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Nortel Communication Server 2100

Geographic Survivability

Planning Guide

SE08 Standard 03.02 May 2005

NORTEL

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February 2004

Version 01.04, SE06, Standard. This is the first standard issue of this document.

Contents

About this document

Purpose and audience

This document describes how the Nortel Communication Server 2100 can be distributed in buildings at separate locations. Geographic survivability ensures that call processing continues in the event that a disaster impacts one of the buildings. This document's audience is service provisioning, administrative and network management personnel.

How to check the version and issue of this document

The version and issue of the document are indicated by numbers (for example, 01.01).

The first two digits indicate the version. The version number increases each time the document is updated to support a new software release. For example, the first release of a document is 01.01. In the next software release cycle, the first release of the same document is 02.01.

The second two digits indicate the issue. The issue number increases each time the document is revised but re-released in the same software release cycle. For example, the second release of a document in the same software release cycle is 01.02.

FOR MORE INFORMATION

To determine whether you have the latest version of this document and how documentation for your product is organized, check the release information in the *Meridian SL-100 Master Index of Publications*.

References in this document

This guide references the following documents for additional information:

- *Meridian SL-100/Communication Server 2100 Application Planning Guide*
- *Communication Server 2100 Product Guide,* 555-4031-806
- *Packet Trunk-IP Engineering Guidelines System Engineering Bulletin,* SEB-02-10-001
- *Compact Commissioning Installation Method,* 24-0992

Solution overview

Description

The Geographic Survivability for Communication Server 2100 solution provides geographic survivability by distributing the redundancy of the Communication Server 2100 architecture in different physical locations. This redundant configuration ensures continued operation in the event that the building in which the Communication Server 2100 resides is damaged. To achieve full geographic survivability, the configuration uses Storage Area Network (SAN) communication architecture used within the Communication Server 2100 and uses transport equipment to provide location redundancy on top of traditional redundancy (for example, power and shelf) built into the architecture.

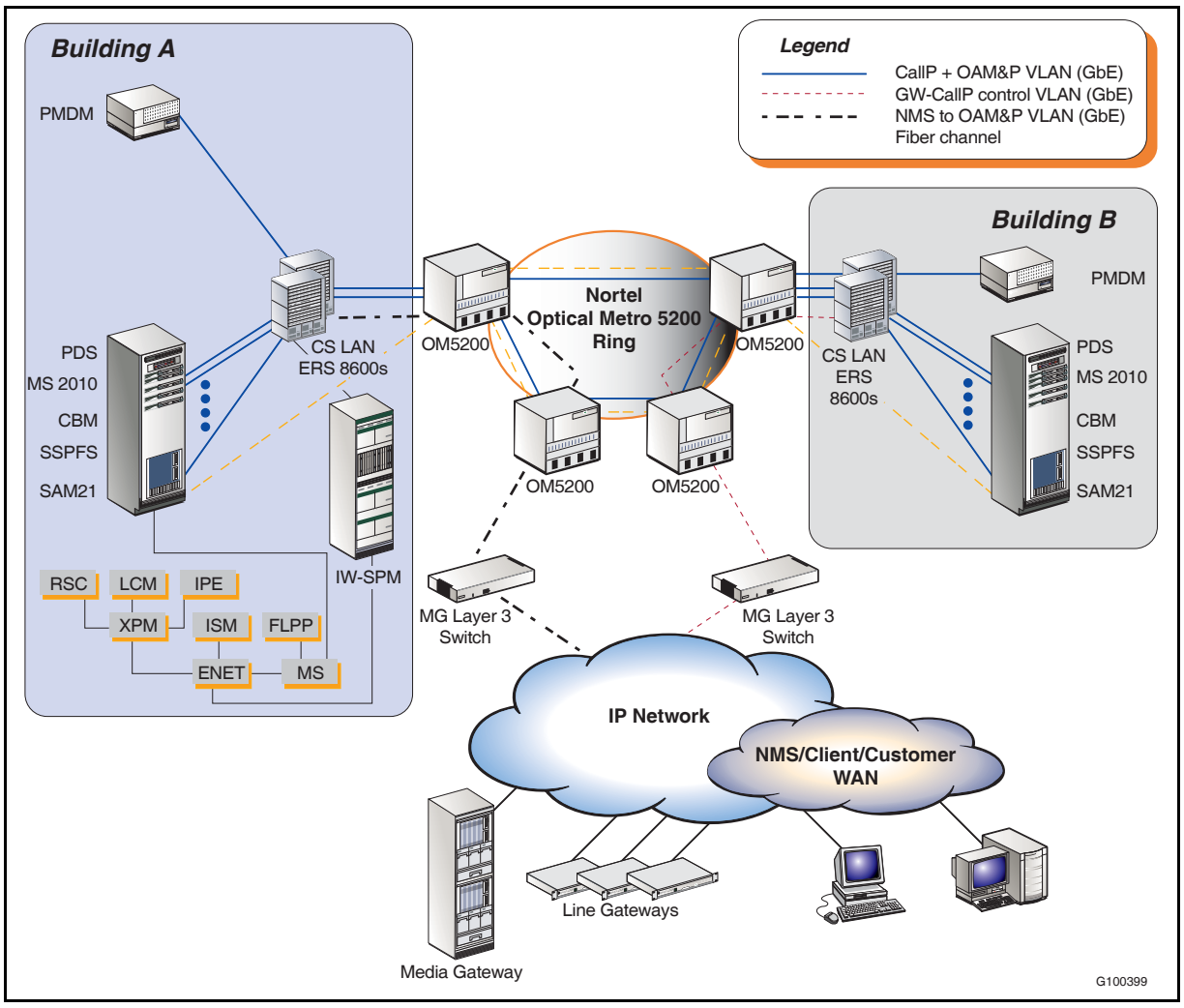
Customers can install each Communication Server in buildings up to 120 kilometers (74.5 miles) apart. In the event of a disaster destroying one of the sites, the second Communication Server takes over call processing to ensure full service and operations. In each location, the maximum distance between the Call Agent and the first optical element is 300 meters (984 feet) (that is, the fiber channel interface on the faceplate of the Call Agent card to the GFSRM GbE/FC circuit pack). The configuration uses two Gigabit Ethernet (GbE) interfaces to provide link redundancy.

> ***Note:*** This functionality does not apply to XA-Core based Communication Server 2100 systems.

This configuration uses a Dense Wave Division Multiplexing (DWDM) ring to connect the distributed locations (SONET is also supported for Greenfield systems only - it does not apply to hybrid configurations). With the two halves of the Communication Server separated, one in Building A and the second in Building B, when a disaster impacts either building, a Unidirectional Path-Switched Ring (UPSR) maintains service from the gateways on the edges of the ring. The Communication Server performs a warm Switch Activity (SWACT) if necessary between the two geographically dispersed halves maintaining full operation in a non-redundant mode. This is the only impact that this feature has on the Communication Server halves.

To provide additional protection from service degradation during a disaster, the Gateway Controllers and element management systems are also separated geographically. Figure 1 shows an example of the geographic survivability configuration of the Communication Server 2100.

Figure 1
Geographic survivability network configuration



Note 1: The IP Client Manager (IPCM) can be geographically split in the SAM21.

Note 2: The Media Server 2010 can be geographically split in the SAM21.

Note 3: For simplicity purposes, Figure 1 does not show all the network element and data equipment. Nortel recommends that a stateful firewall (such as the Nortel Switched Firewall) and Nortel VPN Router/GSISG boxes be used to provide enhanced security.

Figure 2 through Figure 5 on page 15 break out the connections shown in Figure 1 to provide greater clarity.

Figure 2
Fiber channel connectivity

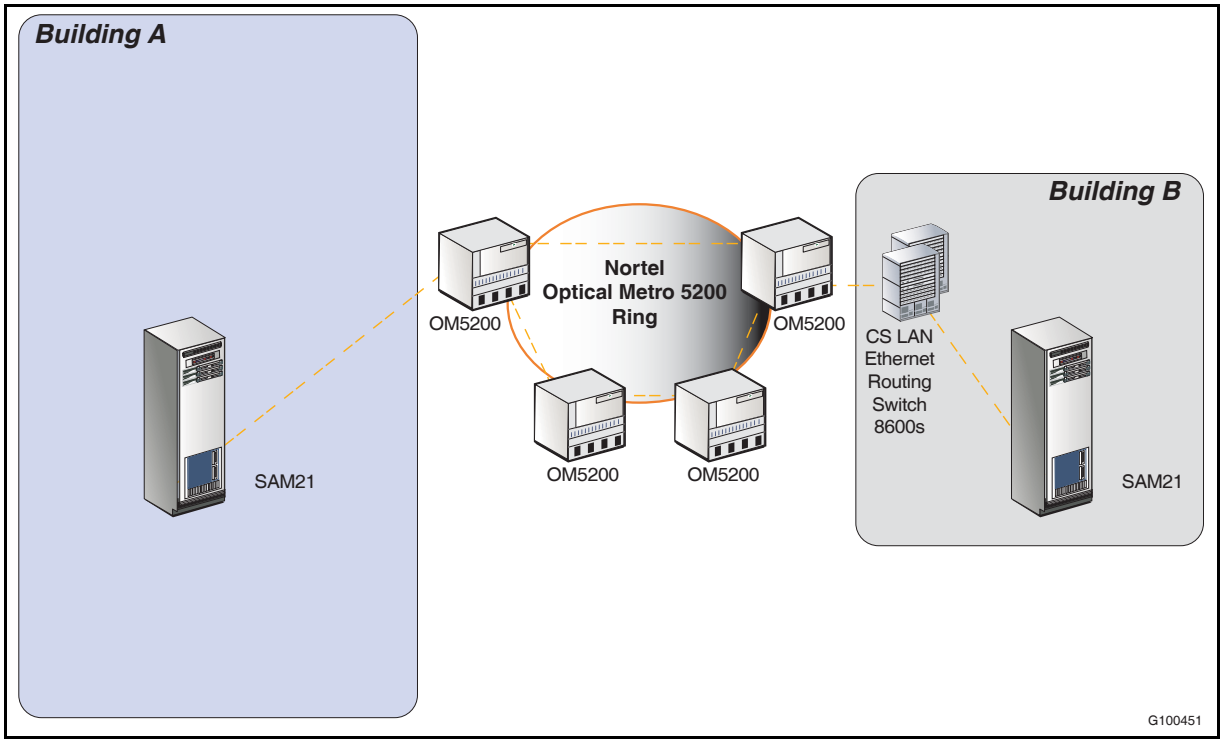


Figure 3
Call processing and OAM&P VLAN connectivity

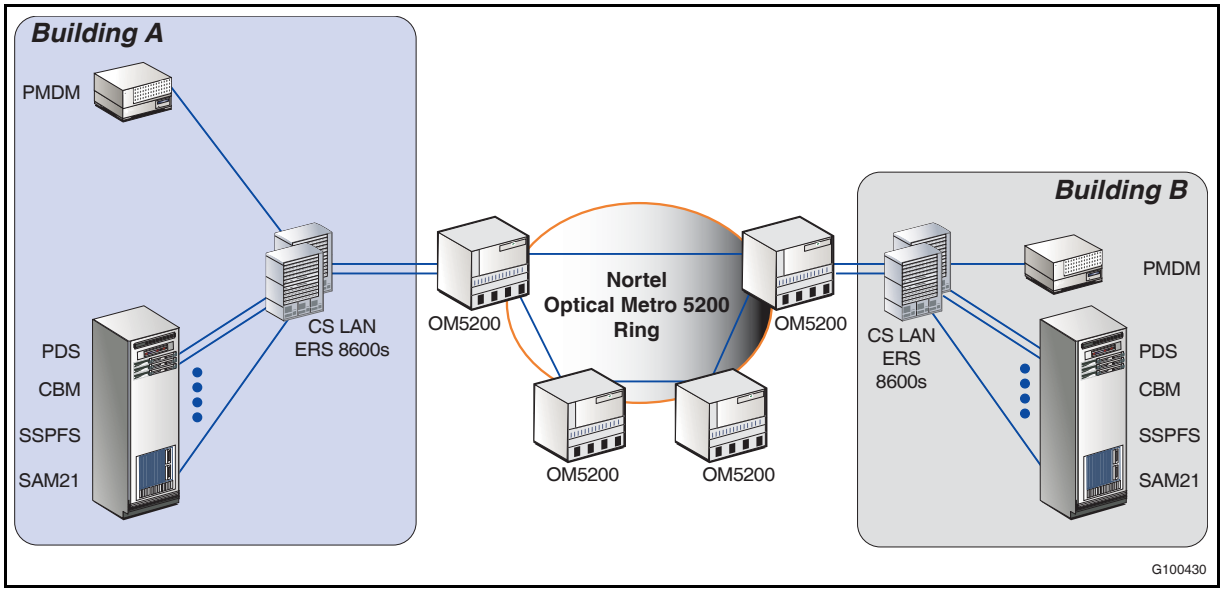


Figure 4
Gateway to call processing control VLAN connectivity

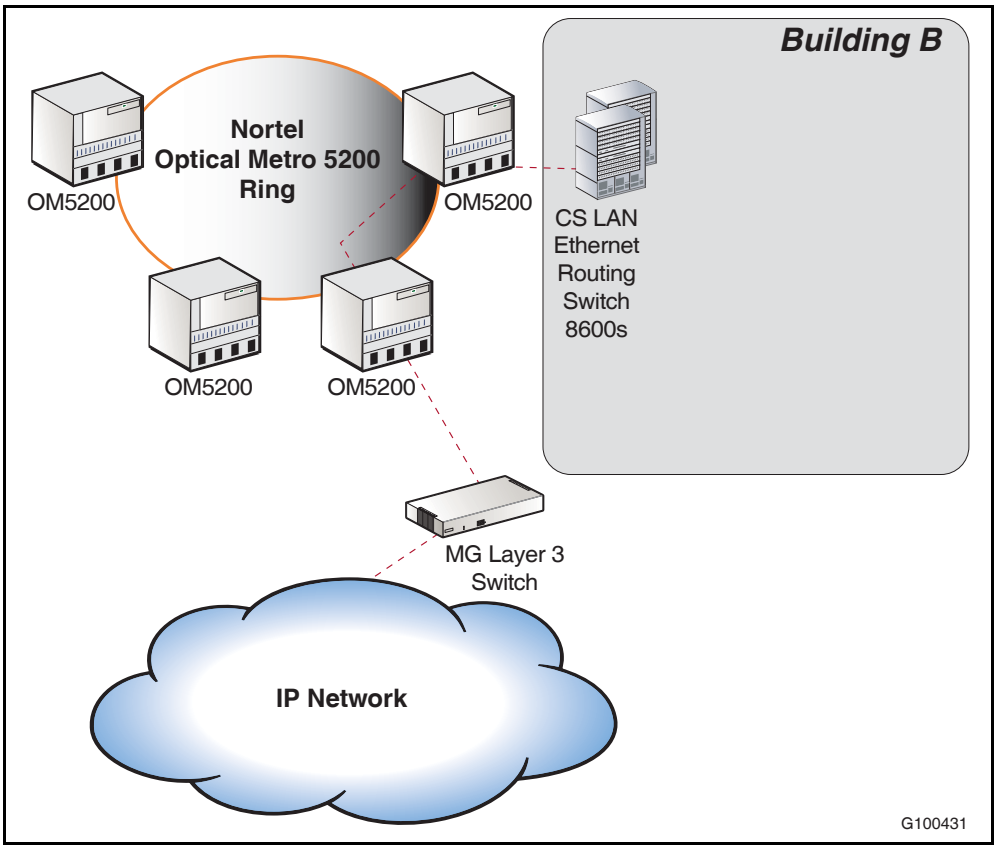
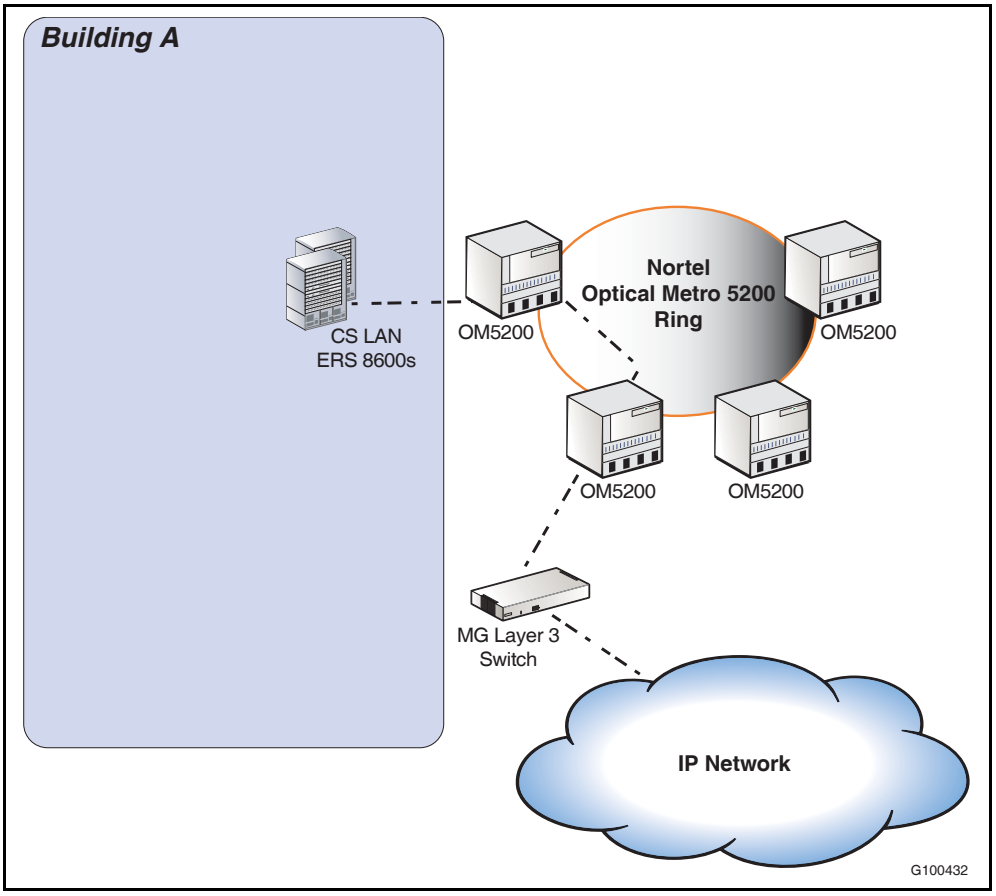


Figure 5
OSS to OAM&P VLAN connectivity



LAN architecture

The LAN architecture does not differ significantly from the base Communication Server 2100 platform; however, additional considerations are implemented to reduce the risk of a gateway having visibility to both halves of the Communication Server, while the two halves cannot see each other. If this occurs, the Communication Server is operating in what is termed as a “split brain” scenario. To prevent this from happening, the gateways cannot reside on the same LAN as the Communication Server. As shown in the previous figures, the gateways must reside outside of the Communication Server LAN. If a gateway can see two active call servers, the gateway will not come into service.

Gateway support

The geographic survivability configuration supports the same gateways as a non-distributed Communication Server 2100. Supported gateways include the following:

Trunk gateways

- Nortel Media Gateway 15000
- Nortel Media Gateway 3000 Series

Line gateways

- Communication Server 2100 IP Client Manager
- Mediatrix 1124 and 1104 Analog Station Gateway

Multiservice gateways

- Nortel Media Gateway 9000

Transport requirements

This section describes the transport requirements for the Communication Server 2100 geographic survivability configuration (see Figure 6 on page 17).

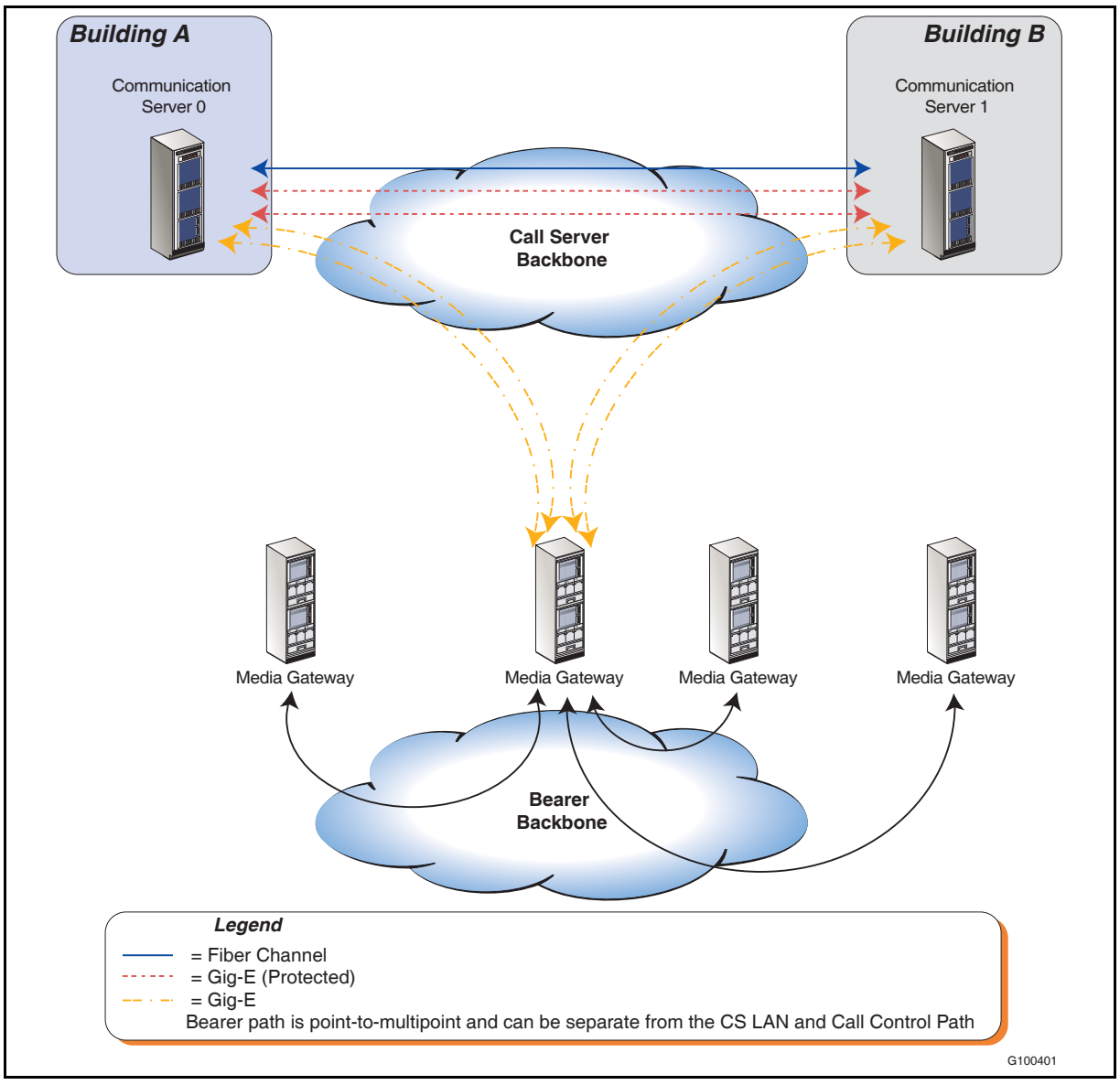
The Communication Sever and call control network have the following characteristics:

- The configuration supports two GbE, and one fiber channel, point-to-point connections between Communication Servers (that is, on the Communication Server LAN).
- The call control path between the gateway and the Communication Server is point-to-two-points.
- The call control path is over the Communication Server LAN.
- A Gateway cannot communicate with both Communication Servers if both Communication Servers cannot communicate with one another.

The bearer path network has the following characteristic:

- The bearer path is point-to-multipoint and can be separate from the Communication Server LAN and call control path.

Figure 6
Geographic survivability transport requirements



TDM support

A geographically survivable Communication Server 2100 supports Time Division Multiplexing (TDM) interfaces only in non-survivable mode. If a disaster occurs that takes down the building housing the TDM portion of the system, TDM service is lost until that Communication Server half recovers. Therefore, the TDM portion of the switch is not geographically survivable.

Components in the TDM portion of the system can include the following:

- Message Switch (MS)
- Enhanced Network (ENET)
- Line Trunk Controller (LTC)
- Digital Trunk Controller (DTC)
- Input Output Module (IOM)
- Integrated Services Module (ISM)
- Conference Trunk Module (CTM)
- Digital Trunk Module (DTC)
- Intelligent Peripheral Equipment (IPE)
- Line Concentrating Module (LCM)
- Line Concentrating Module Enhanced (LCME)
- Link Peripheral Processor (LPP)

Getting started

Hardware requirements

Geographical Survivability for the Communication Server 2100 requires the same hardware as non-distributed Communication Server 2100s. In addition, the following components are required to implement this solution:

- The Ethernet Routing Switch 8600 is required to support the Virtual Router Redundancy Protocol (VRRP) and Multi-Link Trunk (MLT). Although standalone configurations use Ethernet Routing Switch 8600s, the Geographic Survivability solution requires additional Ethernet Routing Switch 8600s.
- A second SAM21 chassis is required for the distributed Communication Server shelf. Optionally, an additional PTE2000 Frame can be used to house the shelf.
- Most customers requiring geographic survivability already have Optical Metro 5200s (OM5200s) for transporting of the Fiber Channel and Gigabit Ethernet over DWDM. Customers without these OM5200s will require them to implement this feature.

Telephone support

The following telephones are supported in the geographic survivability configuration:

- Through the Analog Station Gateway: Analog sets
- Through the IP Client Manager:
  - IP Phone 2001
  - IP Phone 2002
  - IP Phone 2004
  - IP Softphone 6350
  - IP Audio Conference Phone 2033

Configuration summary

This section describes the unique requirements for setting up a Communication Server 2100 across the dual-building geographic survivable configuration compared to the non-distributed configuration. In particular, the different installation and commissioning changes are summarized.

When setting up the geographic survivable configuration, you must be aware of changes when configuring the following components:

- Cabling and configuring the Communication Server 2100 (see "Provisioning the Communication Server 2100" on page 23)
- Cabling and configuring the Ethernet Routing Switch 8600s (see "Provisioning the CS LAN" on page 29)
- Setting up the Optical Metro 5200 optical ring (see "Provisioning the Optical Metro 5200" on page 39)

In addition, due to the modifications made to the non-survivable configuration, changes have also been made to the Network Engineering Guidelines.

FOR MORE INFORMATION

See the *Packet Trunk-IP Engineering Guidelines System Engineering Bulletin*, SEB-02-10-001 for a detailed engineering guidelines when setting up of the Communication Server 2100 geographic survivable configuration.

Operating parameters

In SE08 the following limitations exist or have been removed:

- Operations, Administration, Maintenance, and Provisioning (OAM&P) is now survivable. The OAM&P components (for example, CS 2000 Management System and Core and Billing Manager) can be distributed across the two sites. For example, Site A can have an active CMT and a cold standby CBM, while Site B has a cold standby CMT and an active CBM
- Billing is partially survivable. If an event destroys the main building, the Call Agent switches to backup billing to disk. Backup billing is guaranteed for eight hours and is dependent on available disk space.
- Signaling System #7 (SS7) is not survivable.

- The following limitations are due to the fiber channel on the Call Agents:
  - The transport network must support the fiber channel protocol.
  - Maximum fiber distance supported between the two Communication Server halves is 120 kilometers (74.5 miles).
  - Maximum capacity is 300,000 BHCA for a standard call model of 50 percent line to Integrated Services Digital Network User Part (ISUP), 50 percent ISUP to line, 100 percent billing.

    Note: Extended distances are possible, but the customer will have to accept a lower BHCA.

  - Maximum fiber distance between the Communication Server half and first optical element is 300 meters (984 feet).
- Some stable calls may be dropped during recovery from an isolated Communication Server scenario.
- Time Division Multiplexing (TDM) equipment is not survivable.
- Defence Switched Network (DSN) currently is not supported.

Provisioning the Communication Server 2100

Distributing the Communication Server shelves at dual sites

The most obvious difference in the geographic redundancy configuration from the traditional configuration is the separation of the Communication Server shelves into two geographically distributed buildings. It is important that equipment be located at the proper site. The following lists provide an example.

The Communication Server 2100 components in Building A include the following:

- Service Access Module 21 (SAM21) shelf and cards
- Interworking Spectrum Peripheral Module IP (IW SPM IP)
- Preside Multiservice Data Manager (PMDM)
- Core and Billing Manager
- Succession Server Platform Foundation Software
- Primary Data Storage
- Legacy TDM peripherals (for example, RSC, LCM, IPE, XFM, ISM, FLLP, CNCT, and MS)

  Note: These components will not operate in survivable mode, but are required for TDM interworking for a hybrid Communication Server 2100 in non-survivable mode.

The Communication Server 2100 components in Building B include the following:

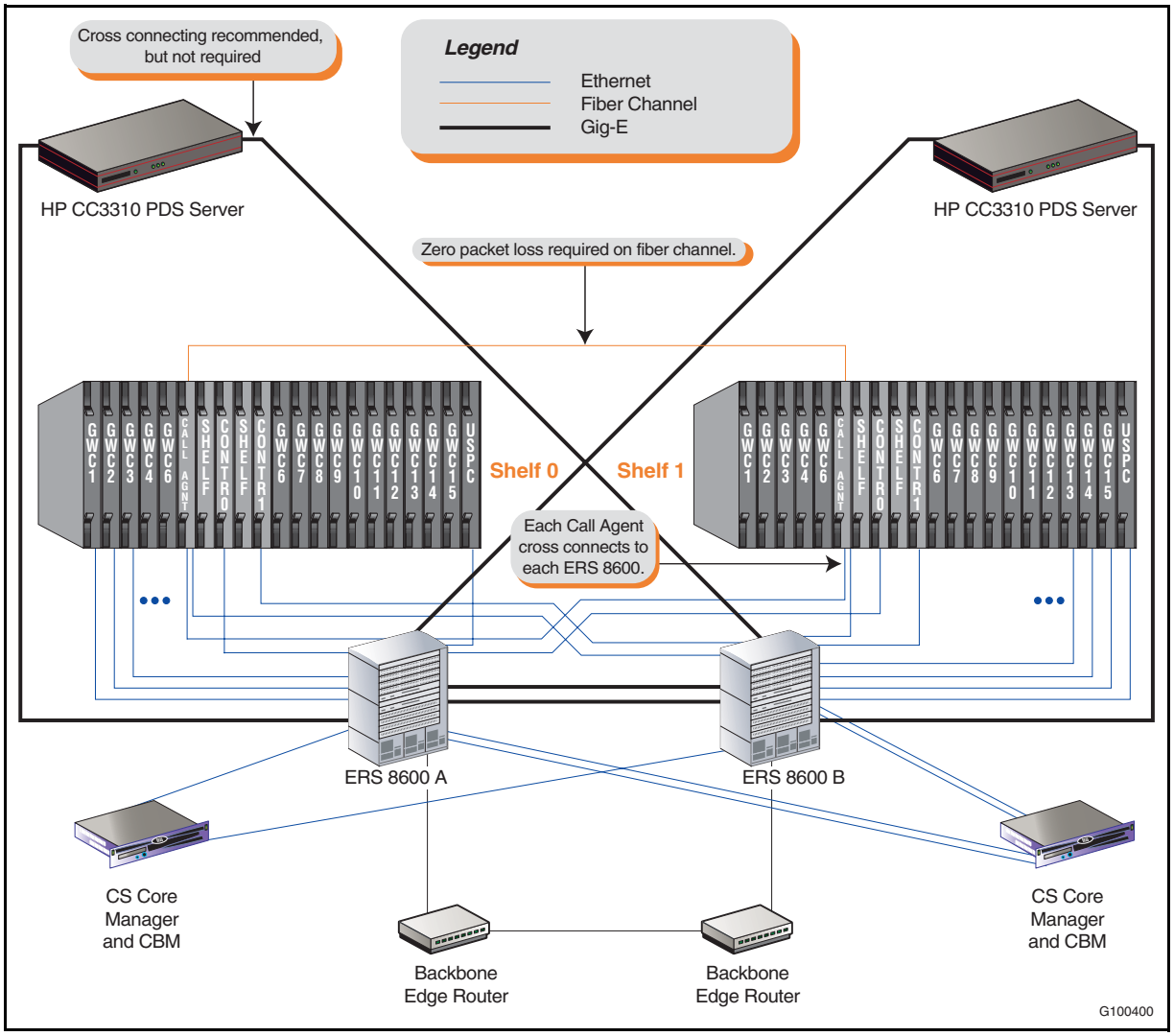
- Service Access Module 21 (SAM21) shelf and cards
- Preside Multiservice Data Manager
- Core and Billing Manager

- Succession Server Platform Foundation Software
- Primary Data Storage

Physical configuration

This section describes the physical layout of distributed Communication Servers. Figure 7 shows the card layout of the two separately-located Communication Server halves.

Figure 7
Logical connectivity of the two Communication Server shelves



CallP subnet

Communication Server 2100

The Communication Server 2100 consists of two shelves. In a non-geographically redundant configuration, each shelf houses a Call Agent and Gateway Controllers (GWC). Both the Call Agent and the GWCs have redundant mates in the second shelf.

The Message Controller (MC) cards, normally deployed one per shelf, must reside in the shelf that is in the same location as the Message Switch (MS) equipment. Therefore, for geographic survivability the shelf configuration can be summarized as follows:

SAM21 shelf in Building A

- one Call Agent card
- two MC cards

SAM21 shelf in Building B

- one Call Agent card
- no MC cards

All TDM equipment must be located in Building A, in which the SAM21 shelf with the two MC cards resides.

Gateway Controller configuration

The Gateway Controller (GWC) pair must be configured in the split shelf configuration, with one shelf deployed in each of the two locations.

Interworking Spectrum Peripheral Module

The IW SPM IP provides IP/TDM interworking. It must be deployed in the same building in which the SAM21 shelf with the two MC cards resides.

OAM&P subnet

In the SE08 release, the OAM&P components are now survivable and duplicated at each site.

Provisioning steps

With the exception of the items described in this document, much of the Communication Server 2100 configuration for geographic survivability builds on the configuration for a non-distributed Communication Server 2100.

FOR MORE INFORMATION

See the *Communication Server 2100 Product Guide* for additional information about the Communication Server 2100.

Table 1 shows the different configuration steps that must be performed when distributing the Communication Server 2100 shelves in dual locations.

Table 1
Communication Server changes (Sheet 1 of 2)

Item	Description
Cabling	The fiber channel link between the two Call Agent cards in slot 6 of both SAM21s must go over the optical ring. Connect the fiber channel link from each Call Agent card to a OCI SRM GbE/FC circuit pack in the Optical Metro 5200 paired to each Communication Server. For more information, see the *Compact Commissioning Installation Method* (24-0992).
Card layout	The two Message Controller (MC) cards must reside in the same SAM21 shelf that resides in the building with the Message Switch (MS) equipment (in the previous example, Building A). In standalone configurations, the normal recommendation is to have one MC/Call Agent card pair reside in each SAM21 shelf, but this is not possible for geographic survivability. For survivability, one location has a SAM21 shelf with one Call Agent card and two MC cards, while the second location has SAM21 shelf with a single Call Agent card.

Table 1
Communication Server changes (Sheet 2 of 2)

Item	Description
Commissioning	Technicians must perform a manual step during commissioning. After commissioning the Call Agent blades using the SAM21 Element Manager, and after the initial boot, perform the following step on one of the Call Agent cards: From the Core and Billing Manager telnet to the Call Agent card and run the following command from the LINUX prompt: `/usr/admin_bin/setgeoredun` Without running this command, it is not possible to synchronize the Call Agent blades. For more information, see the *Compact Commissioning Installation Method* (24-0992).

Provisioning the CS LAN

Ethernet Routing Switch 8600

The Ethernet Routing Switch 8600 is a key component of the geographic survivability Communication Server LAN (CS LAN) configuration. The Ethernet Routing Switch 8600 delivers Gigabit Ethernet performance and Quality of Service (QoS). The Ethernet Routing Switch 8600 switching architecture distributes call processing tasks and eliminates bottlenecks.

Ethernet Routing Switch 8600's switch fabric houses centralized intelligence, including master forwarding tables, management and file system. Silicon hardware at the port level makes packet classification and routing decisions, which results in faster processing than is typically possible in the software-based filtering of legacy routers.

Customer documentation

Table 2 shows where you can find more detailed information about the Ethernet Routing Switch 8600.

Table 2
Documentation references

Document title	Document number
Getting Started Ethernet Routing Switch 8000 Series Software Release 3.7	313189-D Rev 00
Managing Platform Operations and Using Diagnostic Tools Ethernet Routing Switch 8000 Series Software Release 3.7	315545-C Rev 00
Configuring Network Management Ethernet Routing Switch 8000 Series Software Release 3.7	314723-C Rev 00
Configuring QoS and IP Filtering Ethernet Routing Switch 8000 Series Software Release 3.7	316433-C Rev 00
Configuring IP Routing Operations Ethernet Routing Switch 8000 Series Software Release 3.7	314720-D Rev 00
Release Notes for the Ethernet Routing Switch 8000 Series Switch Software Release 3.7	313177-A Rev 00
System Messaging Platform Reference Guide Ethernet Routing Switch 8000 Series Software Release 3.7	315015-C Rev 00
Important Information about the 8600 Series Switch Modules	316340-B Rev 00
Configuring and Managing Security Ethernet Routing Switch 8600 Software Release 3.7	314724-C Rev 00
Packet Trunk-IP (PT-IP) Engineering Rules	SEB-02-10-001

Provisioning steps

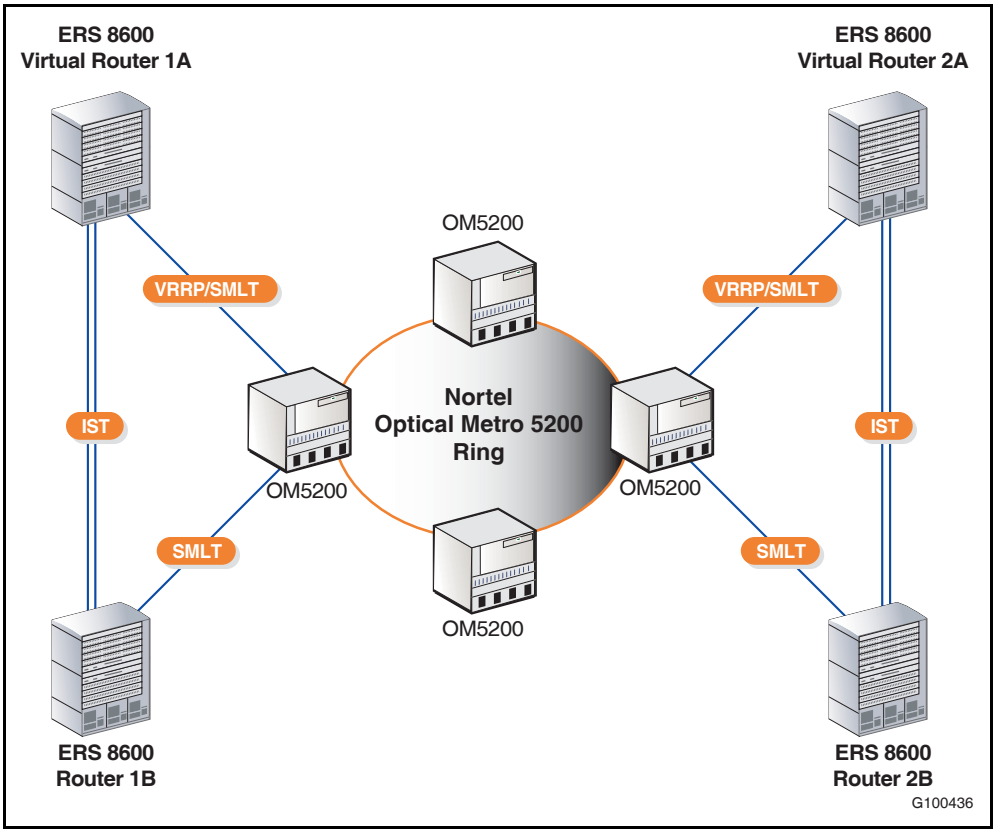
The central components of the geographically survivable CS LAN are two Ethernet Routing Switch 8600s deployed in each geographical location. The locations are interconnected through an optical network.

For load sharing, you must provision one of the Ethernet Routing Switch 8600s in each geographical location with Virtual Router Redundancy Protocol (VRRP) in dual active mode (that is, enable backup master) versus active-standby mode. This configuration facilitates sharing the network traffic load across the two geographical locations thereby minimizing the use of the optical network between the two locations.

Figure 8 on page 32 shows the Ethernet Routing Switch configuration only. As a hardware baseline, each 8010co chassis must be configured with only one 8691SF/CPU module, along with a minimum of two 8632TXE modules.

Note: Dual 8691SF/CPU modules per 8010co chassis are not supported in SE08.

Figure 8
CS LAN Ethernet Routing Switch 8600 configuration



Geographically survivable CS LAN IP address

The number of IP addresses used for the four Ethernet Routing Switch 8600s is as follows:

- one per chassis for the management interface (that is, Out-of-Band [OOB] OA&M subnet)
- one per chassis (physical) for each of the five configured VLANs (minimum) as follows:
  - CS LAN Call Processing (CallP)
  - CS LAN Operations, Administration and Maintenance (OA&M)
  - Bearer (Real-time Transport Protocol [RTP])

  - — Intra-Ethernet Routing Switch 8600 (Inter-switch Trunking [IST])
  - — Intra-locations (Split Multi-Link Trunking [SMLT])
- one for each VRRP logical IP address per VLAN as follows:
  - — CS LAN CallP
  - — CS LAN OA&M
  - — Bearer (RTP)

Therefore, the recommended configuration requires a minimum of 27 IP addresses. From the list above, these can be summarized as follows:

- OOB – 4
- CallP – 5
- OA&M – 5
- Bearer – 5
- IST – 4
- SMLT – 4

Note: Since the Ethernet Routing Switch 8600 management interface is routable, Nortel recommends that it be configured with an OOB IP address from a subnet that is not in the Ethernet Routing Switch 8600's routing table.

Ethernet Routing Switch 8600 redundancy

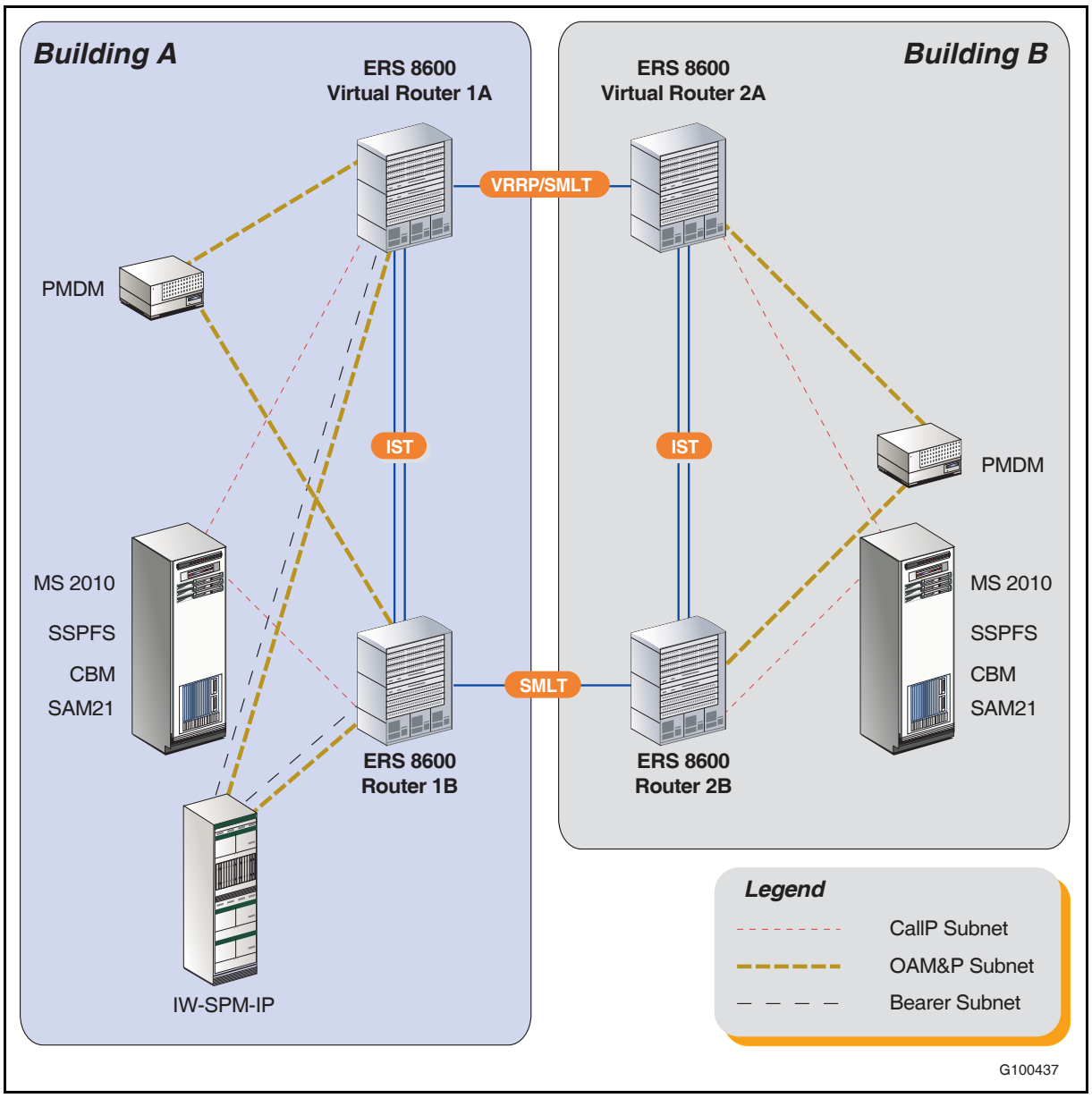
In the geographically survivable Ethernet Routing Switch 8600 configuration, each chassis is installed with a single 8691SF/CPU switching fabric. The inter-switch trunk connection between the two Ethernet Routing Switch 8600s in each location is a Gigabit Ethernet link. You must configure VRRP with default settings between the two Ethernet Routing Switch 8600s, one in each geographic location. This configuration assigns one Ethernet Routing Switch 8600 in one geographic location as the network-side and one Ethernet Routing Switch 8600 at the other location as the user-side. This creates a L2/L3 load-sharing configuration across the two geographic locations (with VRRP backup network-side enabled) and the default gateways for the CS LAN devices are associated with the network-side Ethernet Routing Switch 8600.

As a result of this configuration, all four Ethernet Routing Switch 8600s provide L2 functionality, but only one Ethernet Routing Switch 8600 per location provides an L3 functionality (that is, the Ethernet Routing Switch 8600 with VRRP configured). At each location, the Ethernet Routing Switch 8600 providing L2-only functionality depends on the other Ethernet Routing Switch 8600 in the same location for L3 functionality, or on the L3 Ethernet Routing Switch 8600 in the other location in the case where the local L3 Ethernet Routing Switch 8600 is unavailable. The network-side and user-side L3 Ethernet Routing Switch 8600s share all the switching and routing decisions between the VLANs within the CS LAN and out to the rest of the network, making it a more robust system.

Note: Dual 8691SF/CPU modules per 8010co chassis are not supported in SE08.

Figure 9 on page 35 shows how the subnet LANs are connected between the components at the two geographically distributed buildings.

Figure 9
CS LAN Ethernet Routing Switch 8600 subnet configuration



Inter-Switch Trunking

For optimal reliability, you must configure Inter-Switch Trunking between each pair of Ethernet Routing Switch 8600s in the same geographic location using Gigabit Ethernet ports from multiple modules. Inter-Switch Trunking prevents a single point of failure from disrupting the VRRP messaging which can potentially cause a massive call processing outage. In addition, you must enable the 802.1Q tagging functionality for the IST in order to guarantee that the relevant CS LAN subnets, and their corresponding broadcast domains, can span across the two switches. The VRRP functions are based on this assumption.

Finally, you must add the IST group to the CallP, OA&M, Bearer and SMLT VLANs on both Ethernet Routing Switch 8600s. This IST group configuration ensures that on each of these subnets, which span the four Ethernet Routing Switch 8600 chassis, there is a single broadcast domain across the two chassis at a single location. See "Split Multi-Link Trunking" on page 37 for additional information about extending the subnets across the two locations.

Note: In order to optimize routing within the CS LAN, you must configure the IST links with a 255.255.255.252 mask and enable Open Shortest Path First (OSPF), thereby creating a routed link between the redundant Ethernet Routing Switch 8600s.

The IST group must be comprised of a minimum of two Gigabit Ethernet interfaces for each Ethernet Routing Switch 8600 chassis (that is, one Gigabit Ethernet interface from each 8632TXE module). The IST group cannot be mixed with 10/100 BaseT or any other media type.

Note: Disable the Spanning Tree Protocol (STP) on each of the Ethernet Routing Switch 8600s that are in the IST group. This is done to avoid confusion and to provide consistency (by default, the IST functionality overrides the STP setting to disabled).

Split Multi-Link Trunking

For optimal reliability, you must configure Split Multi-Link Trunking between the Ethernet Routing Switch 8600s and the optical routers in both geographic locations using Gigabit Ethernet ports from multiple modules. Split Multi-Link Trunking prevents a single point of failure from disrupting the VRRP messaging which can potentially cause a massive call processing outage. You must use the same SMLT ID on all four Ethernet Routing Switch 8600s. In addition, you must enable the 802.1Q tagging functionality for the SMLT to guarantee that the relevant CS LAN subnets, and their corresponding broadcast domains, can span across the two switches. The VRRP functions are based on this assumption. Finally, you must add the SMLT group to the CallP, OA&M, Bearer VLANs on all four Ethernet Routing Switch 8600s. This SMLT group configuration ensures that on each of these subnets, which span the four Ethernet Routing Switch 8600 chassis, there is a single broadcast domain across the four chassis of both locations. Figure 8 on page 32 shows this configuration.

Note: In order to optimize routing within the CS LAN, you must configure the SMLT links with a 255.255.255.248 mask and enable OSPF, thereby creating a routed link between the redundant Ethernet Routing Switch 8600s.

The SMLT group must be comprised of a minimum of four Gigabit Ethernet interfaces for each Ethernet Routing Switch 8600 chassis. The SMLT group cannot be mixed with 10/100 BaseT or any other media type.

Note: Disable the Spanning Tree Protocol on each of the Ethernet Routing Switch 8600s that are in the SMLT group. This is done to avoid confusion and to provide consistency (by default, the SMLT functionality overrides the STP setting to disabled).

OSPF on the IST interfaces

To provide optimal routing and avoid inconsistencies, Nortel recommends creating a VLAN for the interfaces in the IST connecting the two Ethernet Routing Switch 8600s in the same location. The IST instance must also be added to the VLAN. In addition, OSPF must be enabled on the IST.

This is recommended so that the Ethernet Routing Switch 8600s co-residing at the same location are neighbors and adjacent. This VLAN configuration optimizes the route exchange of all local routes.

OSPF on the SMLT interfaces

To provide optimal routing and avoid inconsistencies, Nortel recommends creating a VLAN for the interfaces in the SMLT connecting the four Ethernet Routing Switch 8600s in both locations. The SMLT instance must also be added to the VLAN. In addition, OSPF must be enabled on the SMLT.

This is recommended so that all four Ethernet Routing Switch 8600s residing at both locations are neighbors and adjacent. This VLAN configuration optimizes the route exchange of all local routes.

Provisioning the Optical Metro 5200

Optical Metro 5200 ring configuration

The Communication Server 2100 geographic survivability configuration uses the Optical Metro 5200 network to carry Gigabit Ethernet and Fibre Channel protocols to maintain Communication Server and gateway connectivity. The gateways must connect to the Communication Server halves through their own Optical Metro 5200. The gateway router cannot link directly into the Ethernet Routing Switch 8600s as in the non-geographic survivable configuration.

The Fibre Channel from each Call Agent card connects to a OCI SRM GbE/FC (GFSRM) circuit pack on the Optical Metro 5200.

The Gigabit Ethernet (GbE) links from the Ethernet Routing Switch 8600s and gateway routers connect to OCI SRM GbE/FC 1310nm circuit pack on the Optical Metro 5200. The Optical Metro 5200 requires three GbE links for each Communication Server half. One of these three GbE links from each Ethernet Routing Switch 8600 to the Optical Metro 5200 supports intra CS LAN traffic. Another of these three GbE links from either one of the Ethernet Routing Switch 8600s to the Optical Metro 5200 carries the gateway to CS LAN traffic.

OCI SRM GbE/FC card summary

The OCI SRM GbE/FC circuit pack has the following characteristics:

- OM5000 OCI-type card with two bi-directional ports:
  - — Aggregate 2 Gigabit Ethernet or two FC100/FICON ports to a STS-48/STM-16 signal
  - — Aggregate 1 Gigabit Ethernet and one FC100/FICON port to a STS-48/STM-16 signal
- Provides increased density and lower cost per wavelength OM5000 service, while allowing for transport of GE or FC across a SONET network where the traffic can be groomed, switched and monitored.

- Virtual Concatenation allows the bandwidth to be selected in small increments on demand as follows:
  - — Traditional contiguous concatenation comes in course steps.
  - — Provides cost efficient and flexible transport of “leased line” type services across an Optical Metro DWDM and/or SONET network.
- Supports Framed Mapping to SONET/SDH for Gigabit Ethernet and Transparent Mapping to SONET/SDH for Fiber Channel.
- Optical Metro 5000-compatible backplane interface.
- Datapath Diagnostic Loopback Mode.
- Supported on both 5200 and 5100 models as follows:
  - — Interconnect it with FLEX RATE OCLD (through the OCM) on the 5200 shelf.
  - — No OCM cross-connect capability on the 5100 shelf.

Specifications of the OCI SRM GbE/FC circuit pack are as follows:

- two bi-directional ports per card
- NT0H21CC – Enhanced GE/FC SRM, 850nm, 2 Port, (SX) (LC Duplex connectors x2) (multimode [MM]) client-side interfaces
- NT0H21CD – GE/FC SRM 1310nm, 2 Port (LX) (LC Duplex connectors x2) (single mode [SM]) client-side interfaces
- GbE: 1000Base-SX and 1000Base-LX
- Client-side Operational Measurements (for example, frame counts, discard units, etc.)
- Client-side 8B10B PMs (for FC-100/FICON)
- Supports full compliment of section, line and path PMs (B1, B2, B3)
- Maps the signals into Framed Generic Framing Procedure (GFP), which is then carried within a SONET/SDH virtually concatenated or contiguous payload on an OC-48/ STM-16
- Protected or unprotected traffic on the line side

Shelf layouts

Figure 10 on page 41 shows the cards required for each Optical Metro 5200 network element of the Nortel Metro 5200 Ring.

Figure 10
Optical Metro 5200 card configuration

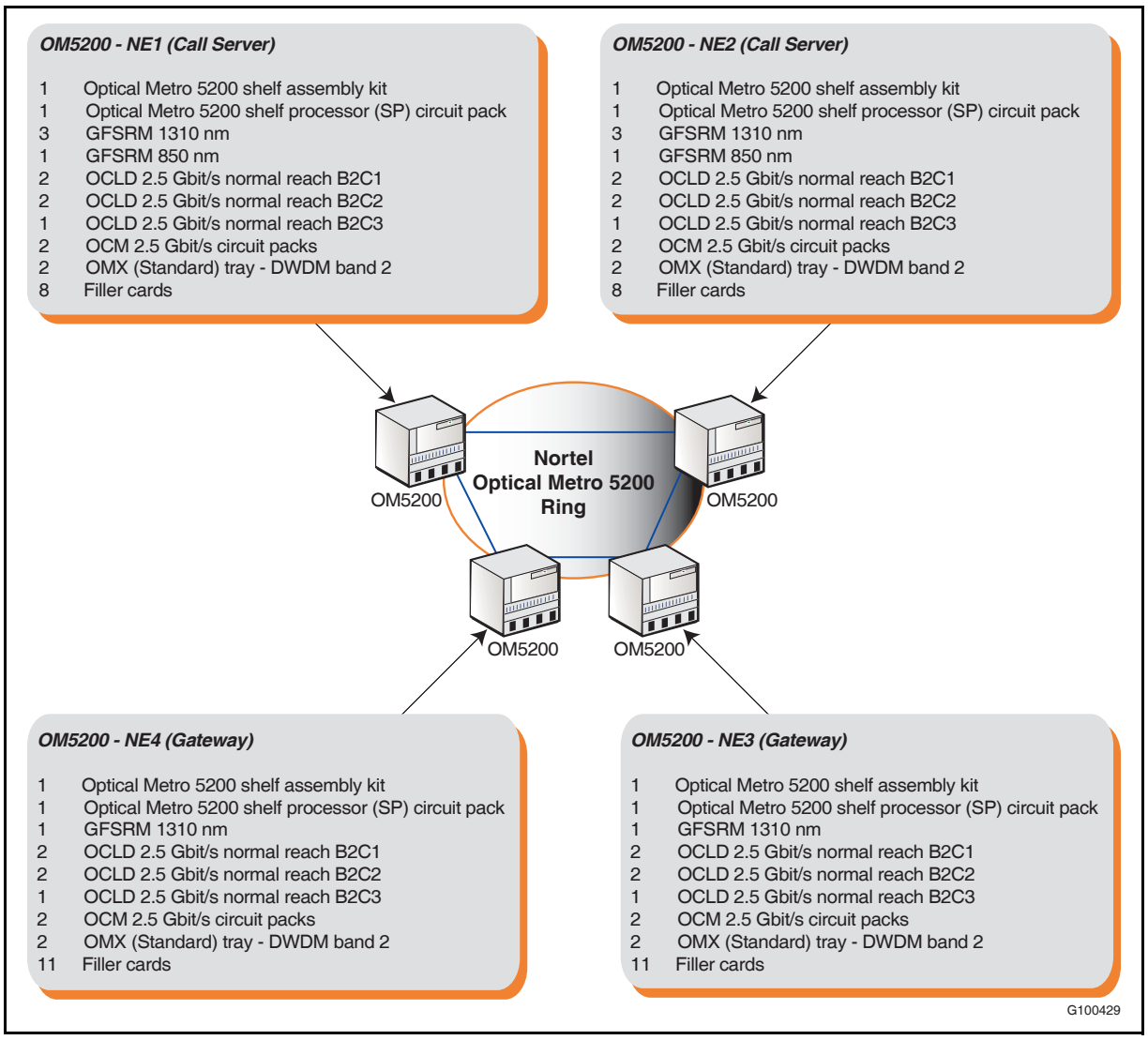


Figure 11 on page 42 presents the Optical Metro 5200 ring configuration used in this application. Figure 12 on page 43 to Figure 15 on page 44 show the shelf layout of each Optical Metro 5200 Network Element (NE) in the ring. To install, configure, provision and maintain this Optical Metro 5200 ring, refer to the Optical Metro 5000-series product documentation (for more information, see "Customer documentation" on page 45).

Figure 11
Optical Metro 5200 ring configuration used in this application

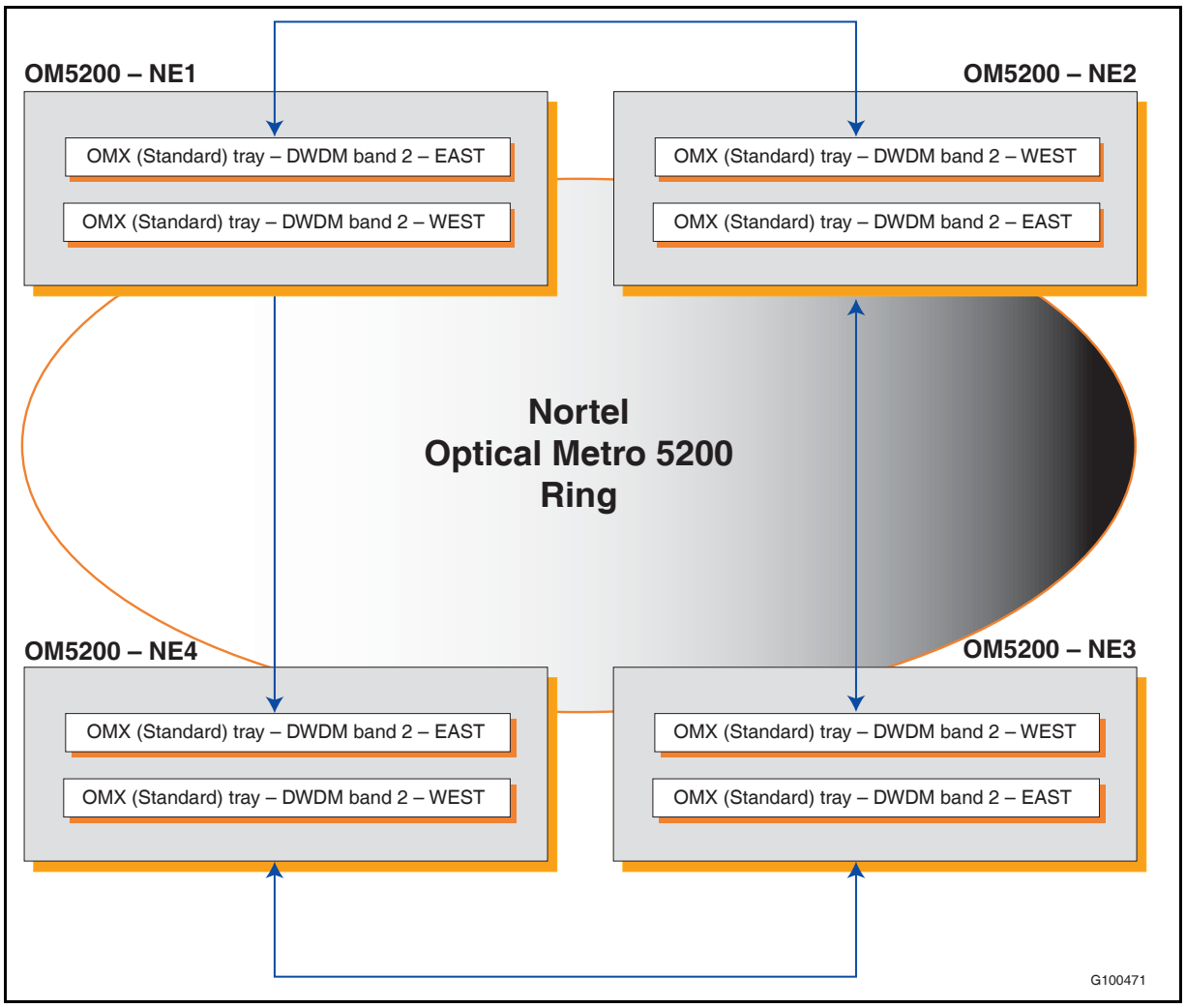


Figure 12
Shelf layout for OM5200 – NE1

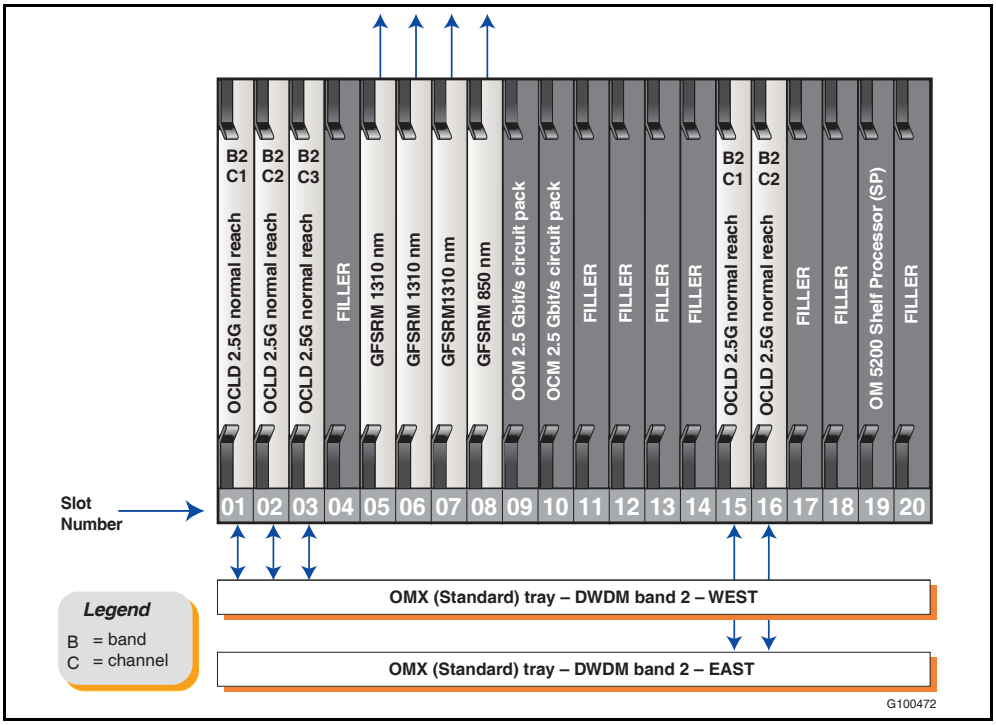


Figure 13
Shelf layout for OM5200 – NE2

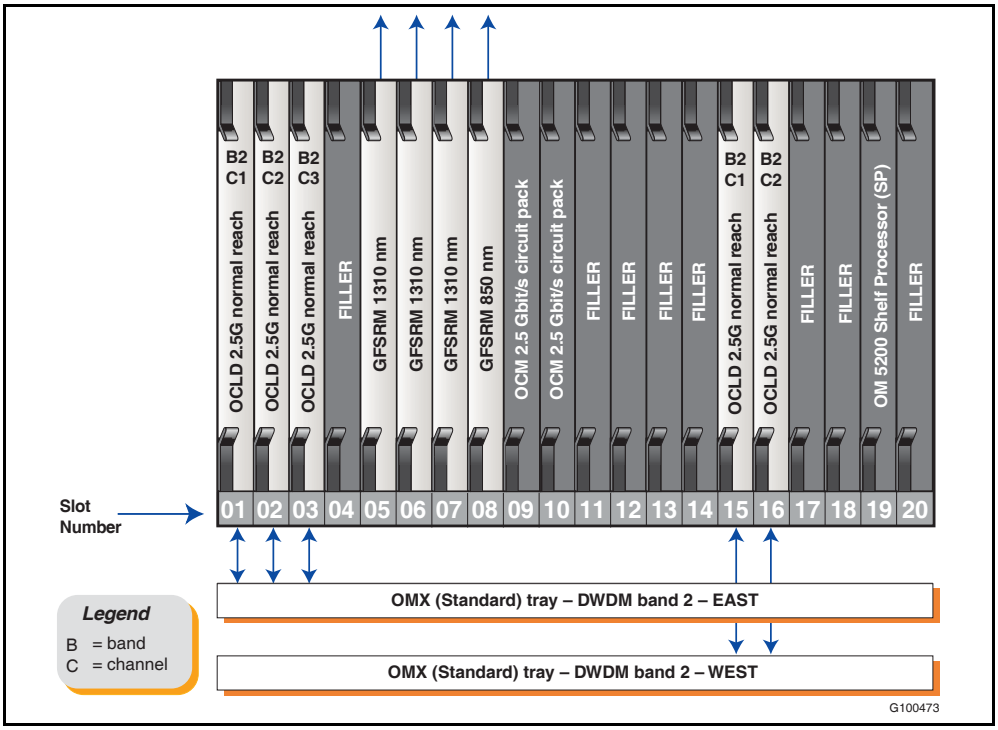


Figure 14
Shelf layout for OM5200 – NE3

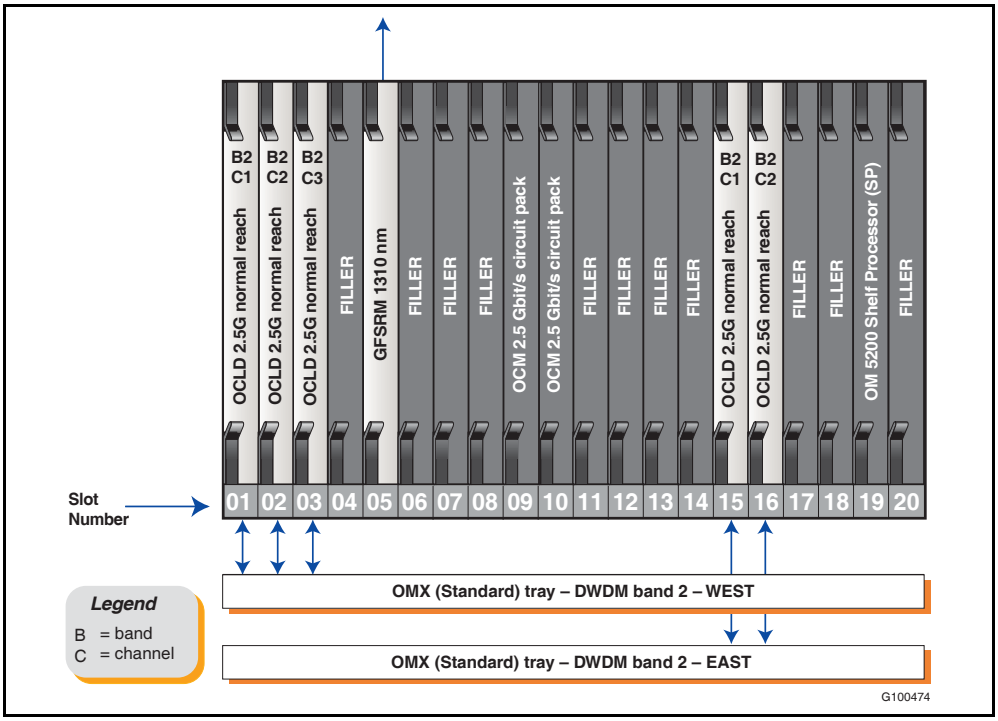
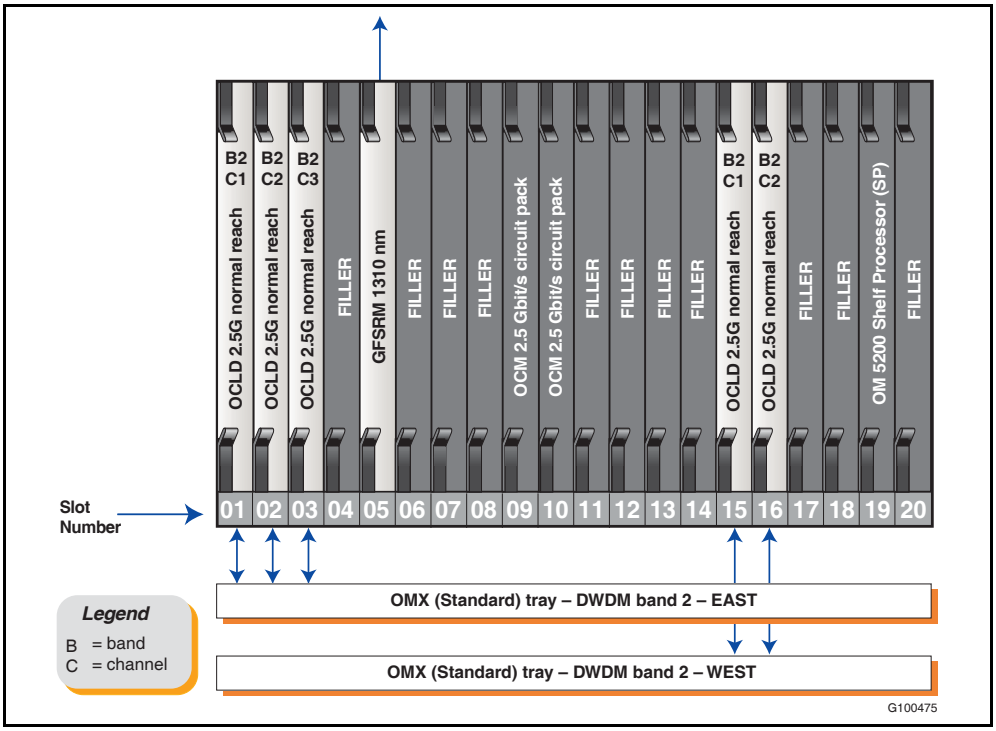


Figure 15
Shelf layout for OM5200 – NE4



Customer documentation

The Optical Metro 5200 information is provided in the Optical Metro 5000-series Multiservice Platform Nortel Technical Publications (NTPs). These NTPs contain descriptive information and procedures including system, software, and hardware descriptions, technical specifications, ordering information, and TL1 user information. These NTPs also contain all procedures required to install, provision and maintain an Optical Metro 5200 network.

Table 3 shows where you can find more detailed information about the Optical Metro 5200.

Table 3
Optical Metro 5000-series Multiservice Platform references (Sheet 1 of 2)

Document title	Document number
Planning a Network	
Network Planning and Link Engineering	323-1701-110 (three volumes)
Software and User Interface	323-1701-101
Hardware Description	323-1701-102
Technical Specifications	323-1701-180
Installing, Commissioning and Testing a Network	
Installing Optical Metro 5200 Shelves and Components	323-1701-201
Commissioning Procedures	323-1701-220
Connection Procedures	323-1701-221 (two volumes)
Testing and Equalization Procedures	323-1701-222
Managing, Provisioning and Testing a Network	
Provisioning and Operating Procedures	323-1701-310 (two volumes)
Customer Acceptance Testing Procedures	323-1701-330
TL1 Interface	323-1701-190 (four volumes)

Table 3
Optical Metro 5000-series Multiservice Platform references (Sheet 2 of 2)

Document title	Document number
Maintaining and Troubleshooting a Network	
Trouble Clearing and Alarm Reference Guide	323-1701-542 (four volumes)
Maintenance and Replacement Procedures	323-1701-546
Release 7.0 Planning Guide	NTY410AJ

List of terms

ASCII	American Standard Code for Information Interchange
ASG	Analog Station Gateway
ATM	Asynchronous Transport Mode
BHCA	Busy Hour Call Attempts
CA	Call Agent
CallP	Call Processing
CLAN	Customer Local Area Network
CMIC	Computer Module Interface Card
CNCT	Connect
cPCI	compact Peripheral Component Interconnect
CPU	Central Processing Unit
CS	Communication Server
CS 2100	Communication Server 2100
CS LAN	Communication Server LAN
DS1	Digital Signaling Level 1
DS3	Digital Signaling Level 3
DSP	Digital Signaling Processor
DTMF	Dual-tone Multifrequency
ECAN	Echo Cancellation
EM	Element Manager
ERS 8600	Ethernet Routing Switch 8600
GbE	Gigabit Ethernet
FLPP	Fiber Link Peripheral Processor
GEM	Gig Ethernet Resource Module
GFP	Generic Framing Procedure

GFSRM	GbE/FC Subrate Multiplexer
GWC	Gateway Controller
IPCM	IP Client Manager
IP	Internet Protocol
IPDR	Internet Protocol Detail Recording
IPE	Intelligent Peripheral Equipment
IPSec	Internet Protocol Security
ISDN	Integrated Services Digital Network
ISM	Integrated Services Module
IST	Inter-Switch Trunking
ISUP	Integrated Service Digital Network User Part
IW SPM IP	Interworking Spectrum Peripheral Module Internet Protocol
LAN	Local Area Network
L2	Layer 2
L3	Layer 3
LCM	Line Concentrating Module
MC	Message Controller
MM	multimode
MS	Message Switch
MS 2010	Media Server 2010
NE	Network Element
nm	nanometer (one billionth of a meter)
NMS	Network Management System
OA&M	Operation, Administration, and Maintenance
OCI	Optical Channel Interface
OCLD	Optical Channel Laser and Detector
OCM	Optical Channel Manager
OM	Operational Measurement
OM5200	Optical Metro 5200
OMX	Optical Multiplexer
OOB	Out-of-Band
OSPF	Open Shortest Path First
OSS	Operations Support System
PBX	Private Branch Exchange

PC	Personal Computer
PCI	Peripheral Component Interconnect
PDS	Primary Data Storage
PDTC	PCM-30 Digital Trunk Controller
PMDM	Preside Multiservice Data Manager
POTS	Plain Old Telephone Service
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RSC	Remote Switching Center
RTP	Real-time Transport Protocol
SAM21	Service Application Module 21
SAM21 EM	SAM21 Element Manager
SAN	Storage Area Network
SC	Shelf Controller
SM	single mode
SMLT	Split Multi-Link Trunking
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
SP	Shelf Processor
SS7	Signaling System #7
SSPFS	Succession Server Platform Foundation Software
STORM	Structure-Oriented Resilient Multicast
STP	Spanning Tree Protocol
TDM	Time Division Multiplexing
UA	User Agent
UPSR	Unidirectional Path-Switched Ring
VLAN	Virtual LAN
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
VRRP	Virtual Router Redundancy Protocol
XA-Core	Extended Architecture Core
XPM	Extended Peripheral Module

Nortel Communication Server 2100

Geographic Survivability

Planning Guide

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