Intelligent Internet

Nortel Networks
Business Policy Switch

Business Policy Switch Benefits

- QoS and policy management
- Web-based management
- Traffic policing and IP traffic shaping
- Stackable up to 8 switches
- Stackable with BayStack 450/410 Switches
- Fail-safe stacking & resiliency
- Common software platform

Figure 1: Single Business Policy Switch.

Business Advantages

Quality of Service (QoS) is becoming increasingly necessary as more of an organization's critical business runs over the network infrastructure. When you implement the Nortel Networks Business Policy Switch QoS features in your network, you can utilize bandwidth more efficiently, optimizing your existing network resources and capabilities.

The Business Policy Switch makes sound business sense for companies looking to improve productivity to maintain or increase profits. If the network is congested or down, if sales people cannot submit orders, if e-mail and intranet traffic threatens on-line Web transactions, and if new applications like voice and video fail, your business could be negatively impacted. The Business Policy Switch

with QoS gives you the performance, features and tools you need to manage bandwidth so that your network is always ready and available for the most critical business transactions.

Product Overview

Part of the successful Nortel Networks BayStack family, the Business Policy Switch (BPS) is a high-density, stackable 10/100 Mbps Ethernet Layer 2 switch that delivers Layer 2/3/4 packet classification and prioritization to the desktop (see Figure 1 and 2). The Business Policy Switch is a robust and highly reliable LAN solution, with advanced Quality of Service IP capabilities and Web-based

NORTEL NETWORKS™

Figure 2: Business Policy Switch Stack.

management features. With the Business Policy Switch, enterprises and carriers are able to confidently and reliably deploy and support mission-critical, resource-intensive or delay-intolerant network communication solutions that can include Voice over IP, multimedia and e-Business applications for full bandwidth utilization and assured network access at the premise.

By classifying, prioritizing, policing and marking (DiffServ Code Point) LAN traffic, networks can offer reliable connectivity and required bandwidth for mission-critical applications like Voice over IP to specific groups and users, and to individual devices.

For each of these applications, advanced QoS features support IETF standard DiffServ QoS architecture, packet classification based on the contents of packet header fields (voice, video, data),

traffic policing, and remote sniffing. As a result, optimal network performance and reliability may be attained while realizing significant cost savings. Customized service type and flow-based administrations through traffic shaping and policing may also be established, providing an opportunity for customer-specific service offerings, which can be implemented to address-specific and unique customer requirements.

High Density Architecture

The Business Policy Switch has twenty-four 10/100 BASE-TX RJ-45 ports, one MDA slot, and a cascade module slot for stacking. Up to eight Business Policy Switches can be stacked to achieve up to 224 10/100 ports (using 4-port 10/100 BASE-TX MDA on each switch). 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.

Performance

2.5 Gigabit per second (Gbps) switching fabric and custom switching ASICs support full 802.1D-compliant MAC Layer frame forwarding and filtering across all ports at the peak rate of 3 million packets per second for the Business Policy Switch.

Stackable with BayStack 450/410 Switches

The Business Policy Switch can also be stacked with the BayStack 450 or 410 Switches providing policy to users or devices that are connected on the Business Policy Switch. With the addition of one Business Policy Switch to an existing BayStack 450 or 410 stack, Web-based management can be achieved for the whole stack (see Figure 3). A maximum of eight switches can be stacked together in any combination of Business Policy Switch/BayStack 450/BayStack 410.

Figure 4: In the unlikely event of a switch failure, the stack integrity is maintained: cascade signals loop back at point of failure.
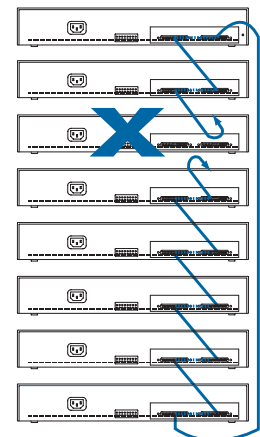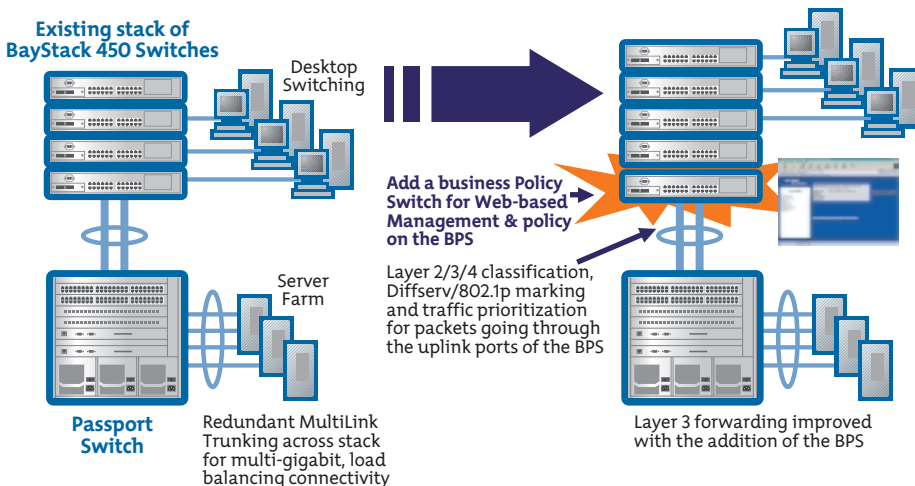
Resiliency

A key differentiation for the Business Policy Switch is its resilient stacking feature. The Business Policy Switch can stack up to 8 units with a cascade stacking design, assuring continuous uptime even if any switch in the stack should fail. A loop-back or cascade cable is used to seamlessly connect the entire stack to provide no single point of failure (see Figure 4).

For redundant power supply support for the Business Policy Switch, a –48V DC-to-DC converter module (AL1904001) must be ordered for connectivity to the BayStack 10 Power Supply Unit (PSU). Uninterruptible Power Supply (UPS) capability is supported on the switch with BayStack 10 PSU.

Figure 3: Web-based management with Business Policy Switch.

Existing stack of BayStack 450 Switches

Desktop Switching

Add a business Policy Switch for Web-based Management & policy on the BPS

Layer 2/3/4 classification, Diffserv/802.1p marking and traffic prioritization for packets going through the uplink ports of the BPS

Server Farm

Passport Switch

Redundant MultiLink Trunking across stack for multi-gigabit, load balancing connectivity

Layer 3 forwarding improved with the addition of the BPS

AC & DC Versions

The Business Policy Switch is available with an AC power supply or with a -48V DC power supply suitable for large carriers with central offices (COs). The DC version has the same features as the AC version except for redundant power supply unit (RPSU) support.

QoS & Policy Management

QoS provides the ability to read, alter, prioritize and tag or mark IP traffic based upon information imbedded in Type of Service (ToS). Based on the IETF Committee's industry standards, the Business Policy Switch provides the ability to prioritize traffic based upon the required level of service for a given transaction. This level of service can be marked in the embedded information inside each IP packet's ToS field. DiffServ is based upon ToS field. The Business Policy Switch has application specific integrated circuits (ASICs) to enable DiffServ Code points can be mapped to 802.1p.

The QoS policies can be configured via the Business Policy Switch 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, which is facilitated through the Common Open Policy Service (COPS) protocol.

Web-based management

Web-based management supports a Business Policy Switch only stack or a mixed stack of Business Policy Switches and BayStack 450/410 Switches. This feature provides summary, configuration, fault, statistics, application, administration and support pages for entire stack. Traffic classification and prioritization can be set via the Web-based QoS Wizard and

Figure 5: Business Policy Switch features flexible HTML tools.
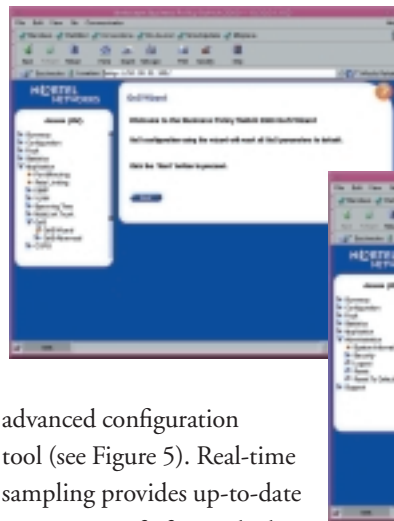
advanced configuration tool (see Figure 5). Real-time sampling provides up-to-date LED, stats info for stacked units. Web interface also allows for static configuration of numerous parameters of the device.

Queuing Function

The Business Policy Switch provides network availability for mission-critical applications, devices, and users. This is done by classifying, prioritizing, and marking LAN IP traffic using up to eight (with new Gigabit MDAs) hardware-based IP service class queues on a per-port basis based on the following parameters:

- ToS / DSCP marking
- IP source address/destination address or subnets
- TCP/UDP source/destination port/port range
- 802.1p priority bits
- Ingress source port
- IP protocol ID (e.g. TCP, UDP, IGMP)
- EtherType (e.g. IP, IPX)
- VLAN ID

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

MultiLink Trunking

This feature enables grouping of links between the switch and another switch or a server to provide higher bandwidth of up to 800 Mbps (when used with 10/100 ports or 100BASE-FX ports) or up to 8 Gbps (when used with Gigabit uplink ports on Business Policy Switches) with active redundant links.

Distributed MultiLink Trunking (DMLT) enables trunked ports to span multiple units of the stack for fail-safe connectivity to mission critical servers and the network center.

Split MultiLink Trunking (SMLT) helps eliminate all single points of failure and creates multiple paths from wiring closet switches such as the Business Policy Switch to the core of the network where Passport 8600 Switches reside. The Business Policy Switch supports SMLT in conjunction with two Passport 8600s. SMLT improves network reliability by providing load sharing among all the links and fast fail-over in case of link failures. For added redundancy, SMLT works in conjunction with DMLT.

Flexible High-Speed Uplink Options

Media Dependent Adapters (MDAs) including Fast Ethernet, Gigabit Ethernet and fiber, connect to Passport Switches, other high-speed switches, or the network center. Also, the BayStack 450-1GBIC (Gigabit Interface Connector) MDA supports long-haul connectivity. This GBIC MDA will support one of the following interface connectors: 1000BASE-SX, 1000BASE-LX, 1000BASE-XD (40km), or 1000BASE-ZX (70km).

Security

The Business Policy Switch features BaySecure, which 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 (maximum 448) identification. In addition, with the Distributed Access List Security feature network access is granted or denied on port basis. The Business Policy Switch also provides Remote Authentication Dial-In User Service (RADIUS) authentication for switch-security management.

IP Manager List limits access to the management features of the Business Policy Switch by a defined list of IP addresses, providing greater network security and manageability.

SNMP v3 feature provides user authentication and data encryption for higher security. It also offers secure configuration and monitoring.

For even greater security, the Business Policy Switch supports Extensible Authentication Protocol (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% physically secure or where physical security needs enhancement. For example, banks, trading rooms, or classroom training facilities could take advantage of this feature. EAP supports client access to the network and interoperates with Microsoft Windows XP.

Traffic Policing

This feature enables provisioning of different levels of service by limiting traffic throughput at ingress (incoming) port of the Business Policy Switch. For example, if a port is set to certain speed 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 especially find this useful to control bandwidth to their customers and to enforce Service Level Agreements.

MAC Addresses

Business Policy 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.

VLAN Support

Up to 256 port-based VLANs can be established for each switch, to extend the broadcast domain and segment network traffic. The 256 VLANs can be spread among port-based, and MAC source address-based VLANs (maximum of 48 MAC source address-based VLANs). The 256 VLANs can be on a standalone switch or across a pure Business Policy Switch stack only. 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 is supported. SVL is the same as the VLAN implementation on the BayStack 450 Switch, in which all VLANs in the switch share the same forwarding database. IVL is a new feature on the Business Policy Switch and lets individual VLANs have separate forwarding databases within the switch. IVL allows the switch to handle duplicate MAC addresses if they are in different VLANs

IGMP Snooping

The Business Policy Switch features IP Multicast support by examining ('snooping') all IGMP traffic in hardware at line rate, and pruning unwanted data streams from affecting network or endstation performance.

Network Management

On-box management: Network management begins with the device. The Business Policy Switch supports 4 groups of RMON on all ports and is SNMPv3 compliant. The SNMP agent software resides in the switch and uses the information it collects to provide management for all ports in the stack. In addition, the agent also provides the ability to set up policy-based networks by supporting the Common Open Policy Service, or COPS, protocol.

Fault Management and Resolution – Optivity Network Management System (NMS): With Optivity NMS the network manager has quick access to the information required to manage and isolate all the Business Policy Switch networks events. Tools such as Physical Topology View inform the network manager how a particular event is affecting the physical connectivity within the network. End Node Locate 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. Completing the solutions are tools such as Expanded View and OmniView. Both of these solutions provide visual and statistical tools necessary to quickly resolve any network event, or to manage performance, real-time.

Configuration Management – JDM and Optivity Switch Manager (OSM): The process of configuration begins with a single device, but finishes across multiple devices. Java Device Manager (JDM) is the single device configuration tool for those configuration functions that require communicating with a single device. However, JDM 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 multiples.

There are a number of configuration items that are best performed though across multiple devices, this is when OSM is used. Configuration functions such as VLAN assignments, MultiLink Trunking (MLT) and Multicast, to name a few, are deployed across multiple Nortel Networks Ethernet Switches. OSM was designed to ensure proper configuration of technologies like this, the first time.

Quality Of Service Provisioning – Optivity Policy Services (OPS): With Optivity Policy Services 2.0.1, policies can be created through a simple intuitive drag and drop workflow. OPS is the Policy Decision Point in a DiffServ QoS implementation. Using OPS, common policies can be created one time and simultaneously implemented across many Business Policy Switches through a single command instead of hours of filter configuration. Policies are easily managed and updated in the OPS GUI.

- Simple intuitive policy creation
- Re-use filter common filter sets
- Network wide view of policies currently being enforced
- Avoid QoS provisioning errors
- Centrally manage DSCP and 802.1p to queue mapping tables
- Save time provisioning the network, thousands of CLI or Web transactions reduced to a few simple actions.

Common Software Platform

All BayStack switches, including the Business Policy 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), menus, Optivity Network Management System (NMS), Optivity Switch Manager (OSM) and Optivity Policy Services (OPS).

Multiple Spanning Tree Protocol Groups (Up to 8)

Business Policy Switch supports multiple spanning tree groups (STGs). It supports a maximum of 8 STGs, either all in one standalone switch or across a stack consisting of Business Policy Switches only. Multiple STGs provide multiple data paths, which can be used for load-balancing and redundancy.

ASCII Configuration File

The Business Policy Switch can download a user-editable ASCII configuration file from a 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.

IP Manager List

You can limit access to the management features of the Business Policy Switch by defining the IP addresses allowed access to the switch.

Version 2.0 Features

New Gigabit Ethernet MDAs

With version 2.0 software, the Business Policy Switch will support three new Gigabit MDAs. Each of these MDAs will support 8 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)

Also, new 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.

IP Traffic Shaping

IP traffic shaping offers the ability to smooth IP classified traffic from egress (exiting) ports of the new Gigabit Ethernet MDAs of a single Business Policy 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 Business Policy Switch to the network core, yielding the most efficient bandwidth utilization. The primary customers for rate shaping are service providers or carrier customers that are selling Ethernet in place of the traditional Frame Relay, ISDN, or ATM WAN access solutions, providing end-to-end Ethernet service for simplicity. Some enterprise customers use traffic shaping as a mechanism to limit bandwidth without having to swap out physical interfaces, leaving them room to grow.

Business Policy Switch

Applications and Solutions

Nortel Networks Business Policy Switch is ideal for enterprise & carrier networks where business applications drive the need to implement and support resource-intensive and delay-intolerant converged voice, video and data applications, devices and users on their network. Businesses implementing applications like Voice over IP, video streaming, and e-commerce need more than "best effort" service. Because the Business Policy Switch supports a wide range of applications you can deploy it in your network where you need it most, optimizing your existing network resources.

Summary

With more than 100 years in telecommunications, Nortel Networks is uniquely positioned to help your business reduce cost 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 Business Policy 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:   Business Policy Switch Technical Specifications.

Physical Specifications	
Weight	4.8 kg (10.60 lb)
Height	7.04 cm (2.77 in.)
Width	43.82 cm (17.25 in.)
Depth	38.35 cm (15.1 in.)

Performance Specifications	
Frame Forward Rate (64-byte packets)	Up to 3.2 million packets per second (pps) maximum, learned unicast traffic
Port Forwarding/Filtering Performance	For 10 Mb/s: 14,880 pps (64-byte packets) maximum For 100 Mb/s: 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	10Mb/s Manchester encoded or 100 Mb/s 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 Mb/s (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

Table 1:   Business Policy Switch Technical Specifications (continued).

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.

Network Protocol and Standards Compatibility	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 100BASE-FX (ISO/IEC 8802-3,Clause 26)
	IEEE 802.1p (Prioritizing)
	IEEE 802.1Q (VLAN Tagging)
	IEEE 802.1z (Gigabit)
	IETF DiffServ

RFC Support	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);

Electrical Specifications

Input voltage (AC Version)	100-240VAC @ 47 to 63 Hz
Input voltage (DC Version)	-48 Volts DC
Input Power consumption (AC Version)	150 W max
Input Power consumption (DC Version)	130 W max
Input Volt Amperes Rating (AC Version)	200VA max
Input current (AC Version)	1.5 A @100 VAC, .6 A @240VAC
Input current (DC Version)	-48 Volts DC @ 2.75 Amps

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.)

Table 1:   Business Policy Switch Technical Specifications (continued).

Safety Agency Approvals	UL Listed (UL 1950)
	IEC 950/EN60950
	C22.2 No.950 (CUL) with all national deviations
	UL-94-V1 flammability requirements for PC board
	NOM (NOM-019)
Electromagnetic Emissions Summary	
Meets the following standards	US, CFR47, Part 15,Subpart B, Class A
	Canada, ICES-003, Issue 2,Class A
	Australia/New Zealand, AS/NZS 3548:1995,Class A
	Japan, V-3/97.04:1997,Class A
	Taiwan, CNS 13438,Class A
	EN55022:1995,Class A
	EN61000-3-2:1995
	EN61000-3-3:1994
	CE
Electromagnetic Immunity	Meets the EN 50082-1:1997 standard

Ordering Information

Table 1:   Business Policy Switch Ordering Information.

Order No.	Description
AL2001x15*	Business Policy Switch 2000 Autosensing Policy Switch (24 10/100BASE-TX plus 1 MDA Slot and 1 Cascade Module Slot)
AL2001016	Business Policy Switch 2000 DC (-48V DC built-in power supply version)
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
AL1904001	BPS -48 V DC-to-DC converter for use with BayStack 10 Power Supply System
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)
AL2033010	BayStack 400-ST1 Cascade Module (includes cascade cable)
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

Table 1: *Business Policy Switch Ordering Information (continued).*

Order No.	Description
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

* 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.
^ BayStack 450 Gigabit MDAs are fully supported by the Business Policy Switch; supports two output (egress) queues
** Requires Business Policy Switch version 1.1 software or higher; supports two output (egress) queues
~ One of these GBICs can be installed in the BayStack 450-1GBIC MDA
*** Requires Business Policy Switch version 2.0 software or higher; supports up to eight output (egress) queues

NORTEL
NETWORKS ™

For more information, contact your Nortel Networks representative or call 1-800-4-NORTEL (1-800-466-7835), or 1-506-674-5470 outside of North America.

www.nortelnetworks.com

United States
Nortel Networks
35 Davis Drive
Research Triangle Park, NC 27709
1-877-655-2ASK

Canada
Nortel Networks
8200 Dixie Road, Suite 100
Brampton, Ontario
L6T 5P6 Canada
1-800-466-7835

Asia Pacific
Nortel Networks
151 Lorong chuan #03-01
New Tech Park
Singapore, 556741
65 287-2877

Europe, Middle East, and Africa
Nortel Networks plc
Maidenhead Office Park
Westacott Way
Maidenhead Berkshire SL6 3QH
United Kingdom
+44 (0)20 8920 4618

Australia
Nortel Networks Australia Pty Limited
380 St. Kilda Road
5th/6th Floor
Melbourne, Victoria
Australia 3004
613 9206 4646