6.7 อุปกรณ์ 10 Gigabit Ethernet

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NORTEL

Hot Sheet 5.3

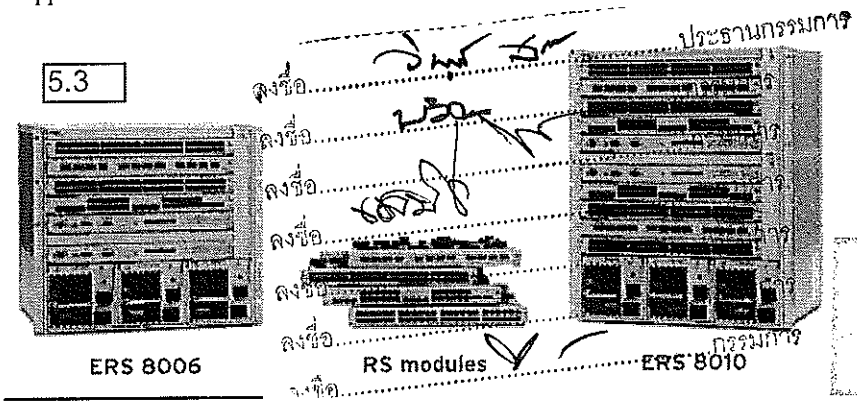
Nortel Ethernet Routing Switch 8600 Release 5.1

What is it?

The Ethernet Routing Switch 8600 takes the complexity out of network design by simplifying the network architecture and increasing value per port per slot. Offering advanced virtualization features and one of the industry's highest 10G densities per module/rack. The Ethernet Routing Switch 8600 is a chassis-based platform that offers intelligent switching and network security. It scales up to 384 Gigabit Ethernet ports and 96 10 Gigabit Ethernet ports. It offers WAN connectivity for ATM, PoS and WDM. All can turn your network into a highly reliable, efficient and cost-effective infrastructure that's ready for unified communications.

Offering exceptional capabilities

- IP Flow Information eXport (IPFIX) IETF RFC 3917 — Benchmarks network traffic and identifies anomalous day-zero behavior
- Integrated Service Delivery Module 8660 — Uses Check Point's Firewall-1NG and SourceFire's Snort-based TPS for deep packet inspection to identify attacks that appear as normal traffic
- IPv6 — Increases scalability for even the most demanding networks
- Split Multi-Link Trunking — Increases resiliency for the most demanding applications and networks
- Delivers high performance to fastpath-enabled MPLS and IP VPN solutions on an R/RS module port
- Offers high-density 10GE, 1GE and 10/100/1000 Ethernet modules at a competitive price/performance
- Includes virtualized Layer 3 with device and network solutions (e.g., VRF-lite, MPLS and IP VPN-Lite)
- Scalable unicast and multicast virtualization solution for VRF-Lite that simplifies network design and maximizes hardware investment
- Enables IP VPN services across the campus for various departments, users and customers through existing IP infrastructure — without the need for additional equipment investment or complex setup and management
- Includes sophisticated mirroring capabilities (i.e., many-to-one, one-to-many, and many-to-many) to enable traffic analysis and IDS/TPS clustering
- Offers increased value per slot by delivering a combo module with copper 10/100/1000, 100/1000 SFP and 10GE XFP interfaces
- Offers unique best-in-class resiliency with SMLT for VMware server virtualization in an iSCSI environment*
- Available with integrated security and applications awareness (optional feature)
- Supports large-scale convergence deployments
- Multicast standard protocols to support applications such as TV distribution, video surveillance, etc.
- Offers ubiquitous and seamless secure access for internal end users and outside users through Nortel Secure Network Access (NSNA) as well as TACACS+ support
- Includes tiered licensing infrastructure to satisfy the needs of different organizations
- Several log file options, system messaging, real-time pluggable optics data, etc. to reduce operational costs
- Uses the NNCLI (Nortel Networks Command Line Interface) — a common interface that follows the de facto industry standard
- Offers an AC dual-input 1500 W Power Supply that provides building-level redundancy as well as dual power feed
- Comes with powerful new 1- and 10-Gigabit pluggables, including 10GBASE-LRM XFP, Digital Diagnostic Interface (DDI) SFP and 120 km SFP; DWDM XFP



* For additional details, visit *www.nortel.com/datacenter.*

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Performance specifications

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- System architecture bandwidth: 720 Gbps
- Sub100ms failover (requires 8692SF with SuperMezz)
- Frame length: 64 to 1,518 bytes (IEEE 802.1Q Untagged), 64 to 1,522 bytes (IEEE 802.1Q Tagged)
- Jumbo frame support: Up to 9.6k bytes (IEEE 802.1Q Tagged)
- Multi-Link Trunks: Up to 128 trunks with 8 links per group with 8692SF + R/RS-Modules/Mode
- VLANs: Up to 4,000 port- or protocol-based; per VLAN Tagging option
- IP Multicast: Up to 4,000 S,G
- Multiple spanning tree groups: Up to 64 (STGs)
- SMLT and RSMLT (Routed Split Multi-Link Trunking)
- Single Port Split Multi-Link Trunking

Network protocol and standards compatibility

IEEE

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1p Priority Queues
- IEEE 802.1Q VLAN Tagging
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- IEEE 802.1v VLAN Classification by Protocol and Port
- IEEE 802.1x Ethernet Authentication Protocol
- IEEE 802.3 CSMA/CD Ethernet (ISO/IEC 8802-3)
- IEEE 802.3ab 1000BASE-T Ethernet
- IEEE 802.3ab 1000BASE-LX Ethernet
- IEEE 802.3ab 1000BASE-ZX Ethernet
- IEEE 802.3ab 1000BASE-CWDM Ethernet
- IEEE 802.3ah 1000BASE-SX Ethernet
- IEEE 802.3ab 1000BASE-XD Ethernet
- IEEE 802.3ah 1000BASE-BX Ethernet
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- IEEE 802.3ae 10GBASE-X XFP
- IEEE 802.3i 10BASE-T – Autonegotiation
- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet (ISO/IEC 8802-3, Clause 25)
- IEEE 802.3u 100BASE-FX
- IEEE 802.3u Auto-negotiation on Twisted Pair (ISO/IEC 8802-3, Clause 28)
- IEEE 802.3x Flow Control on the Gigabit Uplink port
- IEEE 802.3z Gigabit Ethernet 1000BASE-SX and LX

IETF RFCs

Layer 2 features ATM / POS 5.3.3

- RFC 1332 IPCP (POS module)
- RFC 1471 LCP (POS module)
- RFC 1473 NCP (POS module)
- RFC 1474 Bridge NCP (POS module)
- RFC 1552 IPXCP (POS module)
- RFC 1638 BCP (POS module)
- RFC 1661 PPP (POS module)
- RFC 1989 PPP Link Quality Monitoring (POS module)
- RFC 2558 Sonet / SDH (POS module)
- RFC 2615 PPP over Sonet / SDH (POS module) 5.3.3

IPv4 Layer 3 / Layer 4 Intelligence

- RFC 768 UDP Protocol
- RFC 783 TFTP Protocol
- RFC 791 IP Protocol
- RFC 792 ICMP Protocol
- RFC 793 TCP Protocol
- RFC 826 ARP Protocol
- RFC 854 Telnet Protocol
- RFC 894 A standard for the Transmission of IP Datagrams over Ethernet Networks
- RFC 896 Congestion control in IP/TCP internetworks
- RFC 903 Reverse ARP Protocol
- RFC 906 Bootstrap loading using TFTP
- RFC 950 Internet Standard Subnetting Procedure
- RFC 951 / RFC 2131 BootP / DHCP
- RFC 1027 Using ARP to implement transparent subnet gateways/ Nortel Subnet based VLAN
- RFC 1058 RIPv1 Protocol
- RFC 1112 IGMPv1
- RFC 1253 OSPF
- RFC 1256 ICMP Router Discovery
- RFC 1305 Network Time Protocol v3 Specification, Implementation and Analysis3
- RFC 1332 The PPP Internet Protocol Control Protocol (IPCP)
- RFC 1340 Assigned Numbers
- RFC 1541 Dynamic Host Configuration Protocol[1]
- RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
- RFC 1583 OSPFv2
- RFC 1587 The OSPF NSSA Option
- RFC 1591 DNS Client
- RFC 1631 NAT (Network Address Translation) — only with WSM
- RFC 1695 Definitions of Managed Objects for ATM Management v8.0 using SMIv2
- RFC 1723 RIP v2 – Carrying Additional Information
- RFC 1745 BGP / OSPF Interaction
- RFC 1771 / RFC 1772 BGP-4
- RFC 1812 Router Requirements
- RFC 1866 HTMLv2 Protocol
- RFC 1965 BGP-4 Confederations
- RFC 1966 BGP-4 Route Reflectors
- RFC 1998 An Application of the BGP Community Attribute in Multi-home Routing
- RFC 1997 BGP-4 Community Attributes
- RFC 2068 Hypertext Transfer Protocol
- RFC 2131 Dynamic Host Control Protocol (DHCP)
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 2178 OSPF MD5 cryptographic authentication / OSPFv2
- RFC 2205 Resource ReSerVation Protocol (RSVP) — v1 Functional Specification
- RFC 2210 The Use of RSVP with IETF Integrated Services
- RFC 2211 Specification of the Controlled-Load Network Element Service
- RFC 2236 IGMPv2 for snooping
- RFC 2270 BGP-4 Dedicated AS for sites/single provide
- RFC 2283 Multiprotocol Extensions for BGP-4
- RFC 2328 OSPFv2
- RFC 2338 VRRP: Virtual Redundancy Router Protocol
- RFC 2362 PIM-SM
- RFC 2385 BGP-4 MD5 authentication
- RFC 2439 BGP-4 Route Flap Dampening
- RFC 2453 RIPv2 Protocol
- RFC 2475 An Architecture for Differentiated Service
- RFC 2597 Assured Forwarding PHB Group
- RFC 2598 An Expedited Forwarding PHB
- RFC 2702 Requirements for Traffic Engineering Over MPLS
- RFC 2765 Stateless IP/ICMP Translation Algorithm (SIIT)
- RFC 2796 BGP Route Reflection — An Alternative to Full Mesh IBGP
- RFC 2819 Remote Monitoring (RMON)
- RFC 2858 Multiprotocol Extensions for BGP-4
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 2961 RSVP Refresh Overhead Reduction Extensions
- RFC 2992 Analysis of an Equal-Cost Multi-Path Algorithm
- RFC 3031 Multiprotocol Label Switching Architecture
- RFC 3032 MPLS Label Stack Encoding
- RFC 3036 LDP Specification
- RFC 3037 LDP Applicability
- RFC 3065 Autonomous System Confederations for BGP
- RFC 3210 Applicability Statement for Extensions to RSVP for
- RFC 3215 LDP State Machine
- RFC 3270 Multi-Protocol Label Switching (MPLS) Support of Differentiated Services
- RFC 3376 Internet Group Management Protocol, v3
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 3443 Time To Live (TTL) Processing in Multi-Protocol Label Switching (MPLS) Networks
- RFC 3569 An overview of Source-Specific Multicast (SSM)
- RFC 3917 Requirements for IP Flow Information Export (IPFIX)
- RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs)
- RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures
- BFD: IETF Bidirectional Forwarding Detection draft for IPv4 and IPv6 (Single Hop)

IPv4 Multicast

- RFC 1075 DVMRP Protocol
- RFC 1112 IGMP v1 for routing / snooping
- RFC 1519 Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy
- RFC 2236 IGMP v2 for routing / snooping
- RFC 2362 + some PIM-SM v2 extensions (PIM-SM)
- RFC 2385 Protection of BGP Sessions via the TCP MD5 Signature Option
- RFC 2547 BGP/MPLS VPNs
- RFC 3446: Anycast Rendevous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)
- RFC 3618 Multicast Source Discovery Protocol (MSDP)
- RFC 3768 Virtual Router Redundancy Protocol (VRRP)

IPv6

- IPv6 requires 8692SF and SuperMezz Daughter card and R/RS-Modules
- RFC 1881 IPv6 Address Allocation Management
- RFC 1886 DNS Extensions to support IP version 6
- RFC 1887 An Architecture for IPv6 Unicast Address Allocation
- RFC 1981 Path MTU Discovery for IP v6
- RFC 2030 Simple Network Time Protocol (SNTP) v4 for IPv4, IPv6 & OSI
- RFC 2373 IPv6 Addressing Architecture
- RFC 2375 IPv6 Multicast Address Assignments
- RFC 2460 Internet Protocol, v6 (IPv6) Specification
- RFC 2461[4] Neighbor Discovery
- RFC 2462 IPv6 Stateless Address Autoconfiguration
- RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol v6 (IPv6) Specification
- RFC 2464 Transmission of IPv6 Packets over Ethernet Networks
- RFC 2474 Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers
- RFC 2526 Reserved IPv6 Subnet Anycast Addresses
- RFC 2710 Multicast Listener Discovery (MLD) for IPv6
- RFC 2740 OSPF for IPv6
- RFC 2893 Configured Tunnels and Dual Stack Routing per port
- RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers
- RFC 3056 Connection of IPv6 Domains via IPv4 Clouds
- RFC 3363 Representing Internet Protocol Version 6 Addresses in DNS[3]
- RFC 3484 Default Address Selection for IPv6
- RFC 3513 Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587 IPv6 Global Unicast Address Format
- RFC 3596 DNS Extensions to Support IP v6
- RFC 3587 IPv6 Global Unicast Address Format
- RFC 3590 Source Address Selection for the Multicast Listener Discovery (MLD) Protocol
- RFC 3596 DNS Extensions to support IP version 6
- RFC 3810 IPv6 Multicast capabilities
- SSH/SCP, Telnet, Ping, CLI, JDM support for IPv6

Platform

- RFC 1305 (NTP client / unicast mode only)
- RFC 1340 Assigned Numbers
- RFC 1350 The TFTP Protocol (Revision 2)

Quality of Service (QoS)

- RFC 2474 / RFC 2475 DiffServ Support
- RFC 2597 / RFC 2598 DiffServ per Hop Behavior
- Nortel Automatic QoS

Network management

- RFC 1155 SMI
- RFC 1157 SNMP
- RFC 1215 Convention for defining traps for use with the SNMP
- RFC 1269 Definitions of Managed Objects for the Border Gateway Protocol: v3
- RFC 1271 Remote Network Monitoring Management Information Base
- RFC 1304 Definitions of Managed Objects for the Parallel Interface Type
- RFC 1354 IP Forwarding Table MIB
- RFC 1389 RIP v2 MIB Extensions
- RFC 1565 Network Services Monitoring MIB
- RFC 1757 / RFC 2819 RMON
- RFC 1907 SNMPv2
- RFC 2089 Coexistence between v1 & v2 of the Internet-standard Network Management Framework
- RFC 1930 Guidelines for creation, selection, and registration of an Autonomous System (AS)
- RFC 2571 An Architecture for Describing SNMP Management Frameworks
- RFC 2572 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC2573 SNMP Applications
- RFC 2574 User-based Security Model (USM) for v3 of the Simple Network Management Protocol (SNMPv3)
- RFC 2575 View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
- RFC 2576 Coexistence between v1, v2, & v3 of the Internet-standard Network Management Framework

MIBs

- RFC 1212 Concise MIB definitions
- RFC 1213 TCP/IP Management Information Base
- RFC 1213 MIB II
- RFC 1354 IP Forwarding Table MIB
- RFC 1389 / RFC 1724 RIPv2 MIB extensions
- RFC 1398 Definitions of Managed Objects for the Ethernet-Like Interface Types
- RFC 1406 Definitions of Managed Objects for the DS1 and E1 Interface Types
- RFC 1414 Identification MIB
- RFC 1442 Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1447 Party MIB for v2 of the Simple Network Management Protocol bytes

[1] Limited to DHCP Relay only
[2] Limited to DNS Client Support only
[3] NTP client, unicast mode only
[4] Router support only. Host will be supported with infinity 2.0
[5] Partially implemented

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- RFC 1450 Management Information Base for v2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1472 The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol
- RFC 1483 Multiprotocol Encapsulation over ATM Adaptation Layer 5
- RFC 1493 Bridge MIB
- RFC 1525 Definitions of Managed Objects for Source Routing Bridges
- RFC 1565 Network Services Monitoring MIB
- RFC 1573 Interface MIB
- RFC 1643 Ethernet MIB
- RFC 1650 Definitions of Managed Objects for the Ethernet-like Interface Types using SMIv2
- RFC 1657 BGP-4 MIB using SMIv2
- RFC 1658 Definitions of Managed Objects for Character Stream Devices using SMIv2.)
- RFC 1695 Definitions of Managed Objects for ATM Management v8.0 using SMIv2
- RFC 1696 Modem Management Information Base (MIB) using SMIv2
- RFC 1724 RIP v2 MIB Extension
- RFC 1850 OSPF MIB
- RFC 2021 RMON MIB using SMIv2
- RFC 2037 Entity MIB using SMIv2
- RFC 2096 IP Forwarding Table MIB
- RFC 2233 Interfaces Group MIB using SMIv2
- RFC 2452 IPv6 MIB: TCP MIB
- RFC 2454 IPv6 MIB: UDP MIB
- RFC 2465 IPv6 MIB: IPv6 General group and textual conventions
- RFC 2466 IPv6 MIB: ICMPv6 Group
- RFC 2578 Structure of Management Information v2 (SMIv2)
- RFC 2613 Remote Network Monitoring MIB Extensions for Switched Networks v1.0
- RFC 2665 Definitions of Managed Objects for the Ethernet-like Interface Types
- RFC 2668 Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)
- RFC 2674 Bridges with Traffic MIB
- RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol
- RFC 2863 Interface Group MIB
- RFC 2925 Remote Ping, Traceroute & Lookup Operations MIB
- RFC 2932 IPv4 Multicast Routing MIB
- RFC 2933 IGMP MIB
- RFC 2934 PIM MIB
- RFC 3019 IPv6 MIB: MLD Protocol
- RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
- RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 3416 v2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)
- RFC 3635 Definitions of Managed Objects for the Ethernet-like Interface Types
- RFC 3636 Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)
- RFC 3810 Multicast Listener Discovery v2 (MLDv2) for IPv6
- RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management
- RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)
- RFC 3813 Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information Base (MIB)
- RFC 3815 Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)
- RFC 4022 Management Information Base for the Transmission Control Protocol (TCP)
- 4087 IP Tunnel MIB
- RFC 4113 Management Information Base for the User Datagram Protocol (UDP)
- RFC 4624 Multicast Source Discovery Protocol (MSDP) MIB

Physical specifications

Ethernet Routing Switch 8006

- Height: 15.8 in. (40.1 cm)
- Width: 17.5 in. (44.5 cm)
- Depth: 19.9 in. (50.5 cm)
- Weight (empty): 49 lb (22 kg)
- Weight (fully loaded): 140 lb (63 kg)
- Cooling system:
  - Fan trays: 1 per chassis
  - Fans: 20 per fan tray
  - Thermal sensors: 1 per fan tray

Ethernet Routing Switch 8010

- Height: 22.9 in. (58.2 cm)
- Width: 17.5 in. (44.5 cm)
- Depth: 19.9 in. (50.5 cm)
- Weight (empty): 85 lb (39 kg)
- Weight (fully loaded): 225 lb (102 kg)
- Cooling system:
  - Fan trays: 2 per chassis
  - Fans: 15 per fan tray
  - Thermal sensors: 1 per fan tray

Safety agency approvals

- UL Listed (UL1950)
- IEC 950/EN60950
- C22.2 No. 950 (CUL) with all national deviations
- UL-94-V1 Flammability requirements for PC board
- NOM (NOM-019)

Environmental specifications

- Operating temperature: 0°C to 40°C (32°F to 104°F)
- Storage temperature: -25°C to 70°C (-13°F to 158°F)
- Operating humidity: 85% maximum relative humidity, noncondensing
- Storage humidity: 95% maximum relative humidity, noncondensing
- Operating altitude: 3024 m (10,000 ft) maximum
- Storage altitude: 3024 m (10,000 ft) maximum
- Free fall/drop: ISO 4180-s, NSTA 1A
- Vibration: IEC 68-2-6/34
- Shock/bump: IEC 68-2-27-29

Electromagnetic emissions summary

Meets the following standards:

- US: CFR47, Part 15 Subpart B, Class A
- Australia/New Zealand: NZS 3548:1995, Class A
- Canada: ICES-003, Issue 2, Class A
- Japan: V-3/97.04:1997, Class A
- Taiwan: CNS 13438, Class A
- EN 55022:1995, Class A
- EN 61000-3-2:1995
- EN 61000-3-3:1994
- Electromagnetic immunity: Meets the EN 50082-1:1997 standard

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Ordering information

Chassis, power supply and software

Order code	Description
DS1402001	8010 10 slot chassis. Includes chassis, dual backplane, two fan trays, RS232 cable for management console, rack mount kit and cable guide kit. Requires at least one power supply, up to three power supplies supported.
DS1402002	8006 6 slot chassis. Includes chassis, dual backplane, fan tray, RS232 cable for management console, rack mount kit and cable guide kit. Requires at least one power supply, up to three power supplies supported.
DS1402004	8010co 10 slot NEBS chassis. Includes chassis, fan trays, RS232 cable for management console, rack mount kit and cable management. Requires at least two 8004 or 8005 power supplies, up to three power supplies supported. Supports 8600 modules only.
DS1405012-ES	8005AC 100-240 VAC 1140W/1462W Power Supply. At least one power supply required per 8006, 8010 or 8010co chassis. Lower output at 110VAC. Cannot mix with 8004 series supplies. Power cord ordered separately-use AA00200xx series cords.
DS1405011	8005DC 1462W Power Supply. At least one power supply required per 8006, 8010 or 8010co chassis. Cannot mix with 8004 series supplies.
DS1410003-5.0	ERS 8600 Routing Switch Base Software Kit (Includes v5.0 base SW license, Device Manager, and complete SW documentation set). One license kit required per chassis. (Support contracts must be purchased separately.)
DS1410005-6.2	Enterprise Switch Manager version 6.2
DS1405018-E6	Ethernet Routing Switch 8005 Dual Input AC Power Supply
DS1411018-E6	8006CM HS - Cooling Module High Speed - Fan Tray for 8006. Required for RS-Modules. One per chassis.
DS1411017-E6	8006CM HS - 8010CM HS - Cooling Module High Speed - Fan Tray for 8010. Required for RS-Modules. Two per chassis.

Switch fabrics and RS Modules

Order code	Description
DS1404065	Ethernet Routing Switch 8692SF Switch Fabric/CPU to enable redundant terabit core configurations. One required with R Modules, second for load-sharing and redundancy. Operable with pre-E, E and M modules. Includes 256MB SDRAM and 64MB PCMCIA.
DS1404066	8692SF Switch Fabric/CPU with factory-installed Enterprise Enhanced CPU Daughter Card (SuperMezz). SuperMezz is a mandatory requirement for IPv6, Sub-100msec failover, MPLS, IP VPN-Lite, IP VPN and VRF-Lite. Both 8692SF must have the SuperMezz installed; no mixed configurations.
DS1411025	Enhanced CPU Daughter Card (SuperMezz) for 8692SF. Includes dual 1Ghz processors. SuperMezz is a mandatory requirement for IPv6, Sub-100msec failover, MPLS, IP VPN-Lite, IP VPN and VRF-Lite. Both 8692SF must have the SuperMezz installed; no mixed configurations.
DS1404097-E6	8612XLRS - 12 port 10GBase-X LAN XFP Routing Switch Module baseboard (XFPs sold separately). Requires the use of the 8692SF.
DS1404102-E6	8648GBRS - 48 port SFP Routing Switch Module baseboard (SFPs sold separately). Requires the use of the 8692SF.
DS1404109-E6	8634XGRS Combo 2 port 10GBase-X XFP, 24 port SFP (with 100FX support) and 8 port auto sensing 10/100/1000TX Routing Switch Module baseboard (XFPs and SFPs sold separately). Requires the use of the 8692SF.
DS1404110-E6	8648GTRS - 48 port auto sensing 10/100/1000TX Routing Switch Module baseboard. Requires the use of the 8692SF.

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Service Delivery Modules

Order code	Description
DS1404082	8660 Service Delivery Module with 4 Intrusion Sensor ISD Modules for the Ethernet Routing Switch 8600
DS1404086	8660 Service Delivery Module with 2 Firewall / 2 Intrusion Sensor ISD Modules for the Ethernet Routing Switch 8600
DS1404087	8660 Service Delivery Module with 1 Firewall / 1 Intrusion Sensor ISD Module for the Ethernet Routing Switch 8600

Software and Licensing

Order code	Description
DS1410003-5.0	ERS 8600 Routing Switch Base Software Kit (Includes v5.0 base SW license, Device Manager, and complete SW documentation set). One license kit required per chassis. (Support contracts must be purchased separately.)
DS1410021	Ethernet Routing Switch 8600 Advanced License Kit, for 1 chassis. Enabled features: BGP4 (above 10 peers), IPv6 Routing, PCAP, MSDP and BFD. (One license required per chassis.)
DS1410022	Ethernet Routing Switch 8600 Advanced License Kit, for up to 10 chassis. Enabled features: BGP4 (above 10 peers), IPv6 Routing, PCAP, MSDP and BFD. (One license required per chassis.)
DS1410023	Ethernet Routing Switch 8600 Advanced License Kit, for up to 50 chassis. Enabled features: BGP4 (above 10 peers), IPv6 Routing, PCAP, MSDP and BFD. (One license required per chassis.)
DS1410024	Ethernet Routing Switch 8600 Advanced License Kit, for up to 100 chassis. Enabled features: BGP4 (above 10 peers), IPv6 Routing, PCAP, MSDP and BFD. (One license required per chassis.)
DS1410026	Ethernet Routing Switch 8600 Premier License Kit, for 1 chassis. Enabled features: Advanced License features, plus, VRF-Lite, MP-BGP, IP-VPN MPLS RFC 4364/2547, IP-VPN-Lite (IP-in-IP) and Multicast virtualization for VRF-Lite (IGMP, PIM-SM/SSM). (One license required per chassis.)
DS1410027	Ethernet Routing Switch 8600 Premier License Kit, for up to 10 chassis. Enabled features: Advanced License features, plus, VRF-Lite, MP-BGP, IP-VPN MPLS RFC 4364/2547, IP-VPN-Lite (IP-in-IP) and Multicast virtualization for VRF-Lite (IGMP, PIM-SM/SSM). (One license required per chassis.)
DS1410028	Ethernet Routing Switch 8600 Premier License Kit, for up to 50 chassis. Enabled features: Advanced License features, plus, VRF-Lite, MP-BGP, IP-VPN MPLS RFC 4364/2547, IP-VPN-Lite (IP-in-IP) and Multicast virtualization for VRF-Lite (IGMP, PIM-SM/SSM). (One license required per chassis.)
DS1410029	Ethernet Routing Switch 8600 Premier License Kit, for up to 100 chassis. Enabled features: Advanced License features, plus, VRF-Lite, MP-BGP, IP-VPN MPLS RFC 4364/2547, IP-VPN-Lite (IP-in-IP) and Multicast virtualization for VRF-Lite (IGMP, PIM-SM/SSM). (One license required per chassis.)

I/O Modules and miscellaneous parts

Order code	Description
DS1402003	8003 3 slot chassis
DS1304008	Ethernet Routing Switch 8672 ATME 2 Slot MDA Baseboard. Accepts two MDAs, supports up to 8 OC-3 or 2 OC-12 ports
DS1404060	Ethernet Routing Switch 8683 POSM 3 Slot Baseboard. Accepts three MDAs, supports up to 6 OC-3 or 3 OC-12 ports. Expanded memory
DS1404090	Ethernet Routing Switch 8691SF Switch Fabric/CPU Module with 256MB CPU memory – One required for per Ethernet Routing Switch 8600 chassis. Note: Includes 64MB PCMCIA flash memory card and 256MB motherboard DRAM
DS1404063	8630GBR Routing Switch Module. 30 port SFP GBIC baseboard. (SFPs sold separately). The 8630GBR requires the use of the 8692SF
DS1404064	8683XZR three-port 10GBase-X XFP Routing Switch Module baseboard (XFPs purchased separately) . Supports both LAN and WAN PHY. The 8683XZR requires the use of the 8692SF
DS1404101	8683XLR three-port 10GBase-X XFP Routing Switch Module baseboard (XFPs purchased separately) . The 8683XLR requires the use of the 8692SF
DS1404045	8600 WSM. 4-port 1000BASE-SX Gigabit or 10BASE-T/100BASE-TX Ethernet Layer 4-7 Web Switching Module
DS1404011	Ethernet Routing Switch 8616SXE. 16-port 1000BASE-SX Gigabit Ethernet interface module
DS1404024	Ethernet Routing Switch 8632TXE. 32 10/100TX plus 2 GBIC interface module. Requires Release 3.1.2 or higher
DS1404034	Ethernet Routing Switch 8616GTE. 16 port 1000BASE-T Gigabit Ethernet interface module
DS1404035	Ethernet Routing Switch 8648TXE. 48 port autosensing 10BASE-T/100BASE-TX Ethernet Layer 3 switching interface
DS1404036	Ethernet Routing Switch 8608SXE. 8 port 1000BASE-SX Gigabit Ethernet interface module
DS1404037	Ethernet Routing Switch 8624FXE. 24 port 100BASE-FX Ethernet interface module
DS1404038	Ethernet Routing Switch 8608GBE. 8-port 1000 Base GBIC module (GBICs sold separately)
DS1404044	Ethernet Routing Switch 8608GTE. 8 port 1000BASE-T Gigabit Ethernet interface module

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Nortel is a recognized leader in delivering communications capabilities that make the promise of Business Made Simple a reality for our customers. Our next-generation technologies, for both service provider and enterprise networks, support multimedia and business-critical applications. Nortel's technologies are designed to help eliminate today's barriers to efficiency, speed and performance by simplifying networks and connecting people to the information they need, when they need it. Nortel does business in more than 150 countries around the world. For more information, visit Nortel on the Web at www.nortel.com. For the latest Nortel news, visit www.nortel.com/news.

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Proposal Response to:

<Ministry of Interior>

for:

Ethernet Routing Switch 8600 Release 5.0

Dated: November 12, 2009

Nortel

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1.0 Key Features

What are the key features of the product?

The Ethernet Routing Switch 8600 provides key features:

- Virtualization - Extend VPN services easily across campus/metro over existing IP backbone, using Nortel's IP VPN-Lite (IP-in-IP) and localize virtualization of routing domains using VRF-Lite for separating departments/groups traffic. 5.3.11
- Resiliency - Voice calls stay connected, applications remain enabled and streaming media continues to flow even under link, switch and/or site failures by using Split Multi-Link Trunking (SMLT) and Routed Split Multi-Link Trunking (RSMLT).
- Scalability - IPv6, Multicast, high-density ports and software functionality future-proof your network today given tomorrow's requirements.
- Security – Enable a trusted network by IPFIX, Secure Network Access, multi-port mirroring and the Service Delivery Module with Threat Protection System and Firewall.
- Total Cost of Ownership (TCO) - Nortel's converged solutions reduce TCO by providing competitive reduced capital and operational expenditures.

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What are the key benefits of the product?

The Ethernet Routing Switch 8600 provides key benefits:

- Nortel engineered network processors provide flexible fast path functionality and allow you to add new functionality by applying a software upgrade, thus avoiding the need for future fork lift upgrades if standards evolve and new functionality needs to be added to the fastpath.
- VPN Services - Nortel's IP VPN-Lite allows simple setup of VPN services across campus/metro over existing IP backbone without the high expense or complexity of MPLS. The Ethernet Routing Switch 8600 also supports MPLS and can co-exist with IP VPN-Lite.
- IP Flow Information eXport (IPFIX) IETF RFC 3917 - This feature allows customers to benchmark your network traffic at wire rate to identify anomalous day zero behavior. By identifying a spike in traffic, you can minimize new viruses or attacks before a patch, signature, or update can be written for it. 5.3.13
- Integrated Service Delivery Module 8660 on the Ethernet Routing Switch 8600 including Check Point's Firewall-1 NG for data

session integrity monitoring and SourceFire's Snort-based TPS for signature-based attack identification - These features provide deep packet inspection to identify attacks appearing as normal traffic by comparing it against known traffic patterns and contextual inconsistencies.

5.3.15 Hardware based wire speed IPv6 routing and IPv4 to IPv6 translation is enabled by the Nortel engineered network processor (RSP), which allows to upload new functionality by software, thus avoiding fork lift upgrades

- Enabled through the SuperMezz on the 8692 Switch Fabric and 100ms failover of Split Multi-Link Trunking is provided in the event of link switch or node failures.
- 10 Gig WAN/LAN PHY 8683 XZR utilizing 80KM XFP optics - These features are used for Metro Ethernet or Campus-wide connectivity. These interfaces are significantly less expensive than traditional Packet over SONET and ATM.
- Multi-port Mirroring - The RS Modules enhance the mirroring capability to provide the ability to do 1-to-many, many-to-1, and many-to-many mirroring for traffic analysis and IDS/TPS clustering.
- Scaling Enhancements 4,000 VLANs & IP multicast (S, G) - The growing converged networks in the Enterprise requires scalability to manage traffic across multiple devices.
- Software Licensing - New licensing infrastructure Base, Advanced and Premier to provide customers the flexibility to license what they need.
- High Availability Enhancement - Synchronization of configuration and protocol states from active CPU to standby CPU for Layer 2 and Layer 3 protocols.
- High Value Per Port - Enables customers to take advantage of the rich features and utilize the appropriate module type for the network.
- Power Supply Enhancement - Dual AC input 1500-watt hot swappable switching power supply that offers redundancy by connecting to two separate AC inputs.
- 1G & 10G Pluggables - Multiple options to meet network demands such as 10GBASE-LRM XFP over multimode fiber, DD1 SFP & 120km SFP.

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Does your module architecture provide flexibility to delivery new features and protocols?

The Nortel R/RS module architecture uses a programmable 10 gigabit packet processor which delivers higher flexibility for vendors to deliver new features and protocols on existing hardware. The Ethernet Routing Switch 8600's RSP 2.6 is a technology leveraged from carrier technology, making it the most reliable and high-performance processor in the industry.

3.0 Layer 1: Hardware (cont.)

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Category		Ethernet Routing Switch 8600 Specifications
Intelligence		• RFC 783 TFTP Protocol
		• RFC 791 IP Protocol
		• RFC 792 ICMP Protocol
		• RFC 793 TCP Protocol
		• RFC 826 ARP Protocol
		• RFC 854 Telnet Protocol
		• RFC 903 Reverse ARP Protocol
		• RFC 951/RFC 2131 BootP/DHCP
		• RFC 1058 RIPv1 Protocol
		• RFC 1112 IGMPv1 for snooping
		• RFC 1213 TCP/IP Management Information Base
	5.3.10	• RFC 1253 OSPF
		• RFC 1256 ICMP Router Discovery
	5.3.10	• RFC 1583 OSPFv2
		• RFC 1591 DNS Client
		• RFC 1745, obs RFC 1703 BGP/OSPF Interaction
		• RFC 1771 / RFC 1772 BGP-4
		• RFC 1812 Router Requirements
		• RFC 1866 HTMLv2 Protocol
		• RFC 1965 BGP-4 Confederations
		• RFC 4456 BGP-4 Route Reflectors
		• RFC 1997 BGP-4 Community Attributes
		• RFC 2068 Hypertext Transfer Protocol
		• RFC 2131 Dynamic Host Control Protocol (DHCP)
		• RFC 2138 RADIUS Authentication
		• RFC 2139 RADIUS Accounting
		• RFC 2178 OSPF MD5 cryptographic authentication/OSPFv2
		• RFC 2205
		• RFC 2210
		• RFC 2211
		• RFC 2236 IGMPv2 for snooping
		• RFC 2270 BGP-4 Dedicated AS for sites/single provide
		• RFC 2328 OSPFv2
	5.3.10	• RFC 2338 VRRP: Virtual Redundancy Router Protocol
	5.3.12	• RFC 2362 PIM-SM
		• RFC 2385 BGP-4 MD5 authentication

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The Types of Modules Installed in the System

There are two types of modules supported by the 8005 series power supplies. Classic modules are defined as those modules supported in the Ethernet Routing Switch Release 3.x code stream and include non-E, E and M modules as well as the 8690SF, 8691SF, 8691SF/256, 8692SF, WSM and 8661SAM modules. These are relatively low power draw modules. R modules include modules supported by the Ethernet Routing Switch Release 4.x code stream and include the 8630GBR, 8683XLR, 8683XZR and 8648GTR. A system consisting of any R modules (including a mixed system) can use the 8004, 8005AC or 8005DC power supplies.

Note that the 8005AC and 8005DC supplies are hot-swappable with existing 8004AC and 8004DC power supplies as well as the discontinued 8001AC and 8002DC supplies. However, the 8001/8002/8004 series supplies may not be used concurrently with the 8005 series power supplies. Nortel recommends hot-swapping 8005 supplies with previous models within five minutes.

The Number of Modules Installed in the System

The number of modules installed in an 8006, 8010 or 8010co system determines the number of 8005AC power supplies. The number of supplies required for an Ethernet Routing Switch 8600 system is as follows (please refer to the above section on circuit type and module types):

Table: Number of Power Supplies Required for Ethernet Routing Switch 8600 System

Power Supply Rating	Number of 8005 Power Supplies	Redundancy?	Maximum supported Classic Modules	Maximum supported modules in a mixed (Classic & R module) system	Maximum supported R Modules
100-120VAC 20A 1140W 5.3.17	1	No	9	5	5
	2	No	10	10	10
	2	Yes n+1	9	5	5
	3	Yes n+1	10	10	10
200-240VAC 15A 1462W 5.3.16	1	No	10	6	6
	2	No	10	10	10
	2	Yes n+1	10	6	6
	3	Yes n+1	10	10	10

8005AC and 8005DC 1500 Watt Power Supplies Technical Specifications

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3. The RADIUS server examines its data store and verifies that the username/password credentials are valid. It returns any additional attributes that may be associated with the user (such as user roles).

4. The EAP access point communicates with the EPM policy server to open the device port and to provision the port with user-based policies (based on user policy/role combinations). These attributes remain valid during the lifetime of that session.

Does the switch provide command line interface tracking in an encrypted file?

The Ethernet Routing Switch 8600 provides the ability to track modifications made to the configuration of the switch. A local encrypted file is used to store the command list and can only be accessed using the RWA login. The information stored includes the date, time, slot, and the command used.

CLI tracking provides increased security by showing who performed what configuration changes on the switch as well as from where the switch was accessed (IP address).

List the protocols that can be used to gain access to the switch (ex. telnet snmp, http, proprietary).

The administrator uses the following protocols to gain access to the Ethernet Routing Switch 8600:

5.3.14

- Telnet/CLI, SNMP (v1, v2c, v3), SSH (v1/v2): RO/RW capabilities
- JDM: RO/RW capabilities
- HTTP/web: RO. Because HTTPS is not currently supported, it is generally recommended not using the embedded web server, which is anyway provided only for RO capabilities.

Describe how each protocol can provide user authentication (ex. Radius).

The following protocols provide user authentication on the Ethernet Routing Switch 8600 switches: Telnet/CLI, SSH (v1/v2) user access can use RADIUS authentication. JDM/SNMP can be of the secure for SNMPv3, and current HTTP/web is read-only. HTTPs support is a future for the Ethernet Routing Switch 8600.

Can you upgrade your software with minimal impact?

Yes, the administrator can upgrade software with minimal impact to the Ethernet Routing Switch 8600 switches. The process for performing a minimal impact upgrade is as follows:

1) Enable High Availability mode on the Ethernet Routing Switch 8600 (if it is not already enabled), which mirrors the ARP, MAC/FDB, and routing tables (RIP/OSPF) across the 2 CPU/switch fabric modules. This function supports static routes, RIP v1 & v2, and OSPF protocols as well as all other Layer 2 (MAC/FDB) and Layer 3 (ARP) tables. This feature is recommended for daily operation, not just for performing hitless software upgrades.

5.3.10

2) Perform the software upgrade on the secondary CPU "A", which triggers a reboot of the secondary CPU when the upgrade is completed. The secondary CPU is now upgraded, and the tables described above are all mirrored.

3) Perform the software upgrade on the primary CPU "B", which will cause the CPU to reboot when the upgrade is completed. When the primary CPU reboots, the system immediately fails over to the secondary CPU, and with all of the tables mirrored, and there is no interruption in data flow.

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Can features be added without rebooting the device?

Features can be configured or enable/disabled without rebooting the Ethernet Routing Switch 8600 switch, but in general new major features are incorporated in new software releases; and to change software releases a reboot is required.

Can configuration changes be activated without restarting or rebooting the switch router?

Yes, configuration changes can be activated without restarting or rebooting the Ethernet Routing Switch 8600 switch.

Can the following authentication server authenticate user logins: RADIUS, TACACS, Or TACACS Plus?

The Ethernet Routing Switch 8600 switches support industry standard RADIUS authentication. The RADIUS server can be used as a Proxy to TACACS if desired. Note: TACACS/TACACS+ is a Cisco proprietary protocol.

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lower total cost of ownership (TCO) and eliminating forklift upgrades. Additionally, the SuperMezz reduces failover times of Split Multi-Link Trunking by a factor of eight times. Currently the 8692SF is proven to failover in 830ms while processing 44 10 Gigabit Ethernet ports running line rate traffic. This sub-100ms provides unmatched resilience and functionality when combined with IPv6.

With built-in Layer 4-7 performance, the Ethernet Routing Switch 8600 marks and classifies thousands of traffic types without affecting switch performance. Server load balancing, SSL acceleration and integrated firewall allow the Ethernet Routing Switch 8600 to provide data center services for an entire network with a low TCO. Quality of Service (QoS) and extensive traffic filtering ensure that the Ethernet Routing Switch 8600 allocates bandwidth to the applications that need it the most. Filtering or Access Control Lists (ACLs) can also be used to provide security as well as manage traffic flows.

Wire-speed routing and non-blocking switch fabrics provide the performance required for today's unified communication applications. With an architecture capable of supporting 720 Gbps, the Ethernet Routing Switch 8600 scales as well as provides performance. Two active redundant switch fabrics provide seamless failover delivering maximum resiliency. The Ethernet Routing Switch 8600 supports up to 384 Gigabit SFP Ethernet ports, 384 10/100/1000 and 96 10G Ethernet for high-density ports, as well as connections for Wavelength Division Multiplexing (WDM), ATM and Packet over SONET. As network traffic increases, scalability and performance become even more critical for network core devices.

5.3.10

Does the switch support source routing? Does the switch support policy based routing (PBR) such as Cisco?

The Ethernet Routing Switch 8600 switches support policy based routing (PBR) through flexible user defined forward-to-next-hop ACLs/filters.

What is the maximum Layer 3 routing throughput of the switch?

The Ethernet Routing Switch 8600 switch supports a Layer 3 routing throughput of 384 Mpps.

5.3.4

Does the switch support IPX routing?

Yes, the Ethernet Routing Switch 8600 supports hardware-accelerated routing support for the Novell Internetwork Packet Exchange (IPX) protocol. IPX routing is carried out by the ASICs on each module; thus, the Ethernet Switch performance benefits of wire speed and low

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3.0 Layer 1: Hardware (cont.)

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Category	Ethernet Routing Switch 8600 Specifications
	• RFC 2439 BGP-4 Route Flap Dampening • RFC 2453 RIPv2 Protocol • RFC 2702 • RFC 2819 Remote Monitoring (RMON) • RFC 2961 • RFC 3031 • RFC 3032 • RFC 3036 • RFC 3037 • RFC 3210 • RFC 3215 • RFC 3270 (partial) 5.3.12 • RFC 3376 IGMPV3 partial compliancy • RFC 3443 5.3.13 • RFC 3569 PIM-SSM • RFC 3917/RFC 3995 IPFIX • RFC 4364 • RFC 4379 • NAT (Network Address Translation) — only with WSM
IPv4 Multicast 5.3.12 5.3.12	• RFC 1075 DVMRP Protocol • RFC 1112 IGMP v1 for routing/snooping • RFC 2236 IGMP v2 for routing / snooping • RFC 2362 + some PIM-SM v2 extensions (PIM-SM)
IPv6	• IPv6 requires 8692SF and SuperMezz Daughter card and R/RS-Modules • RFC 1981 IPv6 path MTU discovery • RFC 2375 IPv6 Multicast Address Assignments • RFC 2460 IPv6 specifications • RFC 2461 Neighbor Discovery • RFC 2462 Stateless Auto Configuration • RFC 2463 ICMPv6 • RFC 2710 MLDv1/MLDv2 • RFC 2740 OSPFv3 • RFC 2893 Configured Tunnels and Dual Stack Routing per port • RFC 3484 Default Address Selection for IPv6

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3.0 Layer 1: Hardware (cont.)

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Category	Ethernet Routing Switch 8600 Specifications
	Tagged) • Multi-Link Trunks: Up to 128 trunks with 8 links per group with 8692SF + R/RS-Modules/Mode • VLANs: Up to 4,000 port- or protocol-based; per VLAN Tagging option • IP Multicast: Up to 4,000 S,G • Multiple spanning tree groups: Up to 64 (STGs) • SMLT and RSMLT (Routed Split Multi-Link Trunking) • Single Port Split Multi-Link Trunking
Network protocol and standards compatibility	
IEEE	5.3.9.1 IEEE 802.1D MAC Bridges/Spanning Tree Protocol
	5.3.9.2 IEEE 802.1p Prioritizing
	5.3.9.3 IEEE 802.1Q VLAN Tagging
	5.3.9.4 IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
	5.3.9.5 • IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
	• IEEE 802.1x EAPOL
	• IEEE 802.3 CSMA/CD Ethernet (ISO/IEC 8802-3)
	• IEEE 802.3ab Gigabit Ethernet 1000BaseT
	• IEEE 802.3ad Link Aggregation Control Protocol (LACP)
	5.3.9.6 • IEEE 802.3ae 10 Gigabit Ethernet
	• IEEE 802.3i 10BaseT – Autonegotiation
	• IEEE 802.3u 100BaseTX – Autonegotiation
	• IEEE 802.3x Flow Control on the Gigabit Uplink port
	• IEEE 802.3z Gigabit Ethernet 1000BaseSX and LX
IETF RFCs	
Layer 2 features ATM/POS	• RFC 1332 IPCP (POS module) • RFC 1471 LCP (POS module) • RFC 1473 NCP (POS module) • RFC 1474 Bridge NCP (POS module) • RFC 1552 IPXCP (POS module) • RFC 1638 BCP (POS module) • RFC 1661 PPP (POS module) • RFC 1989 PPP Link Quality Monitoring (POS module) • RFC 2558 Sonet/SDH (POS module) • RFC 2615 PPP over SONET/SDH (POS module)
IPv4 Layer 3/Layer 4	• RFC 768 UDP Protocol

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3.0 Layer 1: Hardware (cont.)

NORTEL

Category	Ethernet Routing Switch 8003 Chassis Technical Specifications
Noise	61 dBA maximum
Environmental Specifications	
Operating Temperature	0°C to 40°C (32°F to 104°F)
Storage Temperature	–25°C to 70°C (–13°F to 158°F)
Operating Humidity	85% maximum relative humidity, non-condensing
Storage Humidity	95% maximum relative humidity, non-condensing
Storage Altitude	10,000 ft (3,024 m) maximum
Free Fall/Drop	ISO 4180-s, NSTA 1A
Vibration	IEC 68-2-6/34
Shock/Bump	IEC 68-2-27-29
Electromagnetic Emissions	
Meets requirements of:	
U.S. 5.3.18	FCC CFR47 Part 15, Subpart B, Class A
Canada	ICES-003, Issue-2, Class A
Australia/New Zealand	AS/NZS 3548:1995, Class A
Japan	VCCI-V3/97.04, Class A
Taiwan	CNS13438, Class A
Europe	EN 55022-1998 Class A; EN 61000-3-2/A14, EN 61000-3-3
Global 5.3.18	CISPR 22-1997 Class A CE Mark
Electromagnetic Susceptibility	EN55024:1998/CISPR24:1997
Safety Agency Approvals	
US	UL60950
Canada	CSA 22.2 No. 60950
Australia/New Zealand	AS/NZS 3260
Mexico	NOM-019-SCFI-1998

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5.3.6 Are your linecards hot-swappable?

Yes. Every component in the Ethernet Routing Switch 8600 switch, including fan trays and power supplies is hot-swappable.

What type of power supply redundancy does the switch provide?

The Ethernet Routing Switch 8600 supports three hot-swappable power supplies, providing superior redundancy.

The Ethernet Routing Switch 8600 may have up to three power supplies installed to power all modules. These power supplies not only share the electrical load between them, thus extending the life of an individual unit, but are able to take over the additional load should one of them fail. In addition, these power supplies are hot swappable so that any failed unit may be replaced without disrupting network service.

How often does your equipment need to be upgraded to resolve hardware bug issues?

Resolving hardware bug issues through software fixes is always the preferred method. One of the major advantages of the Ethernet Routing Switch 8600 is that this product has more than a five year evolution of hardware design (longest in the industry for a Layer 3 hardware switch), so our hardware design (and associated software) is stable and dependable. In the history of the Ethernet Routing Switch 8600, all new hardware introductions have been to add additional features, functionality, and connectivity, not to resolve hardware bugs.

Is a 19-inch rack-mountable version available?

Yes, there is a 19-inch rack-mountable version of the Ethernet Routing Switch 8600 switch.

Nortel Ethernet Routing Switch 8600 supports a NEBS-3 compliant central office chassis: the Ethernet Routing Switch 8010CO chassis.

Is this component compliant with any level of the network equipment building system (NEBS) requirements GR-63-CORE?

Yes. Nortel provides a NEBS3-compliant Ethernet Routing Switch 8600 chassis (the 8010CO chassis). This carrier-grade version of the Ethernet Routing Switch 8600 is designed for Metro Ethernet service providers, and will house all Ethernet Routing Switch 8600 modules.

What chassis models are available?

Nortel Ethernet Routing Switch 8600 chassis models use Ethernet technology to offer a scalable, modular product that allows you to choose a wide variety of configurations to best meet your network

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8600 also employs IEEE 802.1p priority, IETF differentiated services, and per-flow rate policing.

Can all FastE and GigE ports support 802.1p?

Yes, all FastE and GigE ports on the Ethernet Routing Switch 8600 switches support 802.1p.

Can all modules support Layer 2/3/4 traffic classification?

Yes, all the modules for the Ethernet Routing Switch 8600 switches support Layer 2/3/4 traffic classification.

Does the switch support per PVC VBR shaping?

Yes, the Ethernet Routing Switch 8600 switches support per PVC VBR shaping. With the Ethernet Routing Switch 8672ATME module you can assign a QoS level to the Ethernet VLAN and then map a VBR PVC to that VLAN and turn the shaping on that PVC.

Does the switch support enhanced traffic shaping?

The Ethernet Routing Switch 8600 switches support enhanced traffic shaping. The Ethernet Routing Switch 8600 switches provide both queue-based and port-based shaping. Egress queue shaping provides shaping for each queue; port-based shaping shapes all outgoing traffic to a specific rate. Only R and RS modules support port-based shaping. The Ethernet Routing Switch 8600 switches support a minimum shaper rate of 1 Mbps and a maximum of 10 Gbps.

The Ethernet Routing Switch 8600 switches support eight hardware output queues with Weighted Fair Queuing algorithm, conforming to standards-based Differentiated Services. Each set of output queues supports up to 4MB of buffer space.

How does the switch use the IP precedence bits in the Type-of-Service (ToS) field of the IP packet header?

5.3.8

The Ethernet Routing Switch 8600 switch classic modules deliver eight hardware-based queues for prioritization (see the figure below). The Ethernet Routing Switch 8600 R/RS modules can use up to eight or 64 queues, depending on the module type. The Ethernet Routing Switch 8600 offers strict priority queuing and Weighted Fair Queuing, with the number of queues dedicated to each type being user selectable. This can be used to deliver strict priority for voice traffic and WFQ can deliver priority for critical data, yet not allow it to starve other data.

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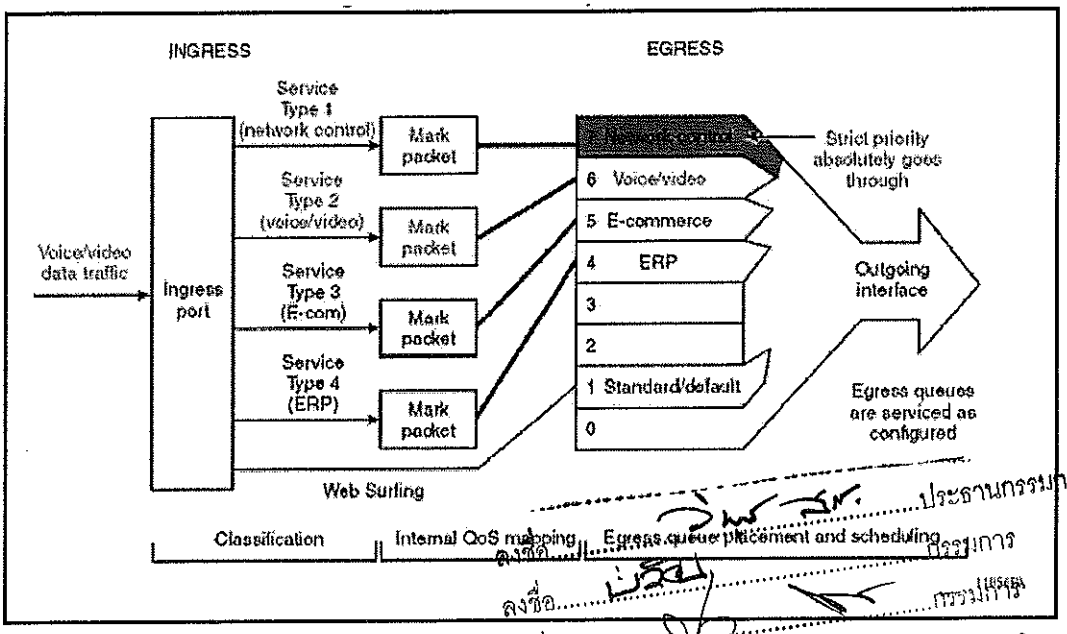
Express Classification (XC) delivering full wildcard support is included for prioritization at Layers 2, 3, and 4.



5.3.8 **Figure: Ethernet Routing Switch 8600 Quality of Service Operations**

The Ethernet Routing Switch 8600 supports the IETF DiffServ draft specification and ToS bits manipulation (see the figure below). The Ethernet Routing Switch 8600 also supports per flow traffic policing to ensure that end station applications remain within contracted traffic rates. If an end station exceeds the contracted rate, packets will be dropped.

The Ethernet Routing Switch 8600 Switches support end-to-end quality of service via standards-based DiffServ as well as 802.1p priority queuing and 802.1Q bit recognition.

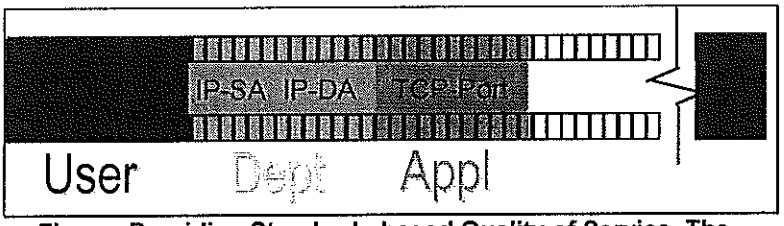


Figure: Providing Standards-based Quality of Service. The Ethernet Routing Switch 8600 supports IP Quality of Service via a combination of priority queuing, 802.1Q and 802.1p bit recognition, deep packet (Layer 2, Layer 3, Layer 4) filtering, and DiffServ (ToS) byte recognition.

Can all modules support ToS rewrite?

Yes, all the modules for the Ethernet Routing Switch 8600 switches support ToS rewrite.

- Increased reliability in the network Core means fewer outages and more network uptime.
- No VRRP, ECMP required in core VLAN.
- No tuning to IGPs necessary.
- No full mesh required.
- No tuning of Layer 3 protocols necessary to improve fail-over-time.
- Sub-second failover for bridged and routed networks.

5.3.7

Routed SMLT (R-SMLT) is an extension of the Split Multi-Link Trunking architecture, providing sub-second failover for routed core networks using Layer 3 routing protocols such as RIP, OSPF, and BGP. R-SMLT brings resiliency to the network core similar to the way SMLT brings resiliency to the network edge. Two Ethernet Routing Switch 8600 switches operate as one logical unit within the network core, allowing all connections to the network core to be utilized. R-SMLT extends the reliability of SMLT to routed core networks. By providing sub-second failover for Layer 3 information, R-SMLT ensures converged applications are viable and maintainable throughout the network.

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Why RSMLT and not just ECMP?

RSMLT uses SMLT as a base, providing designing freedom.

Benefits of using RSMLT (and not just ECMP) include:

- No tuning of the routing protocols
- No equal cost paths
- No full mesh required
- Only one core VLAN and all RSMLT routers participate (3 or 4 per core VLAN)
- Layer 2 and Layer 3 supported on SMLT/RSMLT topology
- No routing protocol convergence involved

Interaction between SMLT and IEEE 802.3ad

The Ethernet Routing Switch 8600 switch fully supports the IEEE 802.3ad Link aggregation control protocol; not only on MLT and DMLT links, but also extended to a pair of SMLT switches. With this extension, the Ethernet Routing Switch 8600 switch provides a standardized external link aggregation interface to third party vendor IEEE 802.3ad implementations. A dynamic link aggregation mechanism is provided.

- MLT peers and SMLT client devices can be network switches, and can also be any type of server/workstation that supports link bundling through IEEE 802.3ad.

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NORTEL

Nortel Ethernet Routing Switch 8600

Installation — SFP, XFP, GBIC, and OADM Hardware Components

Release: 5.1
Document Revision: 02.03

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4 Use the following job aids to determine the appropriate GBIC for your application.

--End--

Job aid

GBICs are hot-swappable input and output enhancement components designed for use with Nortel products to allow gigabit Ethernet ports to link with other gigabit Ethernet ports over various media types. The following table describes supported GBICs. For more information about specifications for these GBICs, see "GBIC specifications" (page 77).

ATTENTION
Attainable cable length can vary depending on the quality of the fiber optic cable used.

Model and connector	Product number	Description
1000BASE-T (RJ-45) 5.3.2	AA1419041-E5	CAT5 unshielded twisted pair (UTP), up to 100 m
1000BASE-SX (SC)	AA1419001-E5	850 nanometers (nm), up to 275 or 550 m
1000BASE-LX (SC)	AA1419002-E5	1310 nm, up to 10 km
1000BASE-XD (SC)	AA1419003-E5	1550 nm, up to 50 km
1000BASE-ZX (SC)	AA1419004-E5	1550 nm, up to 70 km
1000BASE-EX CWDM (SC)	AA1419017-E5 to AA1419024-E5	1470 nm to 1610 nm, up to 120 km

Installing a GBIC

Install a GBIC to complete the transmission path.

Installing a GBIC takes approximately three minutes.

Prerequisites

- Verify that the GBIC is the correct model for your network configuration.
- Before you install the optical connector, ensure it is clean.

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WARNING
Risk of eye injury by laser
Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

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Model number	Product number	Description
10GBASE-LRM 5.3.2	AA1403007-E6	1310 nm. Up to 220 m reach over Fiber Distributed Data Interface (FDDI)-grade 62.5 µm multimode fiber. Suited for campus LANs.
10GBASE-LR/LW	AA1403001-E5	1310 nm SMF. The range is up to 10 km.
10GBASE-ER/EW	AA1403003-E5	1550 nm SMF. The range is up to 40 km.
10GBASE-ZR/ZW	AA1403006-E5	1550 nm SMF. The range is up to 80 km.
10GBASE DWDM	NTK587AE-E5 NTK587AG-E5 NTK587AJ-E5 NTK587AL-E5 NTK587AN-E5 NTK587AQ-E5 NTK587AS-E5 NTK587AU-E5 NTK587AW-E5 NTK587AY-E5 NTK587BA-E5 NTK587BC-E5 NTK587BE-E5 NTK587BG-E5 NTK587BJ-E5 NTK587BL-E5 NTK587BN-E5 NTK587BQ-E5 NTK587BS-E5 NTK587BU-E5	1530.33 nm to 1545.32 nm SMF. The range is up to 80 km.

Installing an XFP

Install an XFP to provide a 10 gigabit Ethernet interface between the switch and other network devices.

Installing an XFP takes approximately three minutes.

Prerequisites

- Verify that the XFP is the correct model for your network configuration.
- Before you install the optical connector, ensure it is clean.

WARNING
Risk of eye injury by laser
Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

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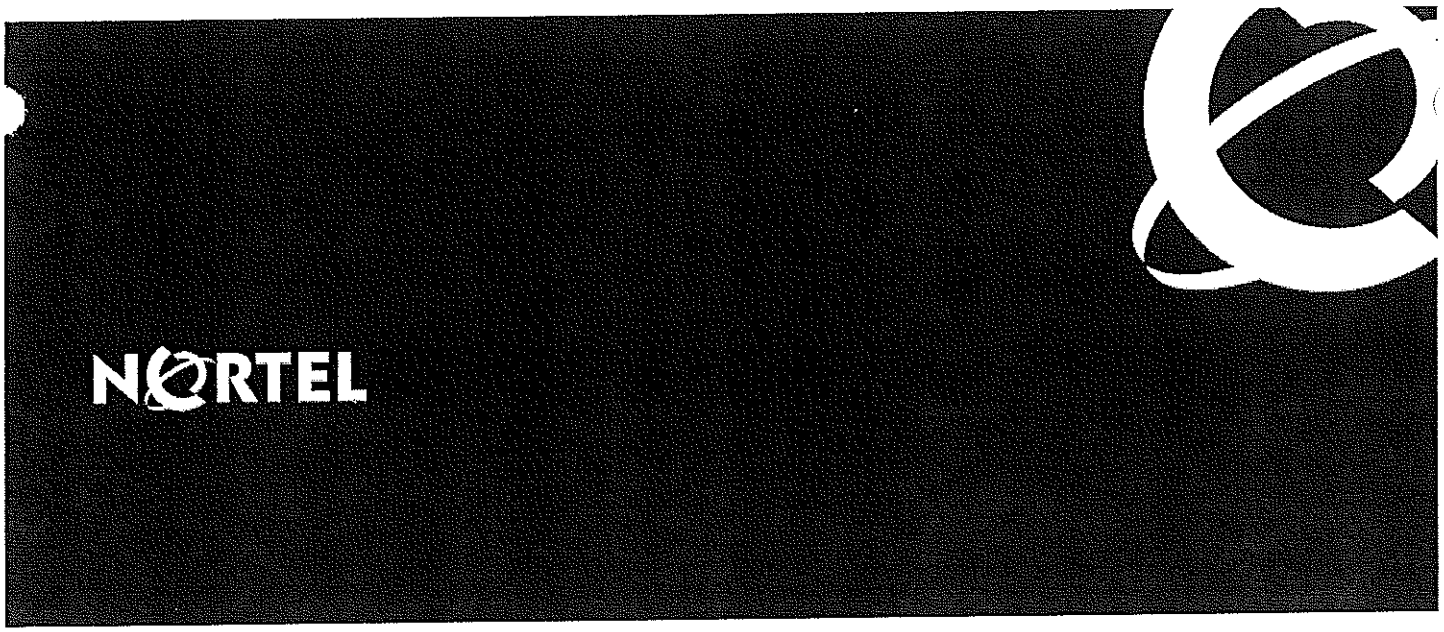

Nortel Ethernet Routing Switch 8600

Installation — AC Power Supply

Release: 5.0
Document Revision: 02.01

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Table 7
DC input power specifications for the Model 8004AC power supply

Parameter	Specifications
Output power (maximum):	850 W (110–240 VAC) 780 W (100–109 VAC)
Individual power ratings: (12V power includes fan power)	3.3 VDC @ 150 A 12 VDC @ 50 A
MTBF:	246 647 hr (MIL-std 217 standard)

Specifications: 8005AC power supply

This section provides power ratings for the 8005AC power supply.

AC input power specifications

The following table describes the technical specifications for AC input power for the Model 8005AC power supply.

Table 8
AC input power specifications for the Model 8005AC power supply

Parameter	Specifications (100–120 VAC input voltage)	Specifications (200–240 VAC input voltage)
Input current:	16 A	9.5 A
Frequency range:	50–60 Hz	50–60 Hz
Input VA:	1600 VA	1846 VA
Input power consumption:	1584 W	1828 W
Heat dissipation (thermal/output):	1515 Btu/hr	1250 Btu/hr
Hold-up time:	20 ms	20 ms

DC output power specifications

The following table describes the technical specifications for DC output power for the Model 8005AC power supply.

Table 9
DC input power specifications for the Model 8005AC power supply

Parameter	Specifications (100–120 VAC input voltage)	Specifications (200–240 VAC input voltage)
Output power (maximum):	1140 W (1050 W + 90 W fans)	1462 W (1372 W + 90 W fans)