
AL2033012	BPS2000-4FX 4-port 100BASE-FX MDA w/mini MT-RJ-type connectors
AL2033013	BPS2000-2FX 2-port 100BASE-FX MDA w/SC-type connectors
AL2033010	BayStack 400-ST1 Cascade Module (includes cascade cable)
AL2018001	BayStack 400-SRC Cascade Return Cable (1 meter)
AL2018002	BayStack 400-SSC Spare Cascade Cable (18 inch)
AL2018004	BayStack 400-SRC Cascade Return Cable (3 meter)
AL2033005^	BayStack 450-1SX 1-port 1000BASE-SX Single PHY MDA
AL2033006^	BayStack 450-1SR 1-port 1000BASE-SX Redundant PHY MDA
AL2033007^	BayStack 450-1LX 1-port 1000BASE-LX Single PHY MDA
AL2033008^	BayStack 450-1LR 1-port 1000Base-LX Redundant PHY MDA
AL2033009^	BayStack 450-1GBIC MDA (GBIC not included with MDA)
AA1419001~	1-port 1000BASE-SX Gigabit Interface Connector (GBIC), SC connector
AA1419002~	1-port 1000BASE-LX Gigabit Interface Connector (GBIC), SC connector
AA1419003~	1-port 1000BASE-XD Gigabit Interface Connector (GBIC)-40km SC connector
AA1419004~	1-port 1000BASE-ZX Gigabit Interface Connector (GBIC)-70km SC connector
AL2033014***	BPS2000-1GT 1-port 1000BASE-TX MDA
AL2033015***	BPS2000-2GT 2-port 1000BASE-TX MDA
AL2033016***	BPS2000-2GE 2-port Small Form Factor GBIC MDA (supports up to two Small Form Factor GBICs)
AA1419013	1-port 1000BASE-SX Small Form Factor GBIC (LC connector)
AA1419014	1-port 1000BASE-SX Small Form Factor GBIC (MT-RJ connector)
AA1419015	1-port 1000BASE-LX Small Form Factor GBIC (LC connector)
AA1419025	1-port 1000BASE-CWDM Small Form Factor GBIC—1470nm Wavelength (40km), LC connector
AA1419026	1-port 1000BASE-CWDM Small Form Factor GBIC—1490nm Wavelength (40km), LC connector
AA1419027	1-port 1000BASE-CWDM Small Form Factor GBIC—1510nm Wavelength (40km), LC connector
AA1419028	1-port 1000BASE-CWDM Small Form Factor GBIC—1530nm Wavelength (40km), LC connector
AA1419029	1-port 1000BASE-CWDM Small Form Factor GBIC—1550nm Wavelength (40km), LC connector
AA1419030	1-port 1000BASE-CWDM Small Form Factor GBIC—1570nm Wavelength (40km), LC connector
AA1419031	1-port 1000BASE-CWDM Small Form Factor GBIC—1590nm Wavelength (40km), LC connector
AA1419032	1-port 1000BASE-CWDM Small Form Factor GBIC—1610nm Wavelength (40km), LC connector
AA1419033	1-port 1000BASE-CWDM Small Form Factor GBIC—1470nm Wavelength (70km), LC connector
AA1419034	1-port 1000BASE-CWDM Small Form Factor GBIC—1490nm Wavelength (70km), LC connector
AA1419035	1-port 1000BASE-CWDM Small Form Factor GBIC—1510nm Wavelength (70km), LC connector
AA1419036	1-port 1000BASE-CWDM Small Form Factor GBIC—1530nm Wavelength (70km), LC connector
AA1419037	1-port 1000BASE-CWDM Small Form Factor GBIC—1550nm Wavelength (70km), LC connector
AA1419038	1-port 1000BASE-CWDM Small Form Factor GBIC—1570nm Wavelength (70km), LC connector
AA1419039	1-port 1000BASE-CWDM Small Form Factor GBIC—1590nm Wavelength (70km), LC connector
AA1419040	1-port 1000BASE-CWDM Small Form Factor GBIC—1610nm Wavelength (70km), LC connector
AA1419001	1-port 1000BASE-SX Gigabit Interface Connector (GBIC), SC connector
AA1419002	1-port 1000BASE-LX Gigabit Interface Connector (GBIC), SC connector
AA1419003	1-port 1000BASE-XD Gigabit Interface Connector (GBIC)-40km SC connector
AA1419004	1-port 1000BASE-ZX Gigabit Interface Connector (GBIC)-70km SC connector
AL2018008	2-pin cable from BayStack 460-24T-PWR to BayStack 10 PSU (for RPSU and load-sharing capability)
DY4311015	Power splitters for i200X phones—bag of 12
AL2011013	Console cable for BayStack Switches and Passport 8300 Switch

* These features will be supported on future software releases available free from the Web.
** The seventh character (x) of the switch order number must be replaced with the proper code to indicate desired product nationalization:
"A" – No power cord included
"B" – Includes European "Schuko" power cord common in Austria, Belgium, Finland, France, Germany, The Netherlands, Norway, and Sweden
"C" – Includes power cord commonly used in the United Kingdom and Ireland
"D" – Includes power cord commonly used in Japan
"E" – Includes North American power cord
"F" – Includes Australian power cord, also commonly used in New Zealand and the People's Republic of China
^ Supports two output (egress) queues
~ One of these GBICs can be installed in the BayStack 450-1GBIC MDA
*** Supports up to eight output (egress) queues

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