Ethernet has emerged as the technology of choice for new service provider deployments for Layer 2 enterprise VPNs and for the delivery of IP-based services, such as triple play of voice, video and Internet access. Carrier Ethernet leverages the investment in Ethernet LAN-based networking to offer a packet switching technology that is the most cost-effective from 10 Mbps to 10 Gbps. Carrier Ethernet also leverages the economics and simple operational model of LAN switches to create the most cost-effective network infrastructure for the delivery of converged IP-based services. For enterprises that want to cost-effectively extend LANs at native rates into the MAN and WAN, Ethernet is the answer. For carriers and service providers looking for a fast, reliable and profitable way to eliminate bandwidth bottlenecks in the MAN, Ethernet is the answer.

Carrier Ethernet enables carriers to build next-generation infrastructures across the metro to provide Ethernet-based services as well as to provide Ethernet-based infrastructures to backhaul IP services and aggregate broadband traffic. Point-to-point, point-to-multipoint and any-to-any connection configurations allow deployment options that meet differing service and application requirements.

Nortel’s Metro Ethernet Routing Switch 8600 builds upon the Ethernet Routing Switch 8600, which has been a workhorse for enterprises and a reliable profit-maker for service providers. It is leading the way in delivering scalable, feature-rich, Ethernet-based Virtual Private Networks (VPNs) and next-generation Ethernet MAN infrastructure.

The Metro Ethernet Routing Switch 8600 is a key component of Nortel’s Carrier Ethernet solution, delivering 1-Gigabit and 10-Gigabit Ethernet performance with Quality of Service (QoS) for business-critical applications and services. The Metro Ethernet Routing Switch 8600 delivers premium performance and availability, QoS-based traffic prioritization, scalability and support for a wide range of interfaces.
The Metro Ethernet Routing Switch 8600 delivers important benefits to service providers seeking to increase their Ethernet-based network footprint (Table 1).

**Table 1. Metro Ethernet Routing Switch 8600 key benefits**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple services (e.g., Internet access, Transparent LAN Service, VoIP VPNs, etc.) supported per UNI port</td>
<td>Maximizes revenue generation</td>
</tr>
<tr>
<td>Efficient IP Multicast and VLAN-to-IP network mapping capabilities</td>
<td>For efficient triple play service delivery on every UNI port</td>
</tr>
<tr>
<td>Ethernet access ring resiliency (when used with Nortel Metro Ethernet Services Unit 1800 and/or 1850), with 50ms protection on the ring</td>
<td>Ensures high availability to meet strict SLAs</td>
</tr>
<tr>
<td>A well-defined Ethernet user-network interface (UNI)</td>
<td>Provides complete end-user service delineation and controls service parameters</td>
</tr>
<tr>
<td>A robust network-to-network interface (NNI), enabling support of up to 16 million Ethernet VPNs</td>
<td>Delivers extraordinary degrees of network and service scalability, security and operational ease</td>
</tr>
<tr>
<td>A flexible suite of traffic policing, QoS and statistics capabilities</td>
<td>Enables multiple levels of service at different price points</td>
</tr>
<tr>
<td>OAM&amp;P tools supporting end-to-end, per-VPN performance monitoring and measurement capabilities</td>
<td>Provides enhanced SLA monitoring for service assurance</td>
</tr>
<tr>
<td>Support for existing and emerging Ethernet-related industry standards</td>
<td>Meets interworking demands of multi-vendor Ethernet switched and transport networks</td>
</tr>
</tbody>
</table>

**What makes the Metro Ethernet Routing Switch 8600 exceptional?**

The principle facing service providers today is that of delivering multiple services to residential and business end-users while leveraging a common, converged infrastructure. Nortel has made this possible with the Metro Ethernet Routing Switch 8600. Nortel’s leading-edge Ethernet UNI offers the following features to support enterprise VPN and triple play revenue-generating services:

- Delineation and security
- Scalability and efficiency
- Quality of Service
- Service management
- Interoperability

With the capability to deliver hundreds of millions of packets per second (Mpps) performance, the Metro Ethernet Routing Switch 8600 provides resiliency with these attributes in a production-tested and proven solution.

**Delineation and security**

The primary responsibility of the Ethernet UNI is service demarcation. Yet the Nortel Ethernet UNI goes beyond simple demarcation by allowing service providers and enterprises to deliver multiple services and service types per port. Customer separation is maintained as traffic ingresses the network with support for customer premises and access network techniques such as IEEE 802.1Q, pre-standard IEEE 802.1ad (Provider Bridge or Q-in-Q) and the stacked tags used by Nortel Metro Ethernet Services Units. Delineation continues on the network side with support for Nortel’s pre-standard 802.1ah (Provider Backbone Bridge or MAC-in-MAC) encapsulation on the NNI link. The end user packet is completely encapsulated by a service provider Ethernet header and assigned a service identifier that is globally unique to that service.

The Ethernet UNI neither uses nor processes any Layer 3 address information from the end-user’s network. Network address translation is unnecessary, because the entire end-customer packet is encapsulated so that the customer’s Layer 3 header is kept intact across the provider network. The 802.1ah encapsulation prevents the so-called ‘MAC-explosion’ scenario in the provider core that could lead to flooding of customer packets across the provider network. The 802.1ah encapsulation prevents undesirable flooding of customer packets across the provider network, thus avoiding inefficiencies and potential security issues. This encapsulation also makes the provider infrastructure transparent to the customer’s Ethernet control protocol packets, allowing for efficient interconnection of customer Layer 2 (bridged) networks. This approach provides a simple option to tunnel enterprise control frames without complex provisioning.

Unknown unicast, multicast and broadcast traffic are constrained within their respective VPNs, effectively limiting unnecessary broadcasting. In addition, the unknown unicast, multicast and broadcast traffic rates within a VPN can be constrained below set levels.

The Metro Ethernet Routing Switch 8600 employs state-of-the-art network processor technology to implement Ethernet VPN functions in a program-mable format, while retaining the high-speed processing capabilities previously associated with fixed silicon implementations. The ability to program the network
processor means that fast-moving changes in the standards defining how VPNs are implemented can be captured and brought to market quickly, and with reduced cost.

Ethernet VPN service topologies supported include point-to-point, point-to-multipoint and any-to-any models. Implementation of these specific topologies gives service providers and enterprises additional flexibility while improving overall resource utilization and network efficiency. For example, an enterprise customer with a headquarters site and many branch offices would benefit from an Ethernet VPN service implemented in a point-to-multipoint or hub-and-spoke fashion. Leveraging a point-to-multipoint service topology, service providers can restrict the spokes to only communicate through the hub, thereby maximizing the efficiencies of their Ethernet infrastructure and optimizing resource utilization and enhancing data security.

Metro Ethernet supported access deployment models are:

- Single enterprise service access via a dedicated link
- Multiple enterprise service access via an IEEE 802.1ad Ethernet access link
- Multiple enterprise service access via an Ethernet Services Unit access ring

This flexibility makes it appropriate for both greenfield build-outs as well as demand-based add-ons to existing infrastructures. These same capabilities limit the number of truck-rolls required to add users and adjust service levels across the network.

**Scalability and efficiency**

Nortel’s Ethernet UNI encapsulates customer data and adds a globally unique service label. Service providers no longer have to worry about overlapping VLAN-IDs or partitioning the network to avoid this issue, significantly simplifying operations. The Metro Ethernet Routing Switch 8600 maps customer and provider VLAN IDs to IEEE 802.1ah service identifiers. A transparent UNI is defined when all traffic on a physical port is assigned to a single service, while a switched (mapped) UNI provides multiple services per physical port to one or more customers. This can be accomplished across thousands of service and customer instances as shown in Table 2.

The Metro Ethernet Routing Switch 8600 — when performing the role of a Provider Backbone Bridge, aggregating Provider Bridge traffic that is Q-in-Q tagged — can use either the outer (provider) Q-tag or the combination of inner (customer) and outer (provider) Q-tags for service assignment and classification. This capability gives the service provider superior flexibility for interworking with a wide variety of access devices to support the desired service definitions.

The Metro Ethernet Routing Switch 8600 improves bandwidth efficiency by tunneling enterprise broadcast traffic inside provider unicast packets. Additionally, the 802.1ah Provider Backbone Bridge implementation uses the MAC addresses of the Ethernet UNIs (ingress ports), rather than customer MACs in the switch forwarding tables. This eliminates the “MAC address explosion” issue by greatly reducing the number of MAC addresses that must be learned and maintained by switches in the service provider’s core infrastructure. Keeping the number of MAC addresses to a minimum reduces the aging out and relearning of MAC addresses, thus enhancing end-to-end performance and making network forwarding far more stable.

### Table 2. Metro Ethernet Routing Switch 8600 scalability

<table>
<thead>
<tr>
<th>Scalability parameter</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique service identifiers</td>
<td>16,000,000 + range</td>
</tr>
<tr>
<td>Customer VLANs per UNI port</td>
<td>4,000</td>
</tr>
<tr>
<td>Provider Bridge VLANs per UNI port</td>
<td>4,000</td>
</tr>
<tr>
<td>Service instances per chassis</td>
<td>30,000</td>
</tr>
<tr>
<td>Customer MAC addresses per ESM 8668 port</td>
<td>98,000</td>
</tr>
</tbody>
</table>
Figure 2 shows the Metro Ethernet Routing Switch 8600 deployed in support of triple play services including video (broadcast TV, video on demand), voice over IP and high-speed Internet access over a common network. Residential subscribers are connected to the network via various access technologies (xDSL, cable, direct fiber, Ethernet access ring, etc.) while enterprise subscribers are connected via direct Ethernet VPNs using the same access infrastructure. A mix of residential and enterprise services are supported on every port, creating a truly shared Ethernet-based infrastructure without compromising on performance. The Metro Ethernet Routing Switch 8600 leverages existing industry-recognized IP multicast features, along with innovative new implementations in order to support triple play efficiently. For broadcast TV in particular, Ethernet is a more efficient service delivery vehicle compared to meshed, point-to-point solutions. Triple play services can be further distributed via an Ethernet access ring topology using Nortel Metro Ethernet Services Units. The Metro Ethernet Routing Switch 8600 supports services through other access topologies, such as point-to-point fiber, IEEE 802.1ad access networks and broadband aggregation devices.

Determinism and Ethernet

Ethernet continues its evolution from a LAN-centric technology to a carrier-grade, multipurpose protocol for the MAN and beyond. In a carrier environment, the connectionless behavior of traditional Ethernet implies a certain unpredictability that is troublesome in such a high availability environment. A recent development in the Ethernet world has been the work on a connection-oriented technique known as Provider Backbone Trunking (PBT). PBT builds on the hierarchical nature of Provider Backbone Bridging (802.1ah), which creates separate customer and service provider domains, eliminating the problem of MAC table explosion and undesirable unknown address flooding.

PBT provides Ethernet with a connection-oriented forwarding mode, which enables service providers to offer dedicated Ethernet links with guaranteed, deterministic performance levels. In this way PBT delivers hard QoS over an Ethernet network without the added cost of connection-oriented alternatives. PBT also delivers the following benefits to the service provider:

- **Scalability** – PBT does not rely on the traditional Ethernet MAC address learning methods. This explicit learning approach removes the undesirable MAC flooding behavior that otherwise limits the size of the network.
- **Resiliency** – Since PBT allows creation of point-to-point connections across the network, working and protection routes can be provisioned to provide end-to-end resiliency across arbitrary mesh topologies.
- **Network utilization** – The ability to fully manage traffic paths and know exactly which customer traffic is being carried over which path allows customer SLAs to be met without over-provisioning and under-utilizing network capacity.
- **Manageability** – Since the operations support system (OSS) is aware of the route taken by each service, functions such as alarm correlation, service-fault correlation and service-performance correlation are simplified.
- **Security** – Using point-to-point Ethernet tunnels across the network protects traffic from misconfiguration errors or interception by users with malicious intent. Furthermore, by avoiding the flooding behavior of conventional Ethernet, unintentional leakage of packets to end-points for which they were not intended can be avoided.

Nortel continues to innovate with pioneering technologies such as PBT in order to deliver the carrier-grade behaviors our customers have come to expect from our Metro Ethernet Portfolio. The Metro Ethernet Routing Switch 8600 will continue to lead the way with these innovations, allowing end-users and service providers alike to benefit from its cost-effective, reliable services.
The Metro Ethernet Services Routing Switch 8600 has the ability to set hard and soft MAC-learning limits, per VPN service, for customer MAC address usage. This helps to prevent a malevolent user or a rogue customer device from flooding the address tables using a MAC-based denial of service attack.

**Reliability**
The Metro Ethernet Routing Switch 8600 architecture is designed to provide protection strategies at multiple levels to deliver “five nines” reliability.

At the device level, the Metro Ethernet Routing Switch 8600 is equipped with redundant, hot-swappable components — switch fabrics, power supplies and fan trays. Temperature sensors constantly monitor the components and cooling systems to maintain acceptable system conditions.

At the trunk level, Distributed Multi-Link Trunking (DMLT) provides redundancy by enabling trunk groups to be configured across different slots in the same chassis. In the event of a failure, links would remain active, because other modules in the trunk group could take over.

Network and link redundancy is provided by several key features:
- 50ms failover when using ring-based access with Metro Ethernet Services Unit 1800/1850 in concert with the Ethernet Services Module 8668
- 50ms failover based on LACP MLT (requires Metro Ethernet 8600 CPU Expansion Mezzanine card on the CPU) between Metro Ethernet Routing Switch 8600s
- Multi-Link Trunking
- Sub-second failover based on RSTP/MSTP protocols (IEEE 802.1w and 802.1s respectively) on NNI trunk ports

Nortel’s innovative Split Multi-Link Trunking (SMLT) improves the scalability and reliability of Layer 2 networks by removing spanning tree convergence issues in the access network and providing faster recovery in the access network.

**Service management**
Service providers require mature network and service management systems that allow quick configuration of the network to support new services as well as quality control of ongoing operations. Since it is important to keep the customer's service running as measured against a service level agreement (SLA), the service provider must have the performance measurements to back up any service-level claims. Additionally, if a fault does occur, the service provider needs the troubleshooting functionality to locate the fault, identify which services have been impacted and react to these appropriately.

Nortel’s Metro Ethernet portfolio provides extensive capabilities for performance enhancements.
monitoring, service assurance, SLA measurement and troubleshooting. An advanced SNMP-based network management toolkit allows scheduling of periodic tests and generation of a history of the test results to validate VPN end-points, test connectivity (uptime), perform performance monitoring (e.g., round-trip delay) and debug failures. These are critical to measuring and validating customers’ SLAs. This capability allows service providers to detect problems with the service before the customer notices the service degradation.

These tools also allow the service provider to troubleshoot and isolate any problem quickly and methodically. This operational simplicity at the service level enables significant operational savings.

Statistics are kept per-port and per-Ethernet VPN. This is key to allowing the service provider to provide flexible tiered services and appropriately bill for each service.

Quality of Service
For enterprises and service providers alike, the network must be able to maintain quality of service profiles and differential treatment from end to end. Traffic classification occurs at ingress, per service end-point, and is done using customer 802.1p or customer Type of Service (TOS) and/or Differentiated Service Code Points (DSCP).

The Metro Ethernet Routing Switch 8600 implementation is based on RFC 2698, Two Rate Three Color Marker. This algorithm meters an IP/Ethernet packet stream and marks its packets based on two rates — Peak Information Rate (PIR) and Committed Information Rate (CIR) — and their associated burst sizes, to be green, yellow or red. A packet is marked red if it exceeds the PIR. Otherwise, it is marked either yellow or green depending on whether it exceeds or doesn’t exceed the CIR.

The Metro Ethernet Routing Switch 8600 supports four classes of service, with four distinctive queues. Applications are prioritized across the network using intelligent agents in the interface modules to support IEEE 802.1p Class of Service (CoS) and IETF Differentiated Service (DiffServ).

All frames egressing an 802.1ah network are marked with proper 802.1p CoS markings, enabling end-to-end QoS and multi-vendor interoperability. Operators can set policing parameters per port for transparent ports and per port per VPN for switched (mapped) ports.

**Policing**
- Ingress policing on a per-port basis for transparent UNI
- Ingress policing on a per-service basis for switched UNI
- User-tunable bandwidth in increments of 64 kbps up to 1 Mbps, then to line rate in increments of 1 Mbps
- Committed and Peak Information Rate policing parameters

**Ingress packet classification**
- Per port basis
- Configurable mapping of customer 802.1p to service provider priority level per service
- Configurable mapping of customer Type of Service (TOS) field to service provider priority level per service

**Interoperability**
With its network processor-enabled flexibility, the Metro Ethernet Routing Switch 8600 interworks with a comprehensive range of Ethernet technologies on the user side, including:
- IEEE 802.1Q Ethernet VLANs
- Pre-standard IEEE 802.1ad Ethernet Stacked VLANs (Provider Bridge)
- HVPLS N-PE

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**Figure 3. A simplified view of residential triple-play service delivery.**
The Metro Ethernet Routing Switch 8600 supports the 8608GBM, the 8630GBR and the 8683XLR for network-to-network interface (NNI) ports. These modules support 8 ports of 1000BaseX GBICs, 30 ports of 1000BaseX SFPs, and 3 ports of 10 Gigabit Ethernet XFPs respectively. Multi-Link Trunking (MLT) and Distributed MLT are supported for n x 1GE or n x 10 GE load balanced trunks. Egress rate shaping is supported on the 8630GBR and the 8683XLR. Handoff can be either Nortel’s pre-standard IEEE 802.1ah Provider Backbone Bridge format for connection to other Metro Ethernet Routing Switch 8600s or 802.1ad format for connection to other devices that support the Q-in-Q format. As an additional security feature, the 8630GBR and 8683XLR modules support 1,000 L2-L7 access control list (ACL) filters on ingress and 1,000 on egress per port. ACLs can be configured to provide an additional safety net to ensure that traffic going to other parts of the network conforms to certain rules.

**Chassis choices**

With a range of fault-tolerant models to choose from, the Metro Ethernet Routing Switch 8600 offers cost-effective Ethernet switching solutions with superior flexibility for enterprises and service providers. Three redundant chassis models are available:

For service provider central offices, Nortel offers a NEBS3-compliant 10-slot chassis designed for the most demanding environments, with enhanced cooling and electromagnetic interference (EMI) protection features.

Where high density, availability and scalability are essential, Nortel offers a 10-slot chassis — one or two slots for a load-sharing CPU/switching fabric module, with the remaining slots available for input/output modules.

Where space is at a premium and lower density is desired, a 6-slot chassis is available.

**Module choices**

A choice of switch modules for access and trunking makes the Metro Ethernet Routing Switch 8600 ideal for the evolving network. Configurations can be mixed and matched to offer Ethernet interfaces from 10 Mbps to 10 Gbps, using the Metro Ethernet Services Module 8668 in conjunction with the Metro Ethernet Service Units or Ethernet switches from Nortel or other manufacturers. In addition, the 8608GBM, 8630GBR and 8683XLR modules (8 x GB, 30 x GB and 3 x 10GB respectively) can be used for NNI functions (UNI functions in the future).

The range of module options means the network can grow as business needs grow. The platform can support scalable switching bandwidth up to 512 Gbps — wire-speed routing of hundreds of millions of packets per second.

This unparalleled flexibility protects the network investment by accommodating evolving Ethernet standards and hard-to-forecast business growth.

The Metro Ethernet Routing Switch 8600 supports single end-point service activation at the Ethernet UNI. Activation can be followed immediately by a VPN continuity verification test to ensure that the activation was carried out correctly.

From the physical to the logical, all aspects of the Metro Ethernet Routing Switch 8600 were designed to be easy to install, operate and maintain for maximum ease and minimum cost of ownership.
<table>
<thead>
<tr>
<th>Order Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chassis</strong></td>
<td></td>
</tr>
<tr>
<td>DS1402001</td>
<td>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.</td>
</tr>
<tr>
<td>DS1402002</td>
<td>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.</td>
</tr>
<tr>
<td>DS1402004</td>
<td>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 power supplies, up to three power supplies supported.</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td></td>
</tr>
<tr>
<td>DS140019-3.6</td>
<td>Metro Ethernet Routing Switch 8600 Software Kit: Includes v3.6 Metro Ethernet Switching SW license, Device Manager and complete documentation set. One license kit required per chassis. Support contracts must be purchased separately.</td>
</tr>
<tr>
<td><strong>CPU/Switch Fabrics</strong></td>
<td></td>
</tr>
<tr>
<td>DS1404026</td>
<td>Metro Ethernet Routing Switch 8691omSF Switch Fabric/CPU Module. One required per 8600 chassis. Supports 8006, 8010 or 8010CO chassis. Includes PCMCIA flash memory card.</td>
</tr>
<tr>
<td>DS1404027</td>
<td>Metro Ethernet Routing Switch 8600 CPU Expansion Mezzanine card. Field Installable for 8691omSF Switch Fabric module. Supports 50ms failover in Metro Ethernet configuration.</td>
</tr>
<tr>
<td>DS1404096</td>
<td>Metro Ethernet Routing Switch 8691ommez Switch Fabric/CPU Module. Combined DS1404026 and DS1404027. Implement only in Metro Ethernet ring configurations for 50ms ring resiliency.</td>
</tr>
<tr>
<td>DS1404103</td>
<td>Metro Ethernet Routing Switch 8692omSF Switch Fabric/CPU. One required with R Modules. Interoperable with all pre-R modules. Includes 256MB SDRAM and 64MB PCMCIA. For use in Metro Ethernet Routing Switch 8600 configuration.</td>
</tr>
<tr>
<td>DS1404066</td>
<td>Metro Ethernet Routing Switch 8692ommez Switch Fabric/CPU 8692 with Expansion Mezzanine card. Supports 50ms failover in Metro Ethernet configuration and 50ms ring resiliency in ring configurations.</td>
</tr>
<tr>
<td><strong>Interface Modules</strong></td>
<td></td>
</tr>
<tr>
<td>DS1404068</td>
<td>8668ESM. Metro Ethernet Services Module. 8-port Gigabit Ethernet interface module, SFP-based* for use in Metro Ethernet configurations.</td>
</tr>
<tr>
<td>DS1404063</td>
<td>8630GBR. 30 x 1000BaseX SFP Gigabit Ethernet ports.</td>
</tr>
<tr>
<td>DS1404101</td>
<td>8683XLR. 3 x 10Gigabit Ethernet XFP ports — LAN PHY only.</td>
</tr>
<tr>
<td>DS1404055</td>
<td>8632TXM. 32 ports autosensing 10/100BASE-TX plus 2 GBIC* ports interface module.</td>
</tr>
<tr>
<td>DS1404056</td>
<td>8648TXM 48 port autosensing 10BASE-T/100BASE-TX Ethernet interface module.</td>
</tr>
<tr>
<td>DS1404059</td>
<td>8608GBM 8-port 1000BASE Gigabit Ethernet GBIC-based* interface module.</td>
</tr>
<tr>
<td>DS1404060</td>
<td>8683POS 8 port 1000BASE-F Gigabit Ethernet interface module (POS Baseboard w/3 MDA Slots. Accepts three MDAs*, supports up to 6 OC-3 or 3 OC-12 ports.</td>
</tr>
<tr>
<td>DS1404061</td>
<td>8608GTM 8 port 1000BASE-T Gigabit Ethernet interface module.</td>
</tr>
</tbody>
</table>

* All SFPs, GBICs, MDAs and XFPs sold separately.
**Capacity and performance**

- Full duplex switching capacity of 512 Gbps, with redundant switch fabrics
- Performance for 64-byte packets: aggregate throughput maximum of 384 Mpps, 10 microseconds latency
- Chassis options: 8006, 6-slot chassis for backbones of lower density or higher space premium; 8010, 10-slot chassis for high availability/high scalability; 8010CO, 10-slot NEBS-compliant chassis. 2 slots reserved for switch fabric, balance for I/O modules.

**Switch Fabric/CPU modules**

One switch fabric required, second optional fabric doubles capacity and provides load sharing

- 8691omSF Switch Fabric/CPU Module.
- 8600 CPU Expansion Mezzanine card for 8691omSF. Field installable. Supports 50ms failover in Metro Ethernet configuration.
- 8692omSF Switch Fabric/CPU. One required with 8630GBR and 8683XLR modules. Interoperable with all pre-R modules.
- 8692ommez Switch Fabric/CPU 8692 with Expansion Mezzanine card. Supports 50ms failover on NNI trunks with Multi-Link Trunking.

**Interface modules**

- 8668ESM. 8-port Ethernet Services Module. SFP-based, Gigabit Ethernet
- 8630GBR. 30 ports 1000BaseX for SFP
- 8683XLR. 3 ports 10Gigabit Ethernet XFP – LAN PHY only
- 8632TXM. 32 ports 10/100 plus 2 GBIC ports
- 8648TXM. 48 10/100TX ports
- 8608GBM. 8-port Gigabit Ethernet, GBIC-based
- 8683POSM. POS Baseboard supports up to 6 OC-3 or 3 OC-12 ports
- 8608GTM. 8 ports 1000BASE-T, fixed Gigabit Ethernet

**IP layer protocols**

- IPv4
- Routing protocols: RIP, RIP2, BGP4, OSPFv2, IS-IS
- IP Multicast: PIM-SM, PIM-SSM, IGAP, IGMPv1, v2, and v3, DVMRP, PGM

**Address database size**

- ESM 8668: 98,000 MAC addresses per port
- M Modules: 128,000 table entries per system (when configured for M mode)
- Addressing: 48-bit MAC address, 32-bit IP address
- Gigabit Ethernet port MTU: 1950 bytes
- Jumbo Frames up to 9600 supported on specific modules

**Ethernet network protocols and standards compatibility**

- IEEE 802.3 Ethernet
- IEEE 802.3z 1000BASE-SX and 1000BASE-LX
- IEEE 802.3ab
- IEEE 802.3ad
- IEEE 802.3ae
- IEEE 802.3x (Flow control)
- IEEE 802.1D Bridging
- IEEE 802.1Q (VLAN tagging)
- IEEE 802.1p (Prioritizing)
- Pre-IEEE 802.1ad (Provider Bridge)
- Pre-IEEE 802.1ah (Provider Backbone Bridge)
- Provider Backbone Transport (PBT)
- IEEE 802.1x (EAP)
- IEEE 802.1w (RSTP)

**Resiliency features**

- Redundant switch fabrics and fans, hot swappable I/O modules, N+1 power supply redundancy
- High Availability Mode = hitless L2 failover; sub-second L3 failover
- Virtual Router Redundancy Protocol (VRRP)
- Load balancing via ECMP for RIP, OSPF and BGP

**Link aggregation on NNI ports**

- IEEE 802.3 ad
- Multi-Link Trunking (MLT) for port level redundancy
- Distributed MLT for trunk level redundancy
- Split MLT for device level redundancy

**Quality of Service traffic management**

- DiffServ (RFC 2474), IP ToS precedence
- IEEE 802.1Q VLAN Tagging, IEEE 802.1p User Priority settings
- Queues: 4 hardware queues per port; strict priority and WRR configurable

**Management and administration**

- CLI
- SNMP (v1, v2, v3) compliant management
- PSP for provisioning
- Java Device Manager for configuration
Nortel is a recognized leader in delivering communications capabilities that enhance the human experience, ignite and power global commerce, and secure and protect the world’s most critical information. Serving both service provider and enterprise customers, Nortel delivers innovative technology solutions encompassing end-to-end broadband, Voice over IP, multimedia services and applications, and wireless broadband designed to help people solve the world’s greatest challenges. Nortel does business in more than 150 countries. For more information, visit Nortel on the Web at www.nortel.com.

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