



555-4001-806

Meridian SL-100/Nortel Networks Communication Server 2100

Product Guide

SE07 Standard 02.06 January 2005

NORTEL

Meridian SL-100/Nortel Networks Communication Server 2100

Product Guide

Publication number: 555-4001-806

Product release: SE07

Document release: Standard 02.06

Date: January 2005

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Publication history

January 2005

Version 02.06, SE07, Standard. This is the second standard SE07 issue of the document; minor changes due to Nortel rebranding.

December 2004

Version 02.05, SE07, Standard. Updated for internal review purposes.

September 2004

Version 02.04, SE07, Standard. This is the second standard issue of the document.

March 2004

Version 01.06, SE06, Standard. This is the first standard issue of the document.

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About this document

Purpose and audience

The SE07 software release build on the Meridian SL-100 migration to packet-based, IP telephony, that began in SE06. This document describes the hardware platform required for the Meridian SL-100 move to IP telephony, which is called the Communication Server 2100. For comparison purposes, this document also contains several chapters that describes the circuit-switched Meridian SL-100 hardware platform, of which many of the components can be reused when evolving to the Communication Server 2100.

This guide is a companion to the *Meridian SL-100/Communication Server 2100 Application Planning Guide*, which describes the applications and services that operate on the two hardware platforms. The *Meridian SL-100/Communication Server 2100 Application Planning Guide* also contains packaging and ordering information.

This document's audience is service provisioning, administrative and network management and planning 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). 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 first two digits indicate the version. The version number increases each time the document is updated to support a new software release. 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, check the release information in the <i>Meridian SL-100 Master Index of Publications</i> .

References in this document

This guide provides an overview of the hardware components that make up the Meridian SL-100 and those that make up the Communication Server 2100. The document is designed to act as a road map to help you find the hardware information related to your specific network configuration. As such, at the end of many of the sections in this guide, there are tables that list references to more detailed information about the component described.

Note: Reference documents may contain Nortel Networks product names used in the carrier market.

Conventions used in this document

This guide provides a quick visual indication of whether the chapter contains Meridian SL-100 or Communication Server 2100 information as shown in the following figure.

Figure 1
Color banners used at beginning of chapters

Banner appearing on the top of the first page of a chapter	
	← Chapter describes a Communication Server 2100 hardware component.
	← Chapter describes a Meridian SL-100 hardware component.

Note: The appendices contain information that applies to both platforms.



What's new in SE07



New hardware elements and applications

The following new elements are being introduced in SE07 to the Communication Server 2100 network configuration:

- IP Client Manager 7.0 (see [“IP Client Manager for the Communication Server 2100”](#) on page 103).

In addition to an embedded IPCM, SE07 provides support for the following new IP terminals and applications:

- 2001 Internet Telephone (see [“2001 Internet Telephone”](#) on page 211)
- IP Conference Phone (see [“2033 IP Conference Phone”](#) on page 224)
- Internet Telephone Key Expansion Module (see [“Internet Telephones Key Expansion Module”](#) on page 226)
- NET6 services and applications on IP phones through a ScreenTop menu (see [“Net6 Application Gateway for Meridian SL-100/Communication Server 2100”](#) on page 236)
- The Mobile USB Headset Adapter for the m6350 soft client (see [“Mobile USB Headset Adapter”](#) on page 235)
- Nortel Networks Media Gateway 9000 (see [“Nortel Networks Media Gateway 9000”](#) on page 108)
- Nortel Networks Media Server 2010 (see [“Nortel Networks Media Server 2010”](#) on page 128)
- Nortel Networks Real-time Transport Protocol (RTP) Media Portal (see [“Nortel Networks Real-time Transport Protocol Media Portal”](#) on page 139)
- New Netra 240 platform for the SuperNode Data Manager (see [“Physical OAM&P architecture”](#) on page 160)

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- Nortel Networks Core Billing Manager that consolidates FCAPS for the Communication Server 2100 (see [“Nortel Networks Core and Billing Manager”](#) on page 166)
- Nortel Networks Integrated Element Management System (IEMS) integrated platform for OAM&P (see [“Nortel Networks Integrated Element Management System”](#) on page 168)



Introduction

Meridian SL-100 evolution

The Meridian SL-100 is tailored for the large enterprise network of 4,000 plus lines and has been for over two decades. Advances in Internet telephony technology are changing the way in which Private Branch Exchanges (PBXs) provide communication services to enterprises around the world. SE07 uses this growing technology to offer businesses unprecedented choices in how to evolve and grow their communication systems to the world of Internet Protocol (IP) telephony.

The evolution to IP telephony leverages Nortel Networks products for other IP solutions. The Nortel Networks Communication Server 2100 delivers the same rich features of today's Meridian SL-100, while also paving the way for a new suite of services that result from the converging of telephony and data networks.

Software release SE07 builds on the evolution of the Meridian SL-100 to packet-based switching and all of its corresponding benefits. SE06 was the first release that bridged the Meridian SL-100 to Nortel Networks IP product portfolio. Previous Meridian SL-100 software releases have now been migrated to the SE software stream.

The Communication Server 2100 provides centralized call processing and control between network components. Using the Real-time Transport Protocol (RTP), the Communication Server 2100 provides translations and routing control for the entire IP telephony network. The Communication Server 2100 also supports Dynamic Packet Trunks (DPTs) between IP telephony networks to optimize the bearer path for calls over DPT trunks.

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The Communication Server 2100 solution is based on the use of a single packet backbone network. This use of packet switching technology provides an alternative to current configurations in which voice and data networks exist in parallel and are managed separately. A migration to IP telephony reduces costs

- by eliminating hardware duplications
- by simplifying and standardizing the management of networks and network elements
- by allowing bandwidth to be used with maximum efficiency, because there is no longer any need for circuit-switched connections

The Communication Server 2100 solution uses Communication Servers designed to offer large enterprises the opportunity to adopt the new packet-based network architecture without having to restrict themselves in terms of the capabilities and services they can offer their employees. The Communication Server 2100 software load includes call processing agents, translations, routing, billing and services software that has been proven on other Nortel Networks platforms in a wide range of markets. The Communication Server 2100's support for interconnect interfaces allows it to be deployed immediately alongside existing Public Switched Telephone Networks (PSTNs), while its support of value-added services ensures increased employee productivity.

The Communication Server 2100 enables the transition from a Time Division Multiplexing (TDM) to packet architecture to be seamless, with existing services remaining fully operational throughout the upgrade process. It is even possible for traditional circuit-switched TDM and packet capabilities to be supported in parallel by the same software load, with the Interworking Spectrum Peripheral Module IP (IW SPM-IP) being used to provide connections between the TDM and packet environments. This offers medium to large enterprise customers a second layer of flexibility when deciding what is the best way, and the best time, to reap the benefits of IP switching. The Communication Server 2100 uses the term "hybrid" to describe that this Communication Server can deliver both IP and traditional TDM telephony services.

Available configurations

To provide Meridian SL-100 customers maximum flexible in any upgrade to IP telephony, Nortel Networks is introducing the following two base platforms, both of which deliver carrier-grade reliability:

- **Communication Server 2100 XA-Core (CS 2100 XA-Core)** – provides packet switching by leveraging current investment through the use of the Nortel Networks' proprietary Extended Architecture Core (XA-Core) processor currently used in existing Meridian SL-100s. For more information about this solution, see [“Communication Server 2100 XA-Core” on page 77](#).

Note: This platform can be based on a full SuperNode, or a streamlined SuperNode Size Enhanced (SNSE), configuration.

- **Communication Server 2100 Compact (CS 2100 Compact)** – provides packet switching by using an industry-standard compact Peripheral Component Interconnect (cPCI) processor. This configuration is sometimes referred to as the “Compact”. This open platform, based on a Motorola cPCI circuit card, runs the same software as the XA-Core. For more information about this solution, see [“Communication Server 2100 Compact” on page 67](#).

The term “Nortel Networks Communication Server 2100”, or “Communication Server 2100”, is used to describe both of the above platforms.

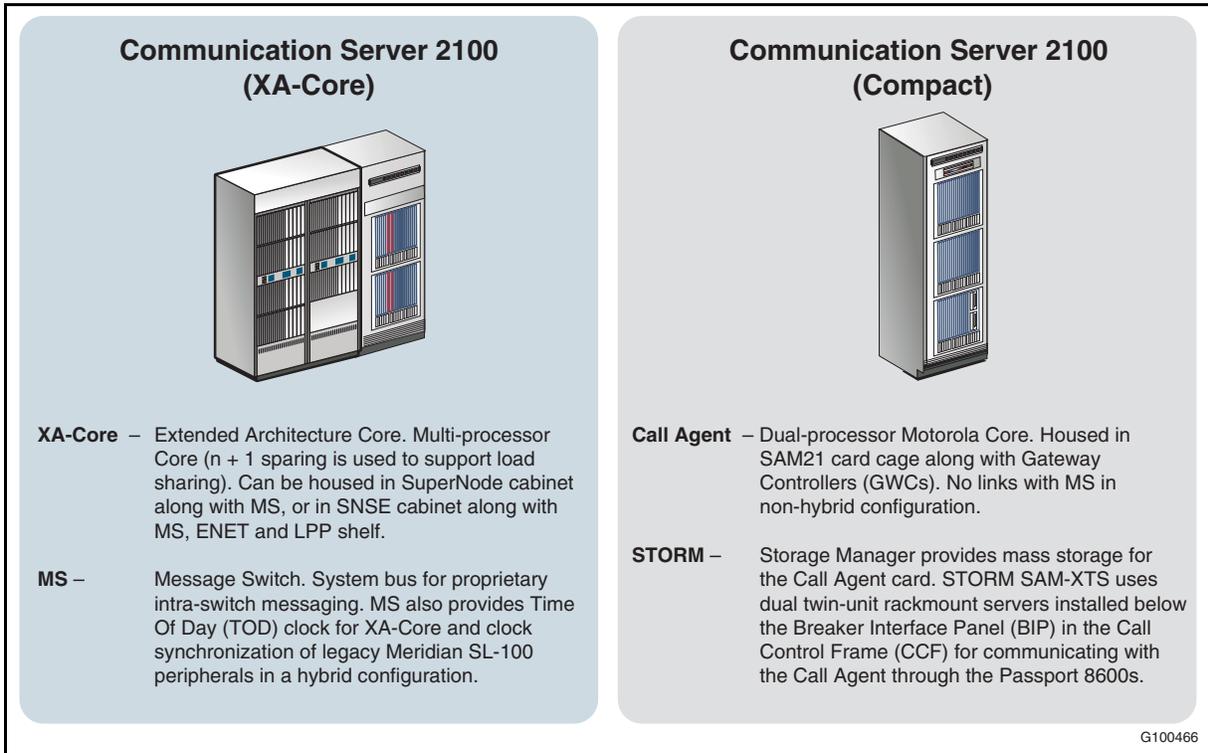
Both configurations support the same range of call processing agents, protocols and telephony features. The main differences between them are that the Communication Server 2100 Compact uses a different processor complex, has a significantly smaller system footprint and delivers reduced call processing capacity. It is, therefore, more appropriate for medium-sized enterprises where minimizing initial capital cost and system footprint is more important than switching capacity.

The Communication Server 2100 is a distributed system comprising a number of different functional elements. The system uses the central processor to control all end points. The main functional elements are common to both configurations, but there are differences between the standard and compact configurations in terms of hardware components used to implement certain functions. See [“Communication Server 2100 hardware” on page 35](#) for further information.

[Figure 2 on page 22](#) summarizes the basic differences in hardware components between the two systems.

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Figure 2
Summary of processing differences between the two configurations



Features and services

The Communication Server 2100 supports the same wide range of features and applications that are currently supported on the Meridian SL-100.



FOR MORE INFORMATION

This document focuses on the base platform of the Communication Server 2100. See the *SE07 Meridian SL-100/Communication Server Application Planning Guide* for a comprehensive description of features and services that the Communication Server 2100 supports.

Capacity

In Table 1 all figures quoted are general, and are subject to variation depending on the network call model and capacity requirements. Network-specific estimates should be determined in consultation with Nortel Networks Sales Engineering.

Table 1
System capacities

Item	Communication Server 2100 XA-Core	Communication Server 2100 Compact
Call processing	<ul style="list-style-type: none"> • Maximum 1.65 million Busy Hour Call Attempts (BHCA's) • Maximum of 165,000 clients (not including trunks) • Maximum 56,000 simultaneous calls 	<ul style="list-style-type: none"> • Maximum 1.3 million Busy Hour Call Attempts (BHCA's) • Maximum of 60,000 clients (not including trunks) • Maximum 32,000 simultaneous calls
Trunks and/or endpoints	Overall maximum of 165,000 trunk and/or endpoints. Within this, the limits that apply to different endpoint types are <ul style="list-style-type: none"> • 48,000 Primary Rate Interface (PRI/H.323) trunks • 130,000 analog subscriber lines 	

Communication Server 2100





Network topology

This chapter contains the following sections:

- **IP network architecture**
- **Communication Server 2100 implementation of IP architecture**
- **Communication Server 2100 support for network architecture**
- **The backbone packet network**

IP network architecture

The network architecture for the Communication Server 2100 is based on a conceptual model defined by the Internet Engineering Task Force (IETF). This model specifies the logical functions that must be provided in a packet backbone network used to support multimedia traffic. Some of these logical functions exist within the packet network, whereas others exist at its periphery supporting access to the packet network from TDM networks and various types of access networks.

A “gateway” provides an interface between two domains (for example, between a packet network and a TDM network). There are two types of gateway functionality as follows:

- **Media gateway** – provides an interface for bearer connections (for example, mapping a packet-based media stream onto a circuit-based media stream, seamlessly providing any required format conversion while maintaining content integrity).
- **Signaling gateway** – provides an interface for signaling connections. It terminates legacy network signaling on one side and packet network signaling on the other, and supports all necessary interpretation and conversion between the two.

These are logical functions, not node types. A given node can provide media gateway functionality, signaling gateway functionality, or both. Similarly, gateway functionality can be provided by a combination of nodes, rather than a single node. For more information about the supported gateways, see [“Gateways” on page 81](#).

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Gateways provide basic connectivity across the packet network. Additional capabilities are provided by various kinds of servers within the packet network. In-band services such as announcements and video are provided by media servers. Call processing capabilities and related features are provided by Communication Servers (also known as Call Servers).

The control and coordination of packet network gateways to support applications such as IP telephony is the responsibility of a Media Gateway Controller (MGC). As with gateways, a Media Gateway Controller is a logical function, not a node type. Media Gateway Controller functionality can be provided by a combination of nodes, rather than a single node. It is also possible for a given node to provide server functionality, as well as Media Gateway Controller functionality.

Communication Server 2100 implementation of IP architecture

In terms of IP network architecture, the Communication Server 2100 is a Communication Server providing call processing capabilities. It also provides Media Gateway Controller functionality. Together with various types of gateway and server, it supports IP telephony. Specifically, Communication Server 2100 capabilities include the following:

- **Basic connectivity and network element control**
 - Control over the media gateways that provide the bearer connection interface between the packet network environment and other TDM or access networks. In SE07, the Communication Server 2100 provides the following three types of access using gateways:
 - Access to/from the Public Switched Telephone Network (PSTN) or other TDM network.
 - Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) access for digital Private Branch Exchanges (PBXs) and other PRI-enabled devices.
 - Analog line access.
 - Control over media servers supporting capabilities such as announcements and conferencing over the packet network.
 - Originations and terminations for inter-Communication Server signaling across the packet network to/from other Communication Server 2100s and compatible Media Gateway Controllers.
 - Originations and terminations for TDM-side signaling.

- **Call processing**
 - Support for a wide range of proven call processing agents.
 - Support for translations and routing of calls entering, exiting and crossing the packet network.
 - Support for requests to apply tones and announcements.
 - Support for billing, event reporting and performance monitoring.
- **Service support**
 - Support for specific sets of value-added features.
 - Support for general-purpose service delivery platforms.

A Communication Server 2100 can be regarded as single node; however, the capabilities listed above are provided by separate components. The Gateway Controllers (GWCs) are essential to the Communication Server and are used for the following main purposes:

- To serve as controllers for media gateways, controlling their operation through device/media control signaling based on packet network protocols.
 - Note:** Depending on the type of access to be supported, a gateway can provide signaling gateway functionality, as well as media gateway functionality, in which case the Gateway Controller and gateway exchange call control signaling and media control signaling. This is the case with PRI and analog line access.
- To support communication between peer Communication Servers for the handling of networked calls. This is accomplished through inter-Communication Server signaling, also based on packet network protocols.

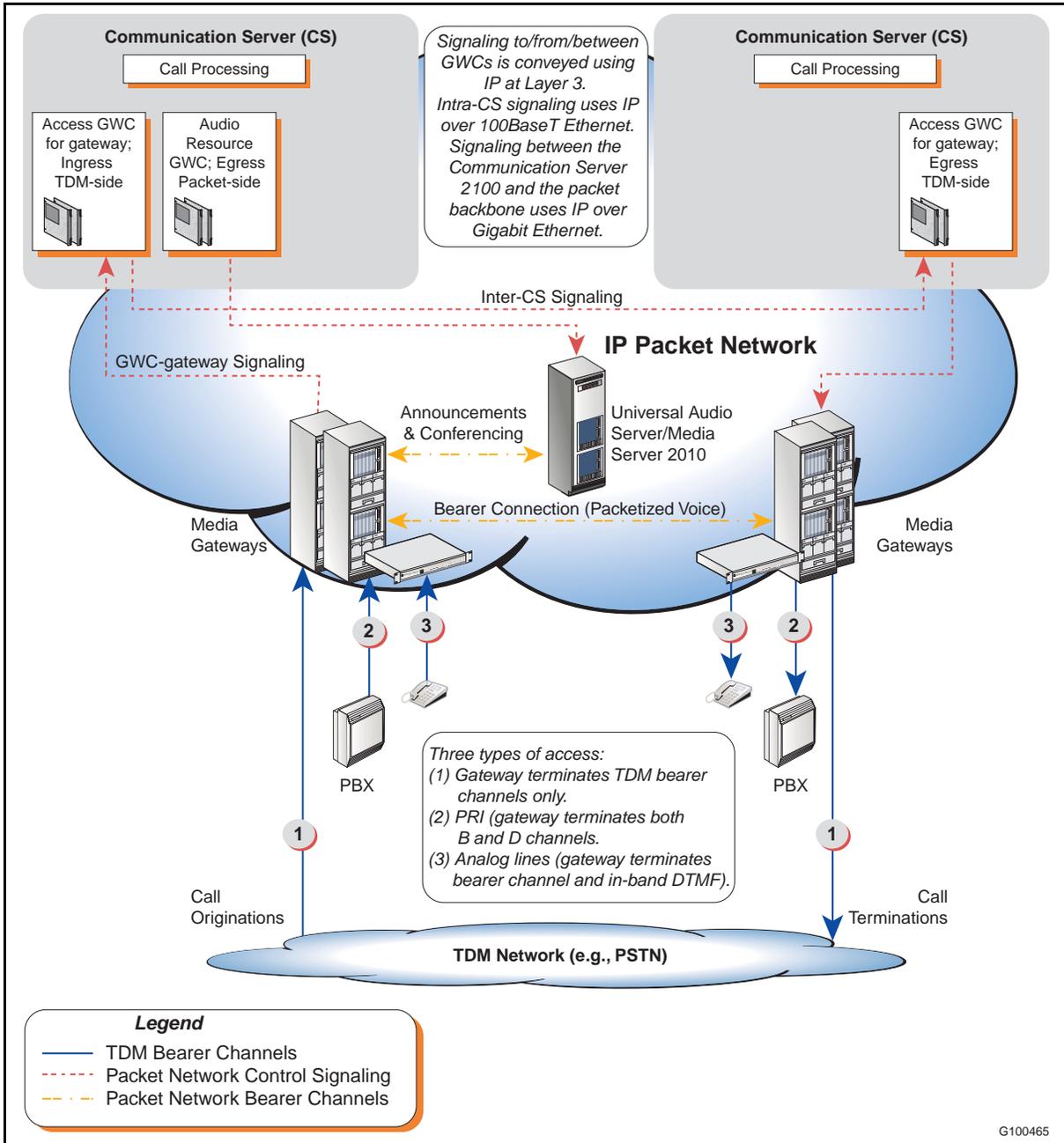
In the Communication Server 2100 architecture, you configure Gateway Controllers as Communication Server 2100 peripherals, but from an IP network perspective a Gateway Controller is an independent host with its own IP address.

A range of packet network protocols has been developed for different types of communication involving Gateway Controllers.

30 Network topology

Figure 3 shows a functional overview of the Communication Server 2100 network architecture for IP telephony. It focuses on the roles of the different Gateway Controller types. For simplicity, Operations, Administration, Maintenance and Provisioning (OAM&P) components are not shown (these are described in “OAM&P for Communication Server 2100 networks” on page 157).

Figure 3
Communication Server network architecture for IP telephony



Communication Server 2100 support for network architecture

Hardware support

Components

Communication Server functionality is allocated to the Communication Server 2100 as follows:

- Call processing is supported by the Communication Server 2100 processor complex (Core).
- Different types of Gateway Controller functionality are provided by Gateway Controllers housed in Service Application Module 21 (SAM21) card slots:
 - Gateway Controllers for media gateways supporting access to the packet network as follows:
 - Trunk gateways support Primary Rate Interface (PRI/H.323) access.
 - Line gateways provide support of analog lines.

A given gateway supports trunk or line access, but not both. Similarly, an access Gateway Controller can control either trunk gateways or line gateways, but not both.

 - Audio Gateway Controller for the Universal Audio Server (UAS)/Media Server 2102 which supports announcements and conferencing.

Gateways

SE07 supports the use of the following gateway types:

- Access gateways
 - Packet Voice Gateway (PVG) supporting IP Telephony.
 - Line media gateways attached to customer Local Area Networks (LANs) to support IP telephony.
- Universal Audio Server/Media Server 2102 which supports packetized announcements and conferencing.

Note: The Universal Audio Server is a 16-slot unit with similar hardware attributes of the SAM21, but in terms of the Communication Server 2100 network architecture it subtends to a Gateway Controller and is therefore categorized as a gateway. The UAS is not supported on the hybrid configuration.

Software support

Because the Communication Server 2100 is a distributed system, it is necessary to consider the support for protocols that are internal to the network, as well as the PSTN interfaces it supports externally. The SE07 software delivers protocol stacks which support three types of IP signaling that are involved in setting up calls across the packet network as shown in the following list:

Note: All packet network signaling is conveyed using IP at Layer 3.

- Access signaling between Gateway Controllers and media gateways. The following types of access signaling are supported:
 - Media or device control signaling that allows the Gateway Controller to control the characteristics of the packet network bearer connections used for a call.
 - Call control signaling (setup and clearing messages) for message-based interfaces such as Integrated Services Digital Network (ISDN) PRI. Access network signaling is terminated at the media gateway.
 - Call control signaling for analog subscriber lines.
- Network signaling between Communication Servers.
- Session Description Protocol (SDP) used to complement both Gateway Controller-gateway signaling and inter-Communication Server signaling by specifying bearer capabilities and IP address information.

SE07 software load

SE07 is the second Communication Server 2100 release for the Meridian SL-100. The SE07 software load provides all of the required software functionality for packet-based signaling. In addition, SE07 can be installed on legacy Meridian SL-100 hardware platforms in which case it is referred to as SE07 (TDM). You can install the SE07 software load in a hybrid configuration that comprises circuit-switched and packet-switched capabilities simultaneously.

The backbone packet network

The backbone packet network comprises the following two logically distinct networks:

- The bearer network used to convey media streams such as speech, data or video.
- The control network used to convey signaling (that is, to set up and control bearer connections between media gateways).

When this document refers to an IP backbone packet network, it denotes the bearer network, not the control network. The control network uses IP at Layer 3.

Note: SE07 does not support Asynchronous Transport Mode (ATM) as the backbone network.



Communication Server 2100 hardware

Overview

This chapter describes the Communication Server 2100 hardware. The chapter also summarizes the differences between the Communication Server 2100 XA-Core hardware platform and that of the Communication Server 2100 Compact.

The Communication Server 2100 is based on a distributed modular architecture that provides inherent scalability, allowing the capacity of each Communication Server 2100 to be tailored for its network role. Most call processing and feature support is provided by the central processor complex or Core, but specialized processing is delegated where possible to peripherals and Gateway Controllers, ensuring that optimum use is made of Core capacity.

Hardware availability is defined in terms of software releases. This is because many hardware components have software dependencies and vice versa.

To meet the divergent needs of large enterprise customers, SE07 supports the following two hardware configurations:

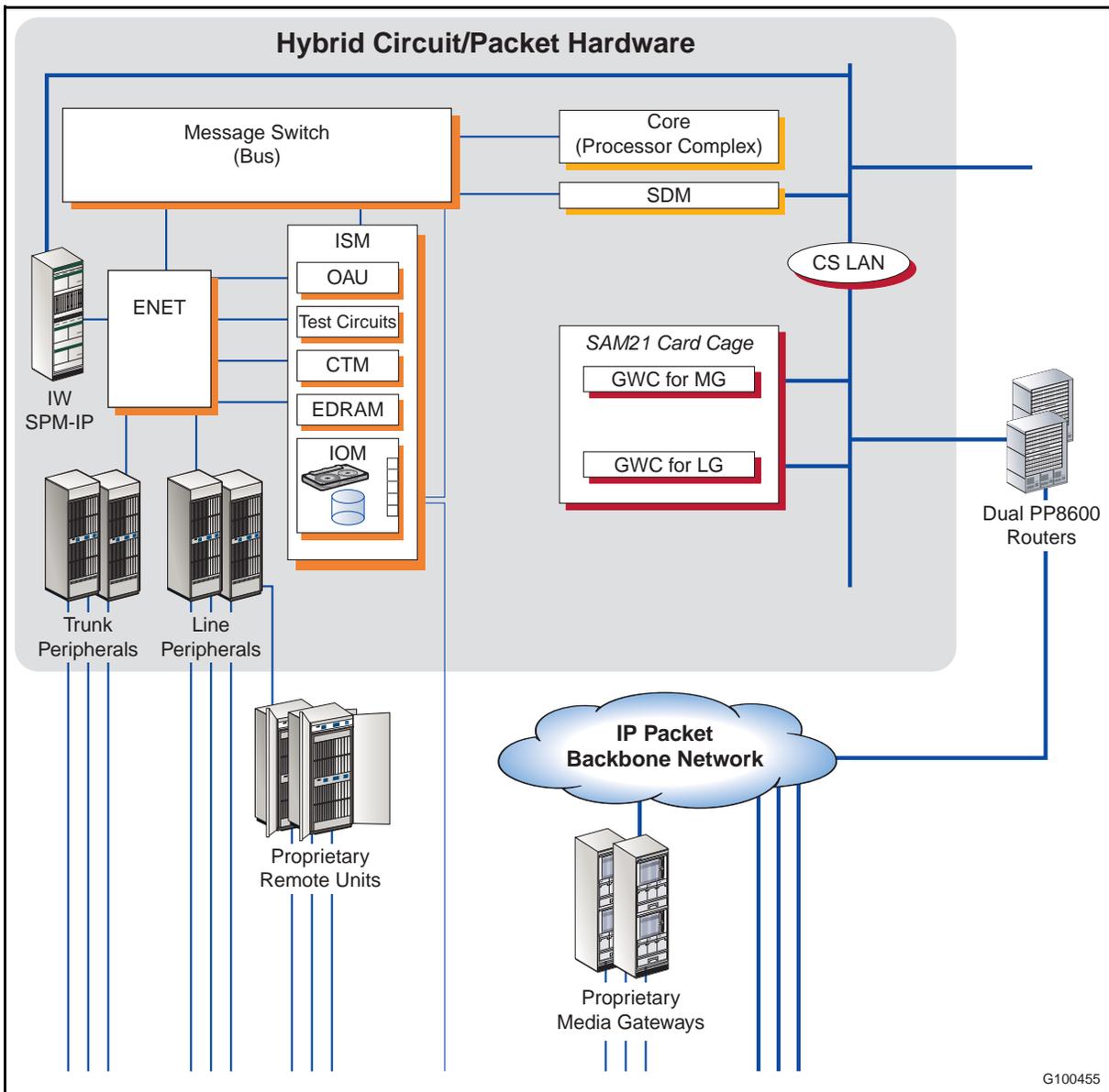
- Communication Server 2100 XA-Core which can be either a full SuperNode configuration or a streamlined SuperNode Size Enhanced (SNSE) configuration.
- Communication Server 2100 Compact configuration with minimized footprint.

A Communication Server 2100 Communication Server is a distributed system comprising a number of different functional elements. [Figure 4 on page 36](#) provides a high-level logical view of the interaction between the main functional elements, which are common to both types of configurations. Some functions are, however, provided by different hardware components in Standard and Compact configurations.

36 Communication Server 2100 hardware

Figure 4 shows a logical view of the Communication Server 2100. Physically, the Communication Server 2100 consists of circuit cards housed in shelves, which are in turn packaged into cabinets to form a cabinet lineup. Many Communication Server 2100 components are duplicated for reliability. Others operate in load-sharing mode using N+1 sparing. In both cases, the objective is for a functional element to be able to survive the failure of one of its constituent hardware units.

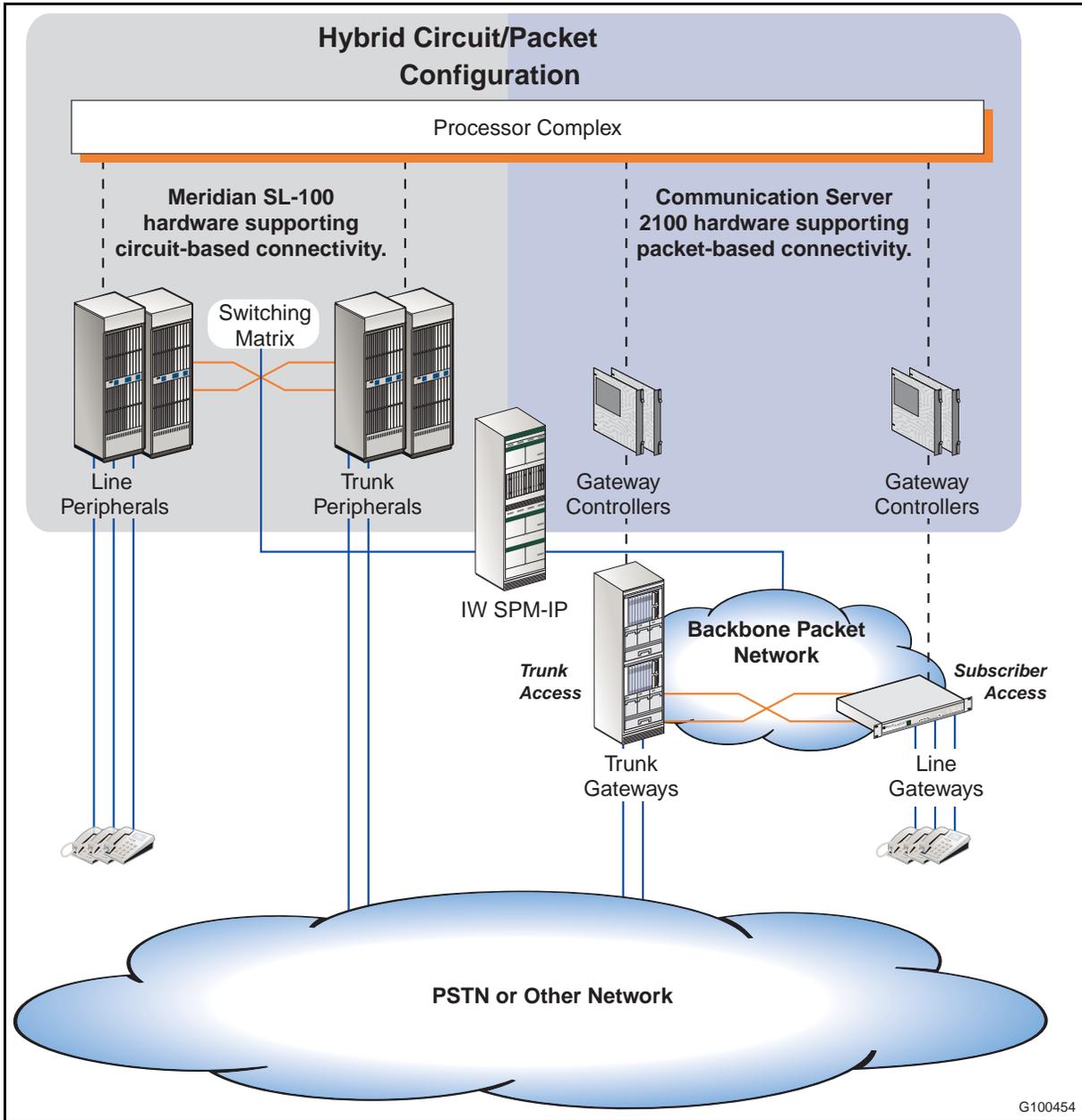
Figure 4
Functional overview of the Communication Server 2100 hardware and CS LAN



Hybrid support

Figure 5 breaks out Figure 4 on page 36 to provide a simplified functional view of the different roles the Communication Server 2100 and legacy Meridian SL-100 switches. The figure shows how these units can be combined in a hybrid configuration to support both circuit-switched and packet-switched capabilities.

Figure 5
Functional view of hybrid circuit/packet configuration



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For more information about the Meridian SL-100 circuit-switched hardware components, see Meridian SL-100 section of this guide.

Chapter format

This chapter focuses on describing the internal hardware components of the Communication Server 2100. Gateways that complement the solution, and media servers such as the Universal Audio Server, are described in separate chapters.

This chapter contains the following sections:

- **Processor complex (Core)**
- **Internal communication (Communication Server LAN and Message Switch)**
- **Gateway Controllers**
- **Interworking Spectrum Peripheral Module IP**

OAM&P platforms are described in a separate chapter (see [“OAM&P for Communication Server 2100 networks” on page 157](#)). In addition, to clearly distinguish between the two types of Communication Server 2100 hardware configurations, this chapter includes the following sections:

- **Communication Server 2100 Compact**
- **Communication Server 2100 XA-Core**

Processor complex (Core)

The processor complex, or Core, is the central computing engine of a Communication Server 2100. This is where you install the Product Computing-module Load (PCL) for the current software release. Although specialized processing is delegated to other components where possible, it is the centrally-located Product Computing-module Load that supports call processing agents for telephony interfaces, translations and routing, and service logic for the delivery of value-added features and services. The Product Computing-module Load also includes software for controlling packet network bearer connections established through Gateway Controllers and media gateways.

Depending on the type of configuration, the Communication Server 2100 supports two different Cores as follows:

- The Extended Architecture Core (XA-Core), as described in “XA-Core” below, provides processing power for Communication Server 2100 XA-Core configurations. XA-Core is also a processor complex for legacy Meridian SL-100 switches.
- The Call Agent as described in [“Processor complex for Communication Server 2100 Compact \(Call Agent\)” on page 44](#), provides processing power for Communication Server 2100 Compact configurations.

XA-Core

The XA-Core is the call processing platform for the Communication Server 2100 XA-Core. The XA-Core provides an OC-3c network connection provisioned for two Permanent Virtual Connections between each trunk gateway for signaling data and a 10BaseT interface to the CS LAN for OAM&P data. The XA-Core connects to the Message Switch using an OC-3 connection. Network element provisioning, configuration, alarms, logs, and maintenance are supported by XA-Core software and are accessed by software applications running of the Core Manager.

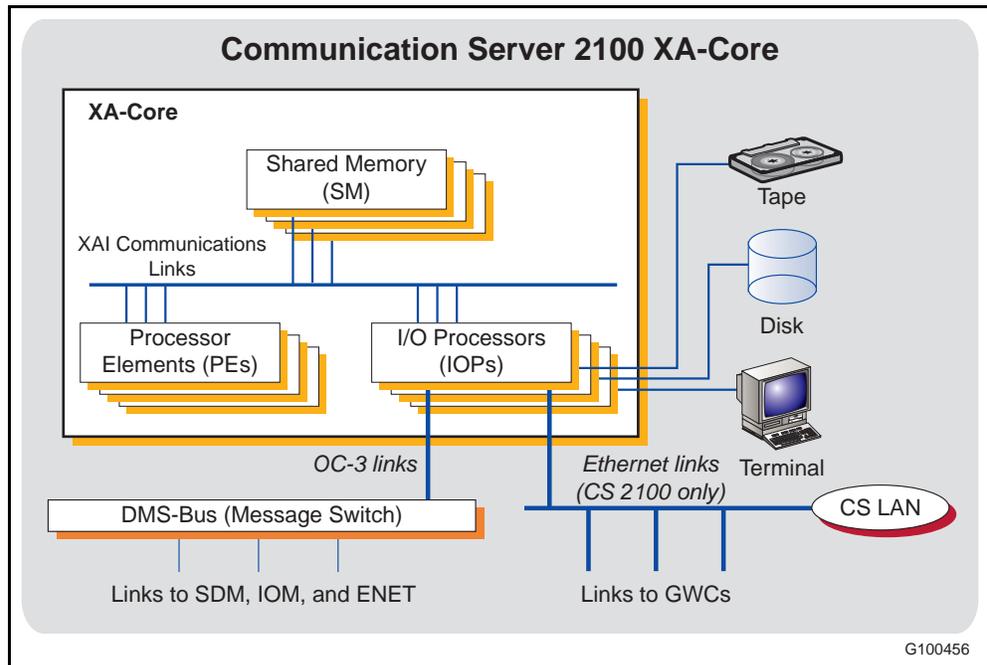
XA-Core design is based on the principle of using independently scalable subsystems to deliver call processing capacity. You can tailor these subsystems incrementally to meet the requirements of your organization, without the need for replacements or upgrades. The XA-Core subsystem consists of the following:

- Processor subsystem
- Shared memory
- Input/output processors

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A set of independent communications links referred to as the Extended Architecture Interconnect (XAI) provide links between subsystems (bus capabilities). Figure 6 illustrates XA-Core architecture at the logical level.

Figure 6
XA-Core logical architecture



Physically, the processor complex implements each type of XA-Core subsystem as a circuit card. XA-Core as a whole consists of a single shelf that provides slots for inserting these circuit cards. A SuperNode C42 cabinet houses the XA-Core shelf.

The XA-Core shelf can be packaged in a cabinet along with the Message Switch and Enhanced Network (ENET) in separate cabinets. Alternatively, the XA-Core can be packaged in a SuperNode SE Combined Core cabinet along with streamlined version of the Message Switch and ENET.

Processor subsystem

Each Processor Element (PE) consists of twin Power MCPN7410 processors and has 512 Mbytes of on-board memory.

The system uses 2+1 XA-Core sparing (that is, three active load-sharing Processor Elements handling a workload engineered for two, thus theoretically leaving one spare). This gives the system the ability to handle a full workload, even in the event of a Processor Element failure.

Shared memory

Each shared memory element is a card housing two or three 128-Mybte memory modules. The overall maximum memory that can be provided by the shared memory subsystem for XA-Core is 1728 Mybtes (1152 Mybtes for SuperNode SE).

Mated pairs of 32-Mybte memory blocks located on different memory cards, each storing duplicated data, provide the memory. In this configuration, the system retains one copy of the data in the event of a memory failure. Pairs of memory blocks are independently mated, so that problems with a given mated pair have no impact on any other mated pair.

Input/output system

Input/Output Processors (IOPs) provide system load capacities and support communications links with other Communication Server 2100 XA-Core components. Each Input/Output Processor motherboard houses one or two dedicated application-specific packets designed to support capabilities such as the following:

- Ethernet ports of Internet Protocol (IP) communication using the Communication Server LAN (CS LAN) with other IP hosts, especially Gateway Controllers housed in SAM21 card cages. XA-Core is equipped with two High-capacity Input/Output Processor (HIOP) cards, which you connect to the Passport 8600 routers through 100BaseT full duplex links. During normal operation, both HIOPs are active and operate in load-balancing mode.
- An interface to the Communication Server 2100 XA-Core Message Switch (bus) for communication with the SuperNode Data Manager. Each Input/Output Processor used for this purpose supports ports for terminating Asynchronous Transport Mode (ATM) over Synchronous Optical Network (SONET) OC-3 links operating at 155 Mbps.
- Disk storage with capacity of 4 Gybtes.
- Tape storage (DAT) with capacity of 1.3, 2 or 4 Gybtes.

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Physical layout

The XA-Core fits in a single shelf in a traditional Meridian SL-100 frame. The shelf contains the following types of circuit cards:

- Processing Element (PE) cards execute all call processing software processes. These processes include the computing module software that provides a user interface through a Maintenance and Administration Position (MAP) terminal, central database functions, call processing services and system-level maintenance functions.
- Input/Output Processor (IOP) cards handle input and output processing. Each Input/Output Processor uses a generic processor card and one or two daughterboards, called packets, which provide I/O services (for example, disk and tape drives, serial, OC-3 and Ethernet interfaces).
- High Performance Input/Output Processor (HIOP) cards provide a hardware upgrade for Input/Output Processor cards supporting 100BaseT Ethernet.
- Shared Memory (SM) cards contain all XA-Core data that can be shared with software processes running on Processing Element and Input/Output Processor cards. These cards also control data access by Processing Element and Input/Output Processor cards.

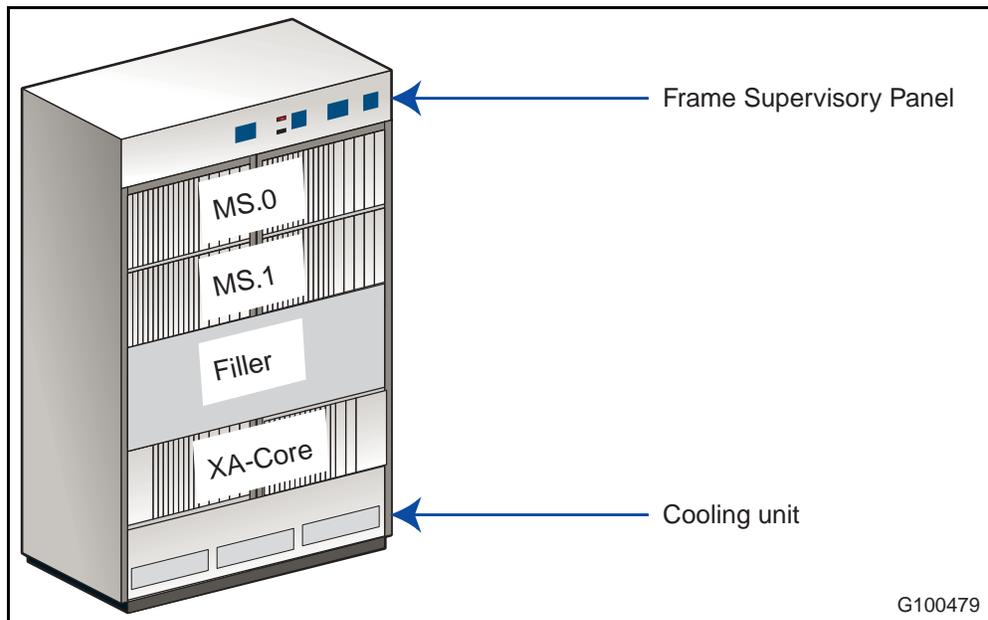
Together these circuit cards form a high-performance, multiprocessing compute engine that is completely scalable in terms of processing, memory and I/O capability. Adjusting system capacity, or adding another interface, is as simple as plugging in a new card.

SuperNode frame

The XA-Core is housed in a SuperNode cabinet and, depending on the configuration, can also contain a Frame Supervisory Panel (FSP), one standard XA-Core shelf, two Message Switch shelves, one filler shelf and a cooling unit. XA-core components reside on a single shelf with a mid-plane design that houses front- and rear-mounted cards.

[Figure 7 on page 43](#) shows the cabinet configuration when the XA-Core and Message Switch shelves are in the same cabinet.

Figure 7
XA-Core frame layout



G100479

For additional information about XA-Core-based systems, see [“Communication Server 2100 XA-Core”](#) on page 77.

References

Table 2 shows where you can find more detailed information about the hardware components used with the Communication Server 2100 XA-Core.

Table 2
Documentation references (Sheet 1 of 2)

Document title	Document Number
Summary of TDM components (including Core and Message Switch)	
<i>Meridian SL-100 Product Guide</i>	555-4001-103
<i>DMS-100 Hardware Description Manual</i>	297-8991-805
<i>DMS SuperNode and DMS SuperNode SE Message Switch Maintenance Guide</i>	297-5001-549
<i>XA-Core Reference Manual</i>	297-8991-810

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Table 2
Documentation references (Sheet 2 of 2)

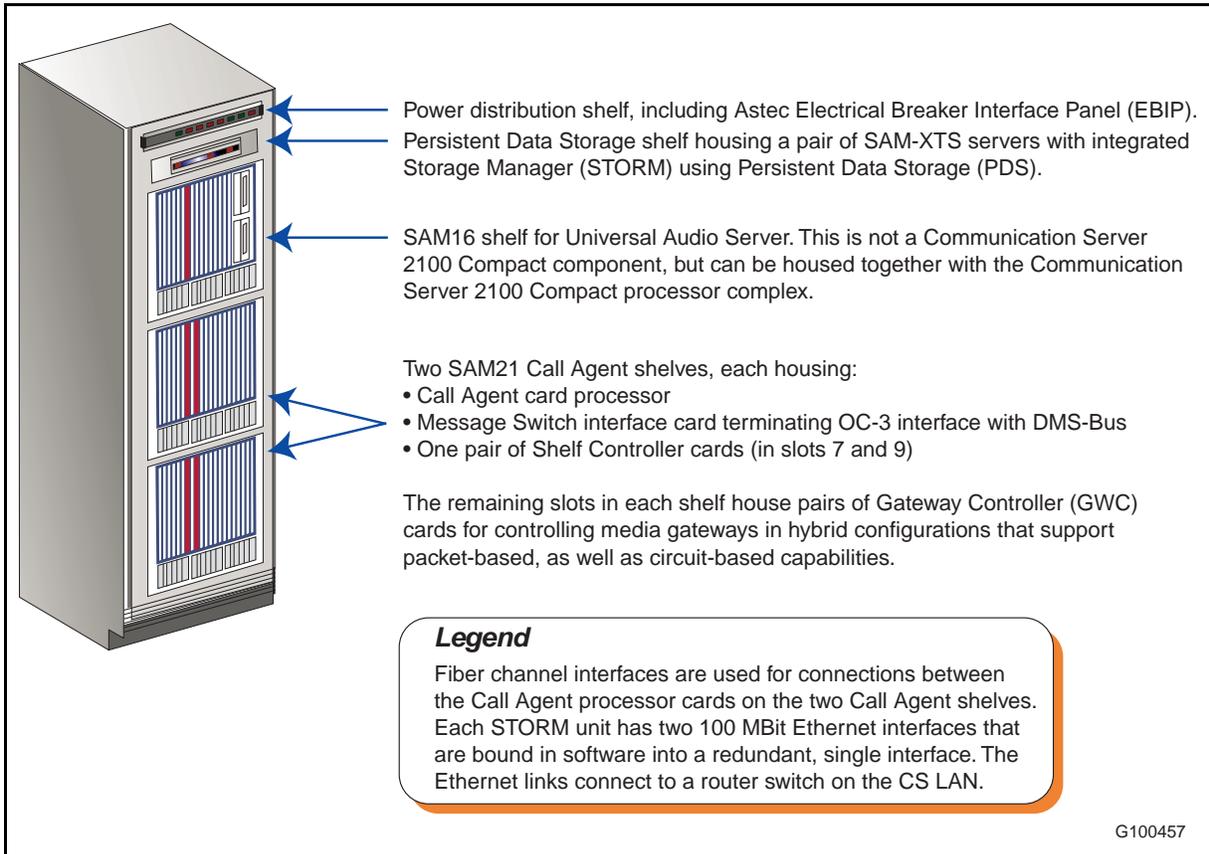
Document title	Document Number
XA-Core	
<i>Communication Server 2000 Basics</i> Note: Due to the commonality between the two systems, these documents also apply to the CS 2100.	NN10286-111
<i>Communication Server 2000 Fault Management</i>	NN10083-911
<i>Communication Server 2000 Configuration Management IAW & IAC Configuration Management</i>	NN10193-511 NN10188-511
<i>Globalized Solution-Level Accounting</i>	NN10400-800
<i>Communication Server 2000 Performance Management</i>	NN10149-711
<i>Communication Server 2000 Administration and Security</i>	NN10171-611
<i>Upgrading the Communication Server 2000 IP Solutions Upgrades</i>	NN10061-461 NN10444-450 V1-2

Processor complex for Communication Server 2100 Compact (Call Agent)

The processor complex for the Communication Server 2100 Compact is referred to as the Call Agent. The Call Agent is a non-proprietary processor, which consists of a pair of Motorola MCPN765 cards, also known as blades. The Call Agent supports call processing and service logic by means of the SE07 load running on a combination of Linux operating system and Protel Environment Emulation Layer (PEEL) software.

A SAM21 shelf in a Packet Telephony Equipment 2000 (PTE2000) frame houses the Call Agent. This frame is referred to as a Call Control Frame (CCF). The SAM21 is so called because it is a Service Application Module shelf with 21 slots. A PTE frame is 61 cm wide x 213 cm high x 61 cm deep (24" x 84" x 24") walled frame with a door. [Figure 8 on page 45](#) illustrates the Call Control Frame and its contents.

Figure 8
Communication Server 2100 Compact Call Control Frame



Frame layout

The Communication Server 2100 Compact resides in a Call Control Frame (CCF) in a Packet Telephony Equipment (PTE2000) frame. Each Call Control Frame consists of the following components:

- Two Communication Server 2100 Compact Call Agent/SAM21 shelves.
- One optional SAM16 shelf for a Universal Audio Server.
- One Astec Breaker Interface Panel (BIC) that serves as the power distribution shelf.
- Two STORM SAM-XTS server units that store data on internal disk drives and use RAID level one (RAID-1) mirroring for data redundancy. RAID-1 allows one of the two drives to fail without loss of data.

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In addition to the Call Control Frame, a Communication Server 2100 Compact cabinet lineup includes a cabinet housing a SuperNode Data Manager platform for the Succession 2000 Manager and a PTE2000 frame housing OAM&P servers for Gateway Controllers and other Communication Server 2100 Compact components (see [“Communication Server 2100 Compact” on page 67](#) for more information).

Shelf layout

Each Communication Server 2100 Compact resides in a SAM21 shelf. Each shelf consists of the following components:

- one alarm panel
- one card cage that consists of the following cards:
 - one Call Agent card
 - seven pairs of Gateway Controller cards
 - one pair of Shelf Controller cards that manage the SAM21 shelf
- three power supply/fan modules

Call Agent card

The Call Agent card is easy to insert, remove and replace at the card level. This improves availability and simplifies such things as maintenance and sparing. The shelf supports the hot swapping of cards.

The Call Agent card increases the density of processing within a given space. The Motorola MCPN765 Call Agent card consists of the following:

- 500 MHz PowerPC 7410 processor
- 1.5 Gig ECC RAM
- 2MB L2 cache
- 16MB on-board flash memory
- on-board debug monitor with diagnostics
- dual Ethernet transceiver, 10/100 Mbps
- 32KB NVRAM and time-of-day clock
- four asynchronous serial ports
- four 32-bit timers, one watchdog timer

Nortel Networks designed the Call Agent card with survivability in mind. The two Call Agent units can be distributed on separate shelves. In this situation, they are interconnected through IP for messaging, Fiber Channel for sparing, with a backup serial link, eliminating the need for the two shelves to be collocated.

References

Table 3 shows where you can find more detailed information about the Call Agent.

Table 3
Documentation references

Document title	Document Number
Call Agent (equivalent of the core)	
<i>Call Agent Basics</i>	NN10023-111
<i>Call Agent Fault Management</i>	NN10087-911
<i>Call Agent Configuration Management</i>	NN10109-511
<i>Call Agent Accounting Management</i>	NN10131-811
<i>Call Agent Performance Management</i>	NN10153-711
<i>Call Agent Administration and Security</i>	NN10175-611
<i>Upgrading the Call Agent</i>	NN10065-461
Storage Management (STORM) (the Call Agent requires persistent storage)	
<i>STORM Basics</i>	NN10024-111
<i>STORM Fault Management</i>	NN10088-911
<i>STORM Configuration Management</i>	NN10110-511
<i>STORM Performance Management</i>	NN10054-711
<i>STORM Administration and Security</i>	NN10176-611
<i>Upgrading the STORM</i>	NN10066-461

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Internal communication (Communication Server LAN and Message Switch)

Internal communication between components of a Communication Server 2100 is based on one or both of the following:

- The Communication Server Local Area Network (CS LAN)

Used primarily to support communication between Gateway Controllers and other components, such as the Core and the SuperNode Data Manager.

Note: In carrier network configurations, the CS LAN sometimes is referred to as the Central Office LAN (CO LAN).

- The Message Switch (bus)

Used to provide a system bus for peer-to-peer messaging between the XA-Core and other Meridian SL-100 legacy components in a Communication Server 2100 XA-Core configuration, such as the SuperNode Data Manager.

Note: The Message Switch is not required, or used, in Communication Server 2100 Compact configurations.

Communication Server Local Area Network

[Figure 4 on page 36](#) depicts how the CS LAN supports communication between Communication Server 2100 components.

Communication Server 2100 components linked by the CS LAN

The CS LAN supports Ethernet communication between Communication Server 2100 hardware components, especially between Gateway Controllers and other units, as follows:

- Components connected though the CS LAN in a Communication Server 2100 XA-Core include the following:
 - Gateway Controllers
 - XA-Core
 - SuperNode Data Manager

- Components connected through the CS LAN in a Communication Server 2100 Compact include the following:
 - Gateway Controllers
 - Call Agent
 - SuperNode Data Manager

The CS LAN also supports communication between Communication Server 2100 components and some co-located non-Communication Server 2100 components, including the following types of server:

- Universal Audio Server (UAS)/Media Server 2010 supporting the following capabilities:
 - Announcements
 - Conferencing
 - Monitoring

For more detailed information about the Universal Audio Server, see [“Universal Audio Server” on page 120](#). For more detailed information about the Media Server 2010, see [“Nortel Networks Media Server 2010” on page 128](#).

- Sun Netra 240 servers housed in a dedicated PTE2000 OAM&P frame, supporting Device Managers and management applications for Gateway Controllers and non-Communication Server 2100 units such as media gateways.
- Dynamic Host Configuration Protocol (DHCP) server.
- Trivial File Transfer Protocol (TFTP) server.

CS LAN characteristics and connectivity

The CS LAN is an Ethernet 100BaseT network based on the Passport 8600 router. Physically, the CS LAN consists of direct Ethernet cable connections between ports on the Passport 8600 and ports on the Communication Server 2100 hardware components.

See [“Passport 8600 routing switches” on page 147](#) for more detailed information about Passport 8600s.

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To provide redundancy, each CS LAN uses two Passport 8600s. A given Communication Server 2100 component, such as a Gateway Controller, connects to both Passport 8600s, using one as its default router and the other as a backup. The configuration implements load sharing over the CS LAN by configuring half of the devices on the LAN to Router A as the default gateway, and configuring the other half to use Router B. The dual Passport 8600 routers serve as a hub for the CS LAN subnetwork providing all the necessary routing functionality for communication across the LAN.



FOR MORE INFORMATION

See the *Packet Trunk-IP Engineering Rules System Engineering Bulletin*, SEB-02-10-001, for comprehensive recommendations for configuring the CS LAN.

The CS LAN not only supports intra-Communication Server 2100 communication, but also provides the interface between the CS LAN and the external managed IP network.

Message Switch (Communication Server 2100 XA-Core bus)

[Figure 5 on page 37](#) depicts how the Message Switch supports communication between Communication Server 2100 components using an OC-3 link (the Message Switch is not used in Communication Server 2100 Compact configurations).

Communication Server 2100 XA-Core components linked by the Message Switch

The Communication Server 2100 XA-Core configuration uses the Message Switch to support peer-to-peer messaging between the following:

- XA-Core
- SuperNode Data Manager
- Enhanced Network (ENET)
- Input/Output Module and Integrated Service Module (ISM)

The system uses an Input/Output Module datalink housed in an Integrated Service Module shelf to bring the SuperNode Data Manager and the Communication Server 2100 XA-Core into service.

ENET

The Enhanced Network (ENET), a fully duplicated switching fabric, performs TDM-based call switching for legacy services. The ENET shelf mounts in a C42 cabinet. The ENET switches calls between TDM-based peripherals and the Interworking Spectrum Peripheral Module IP. The ENET is also used to access Integrated Services Module test and service circuits, and alarms.

Integrated Services Module

The Integrated Services Module is a specialized module designed to accommodate test and service circuit cards used in switch and facility maintenance.

In the Communication Server 2100 XA-Core configuration, the Integrated Services Module houses Input/Output Modules. These provide ports for serial input/output, enabling local and remote devices to communicate with the rest of the Communication Server 2100 XA-Core through the Message Switch. Communication Server 2100 XA-Core Input/Output Modules support datalinks used to bring the SuperNode Data Manager platform and XA-Core into service.

Each single-slot Input/Output Module FX30 Communications Card (CC) supports 16 ports for

- 64 kbps synchronous V.35 links
- 28.6 kbps asynchronous RS232 links

The system supports X.25 data communications over either V.35 or RS232.

Message Switch hardware

The bus consists of two identical load-sharing planes called Message Switches, each with the capacity and connectivity to support the full internal messaging load if the other plane fails. The switch plane consists of the following:

- A 32-bit Motorola 68000 Series control processor with on-board memory.

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- The following two buses for communication:
 - The Transaction Bus (T-Bus) carries the messaging payload (that is, the messages sent from one Communication Server 2100 XA-Core component to another through the Message Switch). The Transaction Bus operates at 128 Mbps, with a typical throughput of 250,000 64-byte messages per second and an average port-to-port delay of less than 100 ms.
 - The Processor Bus (P-Bus) carries internal messages used to control Message Switch operation.
- A mapper subsystem that converts physical address (port numbers within the Message Switch) to/from the logical addresses of switch components.
- A port interface subsystem consisting of a number of Port Interface Units (PIUs), each of which includes the following:
 - An interface card that logically faces towards the Message Switch Transaction Bus and provides Message Switch addressable ports.
 - A paddleboard supporting one or more links to the following other switch components:
 - DS-512 optical fiber links for XA-Core and the SuperNode Data Manager
 - DS-30 copper links for Integrated Service Module Input/Output Modules
- A clock synchronization subsystem that provides the XA-Core with a clock for Time-of-Day synchronization. For accuracy, this clock subsystem connects to an external clock source such as a Building Integrated Timing System or a Global Positioning System (GPS) clock system.

Note: In a hybrid configuration, the clock subsystem also provides the system clock and network synchronization for components such as trunk and line peripherals.

Gateway Controllers

Introduction

The Gateway Controllers manage and manipulate bearer connections on various types of media gateways. They receive instructions from the XA-Core, or Call Agent, to perform such operations as the following:

- create a connection
- release a connection
- collect in-band digits
- provide echo cancellation

The software that the Gateway Controllers use is based on the XPM peripheral loads used in the Meridian SL-100, with some exceptions.

Gateway Controller types and functions

Gateway Controllers enable the Communication Server 2100 to access the packet backbone network. They perform lower-level call setup, protocol mediation and tasks to support call processing. The most important functions of Gateway Controllers include the following:

- Controlling the operation of media gateways that support trunk and line access to the packet network.
- Communicating with remote Communication Server 2100 softswitches across the packet network.

In SE07, the Communication Server 2100 uses the following types of Gateway Controller:

- Gateway Controllers for media gateways including
 - Trunk gateways such as Nortel Networks Multiservice Switch 7480 Packet Voice Gateway (see [“Nortel Networks Multiservice Switch 7480 Packet Voice Gateway”](#) on page 83) or the Nortel Media Gateway 3000 series (see [“Nortel Media Gateway 3000 Series”](#) on page 89). A given Gateway Controller can support up to 4,000 PRI trunks distributed between a number of different media gateways, with a maximum of 1,024 on a given gateway.
 - Line gateways (see [“Mediatrrix 1124 and 1104 Analog Station Gateway”](#) on page 98)
- Gateway Controller for the Universal Audio Server/Media Server 2010.

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Note: The Universal Audio Server is a 16-slot SAM16 unit with capabilities similar to those of the SAM21. However, in terms of the Communication Server 2100 network architecture, the UAS or Media Server 2010 subtends the SAM21 and are therefore categorized as media servers, not as Communication Server 2100 components.

Hardware characteristics

SAM21 card cages or shelves house Gateway Controllers, along with a pair of Shelf Controller (SC) cards operating in hot standby mode to provide control and co-ordination for the entire shelf. In turn, cabinets house SAM21 shelves. The SAM21 is so called because it is a single-shelf Service Application Module (SAM) with 21 slots for housing circuit cards. The SAM21 uses a NEBS Level 3 Motorola CPX8221 industry-standard cPCI chassis with 21 slots. Two slots are reserved for the Shelf Controller cards. 16 slots are input/output slots reserved for up to eight Gateway Controllers, each consisting of two cards operating in standby mode. Logically, a Gateway Controller is a single entity that you can access through a single IP address (that is, that of the currently-active Gateway Controller unit).

There are two 10/100 BaseT Ethernet links running from each Gateway Controller pair to the CS LAN. Each Gateway Controller pair requires four IP addresses. Each Shelf Controller card has one 10/100 BaseT Ethernet link to the CS LAN. Each Shelf Controller pair requires four IP addresses. You can equip a maximum of two Shelf Controllers for each SAM21 shelf.

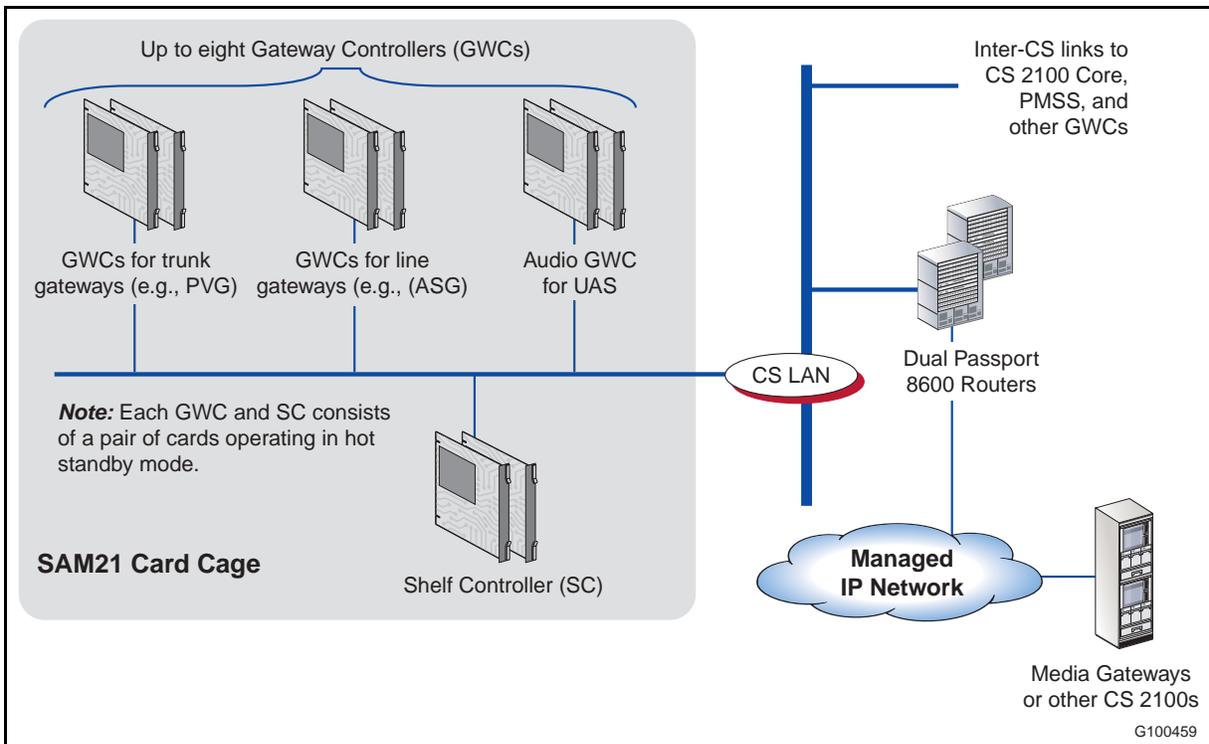
The backplane of the SAM21 card cage provides a compact Peripheral Component Interconnect (cPCI) bus for communication between circuit cards housed in the card cage. Ethernet 10/100BaseT ports on the cards themselves provide access to the Passport 8600-based CS LAN. Gateway Controllers connect to both the cPCI bus on the SAM21 backplane and to the CS LAN. The cPCI bus enables the Shelf Controller to communicate with the Gateway Controllers to provide control and co-ordination of the shelf. The CS LAN enables Gateway Controllers to communicate with other Communication Server 2100 components, including XA-Core (Communication Server 2100 XA-Core only) and other Gateway Controllers, and through the LAN's dual Passport 8600 routers with media gateways and other Communication Server 2100 softswitches.

The Gateway Controller is based on the Motorola MCPN750 single board computer. Two redundant single board computers make up each Gateway Controller node. The single board computers are usually housed side-by-side in a SAM21 cPCI chassis. The Gateway Controller circuit cards host the Gateway Controller software that, together with the Core, provide the Communication Server 2100 with its Media Gateway Controller (MGC) functionality. Processing capacity is scalable by adding additional Gateway Controller card pairs.

The Gateway Controller is a single logical entity that physically resides on two cards. The two cards operate in active/hot standby mode: Unit 0 is the active card, while unit 1 is the inactive card operating in hot standby mode. If unit 0 fails, unit 1 assumes operations and becomes the active card. The two cards share an IP address.

Figure 9 shows the Gateway Controllers, and other units, that are housed in the SAM21. The figure also illustrates how Gateway Controllers use the CS LAN to communicate with each other and with other Communication Server 2100 softswitches and packet network components. Communication between the Shelf Controllers and Gateway Controllers through the cPCI bus is not shown.

Figure 9
Logical view of different Gateway Controller types and their interaction



Cabinets used for Gateway Controllers/SAM21s in the Communication Server 2100 XA-Core

The PTE cabinet is equipped with an alarm panel, three power supply and cooling units, bridge extension modules, transition modules and hot swappable controllers. Two SAM21 Shelf Controller cards reside in the Call Agent shelves and include an OC-3c interface for connection to the packet network.

Cabinets used for Gateway Controllers/SAM21s in the Communication Server 2100 Compact

In a Communication Server 2100 Compact configuration, PTE2000 cabinets with three shelves house SAM21 card cages. Two SAM21 shelves are housed in the main Call Control Frame in the Communication Server 2100 Compact configuration. These shelves not only house Gateway Controllers, but also house the Call Agent processor cards. To increase capacity, a Communication Server 2100 Compact lineup can include a PTE2000 Extension Frame, as well as the Call Control Frame, housing up to three SAM21 shelves with additional Gateway Controllers.

For further information, see [Figure 8 on page 45](#) which depicts the Communication Server 2100 Compact Call Control Frame.

The Call Agent shelf is based on the Motorola CPX8221 which includes the following:

- 17 I/O slots and four system slots per chassis
- redundant -48V d.c. powered with power switch
- field replaceable units that are hot pluggable
- alarm panel to indicate individual slot and system status
- NEBS 3 compliant

Gateway Controller access to the packet network

Media gateway configuration

You must provision Gateway Controllers and media gateways separately with the address information they need to communicate with each other. For each media gateway controlled by a Gateway Controller, you must specify Gateway Controller datafill information such as gateway IP address, User Datagram Protocol (UDP) port, and trunk or line endpoints available. Similarly, media gateway datafill specifies information about the controlling Gateway Controller, including its IP address and the User Datagram Protocol (UDP) port to be used for the device control messaging.

Gateway Controller protocol support

The primary purpose of a Gateway Controller is to act as an intermediary between packet network components (for example, gateways, other Communication Servers, Universal Audio Server) and the call processing and service logic functionality provided by the Core. The Gateway Controller does this by relaying requests and information from the packet network components to the Core and relaying instructions and information from the Core. Gateway Controllers terminate packet network signaling and map this onto proprietary intra-Communication Server 2100 signaling to/from the Core. Gateway Controllers must also provide protocol support for OAM&P access from Device Managers and management applications.

The Communication Server 2100 also supports the Simple Network Management Protocol (SNMP) between Gateway Controllers and the Gateway Controller Manager running on a Sun Netra OAM&P server.

Gateway Controller provisioning and capabilities

Table 4 describes capacity and provisioning requirements for Gateway Controllers.

Note: All figures quoted are general, and are subject to variation depending on the network call model and capacity requirements. Enterprise network planners should consult with Nortel Networks Sales Engineering when determining network-specific estimates.

**Table 4
Gateway Controller engineering guidelines (Sheet 1 of 3)**

Component	Description
SAM21s/ Gateway Controllers	<ul style="list-style-type: none"> • A SAM21 has a maximum of 16 slots available for Gateway Controllers and, therefore, can house a maximum of eight Gateway Controllers of all types. In a Communication Server 2100 Compact configuration capacity is reduced to seven Gateway controllers, because two slots must house the Call Agent cards. • The recommended maximum number of Gateway Controllers that you can provision on a Communication Server 2100 is 60 Gateway Controllers of all types, of which 30 can be Gateway Controllers for media gateways and 30 can be packet-side Gateway Controllers. • A given Gateway Controller can support trunk access or line access, but not both.

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**Table 4
Gateway Controller engineering guidelines (Sheet 2 of 3)**

Component	Description
Trunks/ lines/ endpoints	<ul style="list-style-type: none"> • A Communication Server 2100 can support an overall maximum of 165,000 trunk and/or line endpoints. Within this range, the following limits apply to different endpoint types: <ul style="list-style-type: none"> — 48,000 PRI/H.323 trunks — 130,000 lines • The allocation of the total number of supported trunks between access Gateway Controllers depends on the call model to be supported by the Communication Server 2100.
Trunk access Gateway Controllers	<ul style="list-style-type: none"> • A trunk access Gateway Controller can support up to 30 media gateways. • A trunk access Gateway Controller can support up to 4,096 TDM-side trunk endpoints terminated on media gateways (up to 2,048 on a given gateway). • The maximum BHCA is 76,800 (PRI). • The maximum number of simultaneous calls is 3,960 (PRI). • The maximum number of supported PRI D-channels is 132 and B-channels is 3,960.
Line access Gateway Controllers and gateways	<ul style="list-style-type: none"> • The maximum number of line endpoints that can be supported by a line access Gateway Controller is 6,400. • The maximum BHCA that can be supported by a line access Gateway Controller is 38,000. • CPE LAN line gateway guidelines are as follows: <ul style="list-style-type: none"> — Lines are assigned to line groups, each consisting of a maximum of 1,024 lines (actually 1,023, as one is reserved for maintenance). All of the lines belonging in a given line group (that is, all the gateways serving those lines) must be supported by one Gateway Controller. — Each Mediatrix line gateway supports up to 24 analog subscriber lines. — There is a maximum of 2,000 simultaneous calls per line Gateway Controller.
Audio Controller Gateway Controller for Universal Audio Server	<ul style="list-style-type: none"> • A maximum of 720 ports for IP telephony connections (subject to feature-related limits) as follows: <ul style="list-style-type: none"> — One port is used for each announcement played to a call party. — One port per call party is used for conferencing. — Four ports are used for a call subject to monitoring. • Provides a maximum of 468 simultaneous announcements for IP. • The maximum BHCA is 40,000 or 60,000 depending on the CPU, with a maximum of 20,000 on one interface card.

Table 4
Gateway Controller engineering guidelines (Sheet 3 of 3)

Component	Description
Audio Controller Gateway Controller for Media Server 2010	<ul style="list-style-type: none"> • A maximum BHCA of 80,000. • 120 or 240 ports for conferencing and/or monitoring. • 240 ports for announcements.

Supported protocols

Table 5 describes the protocols that Gateway Controllers support.

Table 5
Protocol summary (Sheet 1 of 2)

Protocol	Description
H.248	Call Control protocol for communication between the Gateway Controllers and Universal Audio Server/Media Server 2010. The Gateway Controller instructs the Universal Audio Server/Media Server 2010 to interact with a media gateway for announcements, conferencing and monitoring.
ASPEN	The ASPEN protocol is based on the Simple Gateway Controller Protocol (SGCP) that includes modifications to support extensions that SGCP does not support. The system supports ASPEN 2.1 call control between Gateway Controllers and media gateways for Primary Rate Interface (PRI) trunk agencies.
ISDN User Adaptation (IUA)	The system transports IUA over SCTP v5 for call control to gateway Controllers for PRI.
Simple Network Management Protocol (SNMP)	Enables the Shelf Controller to manage the Gateway Controllers.
Real-time Transport Protocol (RTP)	Is an IETF standard (RFC 1889) for streaming real-time multimedia over IP in packets. It is designed to carry data that has real-time properties, such as voice and video over packetized networks. The Multiservice Switch 7480 Packet Voice Gateway uses RTP to encapsulate voice packets, which are then carried over User Datagram Protocol (UDP) over IP across the packet network to the terminating media gateway.
Real-time Control Protocol (RTCP)	This protocol is designed to monitor the Quality of Service (QoS) and to convey information about the participants in an on-going RTP session. The system sends feedback information about the session to the sending parties in the form of RTCP reports.
H.323	The ITU-T standard for sending voice (audio) and video using IP on a LAN without QoS. H.323 includes Q.931 for call setup, H.225 for call signalling, H.245 for exchanging terminal capabilities, RTP/RTCP for packet streaming, G.711/G.712 for CODECs, and several other protocols, many of which need to be negotiated to setup a simple voice call.

Table 5
Protocol summary (Sheet 2 of 2)

Protocol	Description
Media Gateway Control Protocol (MGCP)	A protocol used within a Voice over IP system. MGCP is an IETF work in progress. MGCP is an internal protocol used within a distributed system that appears to the outside world as a single VoIP gateway. This system is composed of a Call Agent, and a set of gateways, including at least one "media gateway" that performs the conversion of media signals between circuits and packets, and at least one "signalling gateway".

References

Table 6 shows where you can find more detailed information about Gateway Controllers and Shelf Controllers.

Table 6
Documentation references

Document title	Document Number
Gateway Controllers (GWCs) (provide the equivalent of XPMs)	
<i>GWC Basics</i>	NN10189-111
<i>GWC Fault Management</i>	NN10202-911
<i>GWC Configuration Management</i>	NN10205-511
<i>GWC Performance Management</i>	NN10208-711
<i>GWC Security and Administration</i>	NN10213-611
<i>Upgrading the GWC</i>	NN10196-461
SAM21 Shelf Controllers (play a role in hot swapping cards in the shelf and provide some fault assistance to all the cards)	
<i>SAM21 Shelf Controller Basics</i>	NN10025-111
<i>SAM21 Shelf Controller Fault Management</i>	NN10089-911
<i>SAM21 Shelf Controller Configuration Management</i>	NN10111-511
<i>SAM21 Shelf Controller Performance Management</i>	NN10155-711
<i>SAM21 Shelf Controller Security and Administration</i>	NN10177-611
<i>Upgrading the SAM Shelf Controller</i>	NN10067-461

Interworking Spectrum Peripheral Module IP

Introduction

The Interworking Spectrum Peripheral Module Internet Protocol (IW SPM-IP) transcodes voice between the TDM network and the IP network. The Interworking Spectrum Peripheral Module Internet Protocol is a legacy-based, fault-tolerant peripheral with the following network connections:

- DS512 connection to the ENET
- Gigabit Ethernet connections to the packet network

The Interworking Spectrum Peripheral Module Internet Protocol supports the following:

- G.711 voice coder/decoder (CODEC)
- silence insertion, detection and suppression
- comfort noise generation
- fax and modem detection
- adjustable jitter buffer

Supported call types

The Interworking Spectrum Peripheral Module Internet Protocol supports the following types of call:

- trunk testing call on the gateway trunk using a legacy Maintenance Trunk Module (MTM) test circuit
- legacy TDM trunk and gateway TDM trunk interworking calls
- legacy TDM trunk and Dynamic Packet Trunk interworking calls

Functions

The Interworking Spectrum Peripheral Module Internet Protocol bridges calls between Nortel Networks existing Meridian SL-100 Time Division Multiplexing (TDM) switch and the IP network. As mentioned previously, this solution is referred to as a “hybrid” configuration.

Note 1: Non-hybrid configurations do not require an Interworking Spectrum Peripheral Module Internet Protocol.

Note 2: The Interworking Spectrum Peripheral Module Internet Protocol does not support calls to IP Client Manager 6.1 or 6.2.

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The Interworking Spectrum Peripheral Module Internet Protocol connects to an ENET over C-side DS-512 fiber links and to the IP network over Gigabit Ethernet on the P-side. In between these two connections are the following:

- Common Equipment Module (CEM) – connects to the DS-512 links and performs the bridge management function.
- Gigabit Ethernet Resource Module (GEM) – provides the means to connect these bridges to the IP network over Gigabit Ethernet.

The Interworking Spectrum Peripheral Module Internet Protocol provides interworking capability to legacy Meridian SL-100 TDM peripherals. It enables the legacy TDM equipment to access Dynamic Packet Trunks (DPTs) and make connections to far-end nodes. The Interworking Spectrum Peripheral Module Internet Protocol also provides interworking to test trunk services for media gateways.

The Interworking Spectrum Peripheral Module Internet Protocol is required for both the Communication Server 2100 XA-Core and the Communication Server 2100 Compact hybrid TDM and IP deployment off a single Communication Server. By creating a new resource module that supports an IP packet interface which can be housed in the existing Spectrum Peripheral Module platform, the Spectrum Peripheral Module platform is transformed into an Interworking Spectrum Peripheral Module that can interface with elements of a packet network, such as the Passport Voice Gateway (PVG). The new resource module, called the Gig Ethernet Resource Module, is easily added to an existing Spectrum Peripheral Module in order to support a Gig interface to the network.

Technicians perform Interworking Spectrum Peripheral Module Internet Protocol maintenance functions, such as alarms and logs, by accessing the Maintenance and Administration Position Command Interpreter (MAPCI) on the XA-Core. High density is available with a minimum of 2016 DS0s per shelf/4032 DS0s per frame. The configuration supports Diffuser Quality of Service (QoS) and Remote Monitoring (RMON) statistics.

[Figure 10 on page 63](#) shows an example of how the Interworking Spectrum Peripheral Module Internet Protocol is configured in an enterprise network.

Figure 10
IW SPM-IP enterprise network configuration example

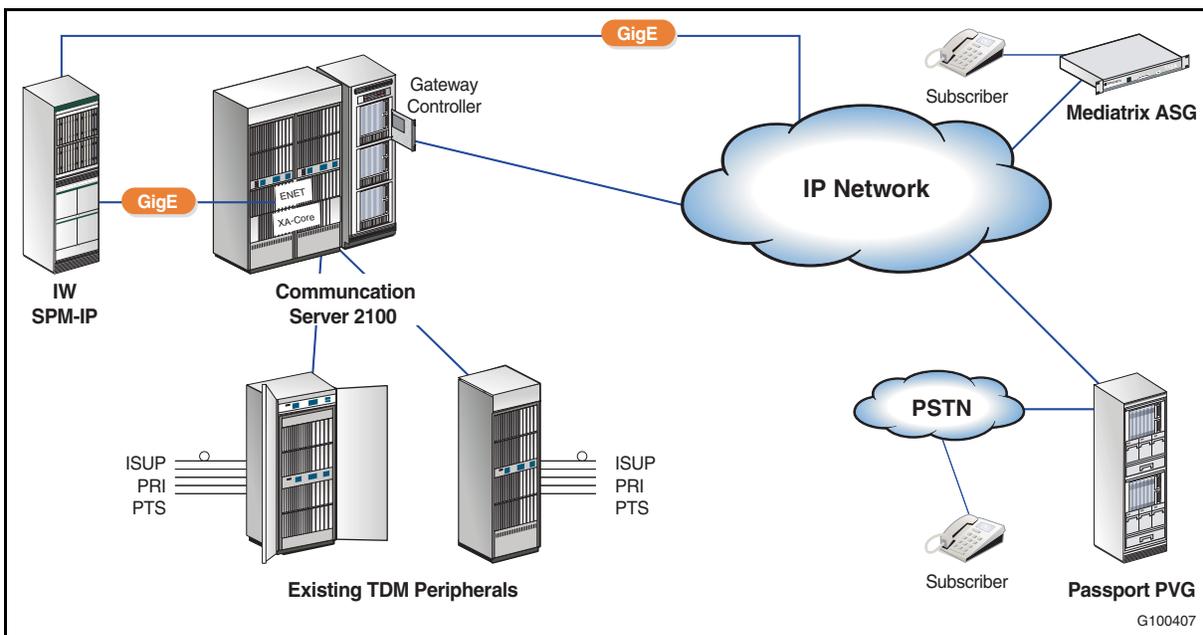
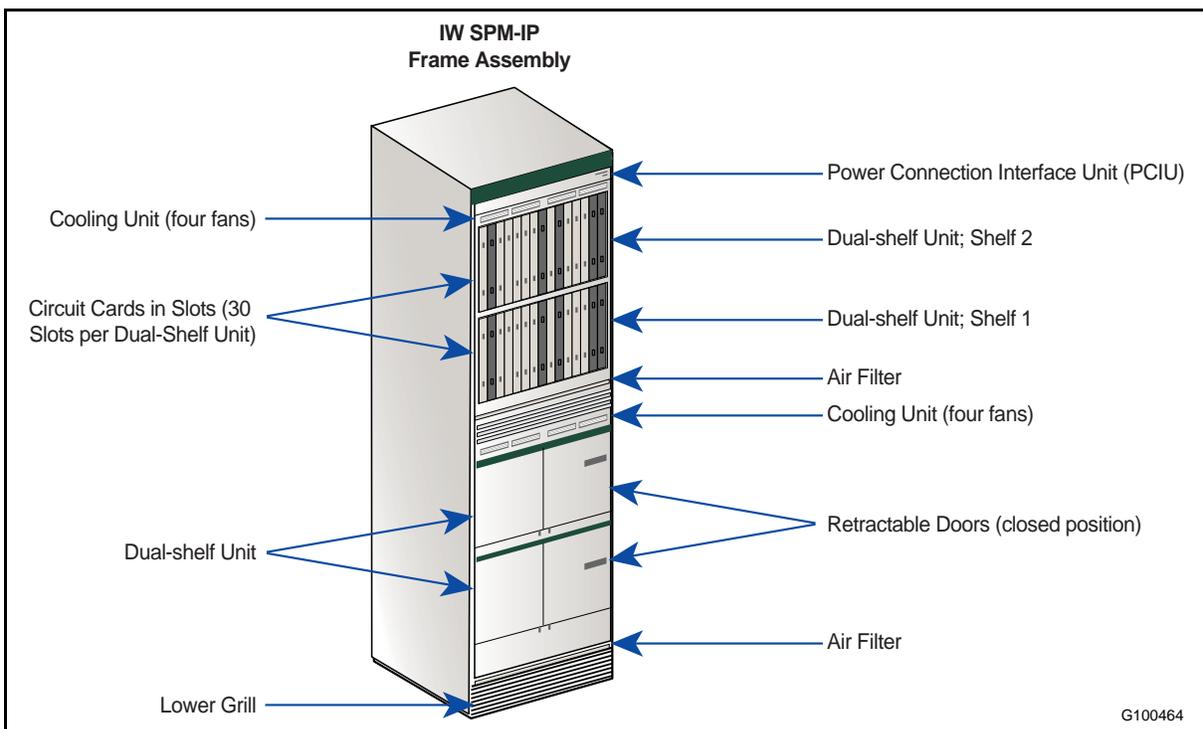


Figure 11 illustrates the layout of an IW SPM-IP cabinet.

Figure 11
Interworking Spectrum Peripheral Module Internet Protocol frame assembly



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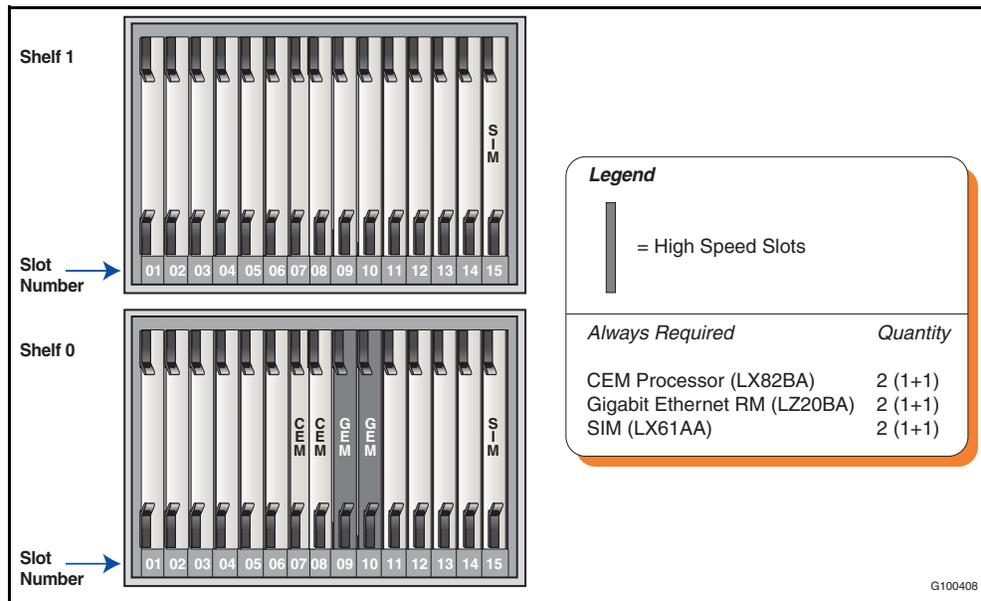
The Interworking Spectrum Peripheral Module Internet Protocol is an ENET-hosted Spectrum Peripheral Module that has four C-side DS-512 links connecting the Common Equipment Module of the Interworking Spectrum Peripheral Module Internet Protocol to the ENET. On the P-side (facing the packet network) the Interworking Spectrum Peripheral Module Internet Protocol has two Gigabit Ethernet links to the Passport 8600s in the CS LAN.

The Interworking Spectrum Peripheral Module Internet Protocol uses Peripheral Processor Virtual Machine (PPVM, an internal Communication Server 2100 protocol) for communication with the XA-Core. The Interworking Spectrum Peripheral Module Internet Protocol uses Real Time Protocol (RTP), or Real Time Control Protocol (RTCP) which compliments RTP by monitoring data delivery, for bearer connections to the Multiservice Switch 7480 Packet Voice Gateway.

Shelf layout and physical interfaces

Figure 12 shows the recommended card configuration for the Interworking Spectrum Peripheral Module Internet Protocol.

Figure 12
IW SPM-IP shelf layout



The Interworking Spectrum Peripheral Module Internet Protocol shelf assembly consists of the following components.

- cooling unit with four fans for forced-air cooling
- two 30-slot shelves that house the following types of modules:
 - The Shelf Interface Module (SIM) provides power to the shelf. Each shelf has one Shelf Interface Module.
 - The Common Equipment Module (CEM) provides the following functions:
 - operational control of the Interworking Spectrum Peripheral Module Internet Protocol
 - control of signal processing
 - system clock
 - physical connection to ENET
 - The Gigabit Ethernet Module (GEM) provides the physical connection to the packet network. The Gigabit Ethernet Module transcodes voice signals. Each shelf assembly contains two Gigabit Ethernet Modules.

Operating parameters

The following operating parameters apply to the Interworking Spectrum Peripheral Module Internet Protocol:

- Junctored Network is not supported.
- The Input/Output Controller (IOC) does not support the magnetic Tape Drive for a disk drive supported by a NT1X55xx-based disk drive controller.
- The following peripheral modules are not supported:
 - Line Module (LM)
 - Remote Line Module (RLM)
 - Digital Carrier Module (DCM)
 - PCM-30 Digital Trunk Controller (PDTC/PDTC-I)
 - Autovon Trunk Module (ATM)
 - Ethernet Interface Unit (EIU) supporting Intelligent Call Management (ICM) only, with telnet available through the SuperNode Data Manager (SDM)
- 2016 simultaneous calls over G.711
- Fax and modem support using G.723 and G.729

References

Table 7 shows where you can find more detailed information about the Interworking Spectrum Peripheral Module Internet Protocol.

Table 7
Documentation references

Document title	Document number
<i>IW SPM-IP Basics</i>	NN10015-111
<i>IW SPM-IP Fault Management</i>	NN10078-911
<i>IW SPM-IP Configuration Management</i>	NN10100-511
<i>IW SPM-IP Performance Monitoring</i>	NN10144-711
<i>IW SPM-IP Administration and Security</i>	NN10166-611
<i>Upgrading the IW SPM-IP</i>	NN10056-461

Communication Server 2100 Compact

Description

The Communication Server 2100 Compact architecture changes the dynamics of traditional switching by distributing its three fundamental elements:

- intelligence or call control
- switching
- connectivity

Media Gateway Controllers carry out the call control. A distributed packet-based network with the line and trunk connectivity through the Media Gateways replaces the TDM switching layer. The Media Gateways themselves are under the direct control of the Media Gateway Controllers. The Gateway Controller acts as a call processing protocol converter to create a bridge between media gateways and Communication Server 2100 Compact call processing.

Enterprise customers have a second core processor option, the Communication Server 2100 Compact. The off-the-shelf hardware platform is based on the Compact PCI standard, which delivers manufacturer inter operability that has its roots in the personal computer, but delivers this flexibility in a standards-based manner.

The off-the-shelf software is the most open software available today, Linux[®]. But this Linux is not your standard operating system. This operating system has been hardened by Motorola and Nortel Networks to deliver the same reliability and operability that is expected from other Nortel Networks products.

The Communication Server 2100 Compact provides flexible, distributed call and service control across a packet network over an IP backbone. The Communication Server 2100 Compact performs all call control processing functions for your network including translations, routing and centralized service delivery. You can deploy next generation services on a single Communication Server 2100 Compact and make them available to multiple customer groups.



FOR MORE INFORMATION

For more information about the SE07 IP telephony solution, see the *SE07 Meridian SL-100 Application Planning Guide*.

There are two 10/100 BaseT Ethernet interfaces running from the Call Agent on the Communication Server 2100 Compact to the CS LAN. Each Ethernet link connects to a different Passport 8600.

Communication Server 2100 Compact hardware

The Communication Server 2100 consists of the following components:

- Call Agent
- Storage Management (STORM)
- Gateway Controllers

Call Agent

The Call Agent is the call processing engine of the Communication Server 2100 Compact. The Call Agent hardware is a Single Board Computer (SBC) that resides in a SAM21 shelf. Two Call Agent cards and two SAM21 shelves are required for redundancy. A single Call Control Frame houses the two shelves. The Call Agent provides the following functions:

- provides call processing services on line and trunk endpoints
- supports translation and routing for all endpoints served by the Communication Server 2100 Compact
- provides a provisioned view of profiles of
 - subscriber services
 - trunk group services
- collects and formats billing data, before sending the data to the Element Management System (EMS)
- collects log, alarm and Operational Measurement (OM) information for use in downstream network management systems

The Call Agent resides on the Call Agent card in the Communication Server 2100 Compact.

Storage Management (STORM)

Storage Management provides Network File System (NFS) services to applications running on the Communication Server 2100 Compact. A Network File System is a distributed file system that allows applications to access files and directories on remote computers. Storage Management acts as a Network File System for Call Agent clients.

Storage Management resides on two STORM SAM-XTS server units. Each Call Agent card uses one STORM unit as a primary storage device and the other STORM unit as a secondary storage device. The STORM units do not provide any redundancy between themselves. All component applications using the STORM services provide their own data redundancy (if required) by ensuring that any important data is written to both STORM units. If a STORM unit is out of service, access to data stored on it is interrupted until the STORM unit is recovered. Each unit is NEBS compliant and has two 72 GB hot swappable disk drives. A CDROM drive on the front of each unit is used for initial software loading and is available for software upgrade media.

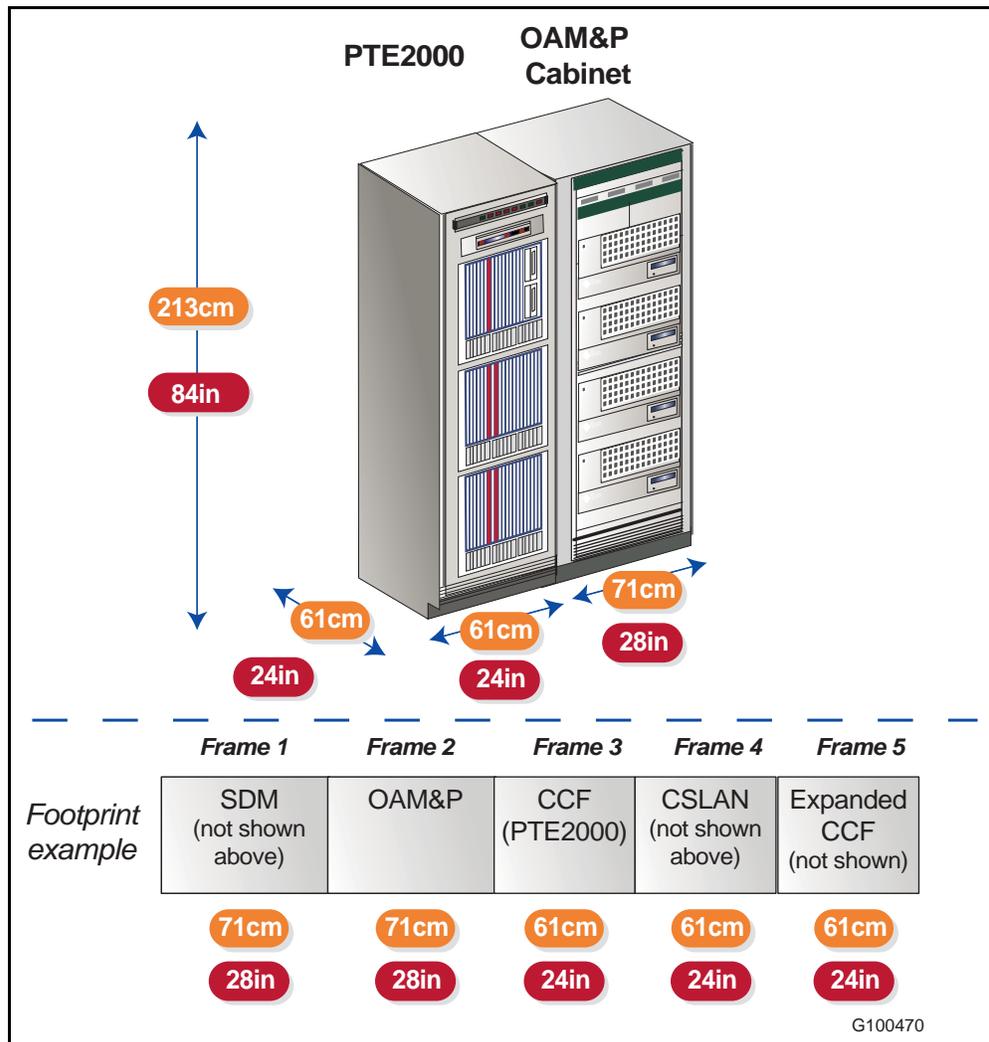
Frame layout

The Communication Server 2100 Compact resides in a Call Control Frame in a PTE2000 frame. Each Call Control Frame consists of the following components:

- two Call Agent/SAM21 shelves
- one optional SAM16 shelf for a Universal Audio Server/Media Server 2010
- two STORM SAM-XTS server units that store data on internal disk drives
- one Astec Breaker Interface Panel (BIP) that serves as the power distribution shelf

[Figure 8 on page 45](#) shows the Call Control Frame. [Figure 13 on page 70](#) shows a sample cabinet lineup.

Figure 13
Sample Communication Server 2100 Compact cabinet lineup

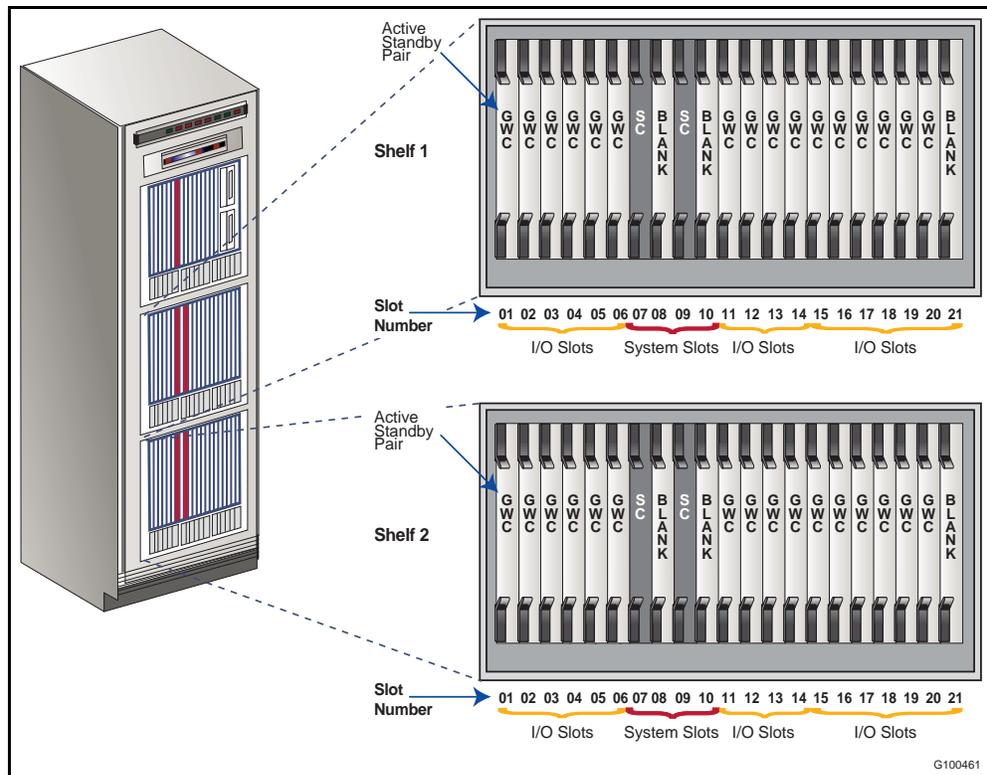


Card configuration

The Gateway Controller circuit card is based on the Motorola MCPN Single Board Computer (SBC). Two redundant SBCs make up each Gateway Controller. The Gateway Controller circuit cards host the Gateway Controller software that, together with the Call Agent, provides the Communication Server 2100 Compact with its Media Gateway Controller functionality. Processing capacity is scalable by adding additional Gateway Controller circuit card pairs. There is a maximum of eight Gateway Controller card pairs for each SAM21 shelf. The 21st slot (front and rear) should always be empty.

The SAM21 Shelf Controllers (SCs) provide physical management of the SAM21 shelf and support resident Gateway Controller or other cards. You can fill all 16 Input/Output slots in the SAM21 shelf with Gateway Controller cards, as shown in Figure 14, depending on the network requirements of your organization.

Figure 14
Communication Server 2100 sample SAM21 shelf configuration



Geographic survivability

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

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Customers can install each Communication Server in buildings up to 100 kilometers (62 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 first Passport 8600). The configuration uses two Gigabit Ethernet (Gig-E) interfaces to provide link redundancy.

Note: This functionality does not apply to the Communication Server 2100 XA-Core.

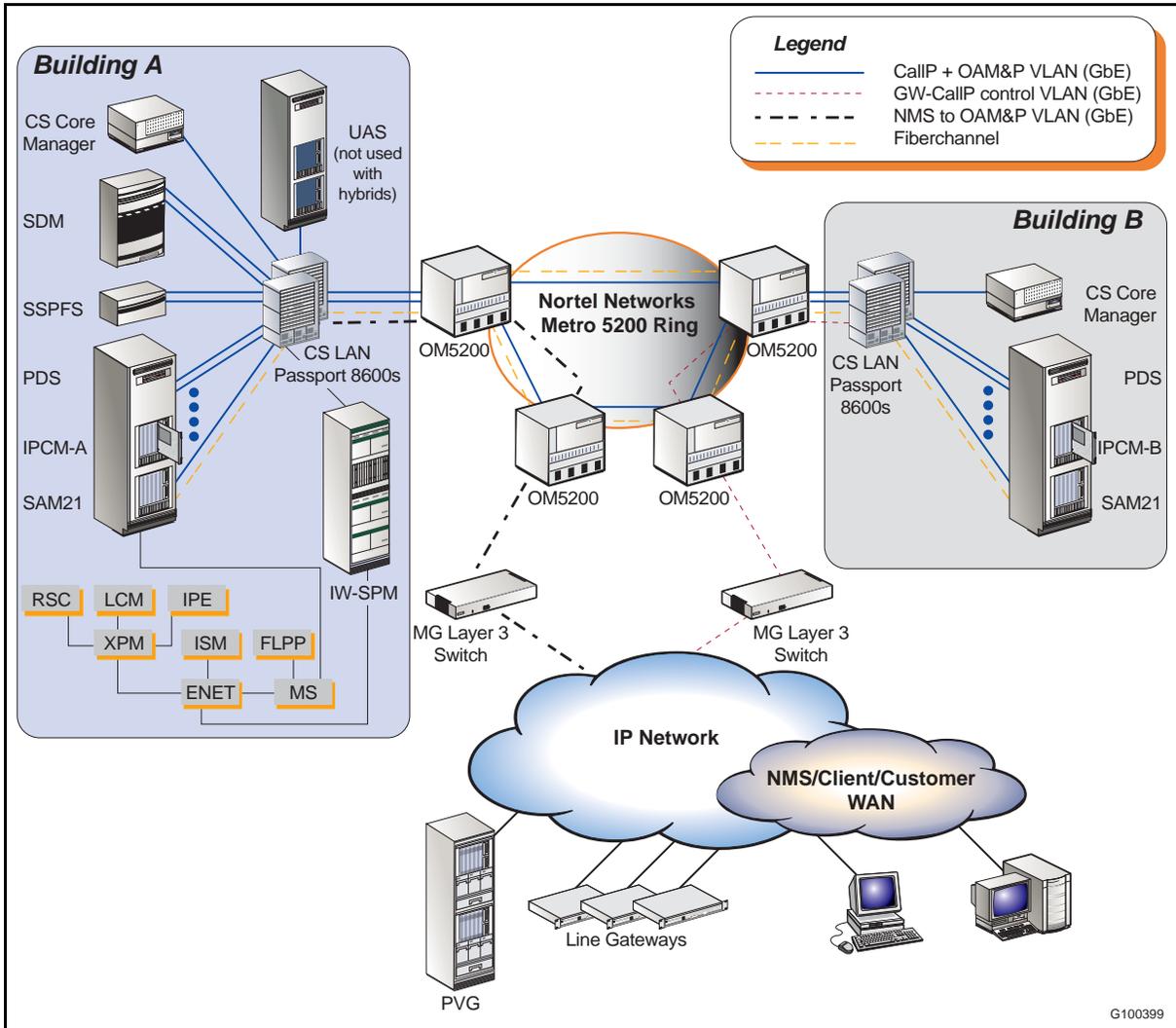
This configuration uses a Dense Wave Division Multiplexing (DWDM) ring to connect the distributed locations. With the two halves of the Communication Server separated, one in Building A and the second in Building B, when a disaster impacts either building, a Unidirectional Path-Switched Ring (UPSR) maintains 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 are also separated geographically.

A geographically survivable Communication Server 2100 Compact 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, or hybrid, portion of the switch is not geographically survivable.

[Figure 15 on page 73](#) shows an example of the geographic survivability configuration of the Communication Server 2100 Compact.

Figure 15
Geographic survivability network configuration



LAN architecture

The LAN architecture does not differ significantly from the base Communication Server 2100 Compact 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 Figure 15, 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.

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Transport requirements

This section describes the transport requirements for the Communication Server 2100 Compact geographic survivability configuration. The Communication Server and call control network have the following characteristics:

- The configuration supports two Gig-E, 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 Communication Server LAN and the call control path are over the same network.
- 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.



FOR MORE INFORMATION

See the *Meridian SL-100 Communication Server 2100 Compact Geographic Survivability Planning Guide*, 555-4031-901, for more detailed information about the geographic survivability configuration.

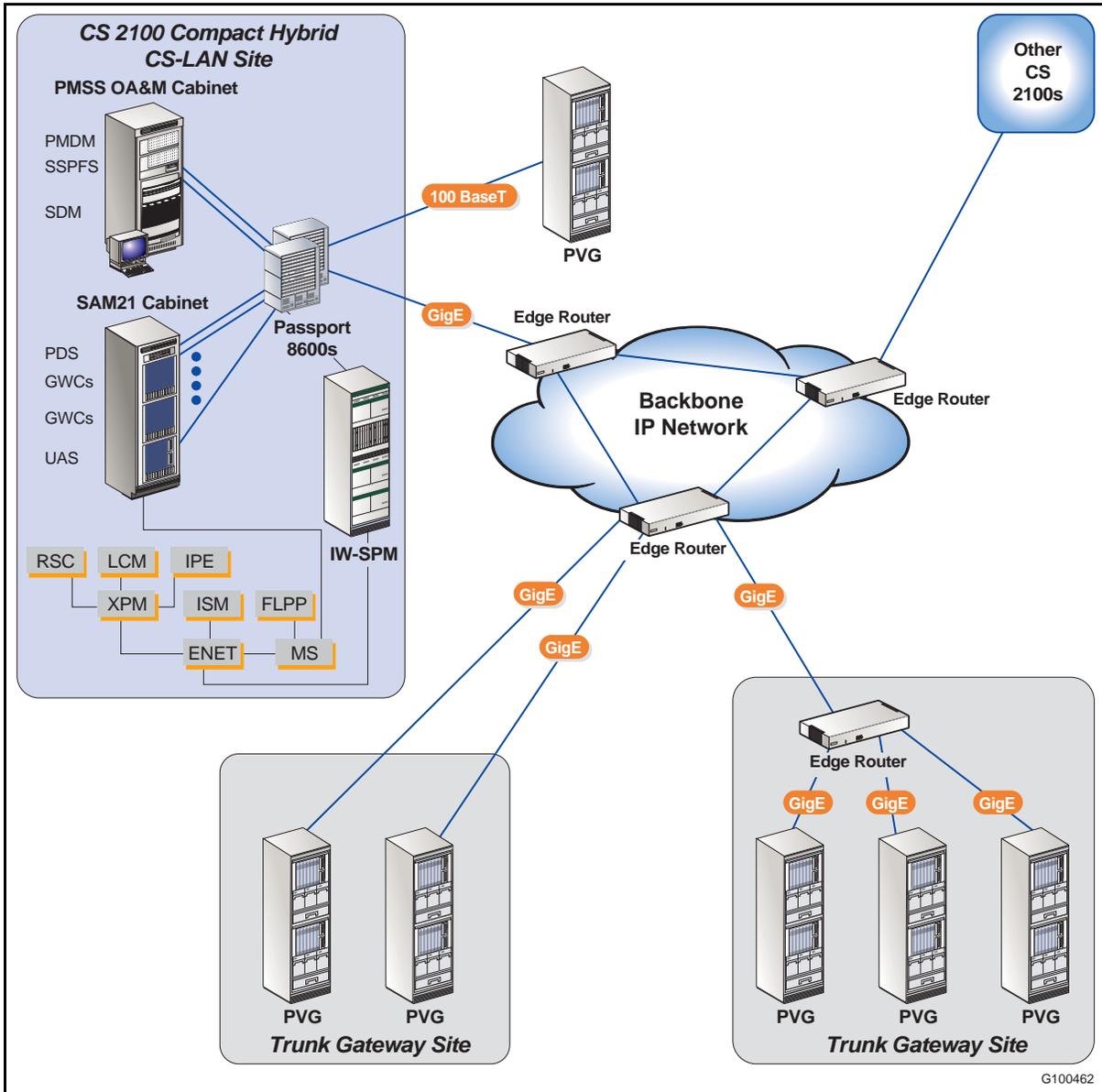
Hybrid support

The Communication Server 2100 Compact provides the ability to support a Time Division Multiplexing and packet softswitch from the same core. The Communication Server 2100 Compact provides hybrid support through the Message Controller (MC) which resides within the MCPN765 processor card. It provides common commands for all subtending TDM components.

[“Appendix B: Peripheral support” on page 359](#) lists the existing Meridian SL-100 peripherals that are supported on the TDM side of the network in a hybrid configuration.

[Figure 16 on page 75](#) shows the Communication Server 2100 Compact in a hybrid configuration.

Figure 16
Example Communication Server 2100 Compact hybrid configuration



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Signaling interfaces

Table 8 shows the telephony protocols to which the packetized portion of this offering can interface.

Table 8
Telephony protocol support

Interface	Abbreviation
Primary Rate Interface National ISDN 1 (also known as NTNA)	PRI NI-1
Primary Rate Interface National ISDN 2	PRI NI-2
Digital Signaling Level 1 (on PVG 7480 using demux)	DS1
Digital Signaling Level 3 (native on PVG 7480)	DS3
Analog line (using the Mediatrix 1124 gateway)	–

Telephone support

The Communication Server 2100 Compact supports a wide range of IP, digital and analog telephones. For more detailed information about supported telephones, see [“Internet terminals” on page 205](#) and [“TDM telephones” on page 329](#).

Operating parameters

The following operating parameters apply to the Communication Server 2100 Compact:

- SE07 does not support the Universal Signaling Point (USP) and Universal Signaling Point Compact.
- The Packet Voice Gateway 7480 does not support Multi frequency (MF) trunks. Signaling System # 7 (SS7) currently is not supported.
- The Communication Server 2100 Compact currently does not support international protocols.
- Communication Servers are limited in capacity in SE07 is as follows:
 - 60,000 clients (not including trunks)
 - 1,300,000 Busy Hour Call Attempts (BHCA)
- NEBS compliant
- In-service upgrades
- 99.999 percent availability

Communication Server 2100 XA-Core

Description

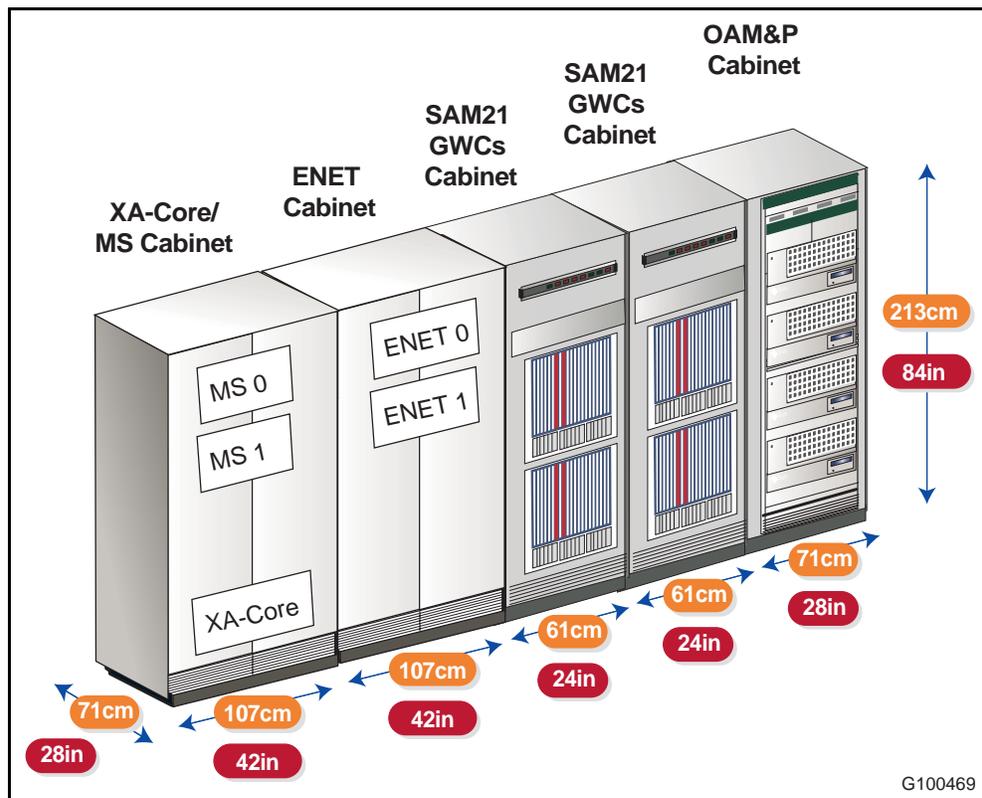
The Communication Server 2100 XA-Core provides the foundation for the IP switching by building on the hardware of existing Meridian SL-100 digital switches. Specifically, it re-uses the XA-Core as its processing engine.

There are two 10/100 BaseT Ethernet links running from the High Performance I/O Processor (HIOP) cards on the Communication Server 2100 XA-Core to the CS LAN. Each Ethernet link connects to a different Passport 8600. The configuration requires 10 IP addresses.

In addition to the Ethernet interface, the XA-Core connects to both Message Switches by dual OC-3 connections. Each Message Switch has several DS-512 port interfaces. A DS-512 pair is used to interface to the Core Manager on the SuperNode Data Manager platform.

Figure 17 shows a sample cabinet lineup.

Figure 17
Sample Communication Server 2100 XA-Core cabinet lineup



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Hybrid support

The Communication Server 2100 XA-Core provides the ability to support a Time Division Multiplexing and packet softswitch from the same Core. The Communication Server 2100 XA-Core provides hybrid support through the Asynchronous Transport Mode (ATM) IOP in the XA-Core shelf and delivers Meridian SL-100 TDM support for the following configuration:

- Message Switch in either a SuperNode SE or SuperNode.
- Enhanced Network residing in either a SuperNode SE or Enhanced Network Combined cabinet.
- Input output devices consist of the Input Output Controller (IOC) and Input Output Module (IOM) supporting Current Loop, Electronic Industries Association (EIA), X.25, and V.35 devices. The Communication Server 2100 XA-Core supports the NTFX32xx based storage media.
- [“Appendix B: Peripheral support” on page 359](#) lists the existing Meridian SL-100 peripherals that are supported on the TDM side of the network in a hybrid configuration.

Signaling interfaces

The Communication Server 2100 XA-Core supports the same telephony protocols as the Communication Server 2100 Compact (see [Table 8 on page 76](#)).

Operating parameters

The following operating parameters apply to the Communication Server 2100 XA-Core:

- Junctored Network is not supported with the Communication Server 2100 XA-Core.
- The Universal Audio Server/Media Server 2010 is not supported in a hybrid configuration.
- The Input/Output Controller does not support the magnetic Tape Drive for a disk drive supported by a NT1X55xx based disk drive controller.
- Software upgrades from BNR Reduced Instruction Set Computing (BRISC) based TDM systems support conversion only from MSL17 to SE06 and SE06 to SE06.
- SE07 does not support the Universal Signaling Point (USP) and Universal Signaling Point Compact.
- The Packet Voice Gateway 7480 does not support Multi frequency (MF) trunks. Signaling System No. 7 (SS7) is currently not supported.

- The Communication Server 2100 XA-Core currently does not support international protocols.
- Communication Servers are limited in capacity in SE07 is as follows:
 - 165,000 clients (not including trunks)
 - 1,650,000 Busy Hour Call Attempts (BHCA's)
- NEBS compliant
- In-service upgrades
- 99.999 percent availability



Gateways

Introduction

In order to perform its network role, you must deploy a Communication Server 2100 along with one or more media gateways for handling packet network bearer connections. A media gateway provides an interface for bearer connections (for example, mapping a packet-based media stream on to a circuit-based media stream, seamlessly providing any required format conversion while maintaining content integrity). Depending on the telephony interface being supported, a media gateway can also provide signaling gateway functionality.

Gateway Controllers convert between Proprietary Processing Virtual Machine (PPVM) messages and open standard protocols used by media gateways (for example, H.248 and MGCP).

This chapter contains the following sections:

Trunk gateways

- [Nortel Networks Multiservice Switch 7480 Packet Voice Gateway](#)
- [Nortel Media Gateway 3000 Series](#)

Line gateways

- [IP Client Manager for the Communication Server 2100](#)
- [Mediatrix 1124 and 1104 Analog Station Gateway](#)

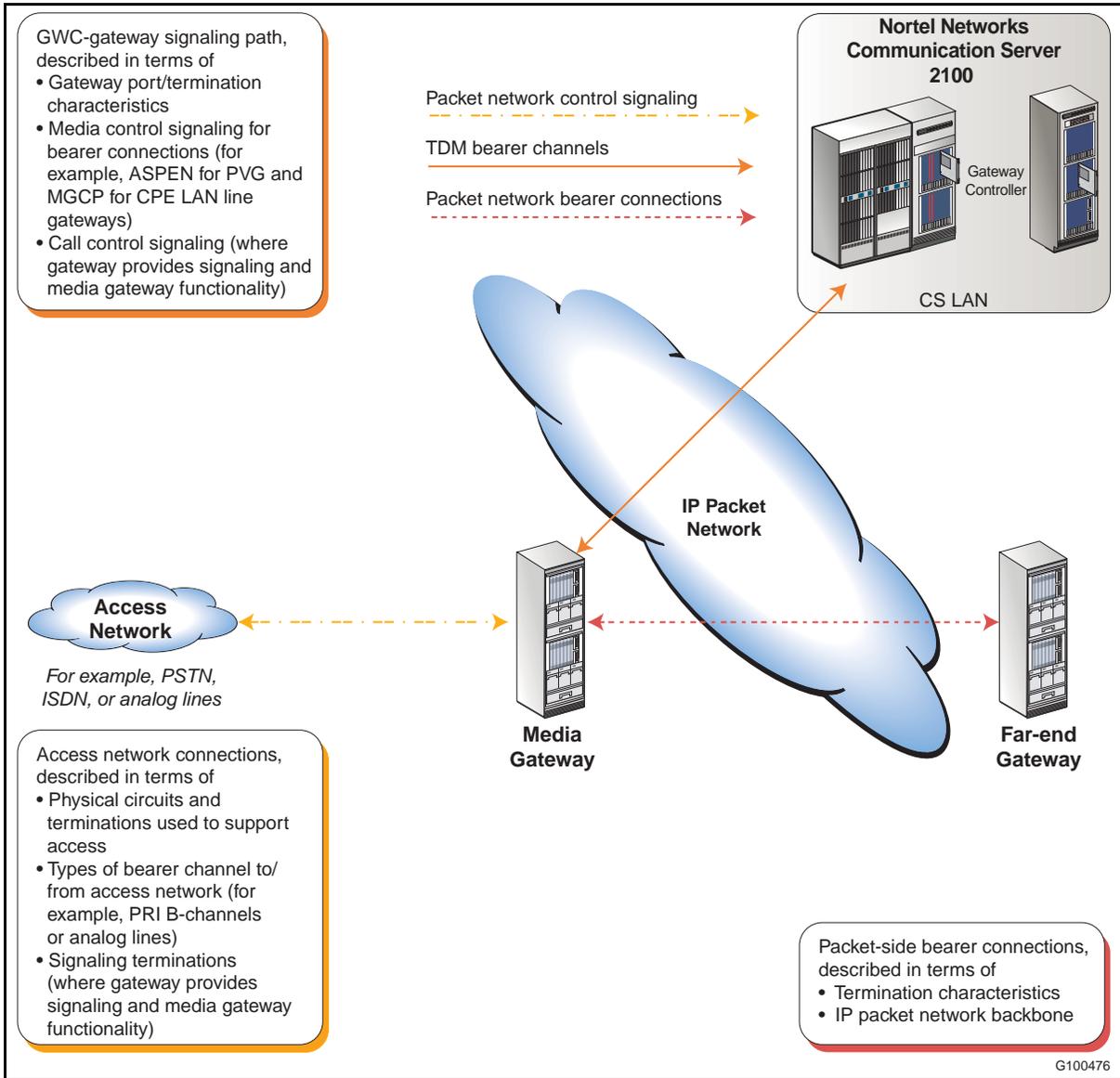
Multi-service gateways

- [Nortel Networks Media Gateway 9000](#)

[Figure 18 on page 82](#) summarizes how gateway capabilities can be categorized.

82 Gateways

Figure 18
Media gateway capabilities



Nortel Networks Multiservice Switch 7480 Packet Voice Gateway

Description

The Multiservice Switch 7480 Packet Voice Gateway is based on Nortel Networks proven Passport product line. The Packet Voice Gateway supports Primary Rate Interface (PRI) trunk access to the IP packet backbone network. It serves as an interface between the TDM network and an IP network. The Multiservice Switch 7480 Packet Voice Gateway performs the following functions:

- converts TDM traffic into IP packets for transfer over an IP network
- converts the IP packets back into TDM format for transfer over the traditional circuit-switched network

Note: The Multiservice Switch 7480 Packet Voice Gateway was previously called the Passport 7480 Packet Voice Gateway.

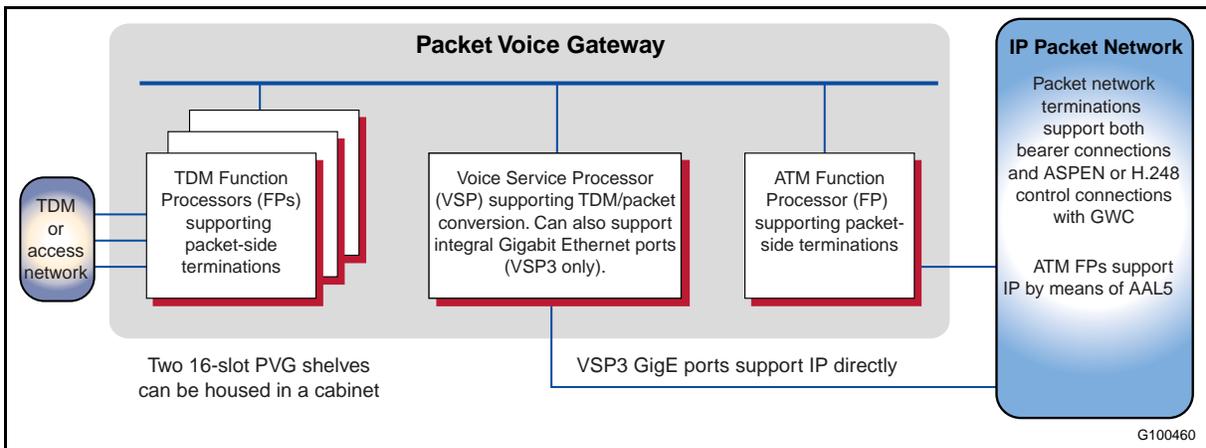
The Packet Voice Gateway application is a carrier-grade integrated voice and data interworking service. With the Passport Packet Voice Gateway, the Communication Server 2100 still manages the call. However, instead of using TDM bearer channels to transport the traffic, traffic is routed through IP circuits on Passport. In SE07, the Packet Voice Gateway uses the switched native IP configuration.

The Packet Voice Gateway provides signaling gateway functionality, as well as media gateway functionality. Media gateway functionality for PRI means mapping ISDN B-channels onto packet network media streams under ASPEN (a proprietary Gateway Controller-gateway device control protocol used for IP telephony) control. Signaling gateway functionality for PRI means terminating ISDN D-channels and backhauling Layer 3 signaling across the packet network so that call processing can take place at the Communication Server 2100.

The 16-slot Multiservice Switch 7480 Packet Voice Gateway offers two load-sharing buses and supports redundant power supplies.

[Figure 19 on page 84](#) illustrates Packet Voice Gateway components and their functions at a logical level.

Figure 19
Logical configuration of a Packet Voice Gateway



The Voice Service Processor is the Packet Voice Gateway component that supports seamless conversion between network media streams (for example, circuit-based PSTN media streams) and packet media streams. For IP telephony, the Voice Service Processor handles packetization of voice samples in Real Time Protocol (RTP) and supports IP datagram encapsulations using AAL5 and RFC1483. Codec capabilities are as follows (you can provision one default and one compression codec for each Packet Voice Gateway):

- G.711, packet size 10 ms or 20 ms
- G.729 and G.729a, packet size 10 ms or 20 ms

From a network perspective, each Voice Service Processor is an independent unit with its own IP address. If more than one Voice Service Processor is housed in a Packet Voice Gateway shelf, the Gateway Controller perceives each one as a separate entity. The trunks on a given TDM-side T1 carrier are all assigned to a particular Voice Service Processor and are not available to any other Voice Service Processor. Similarly, each Voice Service Processor uses only one packet Voice Gateway Function Processor for access to the packet network. Each Voice Service Processor and its associated Function Processor and TDM T1s can therefore be regarded as a logical gateway.

There are Asynchronous Transport Mode (ATM) interfaces from the VSP2 card on the Multiservice Switch 7480 Packet Voice Gateway. In addition, there is a 10/100 BaseT Ethernet link to the CS LAN.

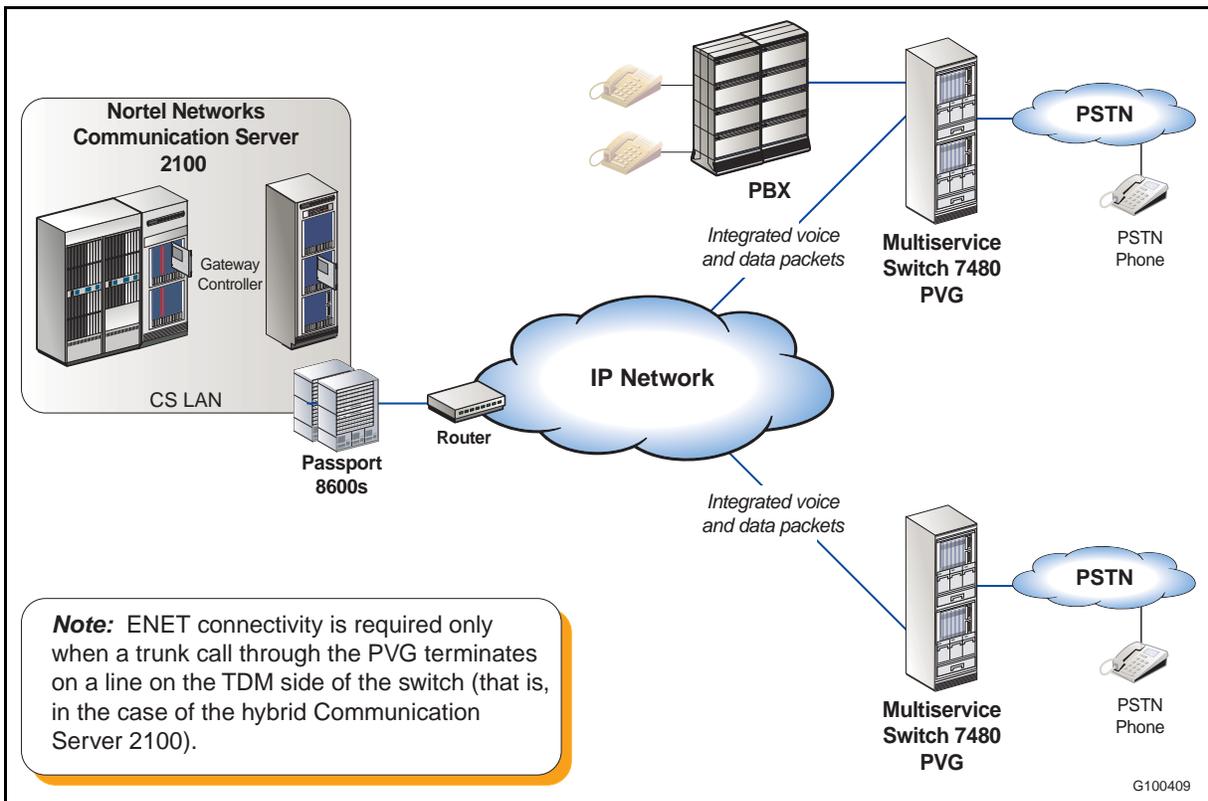
The Multiservice Switch 7480 PVG supports the following:

- toll-quality ITU-T G.711 PCM, G.726 PCM, G.726 ADPCM, or G.729 A/B CS-ACELP voice with silence suppression, comfort noise generation and dynamic downspeaking capability for congestion management
- tone generation on the TDM side of the gateway, such as basic service tones, and basic and expanded call progress tones
- Dual-tone Multifrequency (DTMF) digit collection for ANSI/ETSI PRI agencies
- 56/64 kbps clear-channel fax and modem support
- AAL-2 encoding for voice, modem and fax traffic for low-end delay and high-bandwidth efficiency
- echo cancellation compliant with ITU-T G.165 and G.168
- tone detection complaint with ITU-T G.164 and G.165
- clear channel support for test trunk capability
- software maintenance and release upgrade support
- interworking with TDM trunks through the Interworking Spectrum Peripheral Module IP

[Figure 20 on page 86](#) shows an example of a Passport Packet Voice Gateway in a Communication Server 2100 network. The IP channels transport voice and voice band data traffic over virtual connections within the PVG. The virtual connections consist of the following:

- Permanent Virtual Connections (PVCs)
- Switched Permanent Virtual Connections (SPVCs)

Figure 20
Passport Packet Voice Gateway example configuration



Requirements

The Multiservice Switch 7480 is a 16-slot switch that supports a maximum of 16 processor cards: a Control Processor (CP) with 14 Function Processors (FPs) and a spare Control Processor (or 15 FPs without a spare CP). You can install the Multiservice Switch 7480 in a Passport seismic cabinet or in a standard 19-inch rack. A standard 19-inch rack can hold two switches, or one switch and its related termination panels.

The Multiservice Switch 7480 Packet Voice Gateway resides in a single frame assembly that includes the following:

- one Breaker Interface Panel (BIP)
- up to two Multiservice Switch 7480 Packet Voice Gateway chassis, with each chassis containing a single row of 16 cards

To support a Passport Packet Voice Gateway, you must install a Passport switch that includes the following hardware and software components:

- **Hardware**
 - a Voice Services Processor 2 (VSP2) Function Processor
 - a TDM Function Processor (that is, DS3 for T1)
 - an ATM Function Processor (that is, the OC-3 ATM IP card)
 - a 100BaseT Ethernet Function Processor (for the native IP configuration)
 - **Software**
 - Passport base
 - Packet Voice Gateway
 - ATM networking
- Note:** The CS 2100 only supports AAL5.
- IP
 - Wide Area Network Data Terminating Equipment (WAN DTE)
 - Passport networking

Operating parameters

The following operating parameters apply to the Passport Packet Voice Gateway:

- 99.9999 percent reliability
- NEBS level 3
- Supports DS3 or OC-3; mux to deliver DS1.
- Although the Passport Packet Voice Gateway supports additional protocols, the Communication Server 2100 implementation only supports PRI in SE07. Signaling System #7 is not supported.

Multiservice Switch 7480 physical interfaces depend on the type of Packet Voice Gateway and Voice Services Processor. Table 9 lists the physical interfaces for the Multiservice Switch 7480 Packet Voice Gateway.

Table 9
Multiservice Switch 7480 Packet Voice Gateway physical interfaces

Maximum DS0s Supported			
VSP	Codec	DS0s	Network connectivity
VSP2	G.711 and G.726	1008	Any Multiservice Switch 7480 ATM interface
	G.729	720	

References

Table 10 shows where you can find more detailed information about the Multiservice Switch 7480 Packet Voice Gateway.

Table 10
Documentation references

Document title	Document number
<i>Multiservice Switch 7400/15000/20000 Overview</i>	NN10600-030
<i>Multiservice Switch 7400/15000/20000 Packet Voice Gateway Technology Fundamentals</i>	NN10600-780
<i>Multiservice Switch 7400/15000/20000 Configuring Switched Packet Voice Gateway</i>	NN10600-782
<i>Multiservice Switch 7400 Hardware Description</i>	NN10600-200
<i>Multiservice Switch Hardware Installation, Maintenance and Upgrade</i>	NN10600-240
<i>Multiservice Switch 7400/15000/20000 Commands</i>	NN10600-050
<i>Multiservice Switch 7400/15000/20000 Command Summary Card</i>	NN10600-053

Nortel Media Gateway 3000 Series

Description

Nortel Networks is offering enterprise customers a smaller scale alternative to the Passport Voice Gateway (PVG) traditionally deployed in the carrier market. In the Communication Server 2100 configuration, trunk gateways provide access to the Public Switched Telephone Network. A key strategy of the Meridian SL-100 evolution to the Communication Server 2100 is to provide customers with flexibility. Thus, there is a need to deliver a cost-effective Time Division Multiplexing (TDM) gateway to access the PSTN in the Communication Server 2100 product offering.

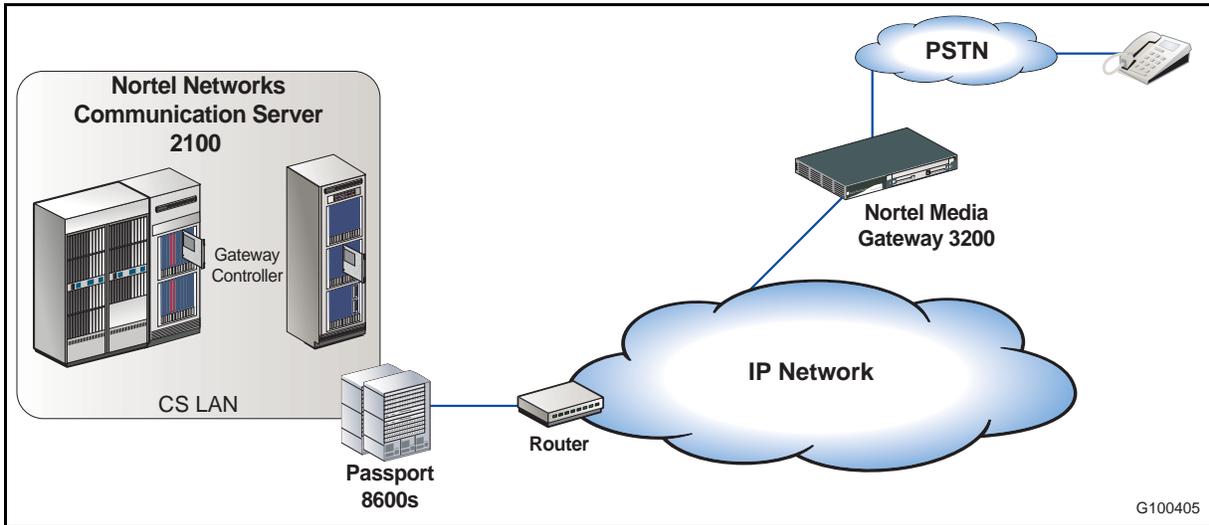
Nortel Media Gateway 3000 Series communicate using the H.248 protocol and support Integrated Service Digital Network (ISDN) Primary Rate Interface (PRI). This section describes how you can integrate the Nortel Media Gateway 3200 Gateway into the Communication Server 2100 environment.

The Nortel Media Gateway 3200 provides options for 1, 2, 4, 8, and 16 spans of independent, simultaneous VoP calls. It supports up to 16 T1/E1 spans.

[Figure 21 on page 90](#) shows an example of Nortel Media Gateway 3000 Series in a Communication Server 2100 configuration.

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Figure 21
Nortel Media Gateway 3200 network configuration



The D-channel of the trunk gateway terminates at the Gateway Controller (GWC) of the Communication Server 2100.

User interface

The Nortel Media Gateway 3200 comes with an embedded web server element manager which supports Simple Network Management Protocol (SNMP) version 2.0.

Feature support**NI-1 Primary Rate Interface (PRI) features**

Table 11 describes the NI-1 features supported by the Nortel Media Gateway 3000 Series gateways.

**FOR MORE INFORMATION**

See the *Meridian SL-100 ISDN Primary Rate Interface Reference Manual*, 555-4001-106, for detailed information about the PRI features that the Meridian SL-100 supports.

Table 11
NI-1 features (Sheet 1 of 3)

Feature	Description
PRI user services	
Calling Line Identification (CLID)	Enables a called terminal to be notified by the network of the address from which the call originated.
Network Redirection and Reason	<p>Informs the calling and called parties about any redirections that occur during the life of a call.</p> <p>The following redirection services are supported:</p> <ul style="list-style-type: none"> • Call Forwarding Universal (CFU) • Call Forwarding Busy (CFB) • Call Forwarding No Reply (CFNR) • Call Transfer • Call Pickup <p>Features of the Network Redirection and Reason are as follows:</p>
<i>Notification of redirection before answer</i>	The calling party is informed of the reason for redirection and the Directory Number (DN) of the new destination by means of the "Redirection number" Information Element (IE) in the NOTIFY message.
<i>Notification of redirection after answer</i>	The connected parties are informed of the reason for redirection and the DN of the new connected party by means of the "Connected number" IE in the NOTIFY message.
<i>Notification of redirected call</i>	The new destination of the redirected call is informed of the original destination and the reason for redirection by means of the "Original called number" IE delivered in the SETUP message.
Network Name CLID	Allows the transport of the calling, redirecting, and called parties' names across the PRI. The service allows an originating node to receive the name of the terminating party and deliver the originator's name to the terminating node. When a call is redirected, the name of the connected party is also delivered.

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Table 11
NI-1 features (Sheet 2 of 3)

Feature	Description
Network Ring Again (NRAG)	Allows a calling user to be notified when a busy called party becomes idle. For example, a user (A) encountering a busy user (B) can monitor that user and be recalled when user (B) becomes idle. If user (A) accepts the recall, the original call is set up again automatically.
Network Automatic Call Distribution (NACD)	Provides the ability to distribute incoming calls to a set of answering positions (agent positions). These positions can be at a local node or remote nodes, where each node can be served by a similar or like node (for example, Communication Server 2100 to Communication Server 2100). Information exchanged between nodes is used to determine the best routing to evenly distribute calls among the answering positions.
Special Number Services	<p>Enables a PRI user to access any Special Number Services available in the public network. These special numbers may not conform to any numbering plans. As such, they are specified in the public network dialing plan to access certain network services (for example, "0" for operator services and "411" for directory information).</p> <p>The special number digits are sent by the user in the "Called party number" IE in a SETUP message. The called party number is coded as conforming to the E.164 numbering plan (for example, an NPI of "E.164" and type of number of "unknown").</p> <p>All special numbers accessible to public network subscribers can be accessed over PRI, including the following:</p> <ul style="list-style-type: none"> • 0 • 411 • 911 • 611 • 1-800 • 1-900 • 0+ (operator assisted calls)
10-Digit Local Display	<p>Allows a called party's display phone to display the three-digit area code, along with the seven-digit DN of the calling party in the following situations:</p> <ul style="list-style-type: none"> • the call is a non-intragroup call from a PRI of a Signaling System #7 (SS7) trunk • both calling and called parties are in the same Serving Numbering Plan Area (SNPA) • both calling and called parties are using CLID
Network Message Service	<p>The following types of Network Message Service are supported:</p> <ul style="list-style-type: none"> • Network Message Waiting Indicator (NMWI) – Allows a Message Service on one node to activate or deactivate the message waiting indicator of a subscriber located at a different node. • Network Executive Message Waiting (NEMW) – Allows the Executive Message Waiting (EMW) feature on one node to activate the message waiting indicator of a subscriber located at a different node.

Table 11
NI-1 features (Sheet 3 of 3)

Feature	Description
Release Line Trunk (RLT) Enhancement	RLT optimizes the use of NTNA PRI trunks and is available on an optional basis. This feature includes the ability to drop PRI trunks between two Communication Server 2100s. It also enables a Communication Server 2100 to receive a call from another Communication Server 2100, transfer the call back to the originating Communication Server 2100, and release the redundant trunk.
Integrated Services Access (ISA)	<p>Permits one PRI interface to replace several dedicated trunk groups, resulting in efficiencies and simplified administration. ISA provides the capability to signal information which specifies the trunk type needed to complete a call. While the individual services continue to exist in the network for INWATS, OUTWATS, TIE, and FX calls, a single PRI connection allows access to all of these services. ISA is supported for both incoming and outgoing calls on a PRI.</p> <p>An ISA call follows normal call control procedures. The “Network specific facilities” (NSF) and “Called party number” (CDN) IEs within the SETUP message are used to select the appropriate service.</p> <p>The following services are supported:</p> <ul style="list-style-type: none"> • OUTWATS – A service provided by telephone companies which permits a customer to originate calls to destinations in specific geographical areas, sometimes identified as a zone or band. The user can request a specific zone or band number. • INWATS – A form of long distance service which allows a subscriber to receive calls originating within specified service areas (zones or bands) without charge to the caller. Typically, the caller dials 1-800 to identify the call as an INWATS call. • Foreign Exchange (FX) – A dedicated line service between the customer’s location and a remote public network exchange. Provides the equivalent of local service at the distant exchange. • TIE – Private dedicated facilities between two private network switches (for example, PBX and Centrex). • PRIVATE – Private calls allow PRI users to access customer-specific routing and number translations. • PUBLIC – Allows PRI users to access the public switched network.
PRI administration services	
Backup D-channel	Increases the reliability of signaling for non-facility associated signaling (that is, when a single D-channel is used to provide call control signaling for more than one interface). This service provides a procedure for employing a standby D-channel which is used if the primary D-channel fails. All active calls are maintained during the switch-over to the standby D-channel.

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NI-2 Primary Rate Interface features

Table 12 describes the NI-2 features supported by the Nortel Media Gateway 3000 Series gateways.

Note: NI2 features are not supported on the Meridian 1 or Communication Server 1000. For the Meridian 1 and Communication Server 1000, the only features supported are subtending features.

Table 12
NI-2 features (Sheet 1 of 3)

Feature	Description
PRI call processing services	
CLID Delivery	For PRI origination, CLID and Redirecting Number Delivery (RND) Screening are available as a single option on a per ISDN PRI basis.
Call-by-Call Service	Provides the ability to convey signaling information over an ISDN PRI that indicates, on a per-call basis, the specific service type associated with the call. Service types include the following: <ul style="list-style-type: none">• FX• TIE• OUTWATS• INWATS• Hotel/Motel• Selective Class of Call Screening (SCOCS)• Public Network
Calling Name	Provides information to the terminating circuit. The service delivers the calling party's name toward the called party (in this description, the called party is connected to the Communication Server 2100 through an NTNI PRI). Several factors can determine if the calling name is delivered, including whether <ul style="list-style-type: none">• the PRI has subscribed to the calling name delivery• the calling line number presentation is allowed• the calling line number is available• the calling name can be successfully retrieved

Table 12
NI-2 features (Sheet 2 of 3)

Feature	Description
Message Service	<p>Allows subscribers to retrieve messages that were previously left for them. Subscribers to Message Service are referred to as client users. Client users can select any call forward variant to route the incoming calls to a Message Storage and Retrieval (MSR) system. The MSR is connected to the Stored Program Control Switch (SPCS) through NTNI PRI.</p> <p>When a call is forwarded by a client user to the MSR, the client user's number is delivered to the MSR. Typically, the MSR provides a personalized greeting from the client user and stores the caller's message.</p> <p>When a message is waiting to be retrieved, the MSR sends a PRI D-channel message to the SPCS requesting that the client user's message-waiting indicator be activated. After the network has activated the message-waiting indicator, the SPCS sends an acknowledgement message to the MSR.</p> <p>The client can directly call the MSR to retrieve waiting messages. Typically, the MSR requires the client user to provide a user ID and password through in-band signaling.</p> <p>When all messages have been retrieved, the MSR sends a PRI D-channel message to the SPCS requesting that the client user's message-waiting indicator be deactivated. After the network has deactivated the message-waiting indicator, the SPCS sends an acknowledgement message to the MSR.</p>
PRI administration/maintenance services	
Back-up D-channel	<p>Increases the reliability of signaling for non-facility associated signaling (that is, when a single D-channel is used to provide call control for more than one DS1 interface). This service provides a procedure for employing a standby D-channel which is used if the primary D-channel fails. All active calls are maintained during the switch-over to the standby D-channel, assuming the associated B-channels remain functional.</p> <p>Back-up D-channel service is available as an option on a per ISDN PRI basis.</p>
Restart Signaling	<p>B-channel restart procedures return a single B-channel, all B-channels on a DS1, or all B-channels associated with a PRI to an Idle condition. Restart procedures clear all calls on the identified B-channels. Additional calls on these B-channels are prohibited until a REST ACK messages is received in response to the REST message.</p> <p>Restart procedures are invoked</p> <ul style="list-style-type: none"> • after a data link reset following a data link failure (that is, after the expiry of timer T309) • after the expiry of timer T308 for a second time, caused by the absence of a response to the RELEASE message • upon data link establishment at the time of a system initialization • when adding or returning B-channels to service from a Maintenance or Out-of-Service state

Table 12
NI-2 features (Sheet 3 of 3)

Feature	Description
B-channel Availability	<p>In order of decreasing availability, B-channel states are defined as follows:</p> <ul style="list-style-type: none"> • In Service (IS) – the B-channel can be allocated to a call by Layer 3 call control. • Out of Service (OOS) – the B-channel is unavailable for use by Layer 3 call control. Out-of-Service state is further categorized to identify which end of the interface initiated the move to that state as follows: <ul style="list-style-type: none"> — near end (NE) — far end (FE) <p>These categories ensure that only the side of the interface that initiated the move to OOS state can subsequently return the B-channel to IS state. The categories, in order of increasing priority, are: IS, OOS/FE, and OOS/NE. The network can track NE and FE status separately, but the NE status procedures take precedence over the FE procedures. Therefore, if the NE status of the channel is OOS/NE and the NE receives a request to change the OOS state, the status of NE remains OOS/NE.</p> <p>OOS state is considered busy for normal call processing. A switch does not assign a channel in OOS state for normal outgoing traffic.</p> <p>A switch assigns B-channels with an IS state for calls and the B-channels can be used for calls offered from the Customer Premises Equipment (CPE). Test calls using the channel are not supported.</p> <p>If a channel carrying a call reaches the OOS state once the call ceases, signaling procedures notify the CPE of the new OOS/NE status. However, the channel remains IS, until the call ceases at which time the state changes to OOS.</p> <p>If a channel is placed in OOS state without waiting for the call to cease, signaling procedures notify the CPE of the new OOS/NE status, the call is cleared, and the state changes to OOS. This is achieved by issuing a Force Release (FRLS) command to the channel.</p>

Operating parameters

The following operating parameter applies to Nortel Media Gateway 3200:

- Signaling System #7 (SS7) is not supported in SE07.
- multiple density options (from one T1 to 16 T1s)
- NEBS level 3 complaint
- Packet Telephony standards compliant
- IETF standards compliant
- optional AC power supply redundancy
- hot swappable enabled

References

Table 13 shows where you can find more detailed information about the Nortel Media Gateway 3200. Note: the Nortel Media Gateway 3000 Series was previously called the Audiocodes Mediant gateways).

Table 13
Documentation references

Document title	Document number
<i>Mediant 2000 VoP Media Gateway User's Manual</i>	LTRT-69801
<i>Mediant 2000 Configuration Instructions for Nortel CS2000 and CS2100 H.248/IUA & H.248/ISUP Solutions</i>	LTRT-72901
<i>Mediant™ 2000 Fast Track Installation Guide MGCP, MEGACO, H.323 & SIP</i>	LTRT-70102
<i>IPmedia™ 2000 Media Server Platform User's Manual</i>	LTRT-69701
Detailed hardware specifications are available at www.audiocodes.com .	N/A

Mediatrix 1124 and 1104 Analog Station Gateway

Description

The Communication Server 2100 supports both the Mediatrix 1124 and 1104 units, with Mediatrix being the supporting owner of these products. The 1124 and the 1104 both use the same internal four-port cards, with the only difference being the amount of cards used and the box in which they reside. In this section, the 1124 is described in detail.

The Mediatrix 1124 (24 analog ports) unit is a telecommunications device that provides full duplex communications for audio/fax/modems over IP-based networks for the 2500-type analog telephone set or G3-type fax machines. Each of the ports on the Mediatrix has its own number. The Mediatrix unit automatically connects its Foreign Exchange Service (FXS) port 1 to the PSTN in occurrences of power failures, LAN faults or for maintenance purposes. You can install the Mediatrix unit in either wiring closets where existing wiring is terminated or in office space.

The Mediatrix unit supports G.711 (A-law and Mu-Law), G.723.1 and G.729 Annex A and B. It uses standard silence suppression algorithms and Silence ID (SID) packet transport over RTP/RTCP on G.729A. Annex B of G.729 refers to this standard. Silence suppression cannot be activated with G.711.

The Mediatrix 1124 ASGW

- is a standalone analog line gateway that connects up to 24 analog phones, Group 3 fax machines, modems, and answering machines to a LAN through a single 10/100BaseT Ethernet port to deliver a wide range of Meridian SL-100 features.
- uses the Media Gateway Control Protocol (MGCP) to communicate with the Gateway Controller located in the Communication Server 2100.
- operates on both hybrid and pure IP Communication Server 2100 platforms.
- uses the Mediatrix Unit Manager Express (UME) GUI for provisioning and configuration using the SNMP protocol. UME installs on a PC connected to the same network that hosts the Mediatrix unit. UME does not interface with any Nortel Networks Communication Server 2100 OAM&P components.
- automatically connects the FXS port 1 to the PSTN using a RJ-11 bypass connection for emergency fail-safe if the IP connection to the LAN fails (for example, power failure, LAN faults or maintenance).

- uses an RJ-45 connector for 10/100 Base-T to connect to the LAN, an RJ-21 connector to a maximum of 24 analog lines, and an RJ-11 bypass connection to the PSTN.



FOR MORE INFORMATION

Refer to the user documentation for Mediatrix the 1104/1124.

Figure 22 illustrates the Mediatrix 1124 ASGW (front view). On the back of the Mediatrix unit, there is a power receptacle connector and a fan. There are also three LED indicators: one for POWER, one for LAN, and one for READY. Refer to the Mediatrix 1104/1124 Hardware and Software Product Specifications documentation for more information.

Figure 22
Mediatrix 1124 ASGW (front view)

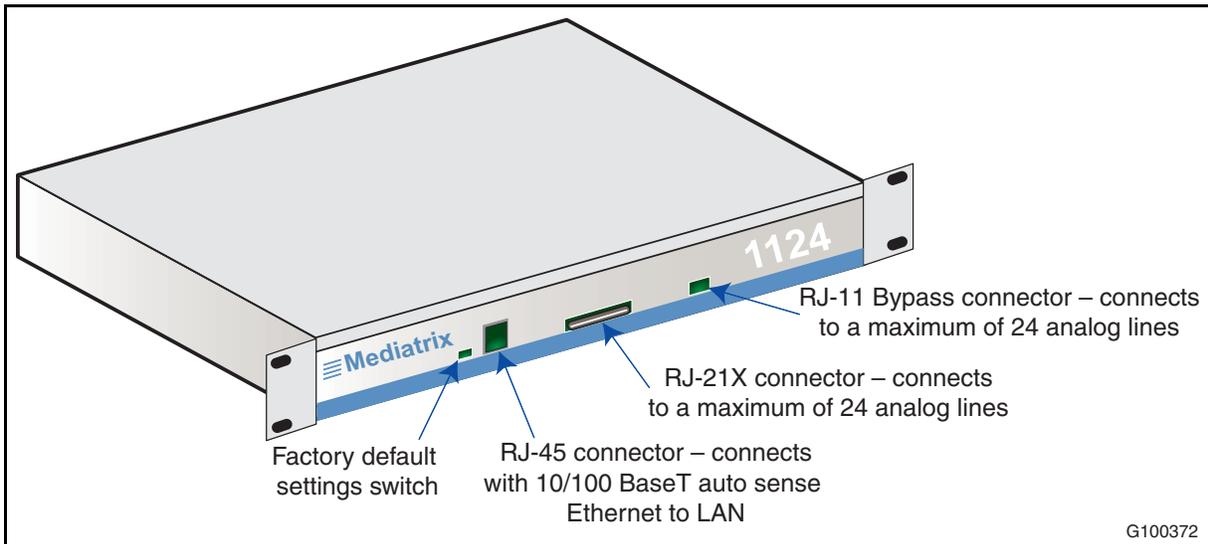


Figure 23 on page 100 illustrates a sample Mediatrix 1124 ASGW configuration supporting various analog devices. Add the supported devices in any configuration to a maximum of 24 devices per Mediatrix 1124 unit.

Figure 23
Mediatix 1124 ASGW configuration supporting analog devices

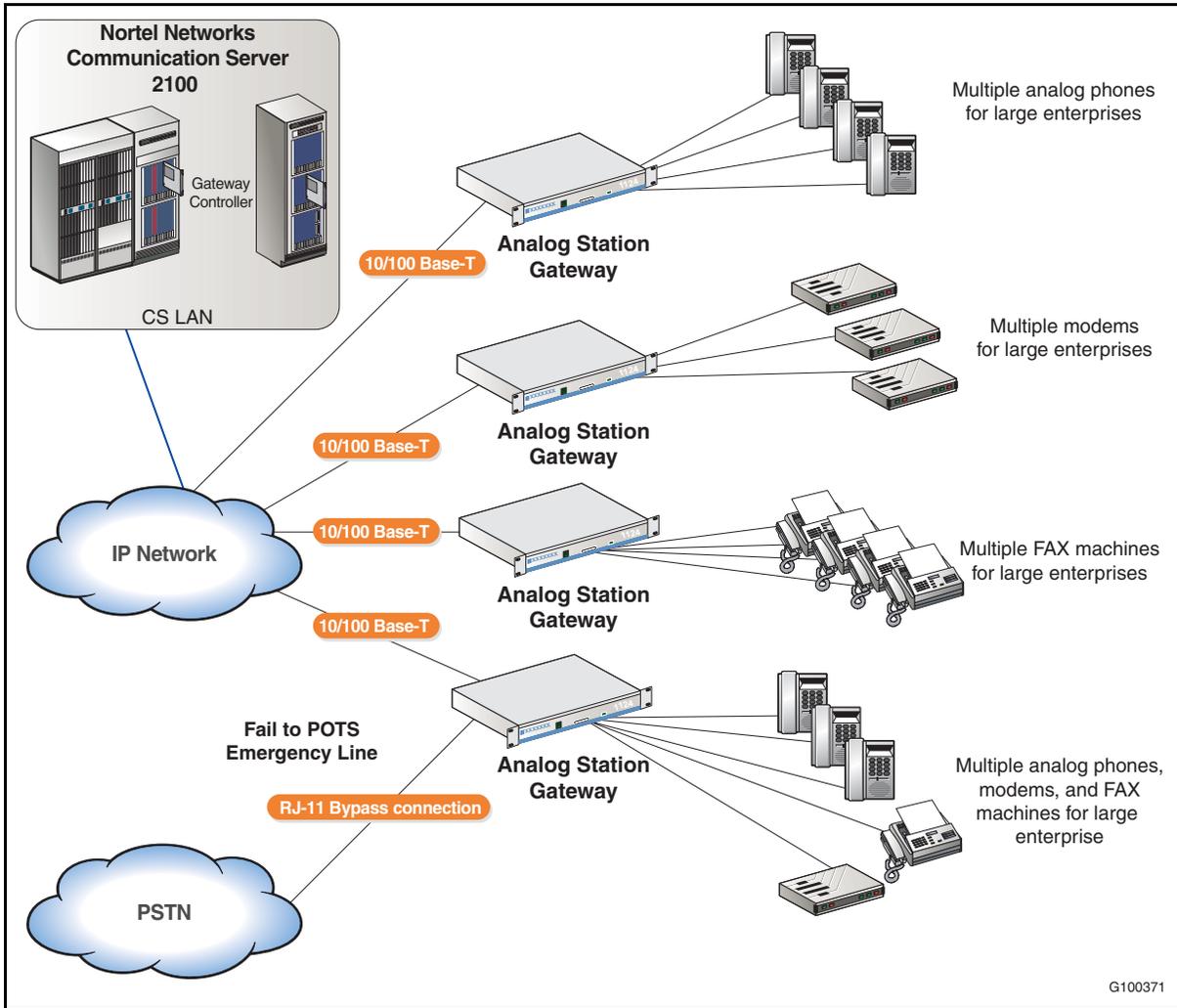
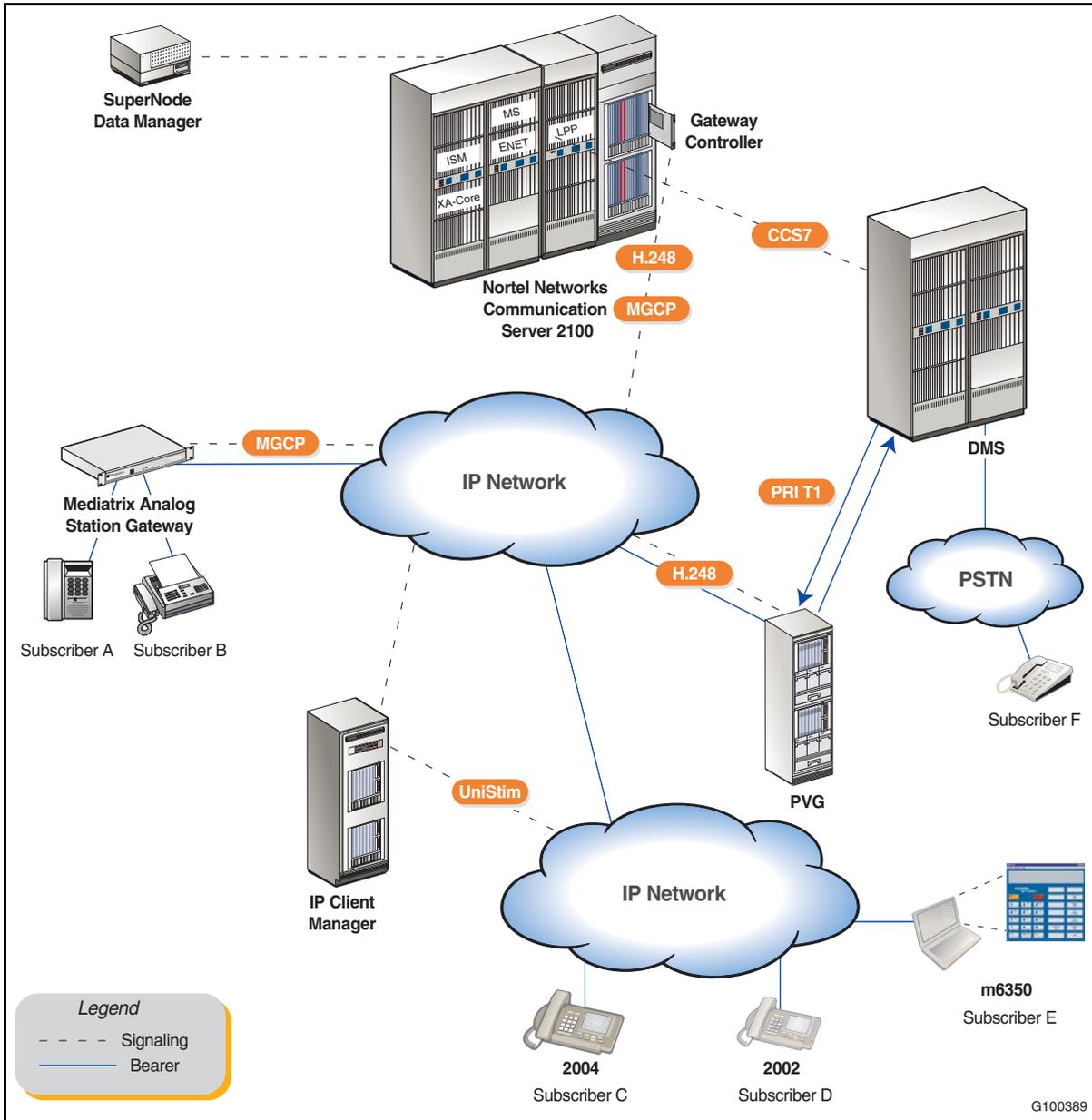


Figure 24 on page 101 illustrates a sample Mediatix 1124 ASGW configuration in the CS 2100 configuration.

Figure 24
Mediatrix 1124 ASGW in a Communication Server 2100 configuration



Hardware and software requirements

The following hardware components are required to implement this solution:

- Mediatrix 1124/1104 Analog Station Gateway
- Cabling per Mediatrix unit:
 - 1 RJ-45 10/100 BaseT Ethernet cable
 - 1 RJ-11 telephone cord
 - 1 RJ-21X cable
- A PC client/server using Microsoft Windows 9x/NT/2000/XP operating system containing the Mediatrix Unit Manager Network (UMN) software.
- For the Mediatrix 1124, up to 24 analog devices: analog phones, G3 fax machines, modems, and answering machines.
- A LAN (with access to an Intranet or Internet) that connects to the Mediatrix unit, Gateway Controller and client/server PC containing the UME.

The following software components are required to implement this solution:

- Mediatrix Unit Manager Express (UME) – a Web-based GUI accessed from a PC client/server that connects to the Mediatrix ASGW and provides configuration and provisioning functions.
- The PC server running the UME software must use Microsoft Windows 9x/NT/2000 operating system.
- Management Information Base (MIB) files – included on the Mediatrix installation disk.

References

Consult the Mediatrix 1104/1124 user documentation for detailed information on Mediatrix 1104/1124 ASGW. The Mediatrix Web site is at www.mediatrix.com

IP Client Manager for the Communication Server 2100

IP Client Manager 7.0

Description

The IP Client Manager (IPCM) uses IP technology to deliver the full Meridian business features sets and capabilities to users connected to a managed IP network. The IP Client Manager connects to a Gateway Controller (GWC) of the Communication Server 2100. In SE06, the Communication Server 2100 XA-Core and the Communication Server 2100 Compact both supported the 2002 and 2004 Internet Telephones and the m6350 softphone through the IP Client Manager.

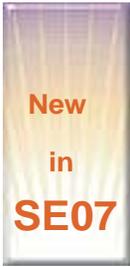
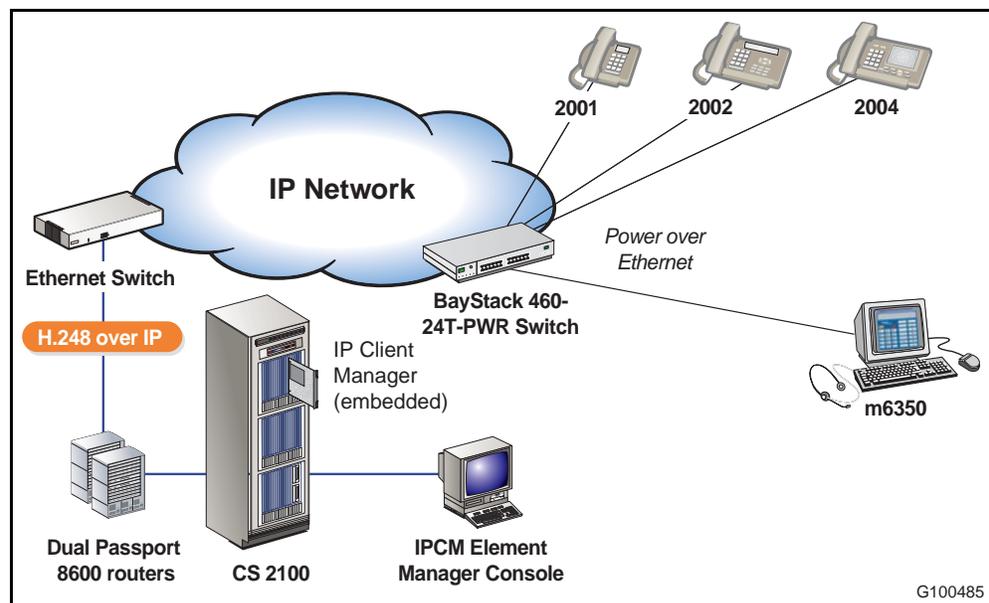
SE07 builds on the SE06 release and introduces the support of the IP Client Manager 7.0 in the Communication Server 2100 network. A pair of IP Client Manager Element Managers (IPCM-EMs) can manage up to 100 IP Client Managers. They provide the OAM&P interface.

There are two possible configurations for IP Client Manager 7.0 as follows:

- The first configuration is the same as the IPCM 6.12 IP configuration.
- The second configuration is new to IPCM 7.0 in which the IP Client Manager, including the Element Manager, reside in a SAM21 chassis (on Motorola 5385 CPUs).

Figure 25 shows how the IP Client Manager now resides in a SAM 21.

Figure 25
IPCM 7.0 embedded network configuration



The IP Client Manager provides the control interface between the Gateway Controller and distributed IP clients on a managed IP network. The IP Client manager communicates with the Gateway Controller using the H.248 IP interface. In this configuration, the IP Client Manager can be considered as a “terminal server” or “signaling gateway”.

Media streams in a Communication Server 2100 IP solution are routed directly between media endpoints. The IP Client Manager terminals (for example, the 2004 Internet Telephone – for more information about supported IP Clients, see [“Internet terminals” on page 205](#)) are media endpoints. Other endpoints in a Communication Server 2100 IP network include the following:

- TDM trunk gateways (for example, the Packet Voice Gateway)
- Analog line gateways (for example, the Mediatrix 1124)
- Voice processing servers (for example, the Universal Audio Server)
- IP terminals hosted off another IP Client Manager

Capacity Each IP Client Manager processor pair supports up to 3,069 users. Series 7.0 supports one or more pairs of CPV5385 CPU processor cards per shelf.

What’s new in IPCM 7.0

In addition to the features supported on Series 6.12, IP Client Manager 7.0 supports the following features:

- Support of the IPCM (including EM) in a SAM21 chassis (on Motorola 5385 CPUs).
- Base OS evolution (upgrading from Window NT Embedded to Windows XP Embedded).
- Support of the 2001 Internet Telephone (see [“2001 Internet Telephone” on page 211](#)).
- Support of the Phase 2 2002 and 2004 Internet Telephones (see [“2002 Internet Telephone” on page 214](#) and [“2004 Internet Telephone” on page 219](#)).
- Support for the Key Expansion Module (see [“Internet Telephones Key Expansion Module” on page 226](#)).
- UNISlim security (gateway to 200x).
- UNISlim security (gateway to soft client).
- Alignment of the Element Manager with Communication Server 2100 Integrated Element Management System (IEMS) (see [“Nortel Networks Integrated Element Management System” on page 168](#)).
- Flow-through provisioning.

- Faults and alarms (reporting to Network Management Systems)
- Performance and Operational Measurements (reporting to Network Management Systems)
- Hitless in-service upgrades
- Enterprise administrator controls
- End user web management
- Geographic survivability similar to the Gateway Controller capability (see [“Geographic survivability” on page 71](#))

Feature support

IP Client Manager 7.0 supports the wide range of features described in *CICM Product and Technology Fundamentals*, NN10044-111. In addition, IP Client Manager 7.0 now supports the following TDM features that were developed explicitly for Meridian SL-100 customers:

- Music on Transfer
- Auto Answer Back (AAB) Enhancement
- Name Display Character Extension
- Call Park Enhancement – SYSPARK
- Call Forward Time of Day
- Station Message Detail Recording (SMDR) Per Use Billing for Features
- Trunk Member Display
- Call Forward Indication
- Call Forward Busy/Call Forward Do Not Answer (CFB/CFD) Per Key Destination
- Multiple Message Waiting Indication
- Fast Transfer on Digital Sets
- Large Scale Message Waiting Indication Reset
- Individual Hold
- Simplified Message Desk Interface (SMDI) ID Override
- Authcode Enhancements



FOR MORE INFORMATION

See the *Meridian SL-100 Feature Description Manual*, 555-4031-801 for a description of these features.

Line Option for IPCM Phones feature

Prior to the Line Option for IPCM Phones feature (A00003653), technicians provisioned IP phones as M5216 sets on the switch using the M5216 Line Class Code (LCC). However, there was no indication in the Core of a line being an IPCM line (for example, as in a QLEN or QDN output).

The Line Option for IPCM Phones feature delivers the IPCLIENT line option. This option distinguishes lines with actual M5216 phones from IPCM lines that have UNISim phones. The Line Option for IPCM Phones feature provides the ability to use SERVORD to provision the IPCLIENT option to indicate that a line with the M5216 LCC is an IPCM line.

You can assign or remove the IPCLIENT option from a line using the following SERVORD commands:

- NEW
- NEWACD
- ADO
- EST
- ADD
- DEO

In addition, the COPYSET, CKLN and CHF commands are supported.

End users have the ability to “hot-desk” from IPCM phone to IPCM phone. However, hot-desking may not occur that frequently and there may be a phone that is the end-user’s primary phone. Therefore, when IPCLIENT is entered as an option, the system prompts the technician for the primary set type. The available options are as follows:

- I2001
- I2002
- I2004
- SOFTCLIENT
- OTHER



FOR MORE INFORMATION

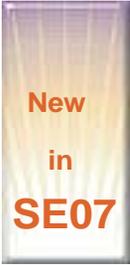
See the *Meridian SL-100 Feature Description Manual*, 555-4031-801 for information about how to configure and administer the Line Option for IPCM Phones feature.

References

Table 14 shows where you can find more detailed information about the IP Client Manager.

Table 14
Documentation references

Document	Order number
<i>CICM Etherset Installation Guide and User Manual</i> Note: Centrex IP Client Manager (CICM) is the carrier name for the IP Client Manager.	NN10027-113
<i>CICM m6350 SoftClient Branding Kit</i>	NN10183-114
<i>CICM m6350 Installation Guide</i>	NN10182-113
<i>CICM Series 7.0 CICM Basics</i>	NN10027-111
<i>CICM Upgrades</i> (describes how to upgrade from IPCM 2.5 and IPCM 6.12 to IPCM 7.0)	NN10230-461
<i>CICM Fault Management</i>	NN10233-911
<i>CICM Configuration Management</i>	NN10240-511
<i>CICM Accounting Management</i>	NN10244-811
<i>CICM Performance Management</i>	NN110248-711
<i>CICM Security and Administration</i>	NN10252-611
<i>Meridian SL-100 Feature Description Manual</i> (refer to the Line Option for IP Phones feature description)	555-4031-801
<i>Meridian SL-100 Service Order Reference Manual</i> (refer to the IPCLIENT – IP Client section)	555-4031-808
<i>Meridian SL-100 Data Schema Reference Guide</i> (refer to the KSETFEAT Feature IP Client section)	555-4031-851
<i>m6350 TAPI Service Provider Installation and Troubleshooting Guide</i>	<i>Magnetic North Software Limited</i>



Nortel Networks Media Gateway 9000

Introduction

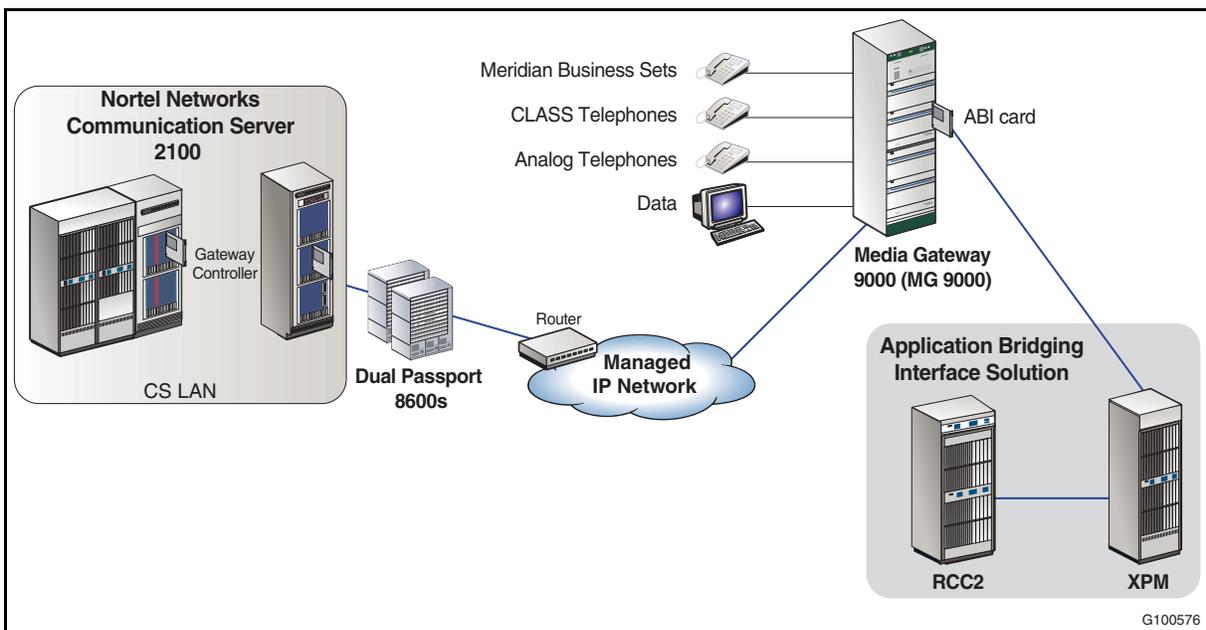
Nortel Networks Media Gateway 9000 (MG 9000) is a multi-service media gateway that enables large enterprises to use a single access platform for a wide-range of services. Positioned at the edge of an IP network, the Media Gateway 9000 combines voice and data services into a single access gateway, with a single network interface and management infrastructure.

The Media Gateway 9000 is has the following features:

- Provides enterprises with the capability to support POTS, P-Phone, Ground Start and Coin line services and Digital Subscriber Loop services.
- Connects subscriber interfaces directly to packet backbone networks.
- Supports the following data connections and services in the master shelf:
 - Full-rate Asymmetrical Digital Subscriber Loop (ADSL).
 - Digital Signal Level 0 (DS0) Specials.
- Supports the Access Bridging Interface (ABI).
- Supports Emergency Stand Alone (ESA).
- Deploys in an enterprise's IP network which it uses to carry packetized voice, call control signaling, Operations, Administration, Maintenance and Provisioning (OAM&P), and data traffic.

[Figure 26 on page 109](#) shows an example of a Media Gateway 9000 network configuration.

Figure 26
MG 9000 example configuration



Benefits

The MG 9000 radically simplifies the network and in the process provides the following benefits:

- Reduces floor space (up to 80 percent).
- Requires fewer cards (up to 50 percent fewer).
- Reduces power and Heating, Ventilation and Air Conditioning (HVAC) (up to 50 percent reduction).
- Supports peripheral hosting using the Access Bridging Interface functionality to extend its reach, while at the same time providing investment protection.

Applications

The Media Gateway 9000 supports the following applications:

- Access Bridging Interface
- switched lines
- Digital Subscriber Loop

Each of these applications can reside in the same shelf or in different shelves. The type and number of individual circuits are limited by the hardware restrictions for each application. For example, paired DS1 cards that restrict the number of switched line circuits can be used on the same shelf.

Access Bridging Interface

The Access Bridging Interface (ABI) on the MG 9000 is another attribute enterprises can use in their packet evolution strategies. This MG 9000 feature helps facilitate PBX consolidation and office collapse for organizations that wish to leverage their TDM access equipment. In addition to the native lines hosted from the MG 9000, the Access Bridging Interface can support most TDM-based line equipment (for example, LCM, LCM-based remotes, GR-303 and TR-08) that subtend from DMS-100, DMS-500 or DMS-10 offices.

During an office collapse, the LCM, GR-303 and TR-08 equipment can remain in place as the office core is removed. Their links will migrate to the MG 9000 Access Bridging Interface for call control through the Communication Server 2100. The MG 9000 packetizes the voice for transport over the packet network. Therefore, the Access Bridging Interface facilitates office collapse by providing access device reuse, less rewiring and quicker upgrades.

The ABI DS-512 Interface cards (NTNY43AA) support DS-512 fiber link connections between Expanded Subscriber Carrier Module Access (ESMA) and Line Group Controller ISDN (LGCI) peripherals and the MG 9000. Each DS-512 cards hosts a single fiber link, consisting of one downstream/TX fiber and one upstream/RX fiber.

The following XPM types can connect to an MG 9000 through the ABI cards:

- Line Group Controller (LGC), Line Group Controller ISDN, Line Trunk Controller (LTC), Line Trunk Controller ISDN (LTCI) with the following subtending devices:
 - Line Concentrating Module (LCM)
 - Remote Line Concentration Module (RLCM)
 - Outside Plant Module (OPM)
 - Outside Plant Access Cabinet (OPCA)
 - Star Hub
 - Remote Switching Center (RSC)
 - Remote Switching Center-Second series (RSC-S)

The RSC and the RSC-S can have an LCM, Subscriber Carrier Module Remote (SMS-R) Mode I or II, OPM and OPAC subtending from them as well.

The ABI functionality also adds support for hosting a Remote Maintenance Module (RMM) off of ABI-based XPMs, specifically the LTC, LTCI, LGC, LGCI and Subscriber Carrier Module-100 Access, Second Version (SMA2).

The ABI cards in the MG 9000 are configured in pairs with “network side/user side” unit status using a one-to-one protection group type. Each ABI card in the pair carries DS30 messaging and bearer traffic to the subtending XPM over DS-512 links. Both cards that comprise the ABI pair can be viewed as a small ENET where each plane (represented by an ABI card) is connected to the XPM the same as a true ENET-configured XPM.

The “network-side” ABI card is responsible for controlling the MIB data, handling connection setup and delegating to the “user side” card as appropriate for data syncing call setup and supervision.

Access Bridging Interface Emergency Stand Alone capability

The Emergency Stand Alone (EAS) feature extends the ESA capability available for MG 9000-based lines to all lines on subtending peripheral modules that use the MG 9000 Access Bridging Interface interface. The MG 9000 can continue processing calls for MG 9000 lines and any subtending Access Bridging Interface lines when call control links to the Communication Server 2100 have been lost.

The main advantage of this feature is that the MG 9000 maintains call processing for MG 9000 lines and MG 9000 Access Bridging Interface subtending lines even when there is a failure on the call control link back to the Communication Server 2100.

Switched lines

The Media Gateway 9000 is a scalable platform providing tip and ring subscriber interfaces and redundant Optical Carrier Level 3 (OC-3)/Synchronous Transport Mode 1 (STM-1) interfaces to the enterprise’s IP network.

Switched line services include wireline access on the Media Gateway 9000 and the services required to support the lines. The switched lines application brings narrowband voice services onto the enterprise IP network and acts as a switch replacement.

Digital Subscriber Loop

Digital Subscriber Loop service transmits two separate data streams with greater bandwidth devoted to the downstream subscriber, than the upstream subscriber. You can provision Digital Subscriber Loop lines on the same shelf with switched lines. The 8+8 ADSL card supports Digital Subscriber Loop lines and terminates eight fully-compliant Asymmetrical Digital Subscriber Loop (ADSL) subscriber loop pairs for analog voice telephone service and standard compliant ADSL data services. Digital Subscriber Loop cards supporting ADSL data services can only be provisioned in the master shelf.

Physical description

The Media Gateway 9000 contains a master shelf for switched lines communication, which contains the common equipment cards for the node. This is the first Media Gateway 9000 shelf in the node (typically the bottom shelf in the frame). Additional shelves are subtended from the master shelf by the use of connections through the Internet Telephony Processor (ITP) card and Internet Telephony Extender (ITX) card. The master shelf contains common equipment cards for the DSL and switched lines applications.

The Media Gateway 9000 is used as a single or multiple shelf node depending on the customer line capacity requirements. The term node is used to describe a Media Gateway network element connected to an IP network. [Figure 27 on page 113](#) shows a Media Gateway 9000 frame.

Figure 27
NTNY01BB Media Gateway 9000 frame

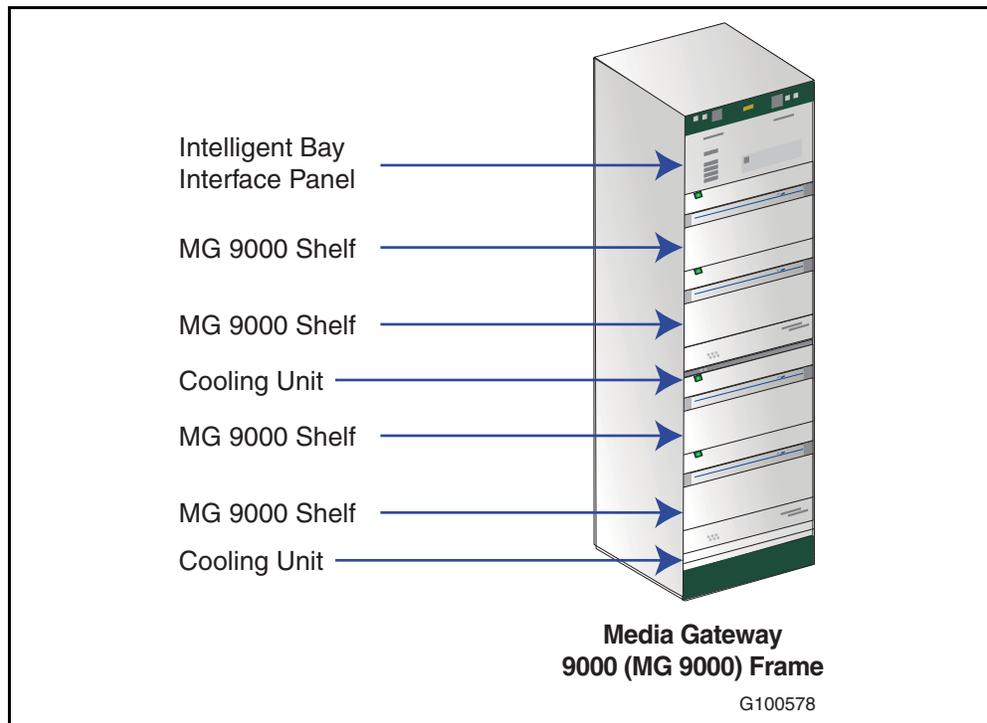


Table 15 describes the components that reside in a Media Gateway 9000 frame.

Table 15
NTNY01BB frame components (Sheet 1 of 2)

Component	Description
Intelligent Bay Interface Panel (IBIP)	<p>The Intelligent Bay Interface Panel contains the following items:</p> <ul style="list-style-type: none"> • Fuse panel – The fuse panel on the IBIP front panel protects the individual dc loads in the MG 9000 frame, such as shelves and cooling units and permits them to be disconnected in a maintenance scenario. The assemblies are protected by 20 fuses. • NTNY25BA Dual Talk Battery Filter cards – The two NTNY25BA Dual Talk Battery Filter cards in the IBIP provide a clean -48 V dc power supply for POTS loop feed. Each card serves as the talk battery filter capacitor for both A or both B talk battery feeds. • NTNY27AA Current Sensors – The NTNY27AA Current Sensors monitor both the A and B -48V talk battery power feed currents to each shelf. • NTNY28AA Alarm Relay card and NTNY29AA Alarm Processor card – The alarm and system monitoring functions of the IBIP are split between the NTNY29AA Alarm Processor card and the NTNY28AA Alarm Relay Card.

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Table 15
NTNY01BB frame components (Sheet 2 of 2)

Component	Description
Data Control Card (DCC), Internet Telephony Processor (ITP) and Internet Telephony Extender (ITX) cards	<p>The functions of these cards is as follows:</p> <ul style="list-style-type: none">• NTNY45AA Data Control Card – The NTNY45 is the control complex and Wide Area Network (WAN) for the Media Gateway 9000. The Data Control Card is used in pairs for redundancy and is always provisioned in slots 10 and 11 of the Media Gateway 9000 master shelf.• NTNY30 Internet Telephony Processor card – Provides subtending to additional Media Gateway 9000 shelves and connects with corresponding Internet Telephony Extender cards. The Internet Telephony Processor card processes the ATM-25 line the Internet Telephony Extender card creates. Each Media Gateway 9000 shelf contains two Internet Telephony Processor cards.• NTNY41AA Internet Telephony Extender card – Supports subtended Media Gateway 9000 shelves, creates an ATM-25 link to transmit data to the main control shelf, connects to corresponding Internet Telephony Processor cards and works in pairs. Each Media Gateway 9000 master shelf requires a minimum of two Internet Telephony Extender cards. Each Internet Telephony Extender pair supports a maximum of eight additional Media Gateway 9000 shelves.
Cooling units	Each frame contains two cooling units.
Media Gateway 9000 shelves	<p>Each frame contains four shelves that are used for POTS/combination lines. Media Gateway 9000 shelves support the following applications:</p> <ul style="list-style-type: none">• switched lines• xDSL services (in master shelf only)

You provision the Media Gateway 9000 shelves from the bottom shelf up, starting with shelf MG9K00 and proceeding to shelf MG9K03. Frames with fewer than four shelves require plenums in the empty shelf spaces to maintain proper air flow for cooling purposes.

The bottom shelf (first shelf) in the frame of an initial Media Gateway 9000 is considered the master shelf for the node. A Media Gateway 9000 frame supports a maximum of four switched line shelves. [Figure 28 on page 115](#) shows an example of a Media Gateway 9000 shelf. The Media Gateway 9000 contains up to 16 service slots in each shelf.

Figure 28
Media Gateway 9000 shelf

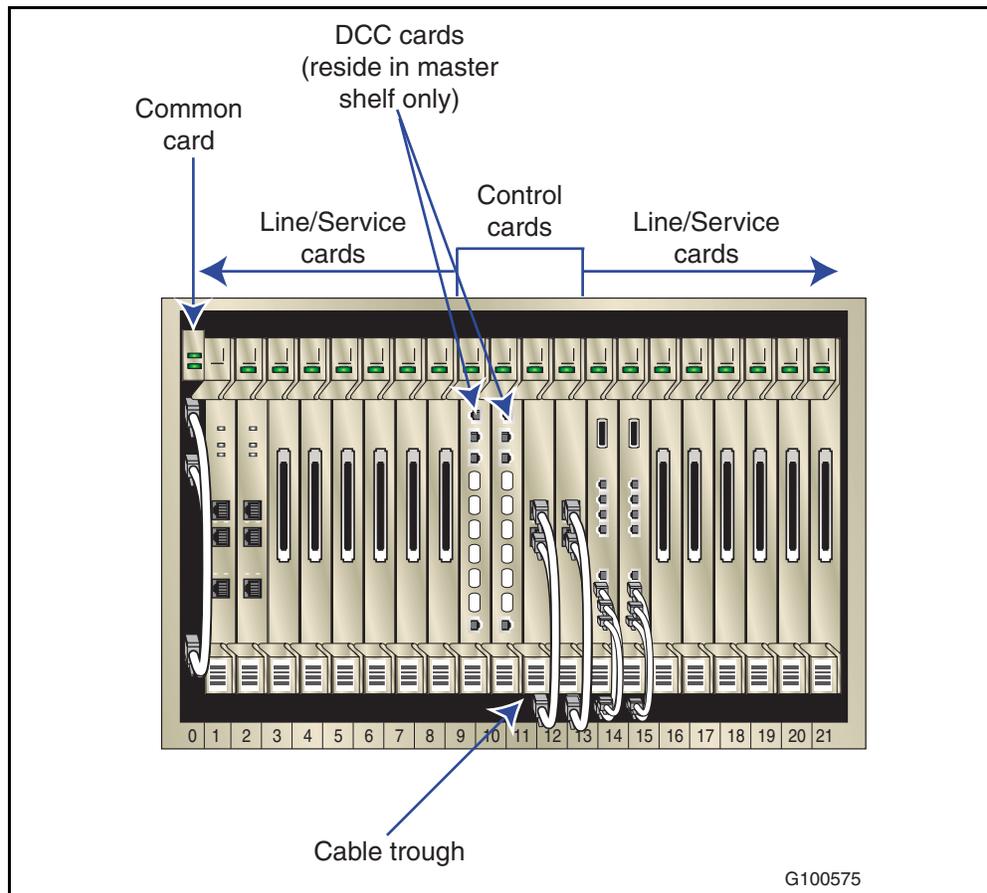


Table 16 describes the shelves in a Media Gateway 9000 frame.

Table 16
Media Gateway 9000 shelves (Sheet 1 of 2)

PEC	Description
NTNY11AA	Media Gateway 9000 shelf. The MG 9000 shelf contains voice and data domains. The domains are independent in the hardware architecture, which prevents traffic conditions in one domain from degrading the operating capacity in the other domain.
NTNY15AA	Air filter assembly.

Table 16
Media Gateway 9000 shelves (Sheet 2 of 2)

PEC	Description
NTNY17BA	Media Gateway 9000 Intelligent Bay Interface Panel shelf.
NTNY18AA	Media Gateway 9000 Cooling Unit shelf with NTNY16AA Local Craft Access Panel (LCAP) (that is, middle cooling unit).

Table 17 lists the Media Gateway 9000 line/service cards that are supported in a Communication Server 2100 network.

Table 17
Media Gateway 9000 line/service cards

Card	Description
POTS 32	Traditional telephone service cards with 32 ports.
ADSL 8+8	ADSL card with eight full-rate data ports (software selectable) and eight POTS ports.

Emergency Stand Alone

Emergency Stand Alone in the Media Gateway 9000 supports basic calls within the Media Gateway 9000, while one or more of the Virtual Media Gateways (VMGs) in the Media Gateway 9000 are out of communication with its assigned Gateway Controller (GWC). Emergency Stand Alone also provides basic emergency service access, such as 911, 411 and 611. In an IP configuration, six- to 13-digit dialing plan lengths are supported.

As mentioned previously, Emergency Stand Alone is also supported with the Access Bridging Interface functionality, in which case the subtending peripherals maintain service.

Protocol support

Table 18 lists the industry-standard protocols that are applicable to the Media Gateway 9000.

Table 18
Media Gateway 9000 protocols

Function	Standard	Description
Call control	ITU H.248	The ITU H.248 media gateway control messaging is used between the Communication Server 2100 and the Media Gateway 9000 to establish calls.
Bearer path	ATMF UNI 4.0	Switched Virtual Circuits use the ATM Forum Unidirectional (ATMF UNI) 4.0 protocol to set up connections through the network.
Management	SMNP 2.0	The Simple Network Management Protocol 2.0 sends management information between the Media Gateway 9000 Manager and the Media Gateway 9000.
Switched lines over IP	RTP	The Real Time Protocol is an Internet Engineering Task Force (IETF) protocol used for switched lines over IP solutions.

Operating parameters

The following operating parameters apply to the Media Gateway 9000:

- The Media Gateway 9000 is supported with SE07 or higher software releases.
- Connection to an Asynchronous Transport Mode (ATM) backbone is not supported in SE07.
- The Universal Access AALI multi-service ATM network solution is not supported in a Communication Server 2100 network.
- The DS1 private lines application is not supported in a Communication Server 2100 network.
- The Media Gateway 9000 is used as a single or multiple node, depending on customer capacity requirements.
- The NTNY01BB Media Gateway 9000 frame supports up to 2,016 lines in subtended frames.
- The NTNY01BB Media Gateway 9000 frame supports up to 1,952 POTS lines in the first frame.

- The Media Gateway 9000 supports a configuration having up to three frames and 12 shelves.
- The following user interfaces are supported:
 - SERVORD, though the Maintenance and Administration Position (MAP)
 - Media Gateway 9000 Element Manager

References

Table 19 shows where you can find more detailed information about the Media Gateway 9000.

Table 19
Documentation references

Document title	Document number
<i>MG 9000 Basics</i>	NN10011-111
<i>MG 9000 Upgrades</i>	NN10048-461
<i>MG 9000 Operational Configuration</i>	NN10096-511
<i>MG 9000 Security and Administration</i>	NN10162-611
<i>MG 9000 Performance Management</i>	NN10140-711
<i>MG 9000 Fault Management</i>	NN10074-911



Media servers

Introduction

A media server is a centralized resource for the delivery, management and manipulation of packet-based media streams and services over the backbone network. In SE07, the Communication Server 2100 supports two media servers: the Universal Audio Server (UAS) and Nortel Networks Media Server 2010. These media servers deliver the following capabilities:

- Packetized announcements provided to call parties in response to a request from the Communication Server 2100.
- Conference circuits for multi-party calls across the packet network.

This chapter contains the following sections:

- **Universal Audio Server**
- **Nortel Networks Media Server 2010**

Universal Audio Server

Description

The Universal Audio Server (UAS)

- is a single-shelf Service Application Module (SAM) 16-slot (contains two eight-slot Universal Audio Server units) unit that delivers announcements, conferencing services and monitoring in IP networks.
- can standalone as an independent media server, but in the Nortel Networks Communication Server 2100 configuration, the Universal Audio Server connects to the CS LAN and the IP network.
- is controlled by the Audio Gateway Controller (GWC) located in the SAM21 card cage of the Communication Server 2100 (CS 2100). The Audio GWC makes a request to the Universal Audio Server to play an announcement, set up of a conference call or start monitoring.
- has OAM&P functions provided through the Universal Audio Server Manager that is a component of the CS 2000 Management Tools package. The CS 2000 Management Tools package is a Web-based GUI application that users access from a Microsoft Windows or SUN provisioning client workstation.

The Universal Audio Server Manager allows you to select UAS Network Elements, view performance measurements, perform maintenance on UAS nodes and cards, configure UAS nodes and cards and configure SNMP for UAS nodes.

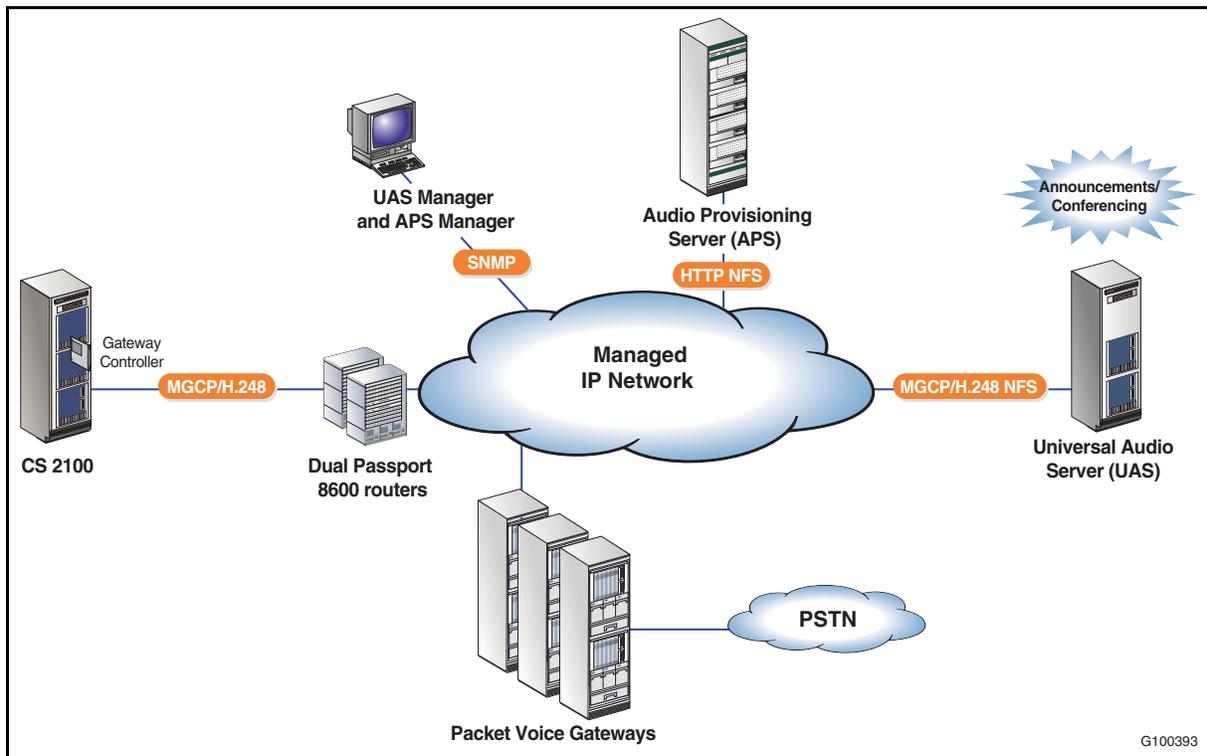
Note: The UAS is not supported on a hybrid Communication Server 2100.

The Audio Provisioning Server (APS)

- is a SUN Netra 240 server platform that runs an Oracle database application, which holds the audio that is distributed to all UAS nodes in the network. Access the APS from a remote provisioning client.
- uses the APS Manager to provision UAS announcements for all UAS nodes on the network.
- is required when you use the UAS as an announcement server.

Figure 29 on page 121 illustrates an example of a configuration of the Universal Audio Server in an IP network.

Figure 29
Universal Audio Server in an IP network



Universal Audio Server capabilities

The UAS supports the following functions:

- Plays and records packet-based voice announcements (stored as G.711 encoded mulaw and alaw) through media gateways to call parties in response to requests from the Communication Server 2100.
- Collects Dual-tone Multifrequency (DTMF) tones for the UAS-IP bearer.
- Contains packet-based audio conference circuits for multi-party calls across the packet network.
- Provides Centralized Replicator (CR) functionality for monitoring services, which allows packet network bearer connections to be monitored by a Law Enforcement Agency (LEA).

Hardware and software requirements

In the Nortel Networks Communication Server 2100 UAS IP solution, the following hardware and software is required:

- One or more SAMF cabinets, each housing up to six UASs on three shelves.
- Nortel Networks Communication Server 2100 with the audio GWC to provide Call Agent functions.
- One OAME cabinet housing the following cabinets:
 - For the PTM-based UAS Element Manager: Sun Netra 240 (twin-processor unit with 2 Gbytes RAM and 4-Gbyte hard disk).
 - For the APS: Sun Netra 240 (twin-processor unit with 2 Gbytes RAM and 4-Gbyte hard disk).
 - One or more Rose KVM switches for communication between UASs in different cabinets (depends on the number of SAMF cabinets).
 - NEW keyboard/monitor.
- UAS Manager and APS Manager.
- Dual Passport 8600 routers.
- Packet Voice Gateway.
- SE06 or later software release.

The UAS has the following hardware and software requirements:

- Motorola CPX8216T NEBS compatible chassis (also called the SAM16 chassis).
- Microsoft Windows 2000 operating system.
- Industry-standard internal busses, physical interfaces and protocols for communication with the network.
- Available as a -48V dc powered, rack-mount chassis (shelf), or as a 100-220 V ac powered configuration.

Note: The 100-220V ac powered configuration is not recommended for the Communication Server 2100 market.

- Industry standard compact Peripheral Component Interconnect (cPCI) bus for data transfer, and an H.110 voice bus for TDM voice transfer between circuit cards. The cPCI cards provide voice capabilities, interfaces and other special functions for the cPCI bus on each server.

- UAS is scalable:
 - up to two separate UAS nodes for each shelf
 - add additional shelves as capacity demands
 - Communication Server 2100 UAS configurations are provisioned using N +1 sparing. N+1 sparing ensures that a spare UAS unit is available to handle the workload if one UAS unit fails. Nortel Networks recommends that the units be located in two separate shelves.
- Each UAS shelf contains the following components:
 - up to two complete UAS nodes
 - one Alarm Panel
 - one H.110 TDM Bus
 - three Power Supplies (2+1)
 - three Cooling Fans (2+1)
- Each UAS contains the following components:
 - one CD-ROM (to load OS).
 - one 36 GB disk (stores up to 780 hours of uncompressed audio files).
 - one host controller CPU Card with a 700 MHz 5370 processor that incorporates SCSI controller functionality for the UAS hard disk.

The CPU card is a dual-port network interface configured in active/standby mode, with one externally visible IP address. If the active link fails, the software transparently switches the IP address to the standby port and makes it active. For reliability, the two interfaces are connected to different CS LAN Passport 8600 routers for signaling over the CS LAN.

When the UAS receives a request to play an announcement, the UAS CPU retrieves the announcement from disk or memory and sends the assembled announcement to the DSP card to be processed and transmitted over the IP network.
 - cPCI I/O Conference Circuit and/or Announcement cards that provide DSP functionality/and or interface terminations for bearer connections.

For IP networks, the UAS uses up to six CG6000 DSP cards (with 100BaseT ports).
 - one Hot Swap Controller (HSC).

Figure 30 illustrates the shelf view of the Universal Audio Server.

Figure 30
UAS shelf view for an IP network

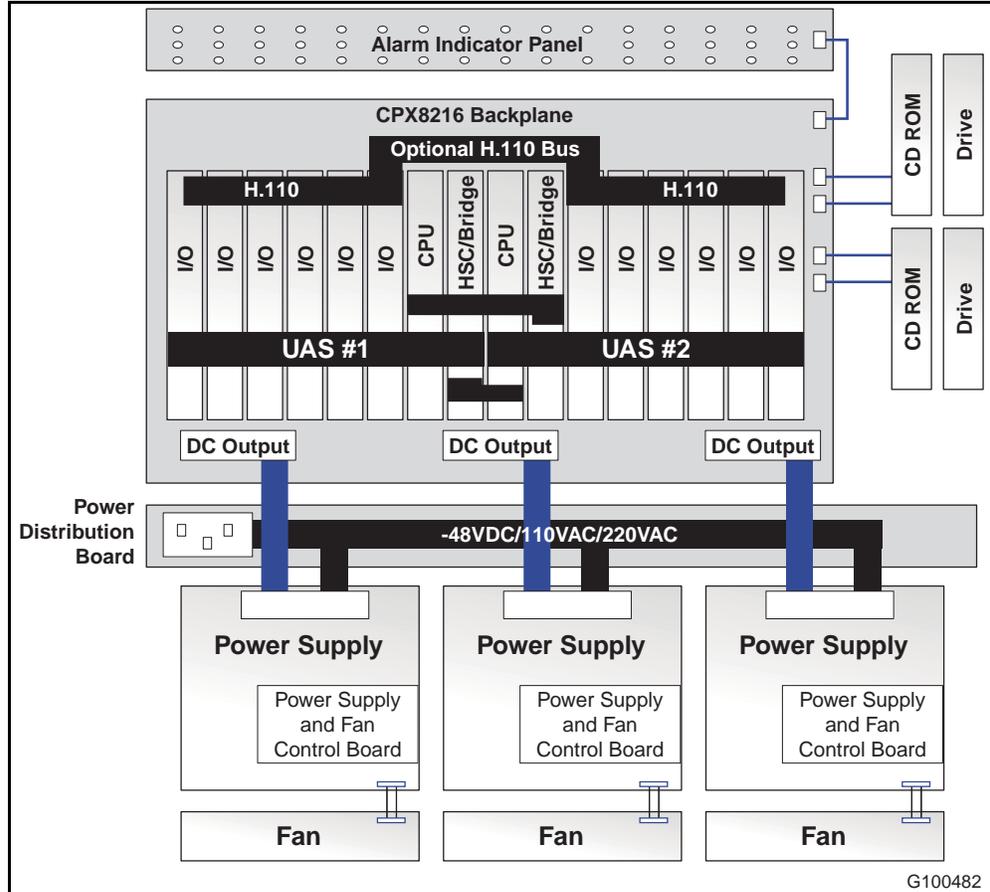
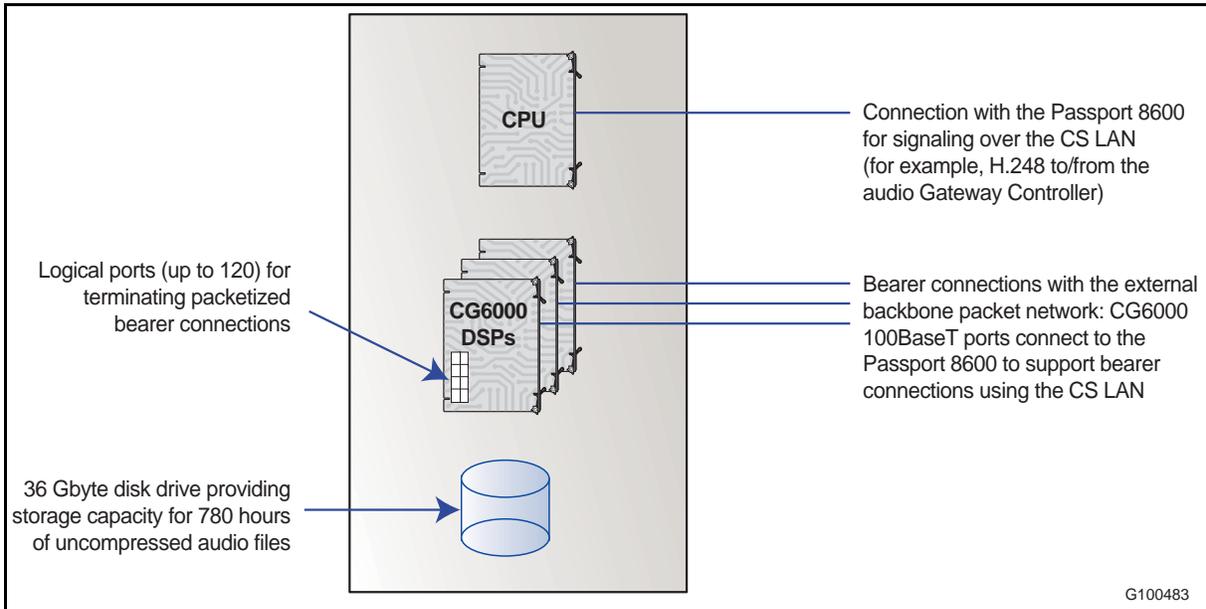


Figure 31 on page 125 illustrates a UAS configured for VoIP.

Figure 31
UAS configured for VoIP



Control protocols in VoIP network

The UAS supports the following control protocols when it is configured in a VoIP network:

- Media Gateway Control Protocol (MGCP) and H.248 protocol. The MGCP Messaging Interface function translates MGCP messages sent from the Call Agent (Communication Server 2100) to the UAS and builds MGCP messages that are sent from the UAS to the Call Agent.
- Simple Network Management Protocol (SNMP) to implement fault management, configuration management and performance management.
- Real Time Protocol/Real Time Control Protocol (RTP/RTCP) for transmission of audio on the bearer channel network.
- Network File System (NFS) protocol supports the transfer of audio files stored on the APS to the UAS.

Operating parameters

UAS has the following limitations and restrictions:

- System capacity is affected by call rate and simultaneous calls.
 - **Call rate**

The capacity of the call processor limits the call rate. As the capabilities of the call processor increases, call rates will increase.
 - **Simultaneous calls**

Simultaneous call capacity is limited by

 - the number of ports on each adapter card
 - the number of adapter cards on each shelf
- The number of UAS nodes that a Communication Server 2100 solution can support:
 - Trunk-only VoIP solution: maximum of eight UAS nodes.
 - Integrated VoIP solution including line access: maximum six UAS nodes.
- The CG6000 DSP card used for IP supports all three UAS features (announcements, conferences and monitoring). Port availability is as follows:
 - Announcements
Maximum 78 ports
 - Conferencing
Maximum 120 ports with 20 ms packetization
Maximum 90 ports with 10 ms packetization
 - Monitoring
Maximum 90 ports
- The capacity limits for a UAS in a Communication Server 2100 configuration:
 - Maximum number of simultaneous announcements per UAS: 300 (this is the maximum number of UAS resources that an audio Gateway Controller can control.)
 - Maximum BHCA per UAS: 60,000 (with a 700MHz 5370 CPU) supports 720 IP connections
 - Maximum BHCA per DSP card: 20,000 for the CG6000 card

Alarms

Use the CS 2000 Configuration Tool for UAS alarm management.

**FOR MORE INFORMATION**

Refer to the UAS and CS 2000 Configuration Tool documentation.

Logs

Use the CS 2000 Configuration tool for UAS log management.

**FOR MORE INFORMATION**

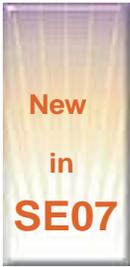
Refer to the UAS and CS 2000 Configuration Tool documentation.

References

For more information about the Universal Audio Server, refer to the latest version of the documentation listed in Table 20.

Table 20
Documentation references

Document title	Document number
<i>Universal Audio Server Basics</i>	NN10010-111
<i>Upgrading the Universal Audio Server</i>	NN10047-461
<i>Universal Audio Server Fault Management</i>	NN10073-911
<i>Universal Audio Server Performance Management</i>	NN10139-711
<i>Universal Audio Server Configuration Management</i>	NN10093-511
<i>Universal Audio Server Administration and Security</i>	NN10161-611
<i>CS2000 Management Tools Basics</i>	NN10020-111



Nortel Networks Media Server 2010

Nortel Networks Media Server 2010 (MS 2010) offers advanced IP packet audio and conferencing services in a Communication Server 2100 enterprise network. It replaces the Universal Audio Server (UAS) beginning in the SE07 software release.

The key features of the MS 2010 are listed below:

- The MS 2010 is a compact media server that provides leading-edge IP-based packet audio services for the Communication Server 2100).
- The MS 2010 supports the following audio and conferencing capabilities:
 - audio conferencing
 - recorded announcements such as branding messages, treatments and broadcast announcements. These announcements can be interruptible by Dual-tone Multifrequency (DTMF) digit entry.
 - Bearer Channel Tandeming (BCT) for monitoring
 - Flexible platform to support future revenue-enabling audio services.
- The MS 2010 uses the Audio Provisioning Server (APS). The APS provides a central database for network-wide provisioning and maintenance of announcements. The APS assures that all Media Server 2010s in the network use the same announcements. The APS is required whenever the Media Server 2010 is used as an announcement server.

[Figure 32 on page 129](#) shows a picture of the Media Server 2100.

Figure 32
Media Server 2010

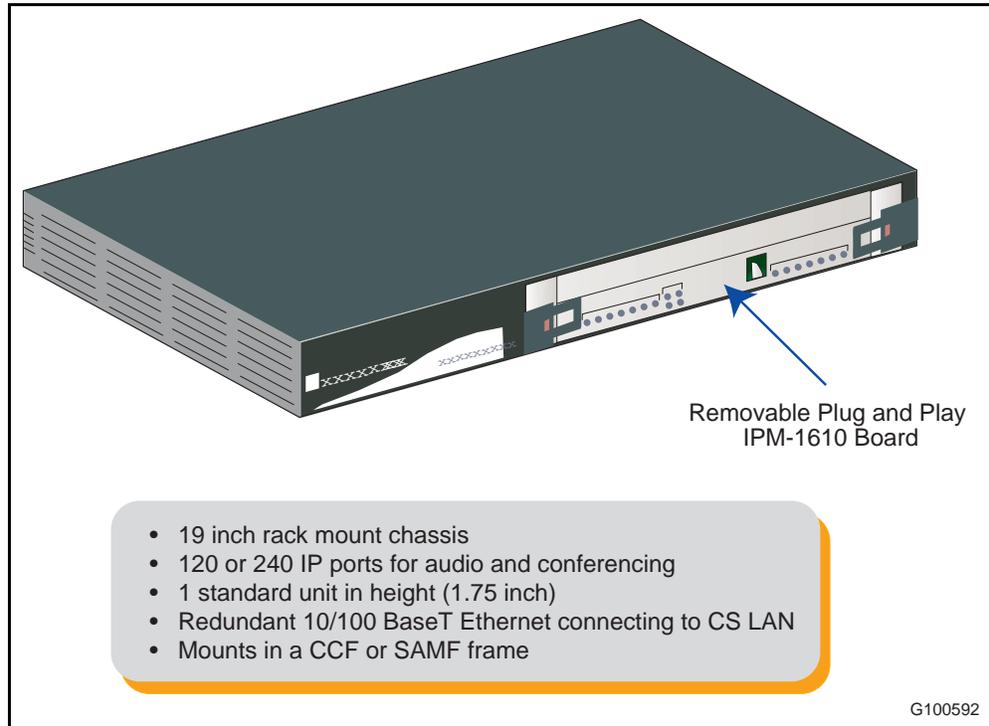


Table 21 describes the features offered by the Media Server 2010.

Table 21
Features for the Media Server 2010 (Sheet 1 of 2)

Feature	Description
Announcements	Play, Play Collect and Play Record.
Conferencing	Conferencing, Optional Deletion of Last Port, Play to Conference, Record from Conference and Monitor only Conference.
Flexible, centralized Audio Management and Provisioning	Together with the Audio Provisioning Server (APS), the Media Server 2010 provides a web-based interface for managing and provisioning audio, ensuring consistent error free audio network wide.
Bearer channel tandeming	Bearer channel of all monitored calls is tandemed through the Media Server 2010, where the content is replicated.

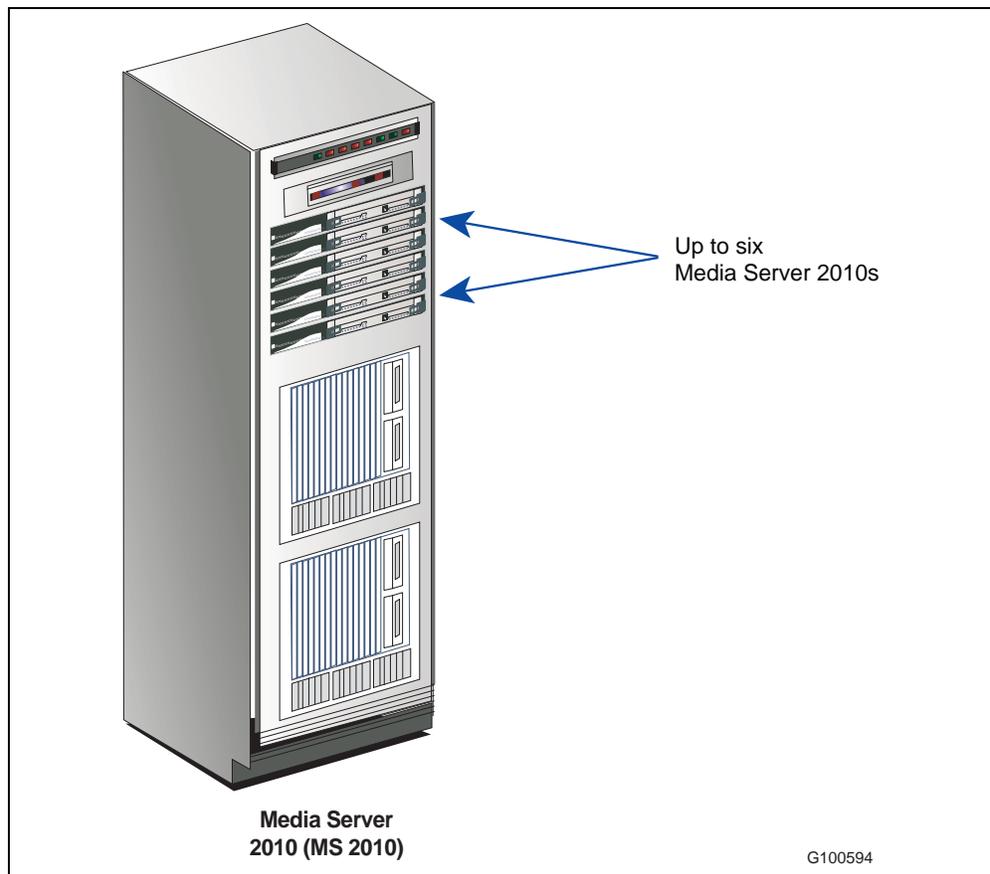
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Table 21
Features for the Media Server 2010 (Sheet 2 of 2)

Feature	Description
Multiple languages	The Media Server 2010 provides the customer options for multiple language models for global delivery and support of static audio services (numbers, time, currency, etc.).
Industry Standard Protocols and Interfaces	The MS 2010 supports industry-standard protocols and interfaces: <ul style="list-style-type: none">– H.248 is used for call signaling– SNMP v3 is supported for OAM messaging– Audio files are transferred using FTP– IP connectivity is 10/100baseT

Figure 33 illustrates Media Server 2010s in a SAMF Frame.

Figure 33
Media Server 2010s in a SAMF Frame



Hardware and software requirements for Media Server 2010

The following hardware and software are required for Media Server 2010 in a Communication Server 2100 enterprise network:

- Communication Server 2100 network configuration with SE07 Release or higher.
- The Media Server 2010 hardware and software. The MS 2010 has the following features:
 - A NEBS 3 compliant 48.3 cm (19 inch) rack mount chassis that is one standard unit (1u) high (4.4 cm or 1.75 inches).
 - Resides on the AudioCodes IPmedia 2000 cPCI rackmount chassis that mounts in a the Call Control Frame (CCF) or the SAMF frame. Either frame can contain up to six Media Server 2010s.

The IPmedia 2000 cPCI rackmount chassis contains the following components:

- one removable plug and play IPM-1610 board
- one rear transition module with an Ethernet interface
- Supports 120, or 240 IP ports for Conferencing, or Bearer Channel Tandeming (for monitoring), in addition to 240 channels of Recorded Announcements.
- Supports 80,000 Busy Hour Call Attempts (BHCAs) per unit.
- Stores up to 20 minutes of audio with real-time update capabilities. Up to 40 minutes of storage are available if updates in real-time are not required.
- Uses the Real Time Operating System (RTOS) that provides a high-performance software environment with reduced security vulnerabilities.
- Incorporates open, standards-based protocols and supports H.248 and Real Time Protocol/Real Time Control Protocol (RTP/RTCP). H.248 is used to transmit call control signals over packet networks. RTP/RTCP are used to transmit audio on the bearer network.
- Supports an industry-standard suite of compressed and uncompressed packet voice encoding including G.711 (mu-law and A-law), G.723.1 and G.729a/b. T.38 Fax is also supported.
- Provides redundant 10/100BaseT Ethernet for IP interfaces that connect to the CS LAN. Each pair of interfaces uses one IP address and operates in active/standby mode.

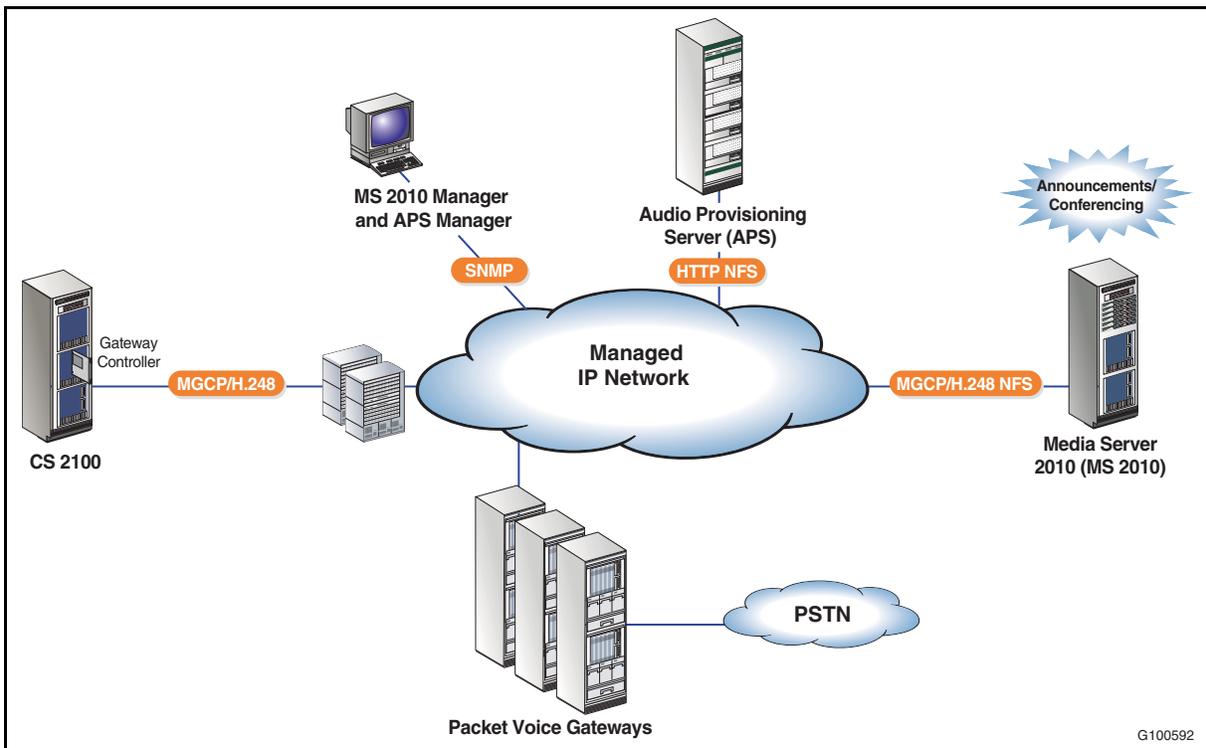
- The Audio Provisioning Server (APS) hardware and software. The APS has the following features:
 - Provides a database to store all recorded audio segments. It can store over 100 hours of audio information.
 - Uses a web-based interface to easily configure and assemble audio announcements for download to the MS 2010 Media Servers and any supported gateway.
 - Runs on a NEBS compliant Sun Netra 240 that uses the SUN Solaris operating system.
 - Lowers the cost and complexity of changing or adding announcements within a network as changes are made centrally and exported to every Media Server 2010 in the network.
 - Provides for monitoring, management of faults, and reporting and clearing of logs and alarms using SNMP.
 - Uses redundant 10/100BaseT Ethernet to connect to the CS LAN. Each pair of interfaces uses one IP address and operates in active/standby mode.

[Figure 34 on page 133](#) illustrates a typical Communication Server 2100 network configuration with Media Server 2010s. The Communication Server 2100 directs the Media Server 2010 to play audio or provide conferencing resources. The Media Server 2010 interprets the messages sent by the Communication Server 2100 and retrieves the audio or initiates the conferencing request.

Audio is added to the system through the provisioning client (APS manager) and sent to the Audio Provisioning Server (APS). The APS stores the audio in an Oracle database and forwards it to the other MS 2010 nodes in the network on start-up of a node or on a periodic basis.

The conferencing capacity of the MS 2010 is based on the total number of conferences that are occurring simultaneously. An MS 2010 supporting 120 channels can support 120 conference participants. Each conference can accommodate from three through 64 participants. Therefore, the maximum number of simultaneous conferences that can be supported is 40.

Figure 34
Media Server 2010s in a typical Communication Server 2100 configuration



Features and benefits of the Media Server 2010

The Media Server 2010 includes the following features and benefits:

- Delivers advanced audio and conferencing services in IP packet networks.
- Provides consistent announcements throughout the network using the Media Server 2010's centralized audio management tool, the Audio Provisioning Server (APS). The APS provides simultaneous, error-free audio updates to all Media Servers in the network, resulting in announcement consistency network-wide.
- Eliminates the need to support traffic between TDM and packet networks for audio services.
- Offers ease in provisioning, network-wide. The APS provides provisioning and element management for the Media Server 2010. It enables provisioning of IP connections for conference and announcement functionality on all Media Server 2010s in the network. The APS also provides for monitoring, management of faults, and reporting and clearing of logs and alarms using SNMP.

- Assures interoperability. The Media Server 2010 incorporates open, standards-based protocols, such as H.248, RTP/RTCP for provisioning in an IP network.
- Delivers a rich set of advanced audio services. The Media Server 2010 has state-of-the-art Digital Signal Processing technology. Enhanced capabilities developed for the Media Server 2010, enable customers to offer new features delivered across Communication Server 2100 networks.
- Engineered system availability is over 99.999 percent or less than five minutes of degraded availability per year.

Document references for Media Server 2010

Table 22 lists documentation references for the Media Server 2010.

Table 22
Document references for Media Server 2010

Document title	Document number
<i>MS 2000 Series Basics</i>	<i>NN10323-111</i>
<i>MS 2000 Series Fault Management</i>	<i>NN10328-911</i>
<i>MS 2000 Series Configuration Management</i>	<i>NN10340-511</i>
<i>MS 2000 Series Performance Management</i>	<i>NN10331-711</i>
<i>MS 2000 Series Administration and Security</i>	<i>NN10337-611</i>



Media proxies

Introduction

A media proxy (strictly speaking, a media transport proxy) is a Network Element that terminates and re-originates the transport layer for media traffic. It acts as an intermediary in a call between two packet network endpoints when the media stream for the call is routed through one or more Network Address Translators and NAT traversal is therefore required. The first section of this chapter describes the media proxy functionality and NAT traversal in generic terms. The second section describes the capabilities of the RTP Media Portal, which is the media proxy implementation supported by the Communication Server 2100 in SE07.

This chapter contains the following sections:

- **Network Address Translator (NAT) functionality**
- **Nortel Networks Real-time Transport Protocol Media Portal**

Network Address Translator (NAT) functionality

Introduction

A media proxy is a Network Element that acts as an intermediary in a call between two packet network endpoints when Network Address Translator (NAT) traversal is required for the call's media stream. The media proxy examines incoming packets on each of its ports to determine their origin and can thus work out the destination to which return packets in the other direction should be sent. Two media proxy ports are used in handling a typical call, each presenting an interface to one of the endpoints involved in the call. There is a connection across the media proxy between the two ports to support end-to-end communication between the two packet network endpoints.

The necessity for using a media proxy on a packet network call arises when one of the call endpoints is behind a Network Address Translator, typically because it belongs to a private network that is kept secure from the carrier's public network. The carrier's public network is actually a private network owned and operated by the carrier, but it is described as public because it can be accessed by all of the carrier's customers to support communication between them, including customers served by different private networks.

For packets that originate from a private network endpoint and traverse a carrier's public network, a NAT changes the originating IP address. Instead of the private IP address of the endpoint, which is not made visible over the public network, the originating IP address of packets routed through the NAT is the public network address of a port on the NAT. The NAT performs mapping or binding between such externally visible public network addresses and the private addresses used within the private network.

Note: If translation is applied to ports as well as to IP addresses, the device is referred to as a Network Address and Port Translator (NAPT).

NAT traversal

NAT traversal for signaling

To support NAT traversal for signaling traffic, media gateways and other hosts that are located behind a NAT must

- Initiate communication with their GWCs (a GWC cannot initiate communication with a gateway behind a NAT).
- Provide their GWCs with address information embedded in signaling packets, which the GWC can then map on to the source address in the packet header (which is that of the NAT, rather than the gateway).

- Use keep-alive messaging to ensure that communication with their GWCs is maintained when no call is in progress (the GWC will otherwise be unable to send setup messages for calls incoming to the gateway).

NAT traversal for bearer traffic

For VoIP, bearer connections across the packet network are established between RTP/RTCP endpoints (that is, ports on media gateways). During call establishment, each gateway uses device/media control signaling to inform its GWC of the bearer capabilities it can support (for example, codecs and packetization rates). It also tells the GWC the IP address and RTP port number to which bearer packets destined for it should be sent.

Bearer capability and media address information is conveyed embedded in device/media control signaling, either in Session Description Protocol (SDP) session description lines in MGCP messages or in UniStim commands. A problem arises if NAT is in use, however, because media address information embedded in signaling packets is of no use to a remote terminating endpoint that receives it; it identifies the originating endpoint by means of a private address to which the terminating endpoint has no access.

NAT traversal for media streams requires knowledge not only of what media gateways can be accessed through a network, but also of which NAT (if any) needs to be traversed to reach a given gateway. Specifically, being able to send media packets to a given gateway requires knowledge of the public NAT address that is bound to the gateway's private address. However, the public NAT address for a media stream cannot be discovered by a GWC in the same way as the public NAT address for a signaling connection, because media packets are by definition not sent by a gateway to its GWC. And RTP/RTCP provides no address discovery mechanism that can be used to set up a two-way connection between media gateways.

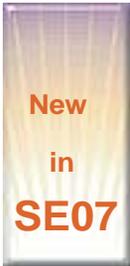
Hence the need for a media proxy as an intermediary. If a GWC knows that a given gateway is behind a NAT, it can insert a media proxy into a call as a destination for media packets from that gateway, and the media proxy can then discover the public NAT address from which those media packets are being sent. The media proxy can then receive media packets from the far-end gateway and send them to the correct public address on the NAT, which uses the previously created NAT bind to send the media to the private network endpoint behind the NAT. Two-way media streams for calls involving media gateways behind NATs can thus be set up, provided that media packets are routed using the media proxy.

To enable Communication Server 2100 GWCs to determine whether a media proxy needs to be inserted in a given call, each GWC stores the following data:

- Information about all the middleboxes in the network, including NATs.
- Information about each media proxy available to the GWC.
- Information about which middlebox(es), if any, needs to be traversed to reach each gateway or remote IP client in the network.

Using a GWC-controlled media proxy to support NAT traversal for media streams means that no changes are required to media gateway or NAT functionality. In particular, it does not require gateways to be aware of network topology and middlebox deployment. It is a scalable solution with no dependencies on factors outside the network operator's control.

The situation for determining whether a media proxy needs to be inserted in a call to support NAT traversal is similar to the situation for determining whether Connection Admission Control (CAC) should be applied. NATs and Limited Bandwidth Links (LBLs) can both be regarded as types of middlebox whose involvement in a call has an impact on call establishment at the GWC.



Nortel Networks Real-time Transport Protocol Media Portal

Overview

Nortel Networks Real-time Transport Protocol (RTP) Media Portal is a GWC-controlled media proxy. Its primary purpose is to support public address discovery for media streams that have been routed using a NAT. The media portal examines incoming packets on each of its ports to determine their origin, and can thus work out the destination to which return packets in the other direction should be sent. In an enterprise network supporting a Communication Server 2100 solution, each media proxy has two connections, one with the private VoIP network supporting the CS LAN and one with the carrier's public network. This enables it to support two specific capabilities:

- It supports communication with and between private address domains (for example, for enterprise networks hosting line media gateways and IP Client Manager clients, by enabling media streams that traverse NATs to be routed across the carrier's public network).
- It can act as a firewall to control the traversal of media streams into the private VoIP address domain used for the Communication Server 2100 CS LAN and large carrier-located gateways.

The RTP Media Portal is built on the SAM16 hardware platform and is controlled by Communication Server 2100 GWCs using the MGCP+ device/media control protocol.

The RTP Media Portal enables elements in the private network to securely communicate with elements in the public network in both directions. It acts as a Media Monitor, Media Directory, and Media Tap, and provides Network Address and Port Translation (NAPT) functions that shield private network components from external exposure through leaks in the media streams.

[Figure 35 on page 140](#) illustrates the network role of the RTP Media Portal in supporting NAT traversal between two media gateways located in private networks behind NAT devices.

Figure 35
RTP Media Portal and NAT traversal

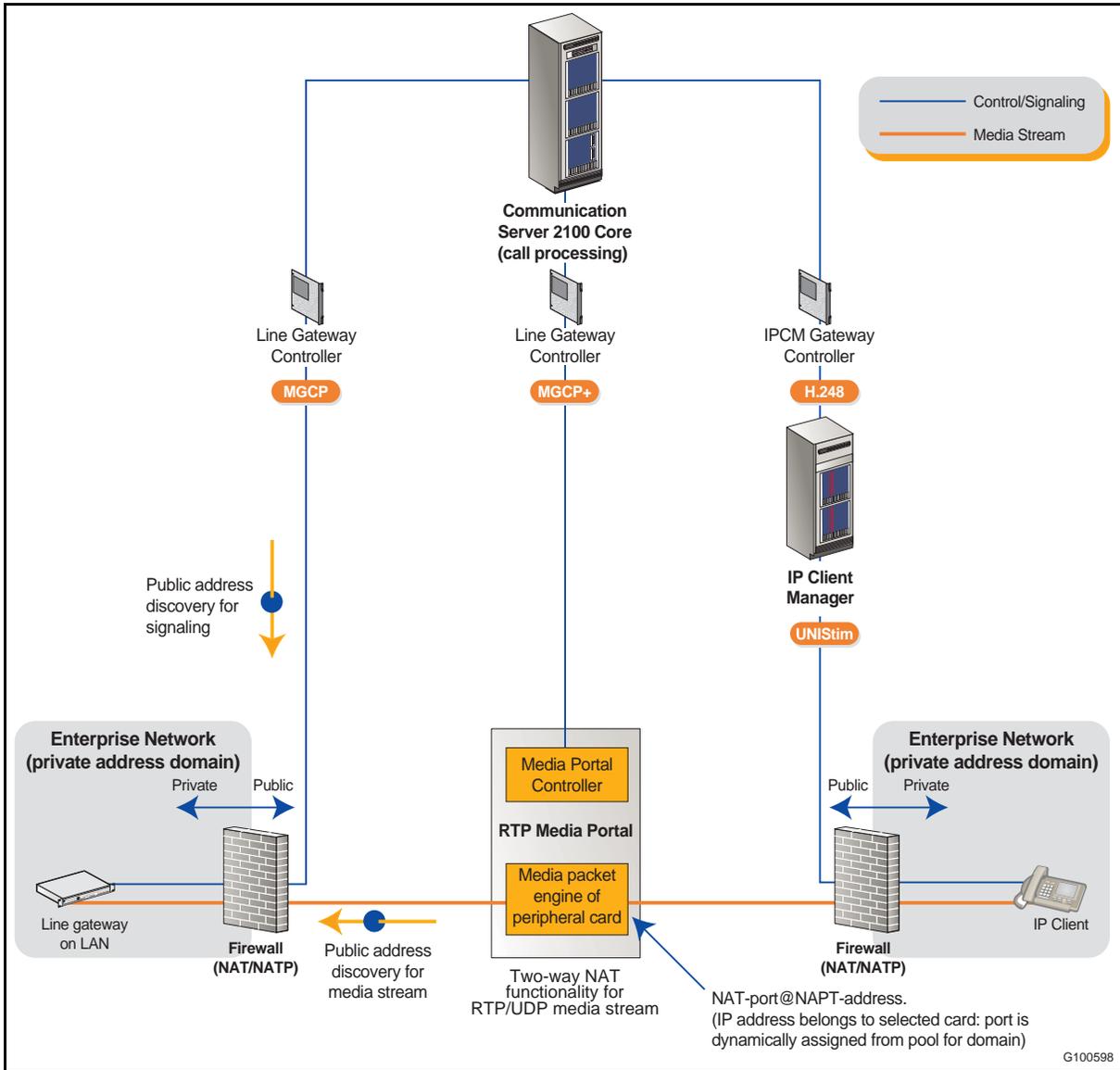
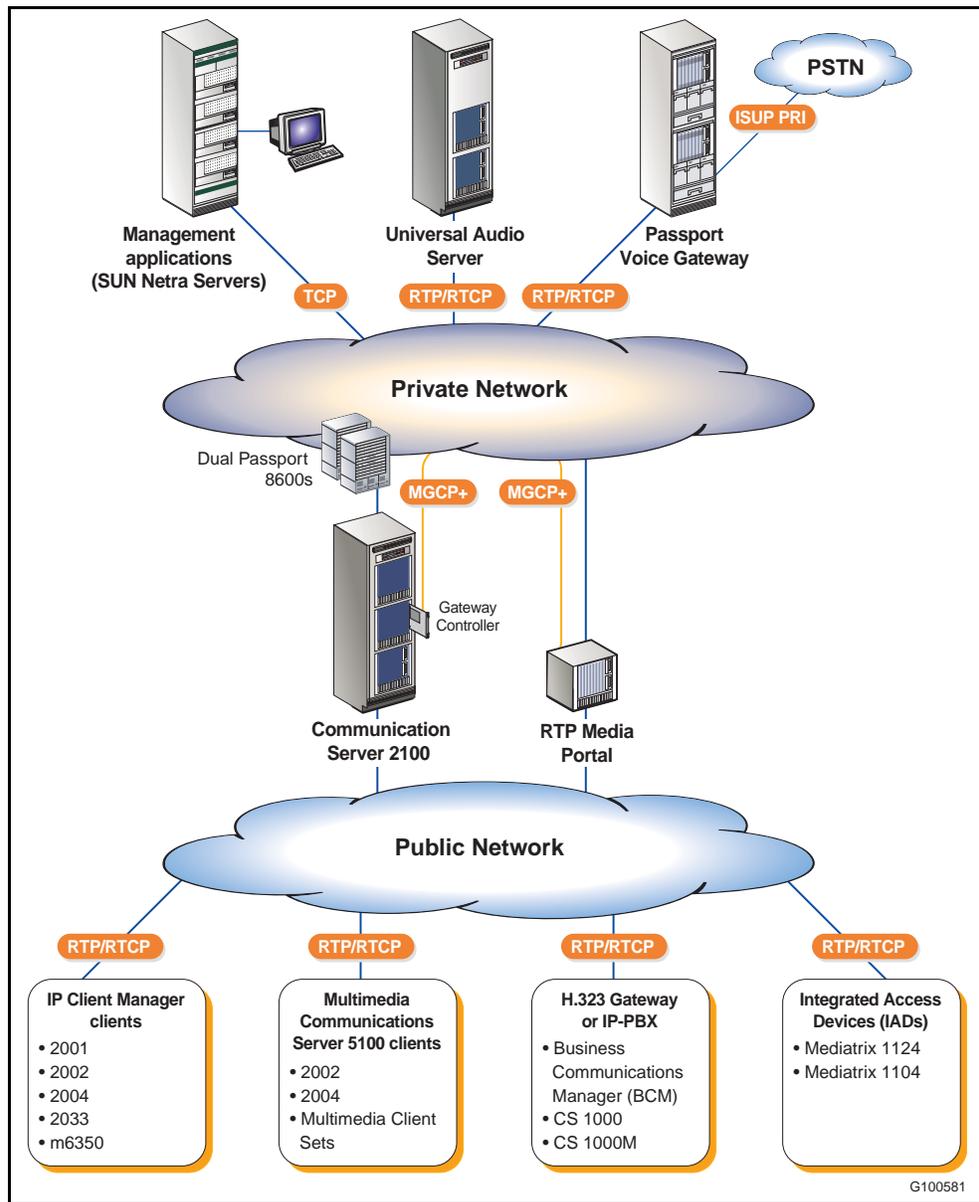


Figure 36 on page 141 shows an example of a RTP Media Portal network configuration.

Figure 36
RTP Media Portal in a Communication Server 2100 network



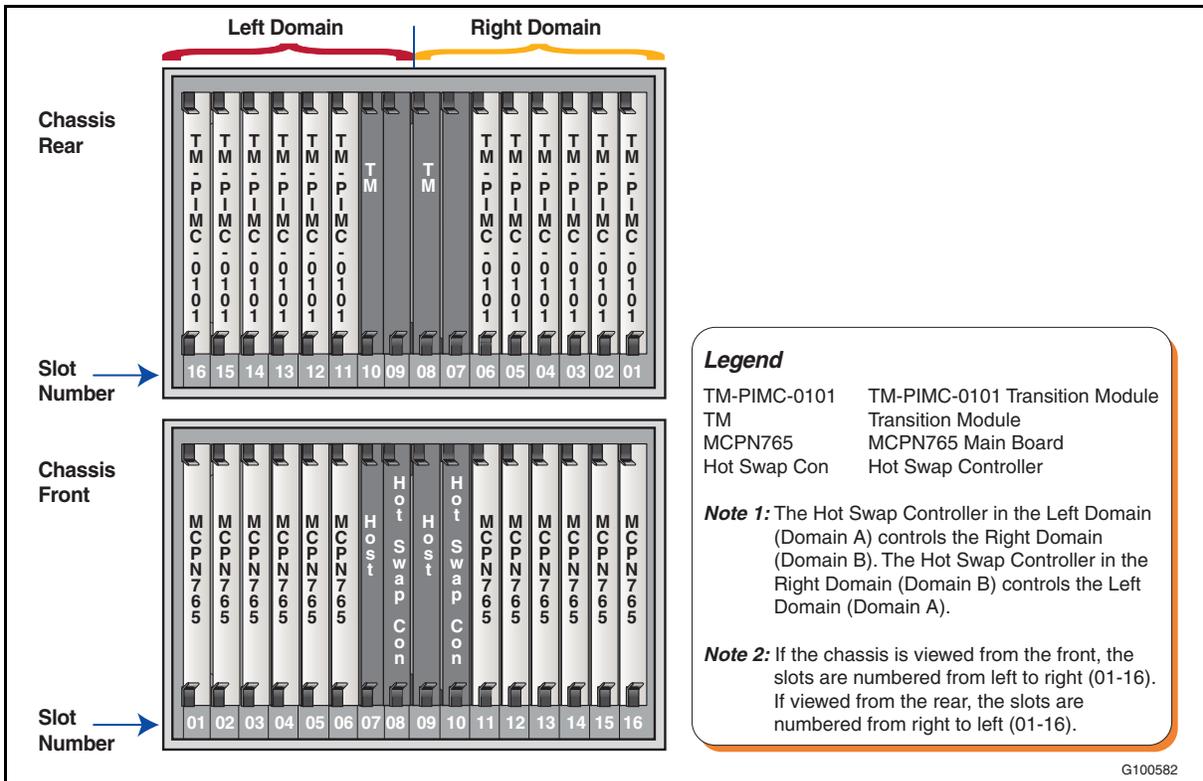
Note: In Figure 36 the public and private networks should not be confused with public and private IP addressing. In addition, the list of clients and gateways is not conclusive.

The clouds in the illustration represent two distinct networks. The “Private Network cloud” interacts with the “Public Network cloud” through the various edge components. In addition to extending service reach to obscured multimedia clients attached to the public network, the RTP Media Portal provides media-layer functionality for the RTP, RTCP and UDP transmissions that traverse between the public network and the private network.

Physical description

The RTP Media Portal resides on a Motorola CPX8216T platform which is a compact Peripheral Component Interconnect (cPCI) chassis design. The chassis provides the basic operating environment, such as power, cooling and mounting slots, required to house cPCI-based single-board computers. The CPX8216T partitions the chassis into two separate logical operating domains, dividing the chassis shelf into two half-shelves consisting of eight-slots each. A RTP Media Portal occupies a single chassis domain (side) on the CPX8216T. Therefore, a single CPX8216T can host two RTP Media Portal components (that is, one in chassis Domain A, the other in chassis Domain B). Figure 37 shows a typical card configuration used for the RTP Media Portal domains.

Figure 37
Card slots for the two different domains



The PCX8216T dual eight-slot architecture further refines the domain definition so that each chassis domain is dedicated to a host card (with an associated Transition Module in the rear), another slot is dedicated to the Motorola Hot Swap Controller (HSC) and the remaining six slots can be populated with what is commonly referred to as media blades (that is, Input/Output cards with an associated Transition Module in the rear).

Each chassis half shelf, and therefore each RTP Media Portal, consists of the following hardware components:

- A single CPV5370 Intel processor board (the host card) with: 1 GB memory, a Small Computer System Interface (SCSI) Input/Output daughterboard and rear Transition Module.
- Hot Swap Controller and Bridge (HSC) module.
- SCSI CD-ROM drive.
- SCSI hard drive.
- Floppy drive.
- One (or more) Motorola MCPN765 Power PC processor board (the media blade) with: 64 MB RAM and associated Rear Transition Module.
- Available ac or dc power options.

The following additional, non-Motorola items must be provided by the customer:

- mouse
- keyboard
- monitor

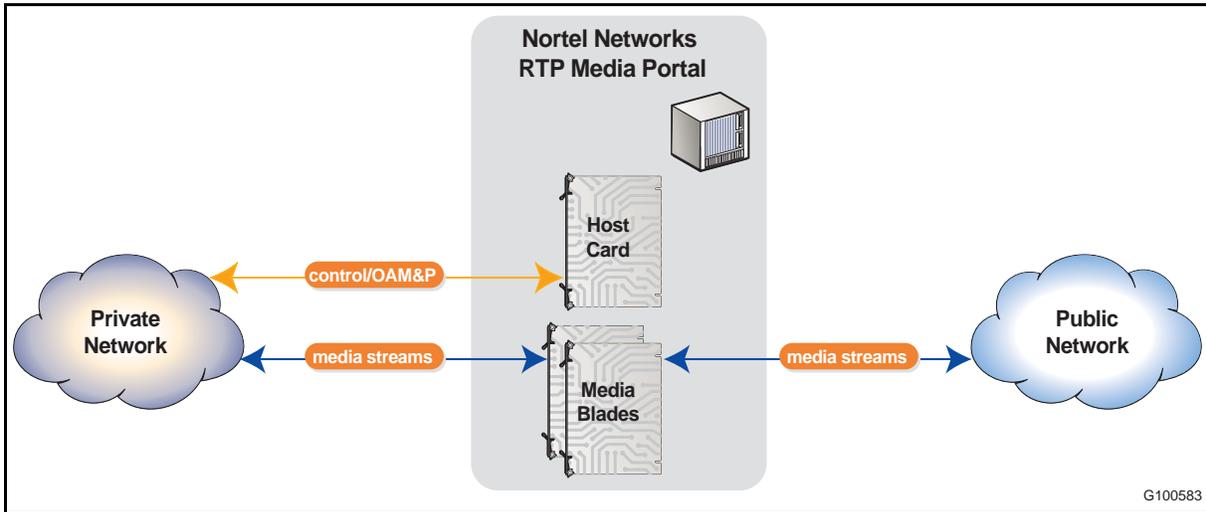
Network interfaces

The host card provides the MGCP+ control signaling and OAM&P data interface to/from the private network through the use of its Rear Transition Module. Each media blade (Input/Output card) provides a media stream interface to the private network and a media stream interface to the public network.

The RTP Media Portal host card connects to the private network. The RTP Media Portal is an edge component that is dual-homed to the public network and the enterprise's private network. It is the media blades that span these two distinct networks (see [Figure 38 on page 144](#)).

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Figure 38
RTP Media Portal interfaces



Cards

Table 23 describes the cards that are used in the RTP Media Portal.

Table 23
RTP Media Portal card summary (Sheet 1 of 2)

Card	Description
Host card	<p>The Rear Transition Module for the host card (CPV5370) provides the following:</p> <ul style="list-style-type: none"> • COM2 port for connection to a Terminal Server and local monitor. • Two Ethernet ports which provide connectivity to the private network. The connection carries control signaling and OAM&P data. Ethernet ports are used as follows: <ul style="list-style-type: none"> — The Ethernet 1 port provides an active connection. — The Ethernet 2 port provides a standby connection. The standby Ethernet function is enabled by default through the “Active IP failover” property when configuring the RTP Media Portal. <p>The Ethernet connections provide the following:</p> <ul style="list-style-type: none"> • MCGP+ control signaling to communicate with the Communication Server 2100. • OAM&P data to the Management Module over TCP.

Table 23
RTP Media Portal card summary (Sheet 2 of 2)

Card	Description
Media blades	<p>Network interfaces on each of the media blades (MCPN765) in the RTP Media Portal provide a path for media streams to/from the private network and public network.</p> <p>A media blade consists of the following Input/Output cards:</p> <ul style="list-style-type: none"> • MCPN765 Front Card • TM-PIMC-0101 Rear Transition Module <p>Note: These I/O cards must always be deployed in pairs. There is a 1:1 relationship between the Front Card and the Rear Transition Module.</p> <p>The Rear Transition Module contains two 10/100 BaseT Ethernet connections for RTP/RTCP/UDP media streams. Each media blade performs the following functions:</p> <ul style="list-style-type: none"> • Address and Port Discovery (APD) for obscured media endpoints. • Provides connectivity for RTP/RTCP/UDP media streams to pass between the private network and the public network. • Relays media packets between endpoints. • Provides an array of NAT and/or NAPT functions. <p>The NET ports are used for the following:</p> <ul style="list-style-type: none"> • NET1 port = connectivity to public network. • NET2 port = connectivity to private network.

OAM&P strategy

The central location for OAM&P management of the RTP Media Portal is the System Management Console. The System Management Console provides an overall view of the various components in the system and provides access to OAM&P functions and is used for fault and configuration management of the RTP Media Portal. RTP Media Portal management data is stored on both the Management Module and the database. The Management Module stores alarm, log, and Operational Measurement (OM) data. Configuration data is stored locally on the RTP Media Portal, as well as persistently in the database.

For more information about system management, see [“OAM&P for Communication Server 2100 networks” on page 157.](#)

References

Table 24 shows where you can find more detailed information about the RTP Media Portal.

Table 24
Documentation references

Document title	Document number
<i>Carrier Voice over IP RTP Media Portal Basics</i> that contains the following modules: <ul style="list-style-type: none">• Overview• Upgrades• Fault management• Configuration management• Accounting management• Performance management• Security and administration	NN10367-111
<i>Carrier Voice over IP System Management Console User Guide</i> – describes the centralized location for OAM&P management of the RTP Media Portal.	NN10370-111



Passport 8600 routing switches

Description

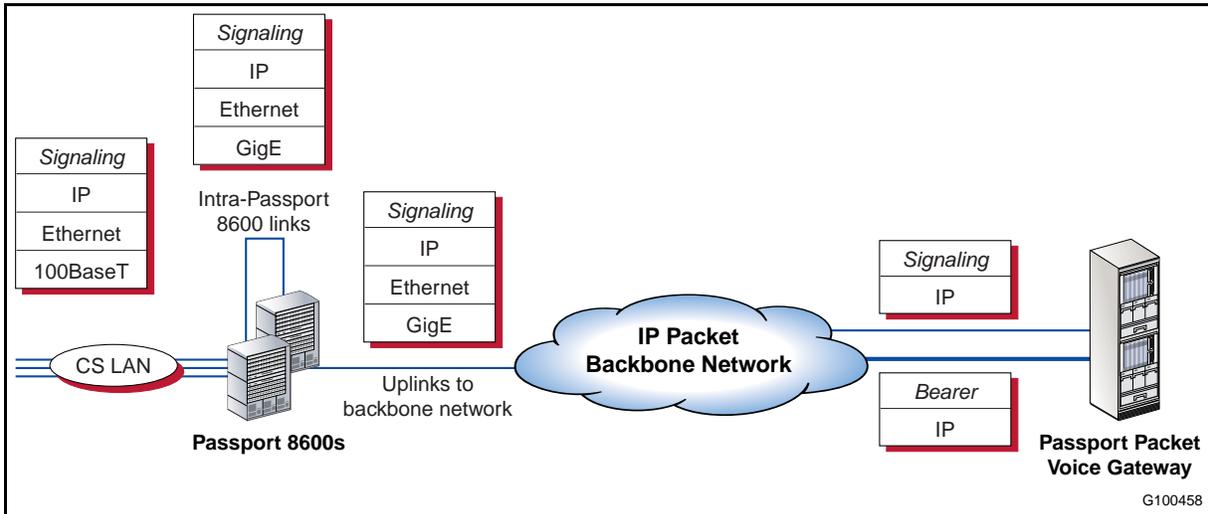
The Passport 8600 routing switches (Passport 8606 and 8610) described in this chapter are used in the SE07 Communication Server 2100 network. Although the Passport 8600 router is a product in its own right rather than a Communication Server 2100 component, the Passport 8600 is an integral part of the Communication Server 2100 Communication Server Local Area Network (CS LAN). It is therefore described in this document as if it were a Communication Server 2100 component.

The Communication Server 2100 CS LAN is an Ethernet network based on the Passport 8600 router. Physically the CS LAN has two Passport 8600s configured to use Virtual Router Redundancy Protocol (VRRP) and operating in load-sharing mode. A given Communication Server 2100 component such as a Gateway Controller is connected to both Passport 8600s, using one as its default router and the other as a backup. The dual Passport 8600 configuration routers serve as a Communication Server LAN, providing all the necessary routing and Ethernet switching functionality for communication across the LAN.

The CS LAN not only supports intra-Communication Server 2100 communication, but also provides the interface between the CS LAN and the external managed IP network (see [Figure 39 on page 148](#)).

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Figure 39
Connectivity for an IP backbone network



The Passport 8600 passes signaling and management messages between the network elements. It provides control messages between the Communication Server 2100 and gateways through the Gateway Controller and other components. It supports the following interfaces:

- Gigabit Ethernet
- Multiport 10/100BaseT

The Passport 8600 also supports a redundant configuration to connect the following components:

- Communication Server 2100
- XA-Core (through Enhanced Input/Output Processor/High-capacity Input/Output Processor) (XA-Core configurations only)
- Gateway Controller
- Universal Audio Server
- Media Server 2010
- Operations, Administration, Maintenance and Provisioning
 - Integrated Element Management System (IEMS)
 - Preside Multiservice Data Manager (PMDM)
 - SuperNode Data Manager (SDM)/Core and Billing Manager (CBM)
 - Preside Management Solutions (PMS)
- Optivity

Note: Two Passport elements are required. Deployment of the two Passport 8600 elements in separate frames is NEBS compliant, or you can select to deploy both elements in a single frame as a low-risk, non-NEBS tested alternative.

In order to provide secure access to different functions, the Passport 8600 router is used to configure the CS LAN as a number of Virtual LANs (VLANs) as shown in [Figure 40 on page 150](#). The CS LAN Passport 8600 routers support three trusted VLANs:

- Call processing (signaling) VLAN which interconnects the functional Communication Server 2100 Network Elements (NEs) such as the Communication Server 2100 Core, GWCs and the UAS/Media Server 2010 which are involved in the call processing and service provision for end users.
- OAM&P VLAN interconnects OAM&P server applications such as PMSS and Element Manager Systems (EMSs) which are the only entities which are allowed to access the NEs.
- The VLAN for media (bearer) connections.

The Passport 8600s also provide access to two types of external communication:

- Intranet connectivity such as access from separate (untrusted) LANs for OAM&P clients such as a Network Management System (NMS).
- Backbone network connectivity through the Access LAN in the form of GigE uplinks to the backbone packet network. This is used for signaling between Communication Server 2100 Gateway Controllers and their remote media gateways, and for peer-to-peer signaling between Communication Server 2100 and compatible Media Gateway Controllers. They can also convey UAS/Media Server 2010 bearer traffic if required.

The main benefit of VLANs is to isolate certain types of network traffic to nodes within the same VLAN (creating a type of Layer 2 VPN with minimal security). This is useful in preventing IP traffic from lesser trusted nodes/networks from reaching critical CS LAN elements.

[Figure 40 on page 150](#) shows an example of a CS LAN Passport VLAN configuration.

Note: For Passport versions 3.6 and earlier, the SDM resides on both the OAM&P and CallIP VLANs.

Figure 40
CS LAN Passport 8600 VLAN configuration

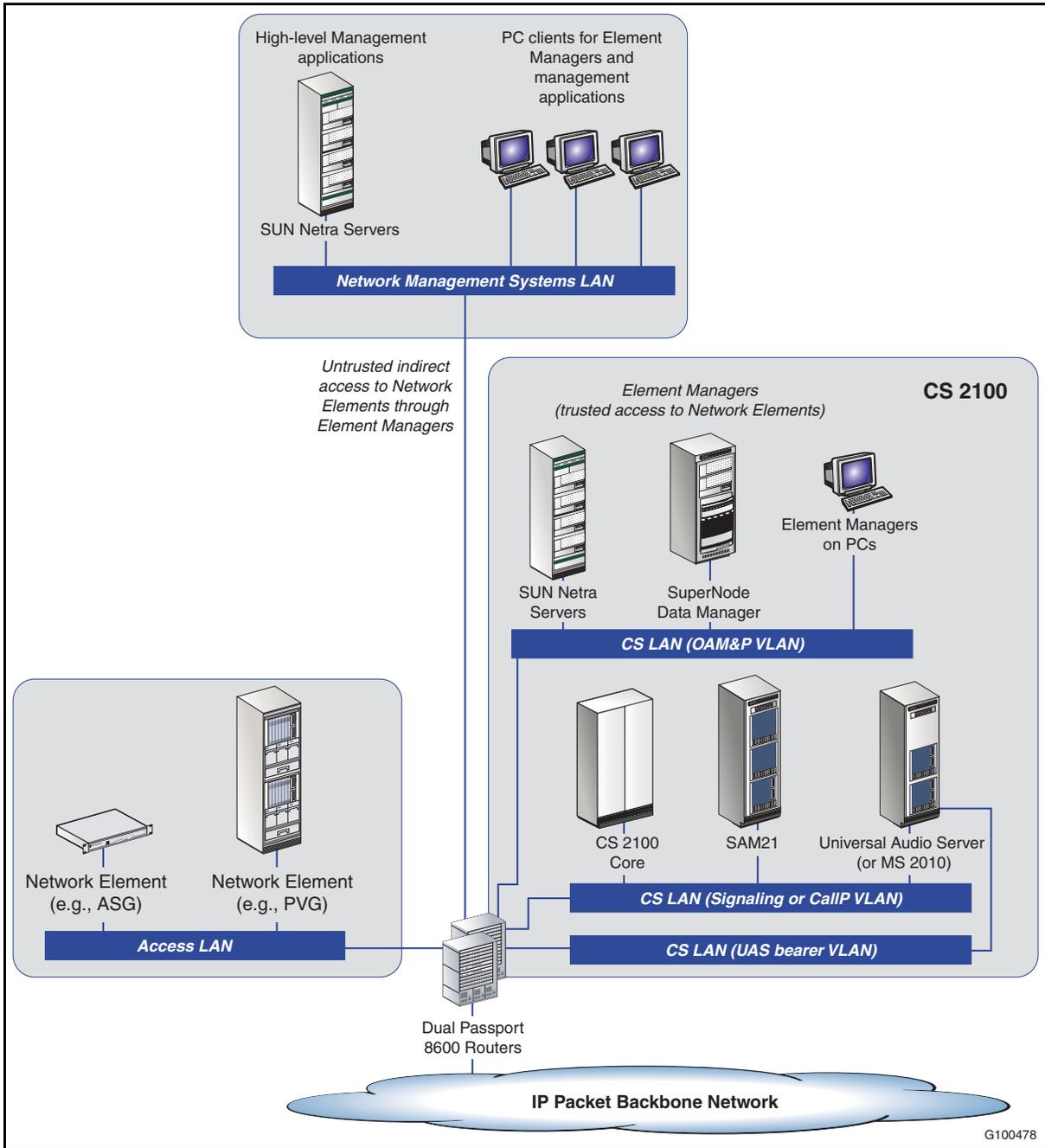
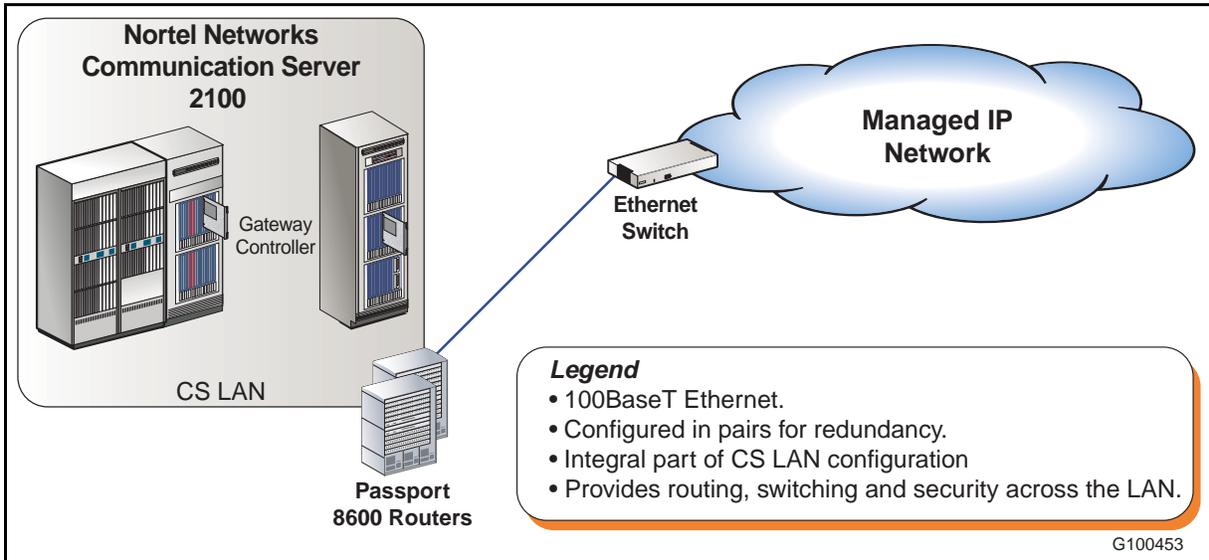


Figure 41 on page 151 shows an example of the Passport 8600 in a network configuration.

Figure 41
CS LAN Passport 8600 network configuration



IP addressing

The VLANs use private IP addresses from within the Communication Server 2100 IP address domain. It protects functional Communication Server 2100 Network Elements from all access, except access from known, secure applications.

Note: These IP addresses are sometimes referred to as public addresses. This means only that they are external to the Communication Server 2100 IP address domain to which functional Network Elements belong, not that they are public Internet addresses. In practice, the organization's OAM&P intranet is also a private network.

Each Passport 8600 requires the following IP addresses, which are allocated as follows:

- one for the management interface
- one Virtual IP address for VRRP
- one for each of configured VLANs

Filtering

The Passport 8600, along with other Passport 8000 series switches, provides filtering capabilities that allow the switch to filter out non-call related traffic to prevent that traffic from interfering with Communication Server 2100 applications. You can configure your network to prioritize specific types of traffic, ensuring that they receive the appropriate Quality of Service (QOS) level. This ensures that network resources are allocated where they are most needed.

Traffic prioritization features on the Passport 8000 series switches allow you to manage bandwidth allocation for traffic flows on the LAN at the Layer 2 level.

Traffic flows on the WAN are routed by the Passport 8600 at the Layer 3 level through a Differentiated Services (DiffServ) network architecture.

Traffic filtering is a mechanism that helps you manage traffic by defining filtering conditions and associating these conditions with specific actions. Within a DiffServe network, IP filtering allows you to assign QOS levels that can be based on a range of filtering conditions.

CS LAN connections for Communication Server 2100 components

Within a Communication Server 2100 CS LAN, communication is based on IP over 100BaseT Ethernet. Table 25 summarizes how the 100BaseT Ethernet ports provided by the dual Passport 8600 routers are used to support CS LAN connections with other components.

**Table 25
CS LAN connections supported by Passport 8600 dual routers (Sheet 1 of 3)**

Component	100BaseT terminations provided by	Connection characteristics
Communication Server 2100 Core		
XA-Core	LX04CA HIOP cards in XA-Core shelf	Redundancy provided by independent connections with both routers. Each High-capacity Input/Output Processor is connected to one Passport 8600, but not to the other. During normal operation, both High-capacity Input/Output Processors are active and operate in load-balancing mode.

Table 25
CS LAN connections supported by Passport 8600 dual routers (Sheet 2 of 3)

Component	100BaseT terminations provided by	Connection characteristics
Call Agent	Two Ethernet ports on NTRX51G2 processor cards, one in each SAM21 Call Agent shelf	Redundancy provided by independent connections with both routers. Two ports per processor card, each connected to one of the dual Passport 8600 routers.
Gateway Controllers in SAM21 chassis (connectivity identical for all Gateway Controller types)	Ethernet ports on Gateway Controller cards	Redundancy provided by independent connections with both routers. One port per Gateway Controller card, therefore two for a Gateway Controller pair. Each card is connected to one of the dual Passport 8600 routers.
SAM21 Shelf Controllers	Ethernet ports on Shelf Controller cards	Redundancy provided by independent connections with both routers. One port per Shelf Controller card, therefore two for an Shelf Controller pair. Each card is connected to one of the dual Passport 8600 routers.
SuperNode Data Manager	NTRX50NK UMFIO Personality Module (PM) cards in SDM shelf.	Redundancy provided by independent connections with both routers. SuperNode Data Manager houses two PM cards, each connected to one of the Passport 8600 routers, but not the other.
Universal Audio Server/Media Server 2010		
H.248 signaling connections	Dual Ethernet ports on Universal Audio Server processor card.	Redundancy provided by independent connections with both routers. Each port is connected to one of the Passport 8600 routers, but not the other.
Bearer connections (VoIP only)	Dual Ethernet ports on CG6000 DSP cards in the Universal Audio Server/Media Server 2010.	Redundancy provided by independent connections with both routers. Each port is connected to one of the Passport 8600 routers, but not the other.
OAM&P nodes		
CS 2000 Manager	Ethernet ports on Sun Netra 240 platform	Redundancy provided by independent connections with both routers. Each port is connected to one of the Passport 8600 routers, but not the other.

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Table 25
CS LAN connections supported by Passport 8600 dual routers (Sheet 3 of 3)

Component	100BaseT terminations provided by	Connection characteristics
Audio Provisioning System	Ethernet ports on Sun Netra 240 platform	Redundancy provided by independent connections with both routers. Each port is connected to one of the Passport 8600 routers, but not the other.
Preside Multi-service Data Manager	Ethernet ports on Sun Netra 240 platform	Redundancy provided by independent connections with both routers. Each port is connected to one of the Passport 8600 routers, but not the other.

Requirements

The Passport 8600 router on which the CS LAN is based is a modular product that offers Layer 2 switching along with wire-speed, IP-based Layer 3 switching functionality in a single 10-slot 8010 chassis. It has no single point of failure, all system components being hot-swappable and redundant, with takeover in the event of failure measured in microseconds.

Each CS LAN is based on two complementary Passport 8600 routers housed in a single cabinet, each in a separate shelf/chassis and provisioned as summarized in Table 26.

Table 26
Passport 8600 hardware (Sheet 1 of 2)

Unit	Function	Provisioning
8010co chassis	Provides 10 slots for housing Passport 8600 cards.	Center slots (5 and 6) reserved for 8691 cards. Other slots (1-4 and 7-10) available for I/O support.
8691CPU/SF	Passport 8600 Central Processing Unit (CPU) and switching fabric.	One per chassis.
8632TXE	Supports: <ul style="list-style-type: none"> 32 Ethernet 100BaseT ports two Gigabit Ethernet ports 	Two per chassis, supporting a minimum total of eight GigE ports for the CS LAN, allocated as follows: <ul style="list-style-type: none"> Four GigE ports are used for fully redundant inter-chassis communication using at least two GigE links. For IP telephony, at least two GigE ports are used for uplinks to the packet backbone network (four can be used if required).

Table 26
Passport 8600 hardware (Sheet 2 of 2)

Unit	Function	Provisioning
8608GBE	Provides eight slots for Gigabit Interface Converter (GBIC) modules.	Each GigE port requires a dedicated Gigabit Interface Converter module or connection to provide its physical and optical interface characteristics. At least one 8608 card is, therefore, required per Passport 8600.
8608SXE	Equivalent to 8608GBE, but uses fixed GBIC connections, instead of GBIC modules.	
8648TXE	Provides 48 10/100BaseT Ethernet ports (RJ-45).	Used to provide additional 100BaseT ports for CS LAN connectivity, if required.

Operating parameters

The following operating parameters apply to the Passport 8600:

- Supports DS1 using demux.
- Supports DS3.

References

Table 27 shows where you can find more detailed information about the Passport 8600.

Table 27
Documentation references (Sheet 1 of 2)

Document title	Document number
<i>Getting Started Passport 8000 Series Software Release 3.7</i>	313189-D Rev 00
<i>Managing Platform Operations and Using Diagnostic Tools Passport 8000 Series Software Release 3.7</i>	315545-C Rev 00
<i>Configuring Network Management Passport 8000 Series Software Release 3.7</i>	314723-C Rev 00
<i>Configuring QoS and IP Filtering Passport 8000 Series Software Release 3.7</i>	316433-C Rev 00
<i>Configuring IP Routing Operations Passport 8000 Series Software Release 3.7</i>	314720-D Rev 00
<i>Release Notes for the Passport 8000 Series Switch Software Release 3.7</i>	313177-A Rev 00
<i>System Messaging Platform Reference Guide Passport 8000 Series Software Release 3.7</i>	315015-C Rev 00

156 Passport 8600 routing switches

Table 27
Documentation references (Sheet 2 of 2)

Document title	Document number
<i>Important Information about the 8600 Series Switch Modules</i>	316340-A Rev 00
<i>Configuring and Managing Security Passport 8600 Software Release 3.5</i>	314724-B Rev 00
<i>Packet Trunk-IP (PT-IP) Engineering Rules</i>	SEB-02-10-001



OAM&P for Communication Server 2100 networks

This chapter describes how Element Managers and Operations, Administration, Maintenance and Provisioning (OAM&P) management applications provide OAM&P capabilities for the Communication Server 2100 and other Network Elements. OAM&P for Communication Server 2100 networks falls under the following categories:

- **Logical OAM&P architecture**
- **Physical OAM&P architecture**
- **Nortel Networks Core and Billing Manager**
- **Nortel Networks Integrated Element Management System**
- **Fault management**
- **Configuration management**
- **Accounting**
- **Performance management**
- **OAM&P security**

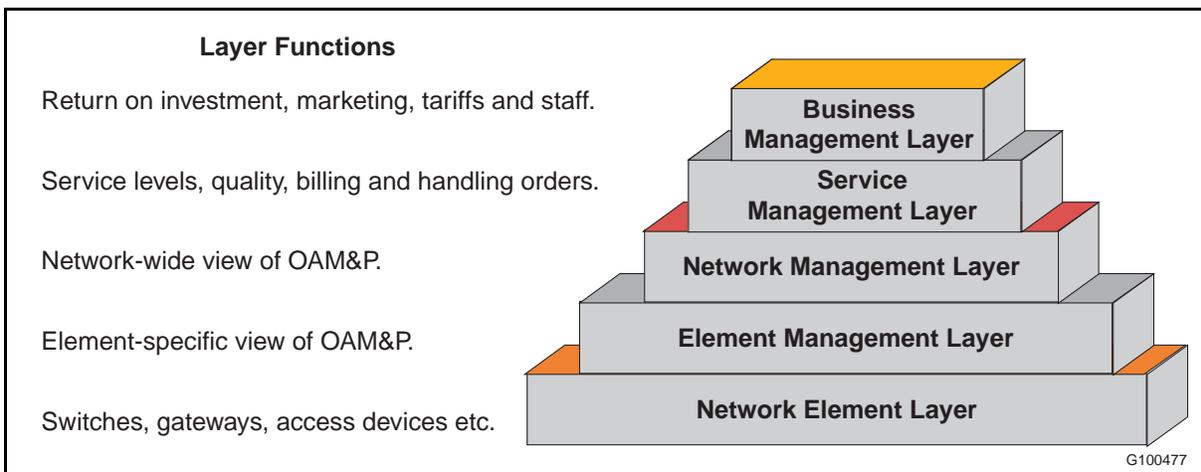
Logical OAM&P architecture

OAM&P applications can be thought of as belonging to a hierarchy (see Table 28).

**Table 28
Telecommunications Management Network hierarchy**

Layer	Description
Network Element Layer (NEL)	At the very lowest level of the Telecommunications Management Network (TMN) hierarchy are the functional Network Elements (NEs) to be managed.
Element Management Layer (EML)	Above the Network Element Layer, at the lowest management level, there is an Element Manager (EM) application for each type of Network Element or device. Each Element Manager provides management and maintenance capabilities customized for the requirements and characteristics of a specific type of device (for example, Gateway Controllers).
Network Management Layer (NML)	Above the Element Management Layer is the Network Management Layer (NML), which is concerned with the management of the network as a whole, rather than individual functional elements (for example, monitoring overall network performance).
Service Management Layer (SML) and the Business Management Layer (BML)	Above the Network Management Layer are the Service Management Layer (SML) and the Business Management Layer (BML) which build on the Network Management Layer view of the network. The Service Management Layer provides a customer interface to the network (for example, the ability to add new subscribers). At the highest level, the Business Management Layer deals with network planning (for example, monitoring network service agreements).

**Figure 42
Telecommunications Management Network hierarchy**



Nortel Networks provides Element Managers for Communication Server 2100 components and a number of Network Management Layer applications that are multi-node in scope. For other Network Management Layer functions, and for integrated network management at the Service Management Layer and the Business Management Layer levels, such integration is supported by third-party applications and third-party correlation and browsing tools.

SE07 supports the following Element Managers:

- Communication Server 2000 Core Manager
- Communication Server 2000 Gateway Controller Manager
- The Passport 8600 Device Manager
- Universal Audio Server Manager
- Audio Provisioning Server (APS) Manager for the Universal Audio Server Audio/Media Server 2010 Provisioning Server
- Element managers for each type of trunk gateway (for example, Preside Multi-service Data Manager (PMDM) for Packet Voice Gateway media gateways)
- Element managers for each type of line media gateway (for example, IPCM Manager)

SE07 supports the following OAM&P applications:

- Communication Server 2000 Core Manager applications:
 - SuperNode Billing Application (SBA)
 - Event Reporting (logs)
 - Operational Measurements (OMs)
 - Data Management
- Trunk provisioning and maintenance applications
- Line provisioning and maintenance applications
- Audio Provisioning Server applications for the Universal Audio Server/Media Server 2010
- Management Data Provider (MDP) for Preside Multi-service Data Manager

Physical OAM&P architecture

Platforms

SE07 introduces the Integrated Element Management System (IEMS) that provides an integration point for various diverse EMS platforms that comprise the Nortel Networks Communication Server 2100 management solution. OAM&P functionality for Communication Server 2100 networks is provided by a range of specialized applications running on a number of different hardware platforms that this section describes. It is important to understand the basic hardware platforms first to gain better a understanding of the Integrated Element Management System that is described in more detail in [“Nortel Networks Integrated Element Management System” on page 168](#).

- **SuperNode Data Manager (SDM)**

In SE07 the SuperNode Data Manager hardware (in previous releases the SDM is a Motorola PowerPC series FX system running AIX – the IBM version of UNIX), is now supported on the SUN Netra 240. The SuperNode Data Manager supports the following Communication Server 2100 Element Managers and management applications:

- Communication Server 2000 Core Manager, incorporating the following applications:
 - SuperNode Billing Application (SBA)
 - Event Reporting (logs)
 - Operational Measurements (OMs)
 - DMS Data Management System (DDMS)

Note: In SE07 the SuperNode Data Manager is being replaced by the Core Billing Manager. For more information, see [“Nortel Networks Core and Billing Manager” on page 166](#).

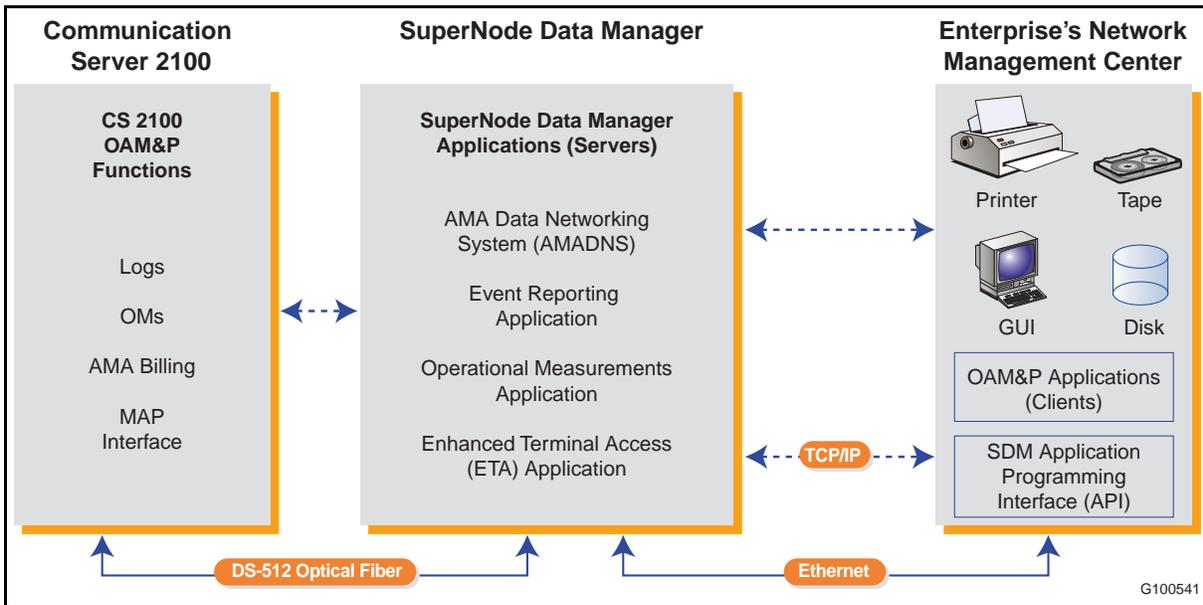
There are several SuperNode Data Manager applications, each providing support for a different OAM&P function. These applications use the client/server model, with the SuperNode Data Manager acting as the server. Application clients run on the organization's workstations, which can be centrally located.

Peer-to-peer communication between clients and SuperNode Data Manager applications is supported by means of the SuperNode Data Manager Application Programming Interface (API), which provides clients with standard mechanisms for controlling SDM operation.

The network connection between the SuperNode Data Manager applications and their clients is provided by the standard TCP/IP protocol over an Ethernet LAN or a direct Ethernet connection. Each SuperNode Data Manager communicates with a central network management site by means of a managed IP network.

Figure 43 illustrates the role of SuperNode Data Manager applications in standardizing access to Communication Server 2100 OAM&P functions.

Figure 43
The role of the SDM and its applications



- **Sun Netra 240**

A number of Sun Netra servers can be housed in a single PTE2000 cabinet. Each server can support one or more of the following Communication Server 2100 Element Managers and management applications:

- Element Managers:
 - Communication Server 2000 Gateway Controller Manager
 - Universal Audio Server/Media Server 2010 Manager
 - Communication Server 2000 SAM21 Manager
 - Audio Provisioning System Manager

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- Preside Multi-service Data Manager (PMDM) for Packet Voice Gateway media gateways
- Management applications
 - Trunk provisioning
 - Line provisioning
 - Node provisioning
 - Optional Trunk Management and Maintenance (TMM) application
 - Optional Line Management and Maintenance (LMM) application
 - Line Test Manager (LTM)
 - Network Patch Manager (NPM)
 - Audio Provisioning Server (APS) Manager for the Universal Audio Server/Media Server 2010
 - Management Data Provider (MDP) for Preside Multi-service Data Manager

Figure 44 shows a line drawing of the Sun Netra 240.

Figure 44
Sun Netra 240



- **Windows PC**

The following Element Manager runs on a dedicated Windows PC:

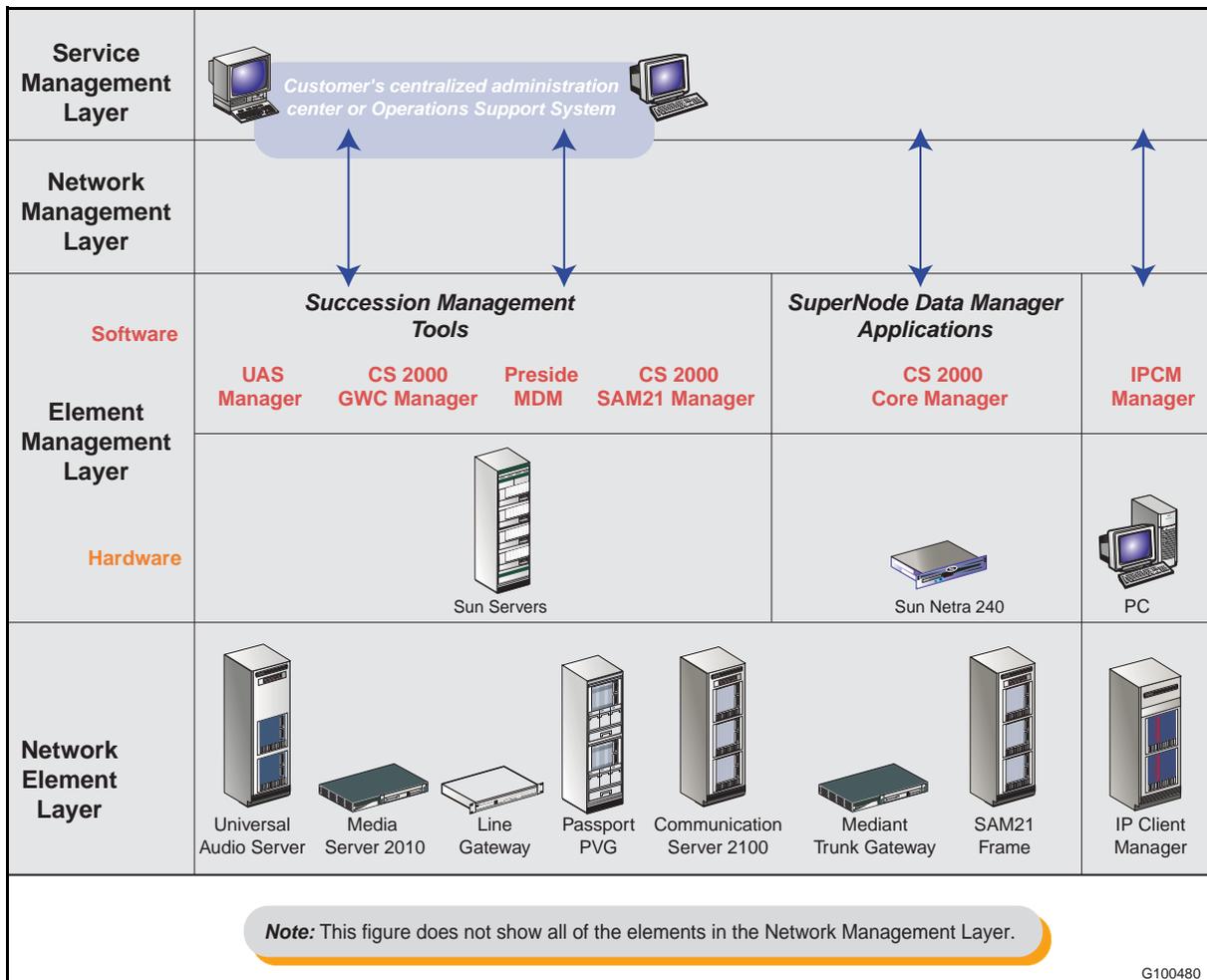
- IPCM Manager
- Passport 8600 Device Manager

The following additional components are used for OAM&P:

- Application client and Graphical User Interfaces (GUIs):
 - Sun workstations supporting X-Windows clients
 - Windows PCs supporting Information Element browser clients and application GUIs
- Secure access
 - Contivity 600, which provides secure remote access to the Communication Server 2100 for Nortel Networks support, using a high-bandwidth TCP/IP connection through the external internet for patching, emergency support and problem solving.

Figure 45 maps the physical component and software applications into the Telecommunications Management Network hierarchy.

Figure 45
Management components and software applications summary



G100480

Client workstations

Table 29 lists the platform and method of invocation for each client application.

**Table 29
Client platforms**

Name	Invocation	Platform	
		PC	SUN
SAM Clients	Desktop		P
SAM21 Manager	Desktop	P	P
Succession 2000 Management Tools Selector	Browser (HTML)	P	P
Gateway Controller Manager	Browser (JWS)	P	P
Universal Audio Server Manager/Media Server 2010	Browser (JWS)	P	P
Line Maintenance Manager	Browser (JWS)	P	P
Node Provisioning	Browser (JWS)	P	P
Network Patch Manager	Browser (HTML)	P	
Trunk Provisioning	Telnet/STELNET	P	P
Line Provisioning	Telnet/STELNET	P	P
Nodes Provisioning	Telnet/STELNET	P	P
Audio Programming System Manager	Browser	P	
STORM Manager	Browser (Proxy)	P	P
Call Agent Manager	Telnet (Proxy)	P	P
Media Device Manager/Management Data Provider	Desktop (X.11)		P
Device Manager	Desktop (Java)	P	P

References

Table 30 shows where you can find more detailed information about OAM&P.

Table 30
Documentation references

Document title	Document Number
CS 2000 Core Manager (manages the XA-Core and subtending TDM components of the Communication Server 2100 XA-Core)	
<i>CS 2000 Core Manager Basics</i>	NN10018-111
<i>CS 2000 Core Manager Fault Management</i>	NN10082-911
<i>CS 2000 Core Manager Configuration Management</i>	NN10104-511
<i>CS 2000 Core Manager Accounting Management</i>	NN10126-811
<i>CS 2000 Core Manager Performance Management</i>	NN10148-711
<i>CS 2000 Core Manager Administration and Security</i>	NN10170-611
<i>Upgrading the CS 2000 Core Manager</i>	NN10060-461
Communication Server 2100 Logs (describes logs by component)	
<i>Succession Fault Management Logs Reference</i>	NN10275-909
Backup procedures (describes backups and restorations by component)	
<i>ATM/IP Security and Administration</i>	NN10402-600
Upgrade procedures (describes upgrades by component)	
<i>IP Solutions Upgrades</i>	NN10344-450
<i>Communication Server 2100 Software Upgrades Reference Manual</i> (provides a roadmap for Communication Server software upgrades from Se6.2 to SE07 and CS 2100-specific procedures not described in the <i>IP Solutions Upgrades</i> document)	555-4031-905



Nortel Networks Core and Billing Manager

Introduced in SE07, the Core and Billing Manager (CBM) consolidates Fault, Configuration, Accounting, Performance and Security (FCAPS) for the Communication Server 2100 XA-Core and Compact on a carrier-grade platform. The Core and Billing Manager is a fault-tolerant system that provides a suite of OAM&P applications through LAN/WAN Ethernet connectivity.

SuperNode Data Manager applications have been extended to the Core Billing Manager. The application and downstream interface are the same as the SuperNode Data Manager.

Benefits

The Core and Billing Manager provides enterprises with the following benefits:

- conforms to the Integrated Element Management System consolidation plan using the latest carrier-grade Sun platform, the Netra 240
- delivers the same applications as the SuperNode Data Manager suite
- provides the ability to be expandable for different applications and call traffic volumes
- offers a smaller footprint than legacy SuperNode Data Manager systems (approximately three times smaller)
- enables many operations initiatives and applications, including Billing Stream Filtering, Secure File Transfer and Operational Measurements
- provides centralized security
- maximizes available resources and paves the way for unmanned offices by supporting a remote centralized location
- uses industry-standard operating environments and protocols (for example, UNIX, TCP/IP and Ethernet)

Functional description

The Core and Billing Manager offers the following capabilities:

- offloads OAM&P responsibilities and processing from the Core
- provides secure access to the Core from the operations intranet
- provides an end-to-end path from the switch to the operations intranet for the transfer of billing files, logs and other data
- supports electronic software delivery and patching

The Core and Billing Manager has two Ethernet connections as follows:

- An Ethernet connection to the Communication Server 2100 XA-Core High-capacity Input/Output Processor (HIOP) card or Communication Server 2100 Compact.
- An Ethernet connection to the operations intranet for communications with the Network Management System (GigE IP).

The Core and Billing Manager provides most of the functionality offered by the CS 2000 Core Manager and SuperNode Manager (SDM) products including the following applications:

- SuperNode Billing Application (SBA)
- Operational Measurement Delivery (OMD)
- Log Delivery

Hardware

The Core and Billing Manager consolidates element managers onto a pair of Sun Netra 240 Servers which results in one platform type and common spares for all OAM&P applications. The Sun Netra 240 server is a NEBS-compliant server that offers the following features:

- two Ultra SPARC IIIi processors at 1.28 Ghz
- 2 gigabytes RAM
- three PCI slots
- Digital Video Disk (DVD)-Read/Write (RW) drive (removable)
- four GigE interfaces
- Advanced Lights Out Management (ALOM) function

The Core and Billing Manager servers are part of the Cabinetized Operations Administration and Maintenance (COAM) platform housed in the PTE2000 cabinet. It can also be deployed in an existing Miscellaneous Equipment Frame (MIS) frame cabinet.

User interface

The Core and Billing Manager uses local MAP-based interfaces for Core-based OAM&P functions. Some Core and Billing Manager applications, such as the SuperNode Billing Application, have unique user interfaces.

Capacity and limitations

The SuperNode Billing Application has scalable storage capacity. It can provide up to 300,000 records per hour of sustained billing throughput (100 bytes per record).

References

Table 31 shows where you can find more detailed information about the Core and Billing Manager.

Table 31
Documentation references

Document title	Document Number
<i>Core Manager Basics</i>	NN10018-111
<i>Core Manager Security and Administration</i>	NN10170-611
<i>Core Manager Fault Management</i>	NN10082-911
<i>Core Manager Configuration Management</i>	NN10104-511
<i>Core Manager Performance Management</i>	NN10148-711
<i>Core Manager Upgrades</i>	NN10060-461
<i>Core Manager Accounting</i>	NN10126-811



Nortel Networks Integrated Element Management System

Overview

Nortel Networks is delivering the next generation “super-EMS” known as the Integrated Element Management System (IEMS). This single point of integration and management reduces the maintenance component of large enterprises long-term operating costs by eliminating the need to handle multiple northbound feeds for different Network Elements flowing into Network Management Systems. Instead the Integrated Element Management System consolidates performance, fault and security functions for the entire VoIP network which reduces cost and integration complexity. Element Manager configuration modules and the billing management module are easily accessed using the Integrated Element Management System. The strategic vision for the Integrated Element Management System includes unification of the configuration user interfaces further simplifying management of VoIP Network Elements.

The Integrated EMS improves the simplicity of VoIP network management by aggregating the Element Management function on as small a footprint as possible.

Introduced in SE07, the Integrated Element Management System Client Interface is a powerful human interface to Communication Server 2100 OAM&P components. The Integrated Element Management System presents complex enterprise management information in clear and easily understandable Graphical User Interfaces (GUIs). Acting as a central integration point, the Integrated Element Management System provides access to the following items of the management solution:

- Element Management System platforms
- Element Managers (EMs)
- Management Applications
- Network Elements (NEs)

The Integrated Element Management System provides a centralized location to view, normalize and forward faults, and a common maintenance interface launch point to access the various devices in a Communication Server 2100 network.

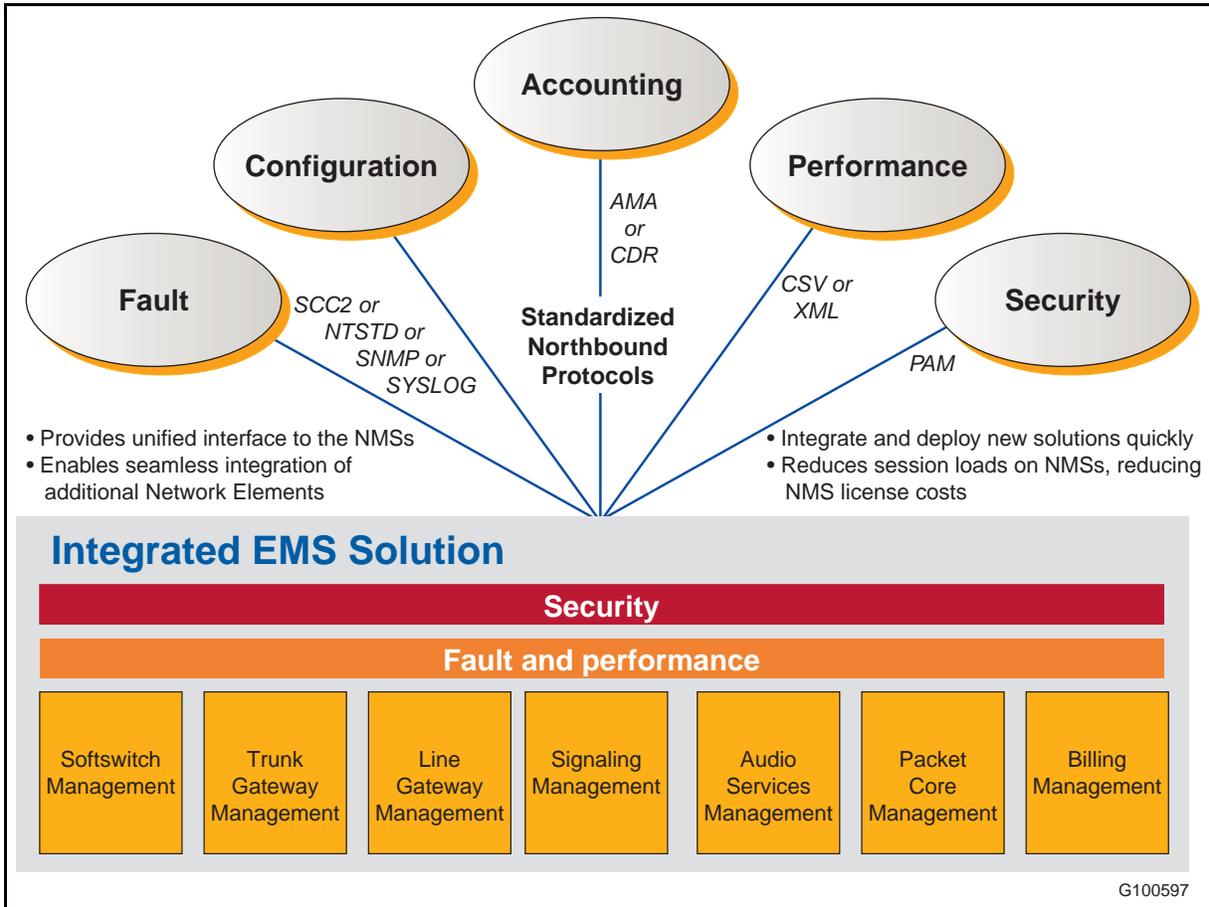
The high-level functional capabilities of the Integrated Element Management System include the following:

- An integrated managed device viewing area.
- An integrated maintenance interface launch point.
- An integrated network event viewing browser.
- An integrated network alarm viewing area.
- Alarm and event mediation from the diverse fault interfaces and standard event interfaces.
- Integrated audit and security log browsers.
- Local security and administration interfaces.

Benefits

[Figure 46 on page 170](#) summarizes the benefits that the Integrated Element Management System provides.

Figure 46
Integrated Element Management System benefits



In response to the feedback from the marketplace, requesting solutions requiring less integration and to drive more simplicity, the Integrated EMS is designed to

- Reduce Network Management System (NMS) integration complexity and resource requirement.
- Construct a framework to consolidate Element Managers and in the process reduce footprint, management complexity and provide a common user interface.
- Deliver security solution enhancements to address multiple strategies to protect data and access to Network Elements.
- Provide a means to quickly manage new Nortel Networks or third-party Network Elements.
- Manage changes in the Network Elements release over release.

The Integrated Element Management System consolidates EMS functions, including configuration and toolsets from the individual EMS modules, and in the process drives simplification.

Figure 47 shows the initial interface that appears when launching the Integrated Element Management System.

Figure 47
IEMS initial interface



Client access modes

A technician can access the Integrated Element Management System client through either the full-featured Java Web Start (JWS) interface or a lighter-weight HTML client. Depending on the circumstances, each of these access modes has its advantages. While the Java Web Start client provides greater functionality, it does impose greater resource demands on the client platform and also requires more launch time. The HTML interface is better suited for lower-speed client connections.

Java Web Start Client interface

[Table 32 on page 172](#) describes the primary functional panels available with the Java Web Start Client.

Table 32
Java Web Start Client GUI panel items

Item	Description
Menu bar	<p>The menu bar contains the labels of drop-down menus that are attached to it. A separator is a horizontal line drawn on a menu. Separators are used to separate one set of operations from another. The menu bar contains drop-down menus including File, Custom Views, Edit, View, Actions, Tools, Look And Feel, Window and Help.</p> <p>The menus appearing in the menu bar are context sensitive to the object selected in the Integrated Element Management System Java Web Start Client. The menus and menu items appear or disappear dynamically according to the object selected in the Integrated Element Management System Java Web Start Client.</p>
Toolbar	<p>The toolbar displays a collection of actions, commands or control functions. Toolbars provide quick access to frequently-used components. The default position for the toolbar is below the menu bar. The system provides a tool tip for each button, which indicates the operations performed by them. Tool buttons include Go Back to Previous, Go Forward to Next, Save, Print, Refresh, Delete, Stop and Help. The toolbar is moveable and floatable.</p> <p>Buttons appearing on the toolbar are context sensitive to the object selected in the Integrated Element Management System Java Web Start Client. They appear or disappear dynamically according to the object selected in the Integrated Element Management System Java Web Start Client.</p>
Tree	<p>The system uses a tree to display a set of the Integrated Element Management System applications with their hierarchical data relationships. The fundamental object in a tree is called a node, which represents a data item in the given hierarchical set. Thus, a tree is composed of one or more nodes. The root node is the top node of the hierarchical data.</p> <p>Nodes inside root nodes are called child nodes. Nodes that contain no child nodes are called leaf nodes. By selecting a particular node, the corresponding panel is displayed in the right-side frame.</p>
Alarm count panel	<p>The alarm panel count shows the alarm category of each severity (that is, Critical, Major, Minor, Warning and Clears) for each alarm category. The Alarm panel appears below the Integrated Element Management System tree. Double-clicking the count displayed in the alarm panel causes the alarms of the specific severity to display in the corresponding alarm panel. The system updates this panel automatically and the counts can be seen continuously, regardless of the functional view (that is, whether maps or events are selected). The tool tip and cursor shape change when the mouse pointer is pointed on alarm counts. By selecting the counts in the alarm count panel, they system displays the respective alarms in the right-side panel.</p>
Status bar	<p>The status bar appears at the bottom of the screen. It indicates the status of the current process. The status bar displays "Done" when all the contents are loaded, or displays "loading..." if the process is still active. The status bar changes from dark blue to green during the loading of the product.</p>
Display panel	<p>The display panel appears on the right-hand side as a frame within the main window. The panel shows the frame that corresponds to the selection made on the tree.</p>

HTML Web Client interface

Table 33 describes the primary functional panels available with the HTML Web Client.

Table 33
HTML Web GUI panel items

Item	Description
Module tabs	<p>Module tabs provide easy navigation of various features in a module of the Integrated Element Management System. The following items are the various modules in the Integrated Element Management System HTML Web Client:</p> <ul style="list-style-type: none"> • Topologies • Fault Management • Performance • Inventory • Admin <p>Click each tab to display the respective module view on the right-side frame of the Web Client.</p>
Module tree	<p>A tree appears on the left side of the HTML Web Client which contains various nodes. This tree differs from one module to another. Click each tree node to get the related information on the right-side frame of the HTML Web Client. For example, in the Topologies view, click the Element Managers node on the tree to display the Element Managers in the network.</p>
Module menus	<p>Menus are available as a drop-down box, links and icons. The drop-down box and links are available only in the Fault Management and Network Database views. The drop-down box contains a set of commands which are useful when you need to perform an operation over multiple elements in a view. For example, in the Inventory view, use options on clicking the icon to perform an operation, such as Delete Object and Traces over a single Network Element. In the same view, when you need to perform the same operation over more than one Network Element, select the check boxes of those Network Elements and then select the option in the drop-down menu.</p>
Alarm count panel	<p>The alarm panel count shows the alarm category of each severity (that is, Critical, Major, Minor and Information) for each alarm category. The Alarm panel appears below the Integrated Element Management System tree. Clicking the count displayed in the alarm panel causes the alarms of the specific severity to display in the corresponding alarm panel.</p>

Launching applications from the Integrated Element Management System

You can launch applications, Element Managers or commands from the topology GUI in the Integrated Element Management System depending on the object selected. This section summarizes the items that can be launched from the centralized Integrated Element Management System platform.

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Launching applications for Element Managers

Table 34 lists the Element Managers with corresponding launch applications based on the Command Line User Interface or GUI applications.

Table 34
Element Managers with corresponding application launched

For Element Manager	Device version	Application or command name	Menu item in object-specific menu or right-click menu of object in topology
Command Line through Integrated EMS Server			
Preside Multi-Service Data Manager (MDM)	6.2	Command Line	Command Line
IPCM Manager	6.2/7.0	Command Line	Launch Command Line
IPCM Manager node	6.2/7.0	Command Line	Launch Command Line
GUI applications			
Audio Provisioning Server	6.2/7.0	APS Manager	APS Manager
CS 2000 Core (manages Call Agent Core and XA Core NEs)	6.2/7.0	Core Manager Maintenance	Launch Core Mgr Maintenance
		MAPCI	Launch MAPCI Session
Gateway Controller (GWC)	6.2/7.0	GWC Manager (CS 2000 Management Tools)	GWC Mgr (CMT)
		GWC Manager Network View	GWC Mgr Network View
SAM21	6.2/7.0	SAM21 Manager	SAM21 Mgr GUI
Media Gateway 9000 (MG 9000)	6.2	MG 9000 Manager 6.2	MG9k Manager
	7.0	MG 9000 Manager 7.0	MG9K Manager
Preside MDM (manages PVG)	6.2/7.0	MDM Manager GUI	MDM Mgr GUI
Universal Audio Server/Media Server 2010	6.2/7.0	UAS Manager (CS 2000 Management Tools)	UAS Mgr (CMT)
IP Client Manager	6.2/7.0	IPCM Manager	Launch CICM Manager

Launching applications for platforms

Table 35 lists the platforms with corresponding launch applications based on the Command Line User Interface or GUI applications.

Table 35
Platforms with corresponding application launched

For Platform	Device version	Application or command name	Menu item in object-specific menu or right-click menu of object in topology
Command Line through Integrated EMS Server			
Multi-service Data Manager	6.2/7.0	Command Line	Command Line
Succession Server Platforms Foundation Software (SSPFS)	6.2/7.0	Command Line	Command Line
		Restart SSPFS	Restart SSPFS
		Restart IEMS	Restart IEMS
SSPFS unit	6.2/7.0	Command Line	Command Line
		Restart SSPFS	Restart SSPFS
SuperNode Data Manager (SDM)	6.2/7.0	Command Line	Command Line
GUI applications			
SSPFS	6.2/7.0	Servman Application Status	Servman Application Status
		Swact Cluster	Swact Cluster
SSPFS Unit	6.2/7.0	Servman Application Status	Servman Application Status
		Swact Cluster	Swact Cluster

Launching applications for EMS applications

Table 36 lists the EMS applications with corresponding launch applications based on the Command Line User Interface or GUI applications.

Table 36
EMS applications with corresponding application launched

For EMS application	Device version	Application or command name	Menu item in object-specific menu or right-click menu of object in topology
Command Line through Integrated EMS Server			
OSSGate	6.2/7.0	BPT Command Line	Launch BPT CLUI
QoS Collector Application	6.2/7.0	Command Line	Launch Command Line
GUI applications			
Line Maintenance Manager	6.2/7.0	Line Maintenance Manager	Line Maintenance Manager (LMM)
Trunk Maintenance Manager	6.2/7.0	Trunk Maintenance Manager	Trunk Maintenance Manager (TMM)
OSSGate	6.2/7.0	OSSGate	Launch OSSGate
		BPT Servlet	Launch BPT Servlet
Network Patch Manager	6.2/7.0	Network Patch Manager	Network Patch Manager (NPM)
Audio Provisioning Server	6.2/7.0	APS Manager (CS 2000 Management Tools)	APS Manager (CMT)
		APS Audio Configuration Tool	APS Audio Configuration Tool

Launching applications for Network Elements

Table 37 lists the NEs with corresponding launch applications based on the Command Line User Interface or GUI applications.

Table 37
NES with corresponding application launched (Sheet 1 of 2)

For NE	Device version	Application or command name	Menu item in object-specific menu or right-click menu of object in topology
Command Line through Integrated EMS Server			
Passport 8600	6.2/7.0	Command Line	Command Line
STORM	6.2/7.0	Command Line	Launch Command Line
Media Server 2010	6.2/7.0	Command Line	Command Line
Call Agent Core managed by Core Manager	6.2/7.0	Command Line	Call Agent Platform Command Line
Call Agent Platform managed by Core Manager	6.2/7.0	Command Line	Call Agent Platform Command Line
GWC NE managed by GWC Manager	6.2/7.0	Command Line	Launch Command Line
UAS	6.2/7.0	Command Line	Command Line
Session Server	6.2/7.0	Command Line	Command Line
Session Server unit	7.0	Command Line	Command Line
IPCM NE	6.2/7.0	Command Line	Launch Command Line
IPCM NE node	6.2/7.0	Command Line	Launch Command Line
GUI applications			
Passport 8600	6.2	Passport 8600 Device Manager	Passport 8600 Device Manager
STORM	6.2/7.0	STORM Manager	STORM Manager
Call Agent Core managed by Core Manager	6.2/7.0	MAPCI Session	Launch MAPCI Session
Call Agent Platform managed by Core Manager	6.2/7.0	MAPCI Session	Launch MAPCI Session

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**Table 37
NES with corresponding application launched (Sheet 2 of 2)**

For NE	Device version	Application or command name	Menu item in object-specific menu or right-click menu of object in topology
Audio Provisioning Server NE managed APS application	6.2/7.0	APS Manager (CS Management Tools) APS Audio Configuration Tool	APS Mgr (CMT) APS Audio Configuration Tool
GWC NE managed by GWC Manager	6.2/7.0	GWC Unit Manager Line Maintenance Manager Trunk Maintenance Manager Network Patch Manager CS Tools	GWC Unit Mgr Launch LMM Launch TMM Launch NPM Launch CS2K Tools
XA-Core managed by CS 2000 Core Manager	6.2 7.0	MAPCI Session MAPCI Session	Launch MAPCI Session Launch MAPCI Session
Session Server NE	6.2/7.0	Session Server	Launch Session Server
Session Server Unit	7.0	Session Server	Launch Session Server
IPCM NE managed	6.2/7.0	IPCM Manager	Launch CICM Manager
IPCM NE node managed IPCM Manager	6.2/7.0	IPCM Manager	Launch CICM Manager
SAM21 NE managed by SAM21 Manager	6.2/7.0	SCU Subnet SCU Manager	Launch SCU Subnet Launch SCU Manager

References

Table 38 shows where you can find more detailed information about the Integrated Element Management System.

Table 38
Documentation references

Document title	Document Number
<i>Integrated EMS Basics</i>	NN10329-111
<i>Integrated EMS Security and Administration</i>	NN10336-611
<i>Integrated EMS Fault Management</i>	NN10334-911
<i>Integrated EMS Configuration Management</i>	NN10330-511
<i>Integrated EMS Performance Management</i>	NN10327-711
<i>Meridian SL-100 Service Order Reference Manual</i>	555-4031-808, 297-8021-808P1 and 297-8021-808P1 (DMS versions)
<i>OSSGate User Guide</i>	NE10004512
<i>CS 2000 Management Tools Administration and Security</i>	NN10172-611

Fault management

There are three aspects to Communication Server 2100 support for fault management as follows:

- Fault reporting using logs:
 - Supported for the Communication Server 2100 Core and SAM21 card cages. Logs are generated in Nortel Networks standard format by the Core and then converted into Switching Control Center 2 (SCC2) format. Switching Control Center 2 is a Bellcore standard for integrating logs generated by different vendor's equipment in a multi-vendor network.
 - Supported by the Preside Multi-service Data Manager (PMDM) used to manage Packet Voice Gateways. The system maps alarm and status reports provided by Preside Multi-service Data Manager onto logs and converts them into Switching Control Center 2 format through the SuperNode Data Manager Log Generation (SLG) Application Programming Interface (API).

If your organization's network uses more than one Communication Server 2100 softswitch, the system optionally sends logs to a Network Management System (NMS).

- Other fault reporting mechanisms

Network Elements that do not generate logs need to provide notification of alarm and status changes.

[Table 39 on page 181](#) summarizes the mechanisms used.

Table 39
Additional reporting mechanisms

Network element	Reporting mechanism		Notes
	From element to Element Manager	To present information to Network Management Layer	
Gateway Controller	SNMP	Common Object Request Broker Architecture (CORBA)	In addition to reporting Gateway Controller faults, Gateway Controllers controlling Packet Voice Gateways provide gateway state reports.
Passport 8600	SNMP	SNMP	
Universal Audio Server/Media Server 2010	SNMP	CORBA	Typically, the Universal Audio Server runs on the same server as the Audio Provisioning Server and the Gateway Controller Element Manager, and information is presented to the Network Management Layer on behalf of all three in a single merged stream of CORBA changes.
Packet Voice Gateway	Packet Voice Gateways use American Standard Code for Information Exchange (ASCII) over TCP to provide the Preside Multi-service Data Manager with the information used to create logs.	CORBA	Packet Voice Gateway state changes are also reported through their Gateway Controllers.

- Fault isolation and correction:
 - Fault isolation and correction is carried out through the Element Manager for the Network Element in question (for example, the Core Manager or the Gateway Controller Element Manager).
 - In addition, the Communication Server 2100 supports the following two optional management applications for trunk and line maintenance through the Core:
 - Trunk Management and Maintenance
 - Line Management and Maintenance

Configuration management

Hardware commissioning

The following items relate to hardware provisioning:

- Commissioning of hardware units for installation is achieved through the local interface and Element Manager for the unit. This applies to the following:
 - Communication Server 2100 Core
 - Gateway Controllers
 - SAM21 card cages
 - IP Client Manager
 - Media Gateway 9000
 - Passport 8600s
 - Universal Audio Server/SAM16
 - Media Server 2010
 - Packet Voice Gateways
- Communication Server 2100 Core configuration through the Communication Server 2000 Manager using ASCII over TCP.
- Gateway Controller configuration through the Gateway Controller Element Manager using SNMP.
- Passport 8600 configuration through the Passport 8600 Device Manager using SNMP.
- Universal Audio Server/Media Server 2010:
 - SAM16 configuration through the Universal Audio Server Command Line Interface (CLI) using SNMP
 - Universal Audio Server/Media Server 2010 audio service configuration through the Audio Provisioning Server using SNMP
 - Automatic discovery of Universal Audio Server/Media Server 2010 hardware to the Universal Audio Server Element Manager
- Packet Voice Gateway configuration and provisioning through the Preside Multi-service Data Manager GUI using ASCII over a TCP interface.
- Primary Trivial File Transfer Protocol (TFTP) server configured on the CS LAN to support load retrieval for Gateway Controllers and SAM21 Shelf Controllers.

Trunk provisioning

Trunk provisioning requires you to update data stored by some or all of the following components:

- Communication Server 2100 Core
- Gateway Controllers
- Trunk media gateways

The following two applications provide help to ensure that these separate updates are co-ordinated:

- Trunk provisioning application
- Node provisioning application

These applications run on a provisioning server. The server hosts a database that provides an integrated view of the network as a whole, combining the separate views of different network nodes. It can also host the optional Trunk Maintenance Manager (TMM) application, which provides maintenance capabilities.

The trunk provisioning and node provisioning applications both provide Extensible Markup Language (XML) input to generate the following types of information:

- ASCII over TCP, which is provided to the Communication Server 2000 Manager on the SuperNode Data Manager and is used by it to update Communication Server 2100 Core datafill.
- CORBA data, which is provided to the Gateway Controller Element Manager and is used by it to update Gateway Controller data.

Line provisioning

Line provisioning requires you to make updates to the data stored by some or all of the following components:

- Communication Server 2100 Core
- Gateway Controllers
- Line media gateways

The following two applications provide help to ensure that these separate updates are co-ordinated:

- Line provisioning applications
- Node provisioning application (also used in trunk provisioning)

These applications run on a provisioning server. This server also hosts a database that provides an integrated view of the network as a whole, combining separate views of different nodes. It can also host the optional Line Maintenance Manager (LMM) application.

The line provisioning and node provisioning applications support different interfaces for handling provisioning data as follows:

- The line provisioning application supports Nortel Network's proprietary Service Order (SERVORD) interface.
- The nodes provisioning application supports an XML interface.

Each application uses line provisioning input to generate the following two types of output:

- ASCII over TCP, which is provided to the Communication Server 2000 Manager on the SuperNode Data Manager and is used by it to update the Communication Server 2100 datafill.
- CORBA data, which is provided to the Gateway Controller Element Manager and is used by it to update the Gateway Controller data.

Application Programming Interface (API) in IEMS

The Integrated Element Management System provides an Application Programming Interface that uses Enhanced SERVORD (SERVORD+) commands. These new commands apply to components in a Communication Server 2100 network (for example, gateways). With SERVORD+ commands, the media gateway name (MGName) and Termination Point (TPName) generally replace the LEN for Communication Server 2100 lines. LEN continues to be used in SERVORD commands for TDM lines.

The SERVORD+ commands are "NEW", "EST", "ADD", "DEL", "OUT", "CDN", and "CHDN" as follows:

- "NEW", "EST" and "ADD" – add the termination point, Directory Number and indicated Line Class Code
- "DEL" and "OUT" – delete the termination point
- "CDN" and "CHDN" – change the Directory Number

Accounting

The Communication Server 2100 supports billing by automatically generating call records to capture information such as call start time, call duration and calling party number. These records are periodically downloaded to a centralized administrative center for processing. They provide the organization with all the information necessary to bill individual subscribers, or departments, for calls made.

The system supports the following call recording formats:

- Automatic Message Accounting (AMA)
- Station Message Detail Recording (SMDR)

Automatic Message Accounting

The Communication Server 2100 uses a flexible variant of Extended Bellcore Automatic Message Accounting Format (EBAF) AMA records for AMA billing. This variant, Universal AMA, uses a subset of the standard EBAF structures, modified to support open numbering plans. The Communication Server 2100 creates Automatic Message Accounting records, which the system then downloads and processes externally to produce subscriber bills.

Dates and times in Automatic Message Accounting records are based on the Communication Server 2100 Core Time-of-Day (TOD) clock.

Bellcore Automatic Message Accounting record types and generation

An Automatic Message Accounting billing record consists of a fixed-length base record, to which the system can append a number of variable length modules to record additional information about a call.

The main types of record that Bellcore Automatic Message Accounting typically generates are as follows:

- ***Records generated as a result of call handling***

Generation of these records is triggered in the course of translating and routing a call. This type of record must provide the following information in order to allow the charges incurred for a call to be calculated:

- Originating subscriber name
- Terminating number of digits
- Time and date of origination
- Duration (conversation time) of call

- **Records generated as a result of administrative activity**

The system typically produces these types of records to inform the downstream processor of events and measurements occurring on the Communication Server 2100 at the time the recording is taking place. The following events typically result in Automatic Message Accounting record generation:

- Closing an active recording file
- Opening a new active recording file

Automatic Message Accounting base record supported structures

The Communication Server 2100 supports the generation of five different Automatic Message Accounting record types for logging call events. The system distinguishes these record types by the following factors:

- The maximum number of called party digits that can be stored, which can be 18 or 30 digits.
- Whether the record includes an additional field that indicates which of the following type of call completion was encountered:
 - Normal answer
 - Call abandoned (tear down during ringing)
 - Busy treatment
 - Any other treatment
 - Abnormal or unknown completion (any other reason)
- Whether the record includes carrier selection information.

Modules appended to provide further information

In some cases, billing requires more information about a call type than can be provided by the base structure. In this event, the system can append modules or data to the base record. Automatic Message Accounting identifies each module by a unique Module Code, with a Module Code of 000 terminating the Module Code list appended onto the record.

Automatic Message Accounting records for long calls

Long calls result in the generation of more than one Automatic Message Accounting record.

The long call audit process runs at regular intervals to check whether there are long calls in progress. The audit interval typically corresponds to the long call threshold value. The audit process also generates a partial billing record for each active long call.

Note: It is important to distinguish between long calls, in which both agents are still active, and hung calls, in which one of the trunk agents involved has remained connected after call clearing, because of some technical problem. The CCBHNG maintenance tool runs at predefined intervals to check for hung calls and to provide notification of them so that the appropriate action can be taken.

Station Message Detail Recording

In a Virtual Private Network (VPN), customers may wish to collect additional information about calls, as well as the information required for billing (for example, to build up a profile of calls made and received per customer group). The Station Message Detail Recording system can record details of billable and non-billable calls for each call leg. The Station Message Detail Recording system uses the Automatic Message Accounting subsystem to collect the call data and record it on a data storage device for subsequent downloading.

Note: The system uses Station Message Detail Recording primarily to collect information about individual subscriber feature usage, but it can also be used to collect information at the customer group level.

File transfer to billing records

The Automatic Message Accounting subsystem of the Communication Server 2100 Core generates Automatic Message Accounting records during the course of call processing. The system immediately transfers the records to the Core Manager SuperNode Billing Application (SBA) on the SuperNode Data Manager to be stored, which means that it is not necessary for this to be done on the Communication Server 2100.

Note: Although billing information is usually routed directly to the SuperNode Data Manager, you must configure backup volumes on the Communication Server 2100 to hold this information in the event of a problem with the Communication Server 2100 to SuperNode Data Manager link.

Core Manager SuperNode Billing Application support for billing

All Automatic Message Accounting records that the Communication Server 2100 Core generates are immediately transferred to the Core Manager's SuperNode Billing Application for formatting and storage. This means that it is not necessary for these tasks to be performed on the Communication Server 2100. The system can use either of the following two formats for storing Automatic Message Accounting records and files on the SuperNode Data Manager:

- SuperNode Data Manager Automatic Message Accounting Data Networking System (AMADNS) format.
- Device Independent Recording Package (DIRP) format, as previously used in legacy Meridian SL-100 switches for the local storage of Automatic Message Accounting records.

Performance management

Each network node collects performance data in the form of Operational Measurements (OMs) or Performance Measurements (PMs). The system provides these Operational Measurements and Performance Measurements to an enterprise's administrative center, or Network Management System, through Element Managers or some other intermediary.

Operational Measurements are standard measurements originally defined by Bellcore for the collection of performance data in circuit-based telephony networks, many of which are also applicable to packet networks supporting IP telephony. Performance Measurements are used to collect data for packet networks nodes and the set of Performance Measurements collected for a given node tends to be node-specific. The Communication Server 2100 uses Operational Measurements and Performance Measurements as follows:

- The system supports performance monitoring through Operational Measurements for all of the Communication Server 2100 Network Elements. It can be complemented by the use of selected Automatic Message Accounting records to monitor performance.
 - The Communication Server 2100 Core collects Operational Measurements and provides them to the Communication Server 2000 Core Manager running on the SuperNode Data Manager using ASCII over TCP. The Core Manager provides Operational Measurements to the Network Management Layer in the following two formats:
 - Standard subsets of Operational Measurements are sent at predefined intervals using the standard Bellcore-defined TR740 and TR746 interfaces.
 - Operational Measurements are assembled into files in Comma-Separated Value (CSV) format and are transferred using FTP.
 - Billing records to be used in performance monitoring are presented to the Network Management Layer using ASCII over TCP.

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- Performance monitoring using Performance Measurements

Table 40 summarizes the way in which the Communication Server 2100 Network Elements, other than the Communication Server 2100, collect Performance Measurements for presentation to the Network Management Layer.

Table 40
Performance Measurement presentation to the Network Management Layer

Network element	Reporting mechanism		
	From element to intermediary	Intermediary	To present information to Network Management Layer
Gateway Controller	SNMP	Performance Measurement Poller running on same server as Gateway Controller Element Manager, Universal Audio Server Element Manager and Audio Provisioning Server	Aggregated Performance Measurements in CSV format using FTP
SAM21	SNMP		
Universal Audio Server/Media Server 2010	SNMP		
Passport 8600	SNMP	Passport 8600 Device Manager	Performance Measurements in CSV format using FTP
Packet Voice gateway	SNMP	Poller task (for example, on an Element Manager)	CORBA

In SE07, Nortel Networks does not offer standard applications for integrated handling of performance reporting and management for a Communication Server 2100 at the Network Management Layer. Instead, such integration is supported by third-party fault collectors and third-party tools for reporting, analysis and management.

OAM&P security

This section describes the security mechanisms used for the OAM&P applications. For more information about security for the entire Communication Server 2100 network, see [“Communication Server 2100 network security” on page 195](#).

Introduction

General OAM&P security requirements

The following are some of the basic requirements for OAM&P security:

- Operation System hardening
- No IP forwarding/IP routing
- No root accounts
- Login security with password changes
- Client is firewall compatible
- Northbound traffic is not anonymous FTP and uses Secure Shell (SSH)

Mechanisms

This section describes the security mechanisms that are used to protect the OAM&P applications. Security in OAM&P covers a wide range of requirements, interfaces and platforms as follows:

- Interfaces
 - Identification/access control level (authentication)
 - Authorization/access control level (authorization)
 - Data integrity
 - Data confidentiality (privacy)
 - Auditing
 - Security administration
 - Monitoring
 - Visibility
- Environment
 - LAN partitioning (VLAN)
 - Firewall
 - Platform hardening
 - Network Elements, Element Management System servers, Element Management System clients and Network Management System interfaces

Nortel Networks recognizes that OAM&P security is a critical requirement for Communication Server 2100 networks. As such ongoing security developments have resulted in improvements in SE07 that include the following items:

- Centralized authentication (Pluggable Authentication Module [PAM]) for GWC Manager, UAS Manager, APS Manager, OSSGate, LMM, TMM, NPM, SAM21 Manager, SSPFS Platform, MDM and SDM.
- Common user groups for GWC Manager, UAS Manager, APS Manager, OSSGate, LMM, TMM, NPM, SAM21 Manager, SSPFS Platform.
- MAPCI, OSSGate and SSPFS platform access through Telnet and Secure Shell (SSH) login.
- Core and SSPFS FTP access through FTP using SFTP (SSH).
- Secure login to web-based applications.
- Removal of Distributed Computing Environment (DCE) dependencies (DCE is optional).
- User login and passwords required for all user interfaces.
- Formalized VLAN partitioning rules.

Name Service Switch

The Name Service Switch (nsswitch) is used for centralized authorization/user profile management (for example, groups, home directory and default shell). This allows a third-party product to supply a Lightweight Directory Access Protocol (LDAP) service (or service compatible with the nsswitch interface) to provide a centralized administration for this data.

The nsswitch capability is compatible with PAM which is used for centralized authentication (that is, userid/password).

Pluggable Authentication Module

Pluggable Authentication Module (PAM) provides a generic interface for authentication (that is, userid/password). PAM can plug into RADIUS, LDAP, SecureID (uses secure tokens), Oracle, Passwerks nsswitch (on Unix) to act as an authentication mechanism.

Integrated Element Management System API security

The security solution for the Integrated Element Management System Application Programming Interface centers around the following:

- PAM for authentication
- nsswitch for authorization
- a Single Sign On (SSO) key generation/verification module

On the interfaces side, a given application, or Network Element, can choose to rely on the underlying Unix PAM/nsswitch or can implement its own RADIUS or Hypertext Transmission Protocol, Secure (HTTPS) interface to interact with the authentication or authorization interfaces.

The Single Sign On key generation interface is available over HTTPS.



Communication Server 2100 network security

This chapter describes the mechanisms used to control access to the Network Elements and applications that comprise Communication Server 2100 solutions. The system implements security functionality in the following:

- The functional Network Elements involved in call processing and service provision for end users.
- Element Managers.
- Integrated Management applications.

The objective of these security mechanisms is to protect the Communication Server 2100 Network Elements from unauthorized viewing and/or modification of data, and from denial-of-service attacks.

Specific mechanisms to provide enhanced security include the following items:

- encryption of network management traffic
- standardized secure logs
- robust password management
- firewall protection
- operating system hardening
- virus free software
- secure remote access
- intrusion detection

Nortel Networks commitment to secure solutions

Nortel Networks has developed a common set of product safety requirements including the following items:

- Secure Sockets Layer (SSL) Guideline
- Secure Shell (SSH) Guideline
- IPsec Software Requirements
- Solaris Operating System Hardening Guide
- HP-UX Operating System Hardening Guide
- Microsoft NT 4.0 Operating System Hardening Guide
- Secure Logs Content Security Requirement
- Secure Logs Format Security Requirement
- RADIUS/PAM Guideline
- Firewall Placement Document
- Password Standard for Nortel Networks Products
- Intrusion Detection Security Requirement
- SNMPv3 Guideline Document
- GR815 Guideline Document
- Secure Remote Access Guideline Document
- Single Sign On/Access Control Security Requirement

Network architecture for access control

Appropriate configuration of the Communication Server 2100 LAN/IP network infrastructure is an important part of the solution for providing secure access to OAM&P functionality.



FOR MORE INFORMATION

See the *Packet Trunk-IP Engineering Rules System Engineering Bulletin*, SEB-02-10-001, for guidelines for configuring the CS LAN security.

In order to configure the LAN setup for a Communication Server 2100 network, the following items are required:

- Passport 8600 (or comparable router), duplicated for redundancy, provides filtering and routing between the LANs (for more information, see [“Passport 8600 routing switches” on page 147](#)).
- Alteon or comparable firewall.

A Network Element or application can talk to others only by going through the Passport 8600. In addition, a Network Element or application uses separate interfaces/ports to talk to each of the applicable VLANs. There is no multi-use of ports for multiple VLANs.

To enhance security, the network for a Communication Server 2100 solution is partitioned into a number of subnets enforced using VLANs, which can be referred to as the internal CS-LAN subnet structure (see [Figure 40 on page 150](#) for a sample depiction of this LAN configuration).

Note: The following is an example only; customer's configurations of private and public IP addresses can vary according to their individual IP network configuration.

The VLANs can be summarized as follows:

- The signaling VLAN (also referred to as the call processing or CallIP VLAN) interconnects the functional Communication Server 2100 Network Elements involved in call processing and service provisioning for end users.

The signaling VLAN uses private IP addresses from within the Communication Server 2100 IP domain. It protects functional Communication Server 2100 Network Elements from access, except access from other Network Elements on the same VLAN. The signaling VLAN is protected from all direct external access.

- The OAM&P VLAN interconnects the Element Management System servers supporting the Element Managers for functional Network Elements.

The OAM&P VLAN uses public IP addresses. Access to the Element Management System servers on this VLAN is by appropriately authenticated entities on the enterprise's Network Management Systems LAN (for example, desktop clients and Higher-Level Management application servers). Other users can access Communication Server 2100 Network Elements only through Element Management System interfaces. They have no direct IP route to the Communication Server 2100 Network Elements. No extension of the OAM&P VLAN to other servers or services is permitted, as this would compromise the security of the Communication Server 2100 Network Elements.

- An Access LAN which connects to the Network Elements (for example, Packet Voice Gateway). It is located on the other side of the Passport 8600s.

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- A Media (and bearer) VLAN is configured to handle Universal Audio Server/Media Server 2010 bearer traffic on the CS LAN.
- A Network Management Systems LAN is an external OAM&P LAN to the various Network Management Systems.

Since the CS-LAN switches provide a common interface to the Access/Aggregation Network, the packet filtering rules enforced by them allow only valid call signaling/media/OAM&P traffic to reach the appropriate servers that it processes. All traffic between Communication Server 2100 network components is isolated from the traffic between external devices and the servers. This limits the types of traffic to which key servers are exposed and minimizes the potential for a malicious attack.

The internal CS-LAN subnet structure enforced by VLAN separation provides further access restrictions for different types of devices. For example, direct access to the call processing and media device is not permitted from the Network Management System. All access must be proxied by the Element Management Systems through secure, authenticated interfaces. This protects the critical call processing functionality from being affected by internal attacks originating in the Network Management System.

In addition to the firewall, the RTP Media Portal provides additional protection for any media components hosted off the CS-LAN. It filters and proxies media traffic by the Communication Server 2100 to the appropriate media gateway in the Media subnet.

Network segregation aimed at protecting the Communication Server 2100 network does not end with the CS-LAN. Only valid VoIP protocols and corresponding OAM&P traffic is allowed on the Core network. Nortel Networks recommends using virtual separation of VoIP traffic into a virtual Communication Server 2100 Core network containing all non-CPE components. This can be achieved using means such as IP Virtual Private Networks (VPNs) or Multiprotocol Label Switching (MPLS) tunnels.

In a VPN configuration, Nortel Networks recommends an internal firewall such as the Alteon Switched Firewall (ASF) be used to protect the servers and inspect bearer streams. Alteon Switched Firewall creates a Secure Voice Zone (SVZ). The ASF firewalls and enterprise infrastructure routing switching (for example, Passport) protect the Communication Server 2100. In addition, extensive use can be made of the Contivity Secure IP Services Gateway (CSISG) platform to provide encrypted VPN tunnels across the corporate WAN (and/or MAN).

The firewall also plays a key role in mitigating Denial of Service attacks by throttling various types of traffic preventing them from exceeding nominal levels or blocking them altogether. Finally, the firewall can provide Network Intrusion Detection functionality to help identify malicious traffic sent towards the Core network.

Security and administration management

Security management includes the authentication and authorization of end users and applications. Security management includes the following tasks:

- creating, deleting and controlling security services and mechanisms
- distributing security information
- recording and reporting security related events

Functional summary

Nortel Networks recognizes that security is a key to any organization's move to IP telephony. As such, SE07 supports the following security management functions:

- Network Element security provisioning through respective Element Managers.
- Operating systems provide security for access to the Gateway Controller Manager, Universal Audio Server Manager and Preside Multi-service Data Manager.
- Single login and centralized user administration support for the Network Patch Manager, Line Maintenance Manager, Trunk Maintenance Manager, Gateway Controller Manager, Universal Audio Server Manager, Line Test Manager and Preside Multi-service Data Manager through the Pluggable Authentication Module (PAM) implementation of user access management.
- FTP, BOOTP, SSH and Telnet proxy support for embedded management systems, such as Call Agent and STORM.
- Support for Sun and PC clients for the Gateway Controller Manager, Line Maintenance Manager, Trunk Maintenance Manager, Network Patch Manager and SAM21 Manager.
- Context-sensitive GUI launching for the Gateway Controller Manager and SAM21 Manager.
- User-level access support for the Gateway Controller Manager, Universal Audio Server Manager, Line Test Manager, Trunk Maintenance Manager, Network Patch Manager, Preside Multi-service Data Manager and Device Manager.
- User activity audit logging for the Gateway Controller Manager.

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- IPSec between the Preside Multi-service Data Manager and Multiservice Switch 7480.
- IPSec log reporting from the Gateway Controller.

User management

User types

The Communication Server 2100 supports the following two types of users:

- The administrative class consists of the root user.
- The maintenance class consists of the maintenance user by default, but additional maintenance class users can be added

Table 41 lists the capabilities available to each class of user.

Table 41
User class profiles

Class	Responsibilities	Capabilities
Administration	System administration	<ul style="list-style-type: none">• User and group administration<ul style="list-style-type: none">— adding and removing users— assigning and restricting user access— password administration• System image backup and restore• Unrestricted command access• Local console access from LAN• Setting the time zone, and the date and time• All maintenance user capabilities
Maintenance	Maintenance	<ul style="list-style-type: none">• Maintenance commands (for example, busy, return to service and off-line)• Monitoring system performance• Restricted command access• Changing system alarm thresholds• Password update• Application-specific configuration tools

Password administration

The root user can change any password on the system at any time. Maintenance class users can only change their own passwords. The following conditions apply to user passwords:

- The maximum duration for passwords is four weeks for root users and nine weeks for maintenance class users.
- The system issues warnings seven days before the password expires and repeats the warning at each login, until the password is changed.
- A user cannot reuse a password for 26 weeks after its assignment.
- If a maintenance class user's password expires, the user has up to two weeks after the expiration date to change the password. During this period, the user must enter a new password to log in. If the user does not change the password by the end of the two-week period, the root user must reset the password, before the maintenance user can log in.
- The minimum length of password is six characters. The password must contain a minimum of one alphabetic character and a minimum of one numeric or special character. Although users can enter more than eight characters for a password, the system considers only the first eight characters.

Note: Although passwords beginning with a number are valid, they cannot currently be accepted following the SMDRLogin command.

Idle logins

The system automatically logs out all users if there is no activity for ten minutes.

Authentication mechanisms

The Communication Server 2100 configuration uses the following mechanisms to manage user authentication:

- Pluggable Authentication Module (PAM) is the default mechanism.
- Component Element Management Systems
- Component operating systems

Pluggable Authentication Module

With the Pluggable Authentication Module framework, multiple authentication technologies can be added without changing any of the login services, therefore preserving existing system environments. The Pluggable Authentication Module integrates login services with different technologies.

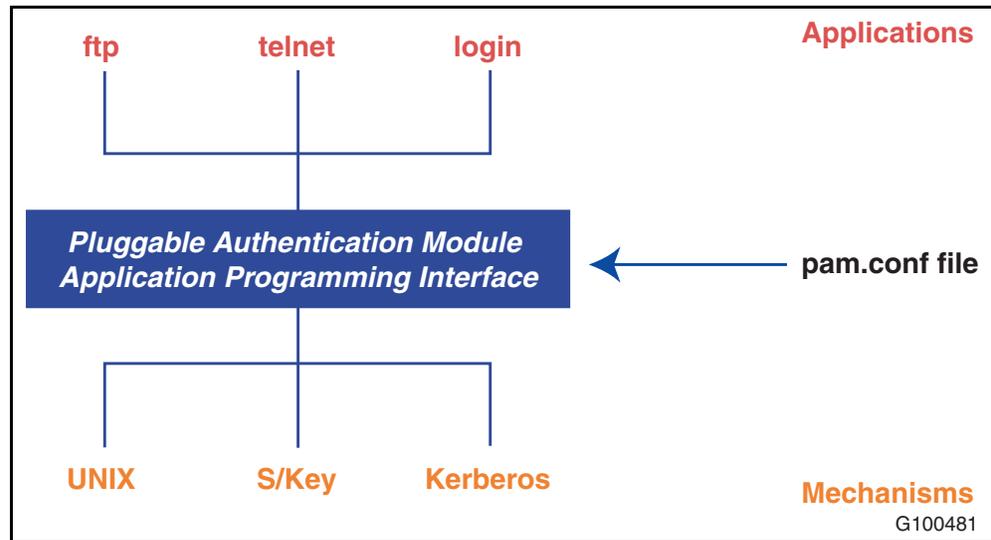
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The core components of the Pluggable Authentication Module framework include the following:

- authentication library Application Programming Interface (API)
- authentication mechanism-specific modules

Figure 48 shows the Pluggable Authentication Module architecture.

Figure 48
Basic Pluggable Authentication Module architecture



When an application calls the Pluggable Authentication Module Application Programming Interface, it loads the appropriate authentication module, as determined by the configuration file, `pam.conf`. The system forwards the request to the underlying authentication module to perform the specified operation. The Pluggable Authentication Module is partitioned into the following functional areas:

- Authentication Management includes the `pma_authenticate` function to authenticate the user and the `pam_setcred` interface to set, refresh or remove the user credentials.
- Account Management includes the `pam_acct_mgmt` function to check whether users should receive access to their accounts. This function can implement account expiration and access hour restrictions.

- Session Management includes the pam_open_session and pam_close_session functions for session management and accounting.
- Password Management includes the pam_chauthtok function to change the password.

Element Management Systems

User authentication for some components is controlled by the component's Element Management System, which controls access through individual user account databases with the Element Management System.

Operating systems

Operating systems provide security for the all the components used in the Communication Server 2100 network. The operating systems of the components are "hardened" to provide additional security diligence.

References

Table 42 shows where you can find more detailed information about the Communication Server 2100 security for large enterprises.

Table 42
Documentation references

Document title	Document number
Securing the Enterprise Network Document Library	A wide range of articles, positioning papers, white papers and solution/application overviews are available on Nortel Networks.com
<i>Secure VoIP for Enterprise SR&S Corporation Case Study Version No. 1.0</i>	TD-0S03-113 -2003



Internet terminals

The Communication Server 2100 supports a wide range of Internet terminals, each of which offers the end user a rich set of telephony features. The Meridian SL-100 evolution to packet signaling introduces the support of IP telephones, or Ethersets, through the use of the IP Client Manager. In addition, the Communication Server 2100 supports TDM terminals when it is configured as a hybrid that supports both circuit-switched and packet-switched capabilities (see [“TDM telephones” on page 329](#)).

Both the Communication Server 2100 Compact, and Communication Server 2100 XA-Core, support the same large family of terminals.

This chapter contains information about the following IP terminals:

- [Overview](#)
- [Network requirements for LAN telephony](#)
- [2001 Internet Telephone](#)
- [2002 Internet Telephone](#)
- [2004 Internet Telephone](#)
- [2033 IP Conference Phone](#)
- [Internet Telephones Key Expansion Module](#)
- [M6350 SoftClient](#)
- [Net6 Application Gateway for Meridian SL-100/Communication Server 2100](#)

Overview

IP clients, or Ethersets, combine the familiarity and ease-of-use of traditional business telephones with powerful capabilities that capitalize on the values of having voice and data converged at the desktop. IP clients use the Nortel Networks proprietary Unified Networks Stimulus (UNISstim) protocol to communicate with the IP Client Manager. Stimulus protocols reflect the user's input stimulus, key presses and reflect display commands sent from the network (which drive displays and lamps on the device). Ethersets offer similar functionality to Meridian Business Sets and connect directly to a LAN. These Internet telephones operate seamlessly across the entire range of Nortel Networks IP-enabled platforms.

The IP Client Manager enables a user to initiate and make IP telephony calls and to use a wide range of features from a Communication Server 2100. In SE07, the IP Client Manager supports the following types of IP terminals:

- The m6350 Softclient application, which is an IP telephony software client installed on a PC, running a Windows 2000 operating system, attached to a LAN. The M6350 works with a headset and adapter which plugs into a Universal Serial Bus (USB) port on the PC.
- Nortel Networks 200x Etherset telephones, which connect directly to a client LAN or a telephony switch module. Currently, the IP Client Manager supports the 2001, 2002 and 2004 models in charcoal and Ethergray.
- The Internet Telephones Key Expansion Module that attaches to 2002 and 2004 Internet Telephones.
- The 2033 IP Conference Phone that provides a full-duplex speakerphone for audio conference calls.
- The 2050 softphone that emulates the 2002 and 2004 (currently supported on IGW access only).

[Figure 49 on page 207](#) shows IP clients in a network configuration.

Figure 49
IP clients connected through Power over Lan Hub

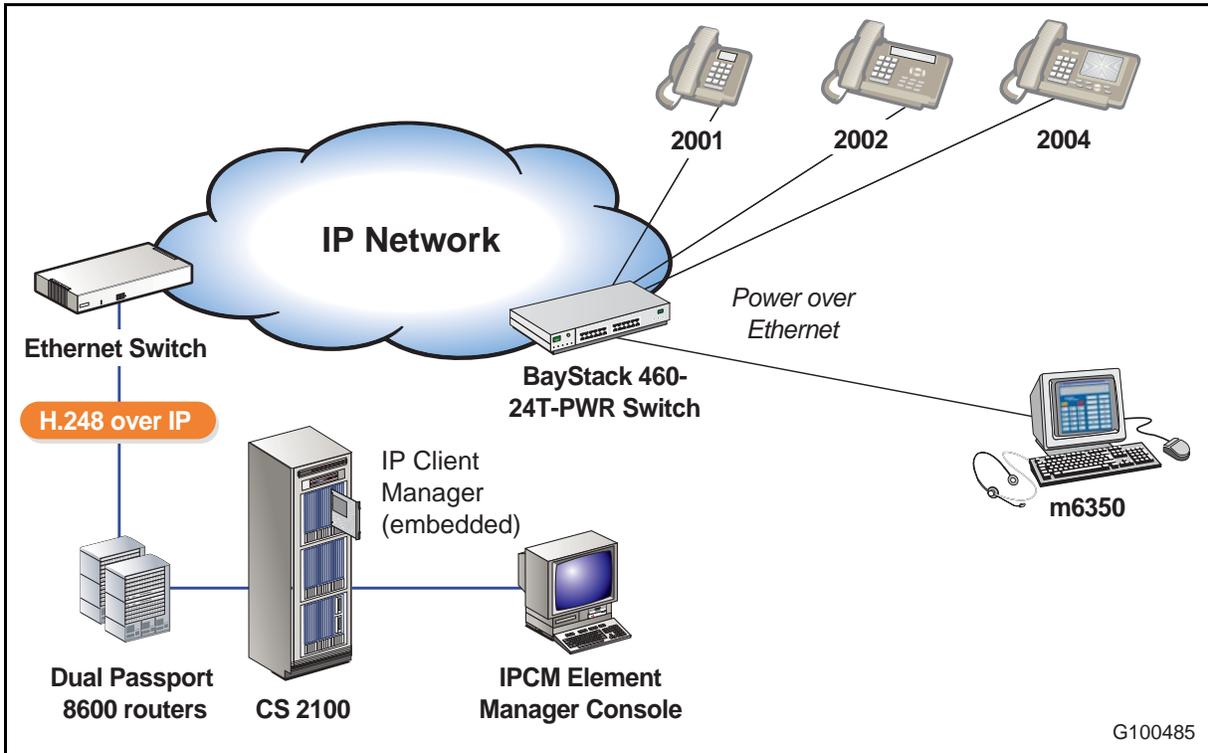


Table 43 shows where you can find additional information about IP terminals.

Table 43
References

Document title	Document number
<i>Centrex IP Client Manager Etherset Installation Guide and User Manual</i>	NN10027-113
<i>Centrex IP Client Manager m6350 SoftClient Branding Kit</i>	NN10183-114
<i>Centrex IP Client Manager m6350 Installation Guide</i>	NN10182-113
<i>Meridian SL-100 Feature Description Manual</i> (refer to the Line Option for IP Phones feature description)	555-4031-801
<i>Meridian SL-100 Service Order Reference Manual</i> (refer to the IPCLIENT – IP Client section)	555-4031-808
<i>Meridian SL-100 Data Schema Reference Guide</i> (refer to the KSETFEAT feature IP Client section)	555-4031-851
<i>IPCM Configuration management</i>	NN10240-511

Network requirements for LAN telephony

This section makes recommendations on how to optimize your network to support the stringent requirements of voice across LAN/campus backbone environments. The intent behind these recommendations is to allow the performance of the network to simulate, as much as possible, the important characteristics of face-to-face, real-time communication.

As a starting point, it is important to measure and characterize end-to-end latency and packet loss across your network. It is also important to look carefully at traffic patterns and peak utilization periods.

There are significant benefits to adding telephony to your existing IP network. However, there are a number of technical points that should be considered before implementing convergence. You should make preparations in the areas outlined below before the network can support the stringent requirements of voice across a packet-switched infrastructure. Nortel Networks Professional Services is available to assist you with this effort (for additional information please contact your authorized Nortel Networks representative).

Delay (latency)

To successfully deploy business quality voice services over a packet-switch infrastructure, network managers must engineer their networks to ensure that the average end-to-end delay does not exceed 150 ms.

Some of the elements that contribute to the total end-to-end delay include the following:

- Frame assembly, voice encoding and compression (processing and packetization delay)
- Jitter and associated jitter buffers (jitter is the difference in transmission time across the network)
- The distance between two communicating end-points (propagation delay)
- Network congestion (queuing and buffering delay)

Delay is the main impairment to the successful deployment of IP telephony. The principal effect of excessive delay is that it adversely impacts conversation dynamics leading to “talker overlap”. Talker overlap results in awkward interruptions in conversation as callers tread on each other’s speech.

Packet loss in IP networks

Packet loss in IP networks also has the potential to significantly impair overall voice quality resulting in speech clipping and dropout. IP-routed networks can become congested. Large buffers can provide temporary relief (at the expense of adding to the overall delay), but it is certainly not unusual for a router to exhaust all its buffers. When this happens, IP packets are dropped. Each packet represents an average of 20 ms of voice. Lost packets due to congestion will dramatically degrade quality. The packet loss characteristics of the network need to be 3 percent or less (1 percent or less packet loss is preferable).

Strategies for reducing packet loss

The following strategies will help reduce packet loss in an IP network:

- Full-duplex, Ethernet switching (10BaseT or 100BaseT) to the desktop is strongly recommended.

Note: Shared-media, half-duplex Ethernet will not typically support the Quality of Service (QoS) requirements of business quality voice.

LAN switching substantially reduces the latency inherent in traditional shared-media environments. LAN switching enables important capabilities such as micro-segmentation (single-station segments offering dedicated bandwidth to each station), full-duplex operation, and “cut-through” switching.

- Minimize processing delay with low-latency, voice encoding algorithms (for example, G.711)
- Use Layer 3 switches as opposed to software-based routers to segment large, flat Layer 2 networks (Ethernet) into smaller broadcast domains or subnets. Layer 3 switches (also known as routing switches) use hardware (Application-Specific Integrated Circuits – ASICs), instead of software to perform packet-to-packet IP routing.
- Upgrade your Layer 2/3 switches to be able to recognize and give priority treatment to delay-sensitive traffic like voice (for example, support for 802.1p at Layer 2 and DiffServ at Layer 3).
- To facilitate greater throughput and to lower end-to-end latency, deploy high-performance switched solutions in the campus backbone (distributed or collapsed), such as Fast Ethernet, Gigabit Ethernet or ATM.

- Even with excellent network engineering, there can still be a certain amount of packet loss during periods of congestion. If speech information is lost, it is impractical to try to retrieve it. The best option is to camouflage the missing information using Packet Loss Concealment (PLC) technology. With PLC, the receiver generates a synthetic replacement signal for the duration of the concealment. The pitch and waveform characteristics of the replacement signal are based on the spectral characteristics of the last prior packet. It is important that all IP telephony end points (such as IP telephones and gateways) support some form of PLC.

Robust and fault-tolerant networking

Real-time, delay intolerant applications such as IP telephony require rapid recovery from equipment and physical link failures. The network architecture must be able to tolerate the failure of any component, or connection between components, without adverse effects on the network as a whole. Examples of enabling technologies that facilitate robust, high available networks, include, but are not limited to, the following:

- Redundant “trunking” strategies – Fail-safe connectivity between critical network components is one of the key elements of a fault-tolerant, campus network solution. Achieve network resiliency by using redundant, logical “trunking” schemes such as MultiLink Trunking (MLT) and Link Aggregation (IEEE 802.3ad Link Aggregation) where multiple, parallel physical links of the same media type and speed are treated as if they were a single, logical link. For example, with MLT, even if any single switching module should fail, communication continues at Gigabit or Fast Ethernet speeds across the operational modules and switches. This kind of redundant “trunking” would typically be deployed between switches or between switches and servers.
- Rapid fault detection – Includes support for rapid detection of Layer 1 hardware failures and redirection of traffic to other links within a logical trunk (where provisioned) or to alternate paths/routes.
- Router redundancy – Includes sub-second recovery in the event that the primary router serving a LAN subnet fails (for example, using Virtual Router Redundancy Protocol – VRRP). This protocol allows for hot-router standby, so that if the default gateway router fails, the hot standby router assumes the role of the default gateway using the same IP address of the original gateway.

Other issues for LAN telephony

Other issues to consider when optimizing your network to support voice across LAN/campus backbone environments:

- Support for redundant power supply to critical network components
- Load balancing
- Policy management
- Traffic shaping
- Comprehensive network management tools
- Server switching
- Security



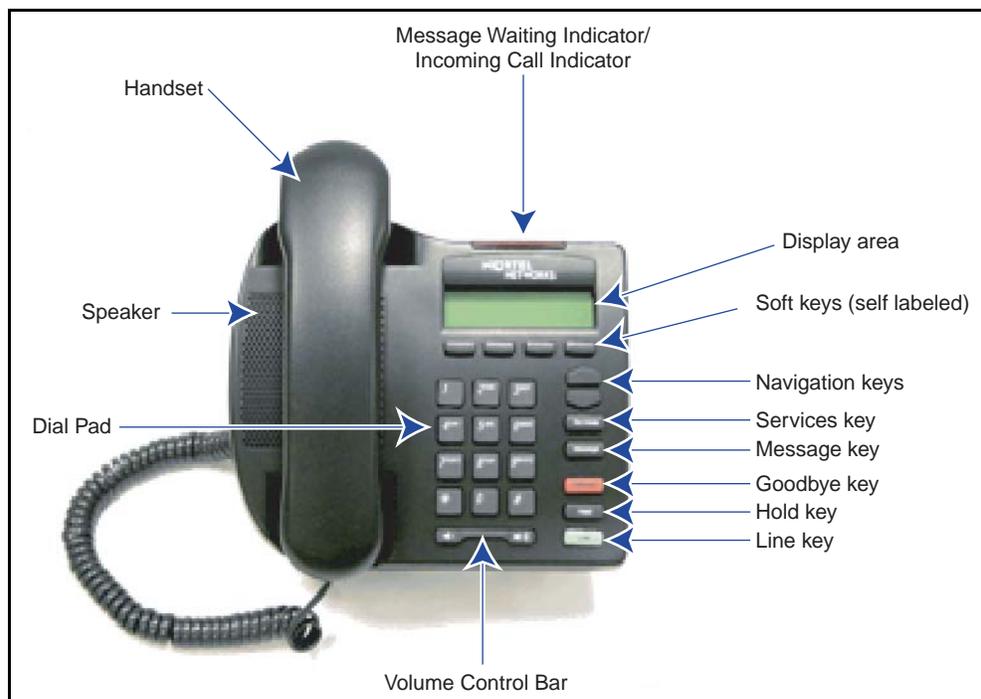
2001 Internet Telephone

Description

The 2001 Internet Telephone brings voice and data to the desktop environment. It connects directly to the LAN through an Ethernet connection.

The 2001 Internet Telephone components are shown in Figure 50.

Figure 50
2001 Internet Telephone



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Table 44 describes the 2002 Internet Telephone components and their functions.

Table 44
2001 Internet Telephone components and functions (Sheet 1 of 2)

Component	Function
Message Waiting Indicator/ Incoming Call Indicator 	The Message Waiting light turns ON to indicate that a message has been left for the user. This light also flashes when the set ringer is ON.
Dial/Line key 	Use the Dial/Line key to access the single line and activate on-hook dialing. No status icon or LED is provided.
Soft keys (self-labeled) Fwd  Fwd 	Soft keys (self-labeled) are located below the display area. The LCD label above the key changes, based on the active feature. Note: A triangle before a key label indicates that the key is active.
Navigation keys 	Use the Navigation keys to scroll through menus and lists in the display area.
Message key 	Press the Message key to access your voice mailbox.
Hold key 	Press the Hold key to put an active call on hold. Press the Line (DN) key to return to the caller on hold.

Table 44
2001 Internet Telephone components and functions (Sheet 2 of 2)

Component	Function
<p>Services key</p> 	<p>Press the Services key to access the following Telephone Options (see Note):</p> <ul style="list-style-type: none"> • Volume adjustment • Contrast adjustment • Language • Date/time format • Local dialpad tone • Ring type • Set information <p>Note: If a call is presented while the user is manipulating an option, the 2001 Internet Telephone rings and the DN key flashes. However, the screen display is not updated with Caller ID. The programming text is not disturbed.</p>
<p>Volume Control bar</p> 	<p>Use the Volume Control bar to adjust the volume of the Handset, Headset, Speaker, Ringer and Handsfree features.</p> <p>Press the right side of the rocker bar to increase volume, the left side to decrease volume.</p>
<p>Release key</p> 	<p>Use the Release key to terminate an active call.</p>

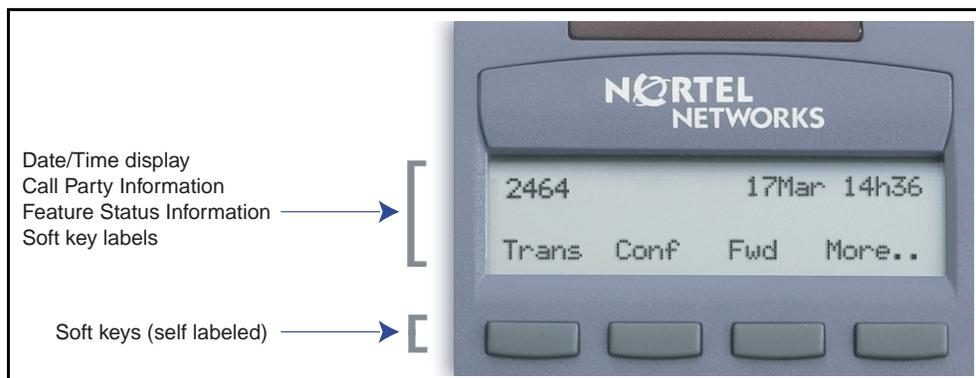
Display characteristics

A 2001 Internet Telephone has the following two display areas:

- The upper display area contains single-line information for items such as the caller number, caller name, feature prompt strings, user-entered-digits, data and time information, and set information.
- The lower area display provides soft key label information.

[Figure 51 on page 214](#) shows the Idle display.

Figure 51
2001 Internet Telephone display areas



2002 Internet Telephone

Description

The 2002 Internet Telephone brings voice and data to the desktop environment. It connects directly to the LAN through the Ethernet connection.

The 2002 Internet Telephone components are shown in Figure 52.

Figure 52
2002 Internet Telephone

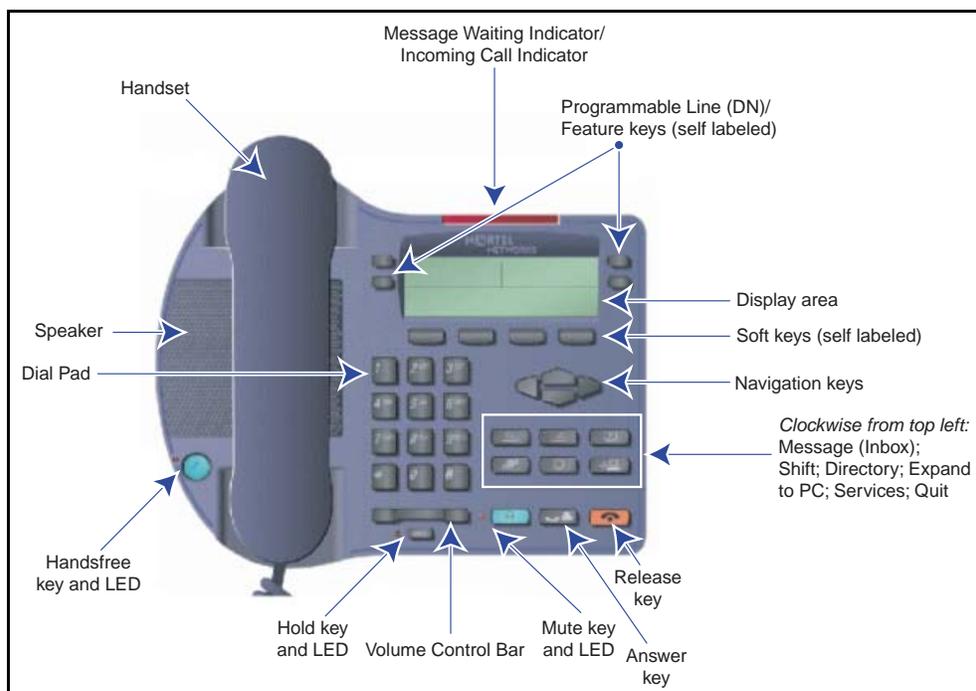


Table 45 describes the 2002 Internet Telephone components and their functions.

Table 45
2002 Internet Telephone components and functions (Sheet 1 of 3)

Component	Function
Speaker 	Press the Handsfree key to activate the speaker.
Programmable Line DN/ Feature keys (self labeled) 	Four programmable line (DN)/feature keys (self labeled) are configured for various features on the telephones. One must be the prime DN key. A steady LCD light beside a Line (DN) key indicates the feature or line is active. A flashing LCD indicates the line is on hold or the feature is being programmed.
Message Waiting light/ Incoming Call Indicator 	The Message Waiting light turns ON to indicate that a message has been left for the user. This light also flashes when the set ringer is ON.
Soft keys (self labeled) Fwd  ► Fwd 	Soft keys (self labeled) are located below the display area. The LCD label above the key changes based on the active feature. Note: A triangle before a key label indicates that the key is active.
Navigation keys 	Use the Navigation keys to scroll through menus and lists in the display area.
Inbox (Message) 	Press the Inbox (Message) key to access your voice mailbox.

Table 45
2002 Internet Telephone components and functions (Sheet 2 of 3)

Component	Function
Shift 	The Shift key is a fixed key that is reserved for future feature development.
Directory 	Press the Directory key to access Directory services.
Quit 	Press the Quit key to end an active application. Pressing the Quit key does not affect the status of the calls currently on your telephone.
Expand to PC 	The Expand to PC key is a fixed key that is reserved for future development.
Goodbye 	Press the Goodbye key to terminate an active call.
Hold 	Press the Hold key to put an active call on hold. Press the Line (DN) key beside the flashing icon to return to the caller on hold.
Mute 	Press the Mute key to listen to the receiving party without transmitting. Press the Mute key again to return to a two-way conversation. The Mute key applies to Handsfree, Handset and Headset microphones. The Mute LED flashes when the Mute option is in use.
Headset 	Press the Headset key to answer a call using the headset or to switch a call from the handset or Handsfree to the headset.

Table 45
2002 Internet Telephone components and functions (Sheet 3 of 3)

Component	Function
<p>Services</p> 	<p>Press the Services key to access the following Telephone Options (see Notes 1 and 2):</p> <ul style="list-style-type: none"> • Volume adjustment • Contrast adjustment • Language • Date/time format • Display diagnostics • Local dialpad tone • Ring type • On-hook default path • Change Feature key label • Set information <p>Note 1: If a call is presented while the user is manipulating an option, the 2002 Internet Telephone rings and the DN key flashes. However, the screen display is not updated with Caller ID. The programming text is not disturbed.</p> <p>Note 2: The user can originate a call using Autodial or Last Number Redial while manipulating an option. However, the display is not updated with dialed digits or the Caller ID and the dialpad is intercepted by the Services.</p>
<p>Volume control bar</p> 	<p>Use the Volume Control bar to adjust the volume of the Handset, Headset, Speaker, Ringer and Handsfree features.</p> <p>Press the right side of the rocker bar to increase volume, the left side to decrease volume.</p>
<p>Handsfree key</p> 	<p>Press the Handsfree key to activate handsfree.</p> <p>The LED lights to indicate when handsfree is active.</p>

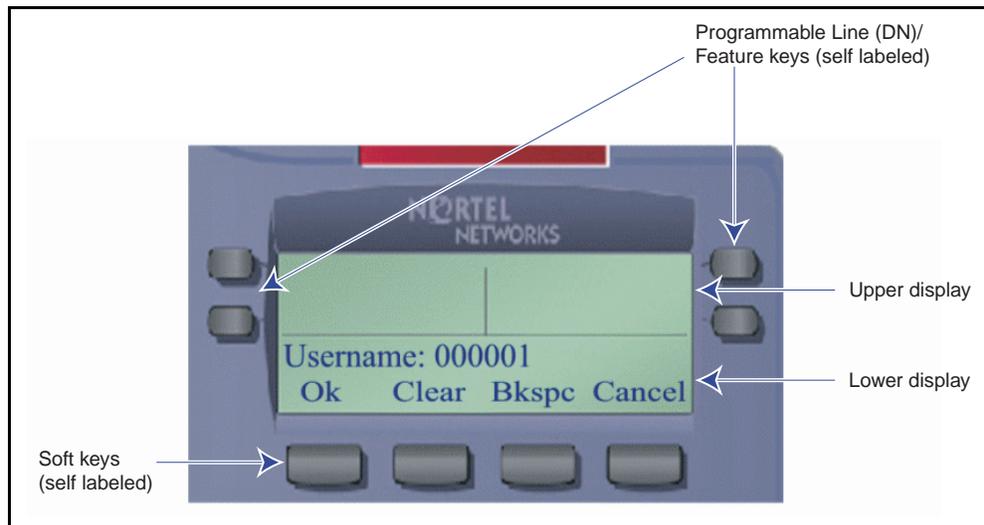
Display characteristics

A 2002 Internet Telephone has the following three major display areas:

- Programmable Line (DN)/Feature Key Label
- Soft Key Label
- Information Line

Figure 53 on page 218 shows these three display areas.

Figure 53
2002 Internet Telephone display areas



Programmable line (DN)/feature key label display

The feature key label area displays a ten-character string for each of the four feature keys. Each feature key includes the key label and an icon. The icon state can be on, off or flashing. Key labels are left-aligned for keys on the left side of the screen, and right-aligned for keys on the right side of the screen.

Note: If a label is longer than ten characters, the last ten characters are displayed and the excess characters are deleted from the beginning of the string.

Soft key label display

The soft key label display area displays a maximum six-character string. Each soft key includes the soft key label and an icon. When a soft key is in use, a flashing icon displays at the beginning of the soft key label, and the label shifts one character to the right. If a feature is enabled, the icon state turns to on. It remains in the on state until the feature key is pressed again. This cancels the enabled feature and turns the icon off, returning the soft key label to its original string.

Information line display

A 2002 Internet Telephone has a one-line information display area with the following information:

- Caller Number
- Caller Name
- Feature prompt strings

- User-entered digits
- Date and time information (if the telephone is in idle state)

The information area displays different information, according to the telephone's call processing state and active features.

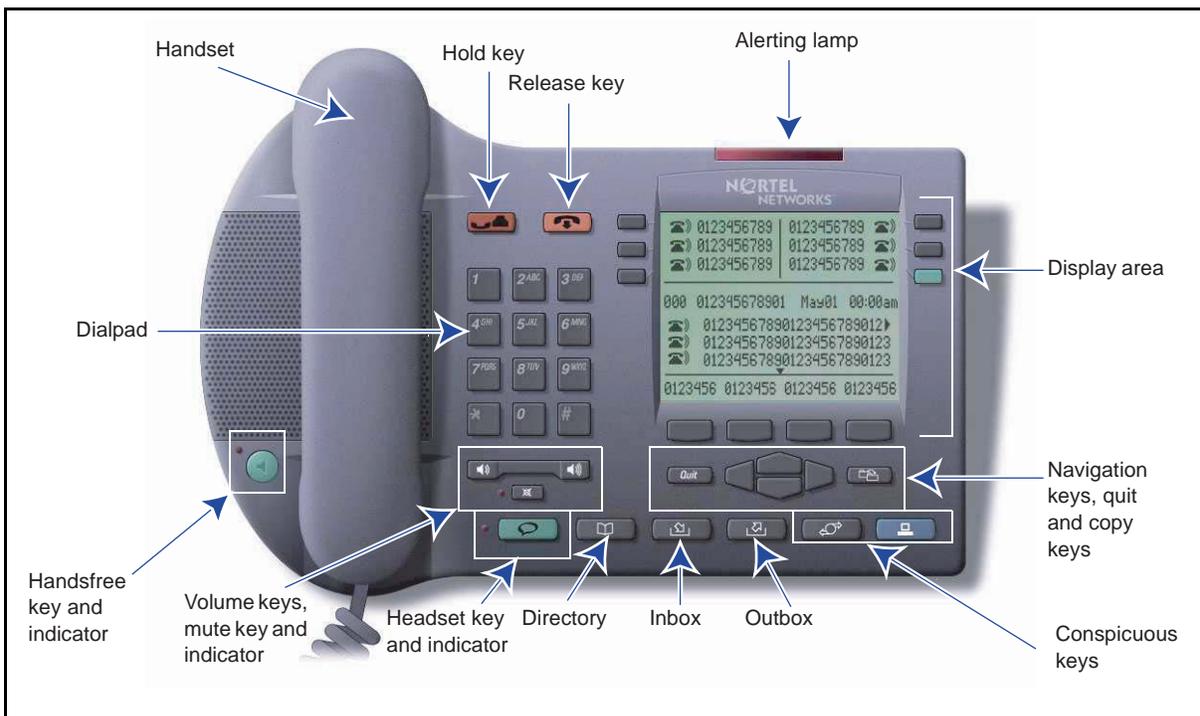
2004 Internet Telephone

Description

The 2004 Internet Telephone brings voice and data to the desktop environment. It connects directly to the LAN through the Ethernet connection.

The 2004 Internet Telephone translates voice into data packets for transport using Internet Protocol. The 2004 Internet Telephone uses the customer's IP network to communicate with the IP Client Manager connected to Communication Server 2100. The 2004 Internet Telephone components are shown in Figure 54.

Figure 54
2004 Internet Telephone



220 Internet terminals

Table 46 describes the 2004 Internet Telephone components and their functions.

Table 46
2004 Internet Telephone components and functions (Sheet 1 of 3)

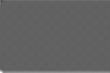
Component	Function
Hold 	Press the Hold key to put an active call on hold. Press the Line (DN) key beside the flashing icon to return to the caller on hold.
Goodbye 	Press the Goodbye key to terminate an active call.
Message Waiting Light/Incoming Call Indicator 	The Message Waiting Indicator turns ON to indicate that a message has been left for the user. This indicator also flashes when the set ringer is ON.
Programmable Line DN/ Feature Keys (self labeled)	Programmable Line (DN)/Feature keys (self labeled) are configured for various features on the telephone. A steady LCD light beside a Line (DN) key indicates the feature or line is active. A flashing LCD indicates the line is on hold or the feature is being programmed.
Soft keys (self labeled) Fwd  ► Fwd 	Soft keys (self labeled) are located below the display area. The LCD label above the key changes, based on the active feature. Note: A triangle before a key label indicates that the key is active.
Fixed Feature keys	Use these keys to access non-programmable standard features.
Expand to PC 	The Expand to PC key is used to access applications through Net6. For more information about Net6, see the “Net6 Application Gateway for Meridian SL-100/Communication Server 2100” on page 236.
Copy	A fixed key reserved for future feature development. An audible non-working tone is generated along with a display message.

Table 46
2004 Internet Telephone components and functions (Sheet 2 of 3)

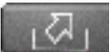
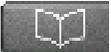
Component	Function
Navigation keys 	Use the Navigation keys to scroll through menus and lists in the display area.
Shift 	Press the Shift key to toggle between two feature key pages and access an additional six lines/features.
Inbox (Message) 	Press the Inbox (Message) key to access your voice mailbox.
Quit 	Press the Quit key to end an active application. Pressing the Quit key does not affect the status of the calls currently on your telephone.
Directory 	Press the Directory key to access Directory services.
Mute 	Press the Mute key to listen to the receiving party without transmitting. Press the Mute key again to return to a two-way conversation. The Mute key applies to Handsfree, Handset and Headset microphones. The Mute LED flashes when the Mute option is in use.
Headset 	Press the Headset key to answer a call using the headset or to switch a call from the handset or Handsfree to the headset.
Volume Control bar 	Use the Volume Control bar to adjust the volume of the Handset, Headset, Speaker, Ringer and Handsfree features. Press the right side of the rocker bar to increase volume, the left side to decrease volume.

Table 46
2004 Internet Telephone components and functions (Sheet 3 of 3)

Component	Function
<p>Services</p> 	<p>Press the Services key to access the following Telephone Options (see Notes 1 and 2):</p> <ul style="list-style-type: none"> • Volume adjustment • Contrast adjustment • Language • Date/time format • Display diagnostics • Local dialpad tone • Ring type • Call timer • On-hook default path • Change Feature key label • Set information <p>Note 1: If a call is presented while the user is manipulating an option, the 2004 Internet Telephone rings and the DN key flashes. However, the screen display is not updated with Caller ID. The programming text is not disturbed.</p> <p>Note 2: The user can originate a call using Autodial or Last Number Redial while manipulating an option. However, the display is not updated with dialed digits or the Caller ID and the dialpad is intercepted by the Services.</p>
<p>Handsfree key</p> 	<p>Press the Handsfree key to activate handsfree.</p> <p>The LED lights to indicate when handsfree is active.</p>

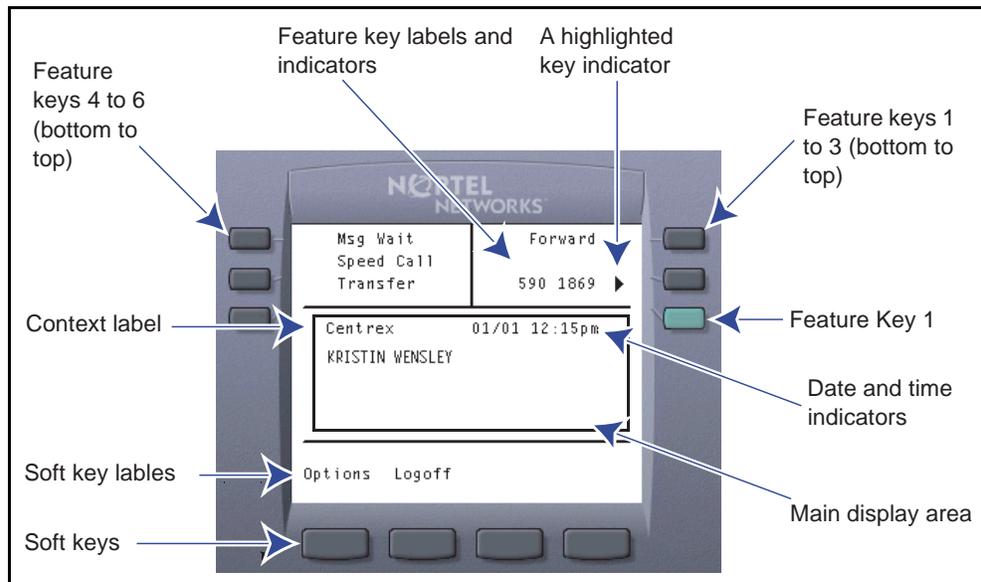
Display characteristics

A 2004 Internet Telephone has the following three major display areas:

- Programmable Line (DN)/Feature Key Label
- Soft Key Label
- Information Line

Figure 55 on page 223 shows these three display areas.

Figure 55
2004 Internet Telephone display areas



Programmable line (DN)/feature key label display

The feature key label area displays a ten-character string for each of the four feature keys. Each feature key includes the key label and an icon. The icon state can be on, off or flashing. Key labels are left-aligned for keys on the left side of the screen, and right-aligned for keys on the right side of the screen.

Note: If a label is longer than ten characters, the last ten characters are displayed and the excess characters are deleted from the beginning of the string.

Soft key label display

The soft key label display area displays a maximum six-character string. Each soft key includes the soft key label and an icon. When a soft key is in use, a flashing icon displays at the beginning of the soft key label, and the label shifts one character to the right. If a feature is enabled, the icon state turns to ON. It remains in the ON state until the feature key is pressed again. This cancels the enabled feature and turns the icon OFF, returning the soft key label to its original string.

Information line display

A 2004 Internet Telephone has a three-line information display area with the following information:

- Caller number
- Caller name

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- Feature prompt strings
- User-entered digits
- Date and time information (if the telephone is in idle state)

The information area displays different information, according to the telephone's call processing state and active features.



2033 IP Conference Phone



Description

The 2033 IP Conference Phone is a multidirectional, full duplex speakerphone that supports the Nortel Networks UNISTim protocol through the IP Client Manager gateway. This audio conference unit is firmware upgradeable through remote downloads and provides a user interface that is consistent with Nortel

Networks family of IP terminals.

Table 47 lists the Meridian Business Set features that the 2033 IP Conference Phone supports.

Table 47
Feature support (Sheet 1 of 2)

Feature	Option
Three-Way Calling	3WC
Call Forwarding Busy	CFB
Call Forwarding Do Not Answer (Business Sets)	CFD
Call Forwarding Universal	CFU
Call Park	PRK
Calling Line Identification	CLI
Call Pickup	CPU
Call Transfer	CXR
Call Waiting	CWT
Directed Call Park Includes Call Park Enhancement/SYSPARK functionality.	DCPK
Directed Call Pickup	DCPU
Last Number Redial	LNR

Table 47
Feature support (Sheet 2 of 2)

Feature	Option
Make Set Busy	MSB
Message Waiting	MWT
Message Waiting Indication	MWIDC
Preset Conference	CONF
Privacy Release	PRL
Ring Again	RAG
Speed Calling	SCU
Station Controlled Conference	CNF

Operating parameters

The 2033 IP Conference Phone works with IP Client Manager 7.0. However, when using IP Client Manager 7.0, only the SAM21 hardware configuration is supported (that is, the SAM16 architecture is not supported).

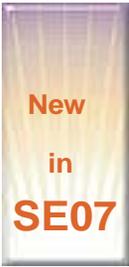
UNISlim security is not supported by the 2033 IP Conference Phone.

User interface

System administration can be performed from the following interfaces:

- SERVORD, through the MAPCI
- Web-based Element Management interface
- Integrated Element Management System for Communication Server 2100 networks (that is, this management system does not work on TDM IP Client Manager configurations).

The Web based Element Manager provides all of the functionality necessary for configuring and administering an IP Client Manager and the 2033 IP Conference Phone (for more information, see [“IP Client Manager for the Communication Server 2100” on page 103](#) or [“IP Client Manager for the Meridian SL-100” on page 307](#)).



Internet Telephones Key Expansion Module

Description

The Internet Telephones Key Expansion Module (KEM) has 24 additional 10-character, self-labeled keys and is used to increase the number of keys on your 2002 or 2004 Internet Telephone. However, the Communication Server to which the terminal or Key Expansion Module is connected determines the number of supported keys, not the devices themselves. Therefore, when used with the IP Client Manager, the Key Expansion Module only provides 22 additional keys, despite there being 24 physical keys on the Key Expansion Module.

The keys are displayed in two columns of 12 keys on either side of a central Liquid Crystal Display (LCD). When deployed with the IP Client Manager, only the bottom 11 keys in each of the left- and right-hand columns are available.

Note: The 2001 does not support the Key Expansion Module.

Each Key Expansion Module has a desk-mount bracket and structural base plate to connect the Key Expansion Module to a Nortel Networks 2002, 2004 Internet Telephone or another Key Expansion Module.

You can connect up to two Key Expansion Modules to your Internet Telephone. Table 48 describes shows the number of additional keys that can be added to the 2002 and 2004 Internet Telephones.

Table 48
Line/feature key availability

IP terminal	Standalone	With one KEM	With two KEMs
2004	14 See Note.	14 + 22 = 36	14 + 44 = 58
2004	11 See Note.	11 + 22 = 33	11 + 44 = 55
Note: Although the IP Client Manager defaults to these numbers as a maximum, they are configurable.			

Note: Not all features are available on all telephone types. Consult your network administrator to verify which features are available for your use.

Features

The Key Expansion Module offers the following features:

- 24 keys, with 22 keys available for use, set in two columns on either side of an LCD display. These keys provide up to 44 logical self-labeled feature keys or additional line (DN) appearances for use by the Internet Telephone.
- Desk-mount bracket and structural base plate to connect the Key Expansion Module to a 2002 or 2004 Internet Telephone or to another Key Expansion Module.
- Wall-mount bracket to install the Key Expansion Module alongside a wall-mounted 2002 or 2004 Internet Telephone.

Your telephone option menu and the Key Expansion Module

The Key Expansion Module does not have an option menu of its own. All its features and options are set through the telephone option menu on the Internet Telephone to which it is attached.

You can use your telephone's option menu to set characteristics for the Key Expansion Module such as the following:

- Language displayed
- Screen contrast
- Display diagnostics
- Local dialpad tone
- Feature key label

Note: The only KEM-specific options under the IP Client Manager terminal setting menu are available under "Display", which allows contrast adjustments.

Controls

When a Key Expansion Module is installed on a 2002 or 2004 Internet Telephone, the telephone controls on the Internet Telephone affect both the Internet Telephone itself and the Key Expansion Module.

For example, feature keys on the Internet Telephone, such as Quit, Navigation, and Handsfree function the same for DNs terminating on the Key Expansion Module as they do for DNs terminating on the Internet Telephone. Feature and soft keys, such as the Navigation keys, the Shift key, and Quit soft key work on the Key Expansion Module as they do on the Internet Telephone. Features such as Autodial and Predial also work the same on both units.

Internet Telephones Key Expansion Module display

This section summarizes the display features of the Key Expansion Module.

The Key Expansion Module has one LCD display area set between the two rows of 12 keys as shown in the Idle display in Figure 56.

Figure 56
2002 Internet Telephone and Key Expansion Module display areas



Each of the 24 physical keys on the Key Expansion Module can have a 10-character display label. This label is set using the controls on the Internet Telephone. The Key Expansion Module keys are numbered sequentially after the last defined key on the Internet Telephone.

Note: When connected to an IP Client Manager, the Key Expansion Module only supports 22 keys.

You can adjust the contrast of a Key Expansion Module through the IP Client Manager “Display” entry by using the terminal settings menu. You can adjust the display for the IP Telephone and the Key Expansion Module individually. In other words, the IP Client Manager supports different contrast settings between the terminal and the Key Expansion Module and between the two Key Expansion Modules, if two are attached.

Installation and provisioning procedures

How it connects

The Key Expansion Module mounts on the right side of a 2002 or 2004 Internet Telephone. The Key Expansion Module snaps into the receptacle on the back of the Internet Telephone, using the desk-mount bracket and structural base plate supplied with the Key Expansion Module. Completed connections are covered by the attachment bridge. Figure 57 shows the back view of a Key Expansion Module attached to a 2002 Internet Telephone.

Figure 57
Key Expansion Module attached to a 2002



The Key Expansion Module attaches to the 2002, 2004, or another Key Expansion Module using an Accessory Expansion Module (AEM) interface.

Extending from the left side of the Key Expansion Module is a 10-pin female header on a ribbon cable attached inside the Key Expansion Module. It is positioned to enable you to perform the following:

- Connect Key Expansion Module 1 to the Accessory Expansion Module (AEM) connector on the right side of the Internet Telephone.
- Connect Key Expansion Module 2 to Key Expansion Module 1.

The Key Expansion Module also has a 10-pin recessed male header. Plug the 10-pin female header on the ribbon cable of Key Expansion Module 2 into the 10-pin recessed male header of Key Expansion Module 1.

Installing the Key Expansion Module

Follow the steps in Procedure 1 to install a Key Expansion Module.

Procedure 1 Installing a Key Expansion Module

- 1 While pressing the telephone tilt handle, pull the telephone away from the tilt base until it clears the final stop.
- 2 Place the telephone and the Key Expansion Module face down on a nonabrasive surface and align them.
- 3 Plug the cable from the Key Expansion Module into the AEM port on the Internet Telephone.
- 4 Wrap the clamp around the cable and screw the clamp into the back of the telephone with a 3 and 8 mm screw.
- 5 Thread the cable through the opening in the side of the Internet Telephone.
- 6 Insert the clips on the Internet Telephone into the hinges on the footstand and then press onto the front of the footstand until it snaps into place.
- 7 While squeezing the telephone tilt handle, swing the footstand into the desired position.
- 8 Insert the clips on the Key Expansion Module into the hinges on the Key Expansion Module footstand; then, while squeezing the Key Expansion Module tilt handle, swing the footstand into the desired position.
- 9 The Key Expansion Module powers up.

Note: The Key Expansion Module uses the electrical connection of the Internet Telephone to get power. It does not have its own power source.

This procedure is now complete

Wall mounting The Internet Telephone and Internet Telephone/Key Expansion Module combination can be wall-mounted using the optional bracket kit provided with the Key Expansion Module. Each subsequent Key Expansion Module is attached to the right side of the previous Key Expansion Module.

Tilt base The tilt base for the 2002 Internet Telephone cannot be adjusted; however, the tilt base on the Key Expansion Module can be adjusted to match the fixed angle of the 2002 Internet Telephone. The 2004 Internet Telephone has an adjustable tilt base. Adjust the tilt of both the 2004 Internet Telephone and the Key Expansion Module as desired.

Initializing the Key Expansion Module

Once the Key Expansion Module has been installed and powered up on your 2002 or 2004 Internet Telephone, the Key Expansion Module initializes itself. Table 49 describes how the process works.

Prerequisite: Selection of firmware versions is a function of the Communication Server. Nortel Networks recommends that the minimum firmware versions be 1.64 (B64) for phase 0 and 1 terminals and 3.21 (D21) for phase 2 terminals.

Table 49
Initialization process on the Key Expansion Module

Phase	Description
Key Expansion Module performs self-test	The self-test confirms the operation of the Key Expansion Modules local memory, CPU, and other circuitry. While undergoing this self-test, the Key Expansion Module display lights up. Note: If the Key Expansion Module display does not light up, or lights up and then goes blank, or fails to begin flashing, contact your system administrator.
Key Expansion Module establishes communication with base IP Phone	The Key Expansion Module display flashes until it establishes communication with the base Internet Telephone. Note: If the Key Expansion Module display does not stop flashing, communication has not been established with the IP Phone. Contact your system administrator for further assistance.
Key Expansion Module downloads keymaps	The keymaps download to the Key Expansion Module. The display on the Key Expansion Module is blank.
Troubleshooting tip: On the IP Client Manager platform, in some circumstances, it may be necessary for the user to log out and log back in to their IP Telephone after attaching the device(s) to the terminal in order for the KEM to become operational.	

When the three phases complete successfully, you are ready to use the additional feature and line (DN) keys on your Key Expansion Module.

Note: If you have more than one Key Expansion Module installed on your IP Phone, the one to the immediate right of the telephone (KEM 1) must be functional for the subsequent Key Expansion Module (KEM 2) to work as well. This is because the second Key Expansion Module gets its power and communicates with the Internet Telephone through the first Key Expansion Module.

M6350 SoftClient

Description

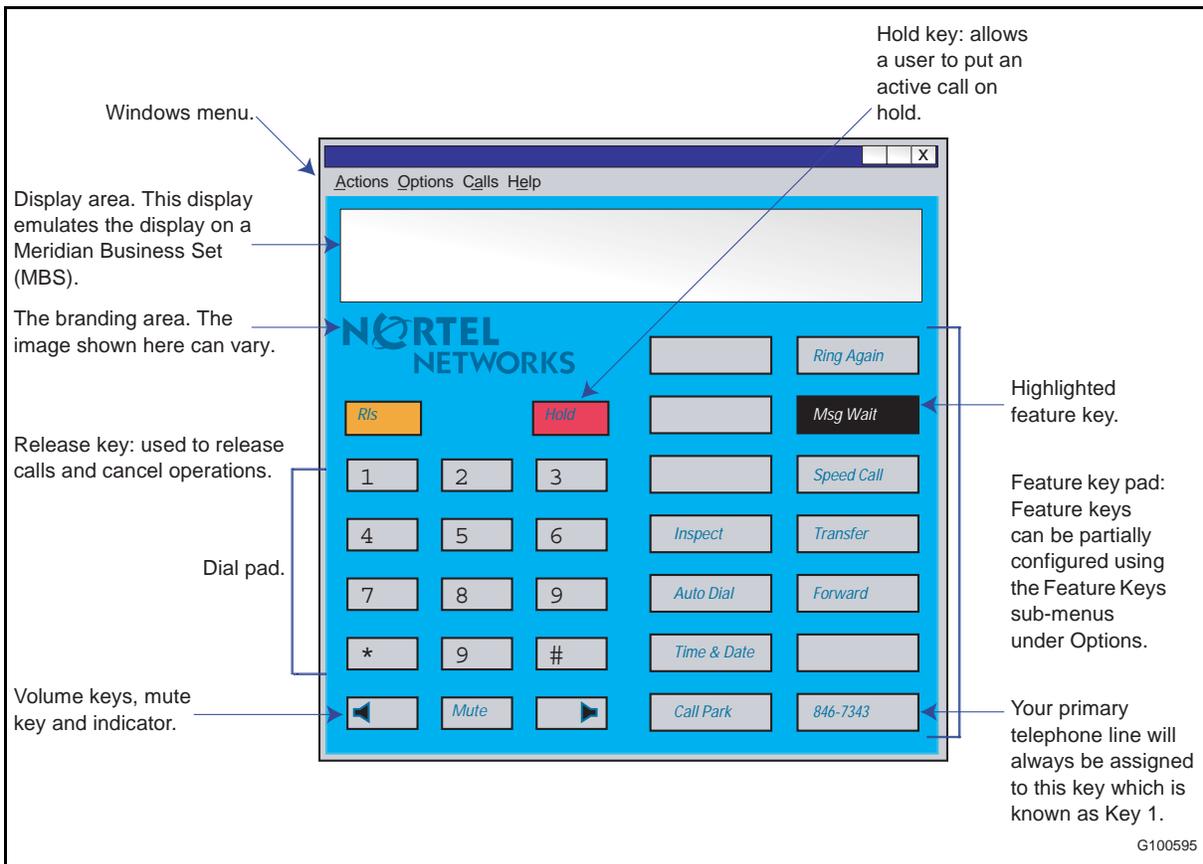
The m6350 SoftClient is accessed through a desktop or notebook Personal Computer (PC) and offers the feature set provided by the M63xx series telephone, while adding extra features and functionality that can be implemented only in a software environment. The M6350 SoftClient is a PC application that emulates an M5216 Business Set. The m6350 software is normally distributed and accessed online as a Windows installable kit. A CDROM version is also available.

The M6350 SoftClient offers the following features:

- Mirrors Meridian Business Set appearance
- Display area (two 24-character lines) with customizable fonts
- Release and Hold keys
- Mute key with indicator
- Volume keys
- 14 feature keys (with auto-labels); up to four additional banks of keys can be added
- Capable of controlling a 2004 Internet Telephone
- Telephony Application Programming Interface 2.1 Service Provider through TAPI Service Provider (TSP)
- Call Inbox and Outbox
- Adjustable microphone gain level
- On-hook dialing (provided through a pop-up dialogue)
- Customizable appearance

[Figure 58 on page 233](#) shows the m6350 SoftClient user interface.

Figure 58
m6350 SoftClient user interface



Note: The feature key template can be configured by your system administrator. Therefore, your SoftClient template may differ from what is shown in the above figure. In addition, the feature key assignment is also configurable.

Functions

The m6350 provides similar functionality to that offered by the M63xx series telephone, with some unique additions. Its feature set includes the following:

- All basic call capabilities.
- Digital Multiplex System (DMS) feature set and calling display.
- On-hook dialing which allows the user to select a line and dial a call without lifting a handset.
- A fully customizable background and selectable fonts in the display area.
- Language selection (available languages may vary).

- Up to four extension modules each containing 11 features keys.
- An incoming and outgoing calls viewing capability.
- An online help system.

Software

The m6350 is distributed as a Windows installable kit. This kit is wrapped up in a self-extracting executable. When the kit is opened, an installation wizard guides the user through the installation process.

The software is typically distributed online; however, it is also possible to obtain the image on CDROM.

Online help

The m6350 contains a comprehensive online help menu which describes the components of the interface and the features it provides. To access online help select **Help > Help Topics** in the Windows menu.

In addition, at anytime while the m6350 interface is in focus, you can invoke the Help file using the following keys:

- Press F1 to display the help menu.
- When the mouse pointer is over an area of the m6350 interface, press Shift+F1 to bring up information about that item.
- When hovering over a menu item press F1 to display information about that item.
- When a dialog is displayed, F1 brings up associated help if it exists.

Telephony Application Programming Interface (TAPI) compliance

The m6350 can also be used with third-party software that adheres to the Microsoft TAPI 2.1 standard. The TAPI Service Provider (TSP), provided by Magnetic North, is a separate component that provides access to the m6350 from Windows applications such as Outlook.

Installation and provisioning procedures

The following section provides an overview of the m6350 SoftClient installation and provisioning process.

Kit installation

The installation kit image is self-extracting. Therefore, to install the m6350 software simply requires double-clicking on the icon. Following successful installation, an “m6350” shortcut icon will appear on your desktop. This can be used to run the software at any time.

Note: To successfully install the m6350 on Windows NT or Windows 2000, you will require administrator privileges on your computer and write access to the common program group folder. This allows access to the “All Users” folder.

The installation process will install and register all the necessary components. When they have been installed, you will be given the opportunity to read the ReadMe file information. Please take the time to read this file as it may contain last-minute information regarding the software you are installing.

Installing the m6350 For detailed procedures on how to install the m6350, see the *m6350 SoftClient Installation Guide*, NN10182-113.

Mobile USB Headset Adapter

Employees can use the m6350 and Mobile USB Headset Adapter when on the road or at a hotel to connect to the enterprise LAN using a secure VPN client, such as the Nortel Networks Contivity VPN client. Once connected over a high-speed access, the user has complete access to both the data services and the enterprise voice network.

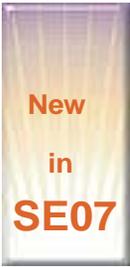
In this configuration, the employee has the same number, regardless of whether they are working remotely or not. They appear as if they are in the office. Unanswered calls go to voice mail.

The payback for the enterprise workers who obtain the service is relatively quick. Even a conservative assumption of a couple hours a week savings in long distances charges yields a quick payback. In addition, when in a hotel, usage fees can be reduced or eliminated.

Business continuity

The IP Client Manager can be an integral part of a Business Continuity Plan. With the m6350 and Mobile USB Headset Adapter, if a site is rendered inoperable, employees can still access their enterprise voice services. Using high-speed access, from home or on the road, this feature enables employees to continue working, even if they cannot access the building.





Net6 Application Gateway for Meridian SL-100/Communication Server 2100

In a Communication Server 2100 or Meridian SL-100 enterprise network, the Net6 Application Gateway (AG) along with Net6 Design Studio (PC-based point-and-click GUI application), converts existing web or XML-based applications into a format (device-specific protocol conversion) that allows users to interact with these applications using Nortel Networks 2000 series IP phones.

Net6 Design Studio provides web or XML-based applications to Nortel Networks 2000 IP phones by specifying how these applications should appear when delivered. When you use Design Studio you do not change existing content; instead, you create transformation instructions that customize applications for delivery to these devices.

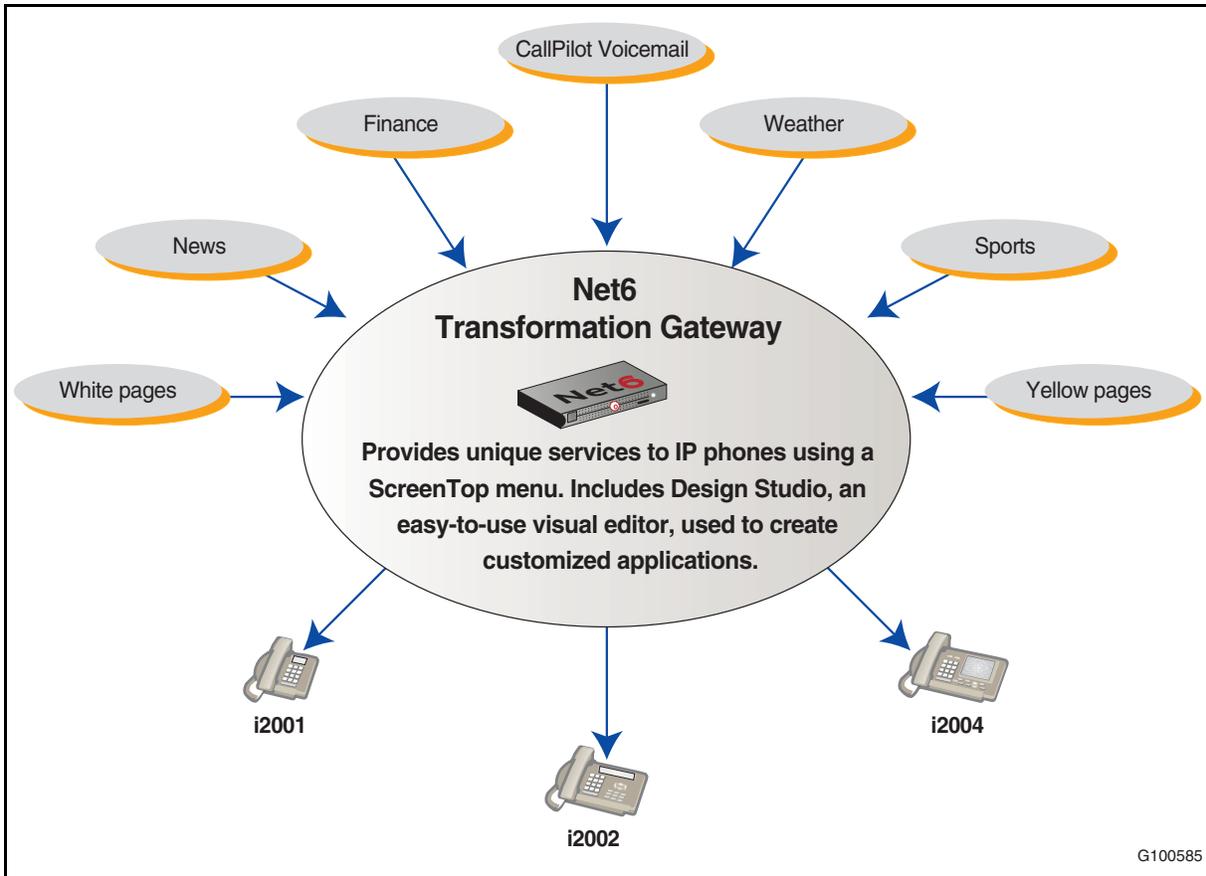
IP Client Manager 2.5 or 7.0 embedded in the Communication Server 2100 or Meridian SL-100 delivers the Meridian telephony feature set to the Nortel Networks 2000 series IP phones.

To transform an existing application for interaction on Nortel Networks 2000 series IP phones or wireless devices using Net6 Design Studio:

- Open the application you want transformed inside Design Studio and highlight and select the desired parts of the application you want delivered.
- Use Design Studio to layout how the transformed application will appear on the 2000 series of IP phones (transformation instructions).
- Once the transformation instructions are complete, they are saved on the Net6 Application Gateway and used to transform requests from 2000 series IP phones.
- The Net6 Application Gateway automatically recognizes the 2000 IP series phone that is making a request for the transformed application, then dynamically transforms the application according to the transformation instructions to suit the memory, markup language, and screen size of the IP phone or device.

[Figure 59 on page 237](#) illustrates the Net6 Application Gateway converting various applications into the proper format for interaction with Nortel Networks 2000 series of IP phones.

Figure 59
Net6 Application Gateway transforms applications and delivers them to Nortel Networks 2000 series of IP phones



With the Net6 Application Gateway, customers can access packaged applications or customized applications from their Nortel Networks 2000 series IP phones:

- **Packaged applications** include:
 - **Nortel Networks CallPilot Visual Voicemail** enables users to see a visual list of their voice messages with the ability to select the most important ones to review, without listening to each message one after another.
 - **Express Directory** provides an LDAP-based, organization-wide directory with high-speed, real-time pruning. This new directory user interface reduces the time to look-up and dial by 75 percent over current solutions.

- **Push to Talk** enables an IP telephone user to immediately connect with and talk to other users from a personalized contact list.
- **Zone Paging** enables users to page through groups of IP phones in specific zones without the expense of installing an overhead paging system.
- **Alerts** delivers priority messages such as emergency, Information Technology (IT), and weather alerts in the form of text, graphics and audio messages to IP telephones.
- **Conference Manager** enables audio conference management right from the screen of the 2004 IP phone including count and announce attendees, drop and mute individual participants, schedule an ad-hoc conference, add 15 minutes to conference, etc.
- **E-mail and Personal Information Manager (PIM)** enables employees to access popular e-mail packages like Microsoft Exchange. Users can check and respond to e-mail from conference rooms, view their calendar from a conference room or keep it opened at their desk, and soft-dial from their contacts from anywhere on campus.
- **Customized applications** created by using Net6 Application Gateway and Design Studio to transform existing workplace applications originally designed for PC access for use with the Nortel Networks 2000 series IP phones. Examples of customized applications by market include:
 - **Healthcare:** Visual voicemail, patient scheduling, resource scheduling, patient tracking, reference libraries, Physician order entry, text paging and patient charting.
 - **Financial services:** Visual voicemail, financial services, news updates, market statistics, financial rates, conference room booking, customer accounts and employee services.
 - **Education:** Visual voicemail, student services, e-mail, class schedules, registration, account status, student attendance, campus calendar, campus directory, announcements, faculty services and job postings.

- **Retail:** Visual voicemail, store services, announcements, sales/specials, inventory look-up, price check, time clock and work schedule.
- **Manufacturing:** Visual voicemail, plant services, announcements, work schedule, job status, time clock, efficiencies and order status.
- **Employee Kiosk:** Visual voicemail, HR information, work schedule, vacation schedule, vacation requests, time clock, bulletins and shift swap.
- **Hospitality:** Visual voicemail, guest/staff services, hotel news, hotel directory, restaurants, local attractions, wake-up call, room checkout, repair request and time clock.

Figure 60 shows CallPilot Visual Voice Mail delivered to the screen of a Nortel Networks 2004 IP phone using Net6 Application Gateway.

Figure 60
Visual Voice Mail delivered to a Nortel Networks 2004 IP phone using Net6 Application Gateway



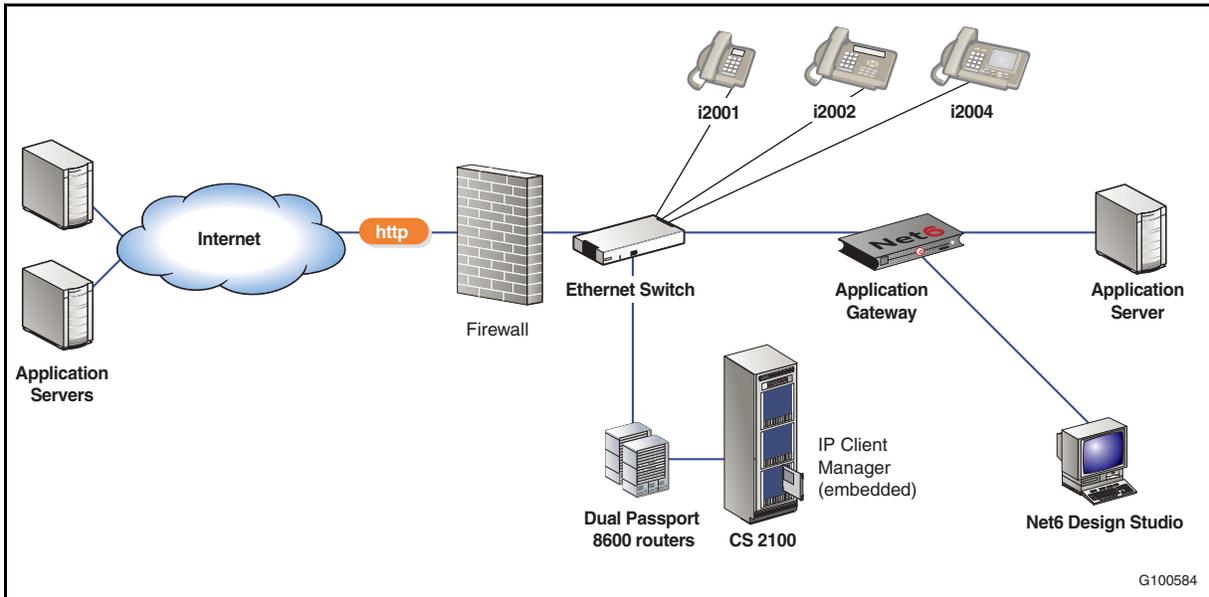
Net6 Application Gateway hardware and software requirements

The following hardware and software is required for the Net6 Application Gateway in a Meridian SL-100/Communication Server 2100 network:

- Net6 Application Gateway with Net6 Design Studio
- Nortel Networks 2000 series of IP phones (2001, 2002, 2004 IP phones)
- Communication Server 2100 or Meridian SL-100 running SE07 release or later with IP Client Manager 2.5 or 7.0.
- Pre-packaged and customized applications that Net6 Application Gateway transforms for use on Nortel Networks 2000 series IP phones.

Figure 61 illustrates an example of how Net6 Application Gateway can be deployed in a Communication Server 2100 enterprise network.

Figure 61
Example of how Net6 Application Gateway can be deployed in a Communication Server 2100 enterprise network



Net6 Application Gateway features and benefits

Net6 Application Gateway includes the following key features and benefits:

- Net6 Application Gateway is a network appliance that is scalable and secure and easy to deploy and maintain.
- Leverages the time, resources and capital that an organization spends developing its application portfolio, instead of building applications specifically for the screen of the 2000 series IP phone from scratch.
- Network appliance approach provides simple deployment, low maintenance and seamless integration with other networking components.
- Organizations can use their screen-based 2000 IP phones as a cost-effective alternative to PCs or computer terminals.
- Future proof – An application transformed using the Net6 Application Gateway will automatically support new 2000 series IP phones by simply downloading a new device definition file for that phone.
- Net6 Application Gateway, combined with Nortel Networks Meridian SL-100/Communication Server 2100 network and Nortel Networks 2000 series IP phones, allows organizations to use their converged infrastructure for more than just voice – improving employee productivity, enhancing customer satisfaction and reducing the cost of operations.

Net6 Application Gateway document references

Table 50 lists documentation references for Net6 Application Gateway.

Table 50
Net6 Application Gateway document references (Sheet 1 of 2)

Document title	Document number
<i>Quick Start Guide – Net6 Application Gateway and Design Studio</i>	N/A
<i>Hardware Installation Guide – Net6 Application Gateway (AG)</i>	N/A
<i>Configuring Quick Complete Directory for Nortel i2004 Internet Telephones</i>	N/A
<i>Using Quick Complete Directory on Nortel 2004 Internet Telephones</i>	N/A
<i>Release Notes – Net6 Application Gateway and Design Studio</i>	N/A
<i>Application Gateway – Administration Guide</i>	N/A
<i>Design Studio Getting Started Guide</i>	N/A

242 Internet terminals

Table 50
Net6 Application Gateway document references (Sheet 2 of 2)

Document title	Document number
<i>Design Studio User Guide</i>	N/A
<i>Using Visual Voice Mail on Nortel 2004 Internet Telephones</i>	N/A

Meridian SL-100





Meridian SL-100 hardware overview

This section describes the Meridian SL-100 circuit-switched hardware components.



FOR MORE INFORMATION

For more detailed information, see the documents listed in the “References” section at the end of this chapter.

This chapter contains the following sections:

- **SuperNode generations**
- **Meridian SL-100 platforms**
- **Meridian SL-100 cabinets and frames**
- **References**

To provide large enterprise customers with maximum flexibility when selecting their communication system, Nortel Networks continues to offer the circuit-switched Meridian SL-100 solution. The Meridian SL-100 combines the best of both worlds: Nortel Networks carrier-grade Digital Multiplex System (DMS) and the world leading Meridian 1 Private Branch Exchange (PBX). The Meridian SL-100’s architectural design which includes processing, switching, access and call control layers, enables you to invest in new technologies, such as IP technology, and to do so incrementally while leveraging your investment in the rest of your Meridian SL-100 system.

The Meridian SL-100 provides fully integrated voice and data communications and management. It serves as either a switching or networking manager for corporate, military and institutional purposes. This large-scale, software-controlled private switching system handles up to 60,000 digital voice or data connections, or a combination of both, to a wide variety of other voice or data systems.

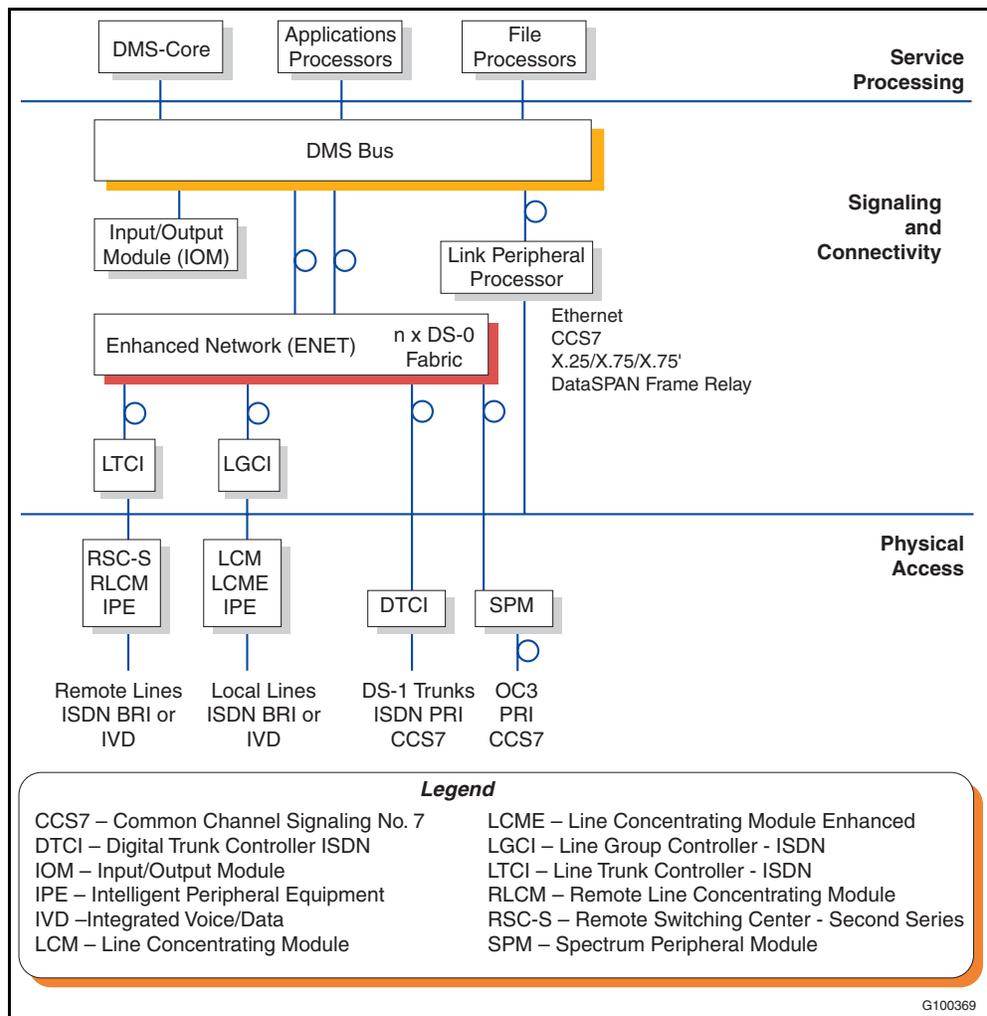
246 Meridian SL-100 hardware overview

There are two types of Meridian SL-100 systems and they are differentiated by the core processor. The first type is the SuperNode core with enhanced call processing and handling capabilities. The second type is a scaled-down version of the SuperNode core, called the SuperNode Space Enhanced (SNSE) core, designed to serve smaller offices with a maximum of 36,000 lines.

Note: The number of lines supported depends on the switch configuration, the feature implementation, the amount of ISDN line penetration and the Centi-Call Seconds (CCS) per line.

Figure 62 illustrates the Meridian SL-100 hardware architecture.

Figure 62
Meridian SL-100 layered hardware architecture



Some of the attributes of the hardware architecture which distinguish the Meridian SL-100 from the competition include the following:

- built-in redundancy which sets the standard in reliability
- small footprint and energy-efficient design to minimize facility costs
- modular design which allows organizations to scale the system to meet their requirements
- clear evolutionary paths to minimize upgrade costs and maximize investment protection, including the migration to the Communication Server 2100 which is the next generation of the Meridian SL-100

SuperNode generations

The SuperNode generation of switches, which includes the SuperNode and SuperNode SE systems, is based on evolutionary technology, yielding the following improvements over the NT40 generation of switches:

- increased processing and call-handling capability
- reduced size
- improved reliability

SuperNode switches consists of the following three components:

- core – the control component.
- bus – the messaging component; hereafter called the Message Switch (MS) bus or MS bus in this document to differentiate it from other types of buses.
- link – the software infrastructure that implements public networking standards including Common Channel Signaling and ISDN public standards and protocols.

SuperNode switches have a distributed architecture and increased processing capabilities, which provide an infrastructure for the development of new features and services. The SuperNode system also provides an interface with fiber transmission systems.

Overview of functional elements

All Meridian SL-100 systems consist of the same functional elements: the control component, the messaging component, the switching network, the peripheral modules and the input/output controller. Table 51 describes the functional elements.

**Table 51
Meridian SL-100 functional elements**

Element	Description
Control component	<p>The duplicated control component coordinates call processing, including the actions of the switching network and of the Peripheral Modules. The SuperNode control component is called the "core." The core's major elements are a Computing Module (CM) and System Load Module (SLM).</p> <p>Note: The SuperNode messaging component is not contained in the control component, but is separate and called the message switch bus.</p>
Messaging component	<p>The messaging component routes messages within the Meridian SL-100 system. The SuperNode messaging component is the MS bus. The MS bus consists of duplicated message switches. The message switch is based on the SuperNode CPU; thus, it uses some of the same software as the Computing Module and the Central Control Complex CPU.</p>
Switching network	<p>The switching network is a digital switching matrix that interconnects the Peripheral Modules using Time Division Multiplexing (TDM). The switching network has duplicate network planes for reliability. It is made up of microprocessor controlled digital switching Network Modules (NM) and is connected to the SuperNode MS bus.</p>
Peripheral Modules	<p>The Peripheral Modules (PMs) provide an interface between the switching network and telephony terminals such as lines and trunks. They also provide an interface between the Meridian SL-100 system and Remote Digital Terminals (RDTs), access nodes and other vendors' switching equipment.</p>
Input/Output Controller	<p>The Input/Output Controller (IOC) provides an interface between the messaging component (the SuperNode MS bus) and input/output devices such as magnetic tape drives, disk drives, data links, video display units and printers. A video display unit connected to the IOC is used as a component of a MAP workstation. The MAP workstation provides a user interface to the Meridian SL-100 system.</p>

Meridian SL-100 platforms

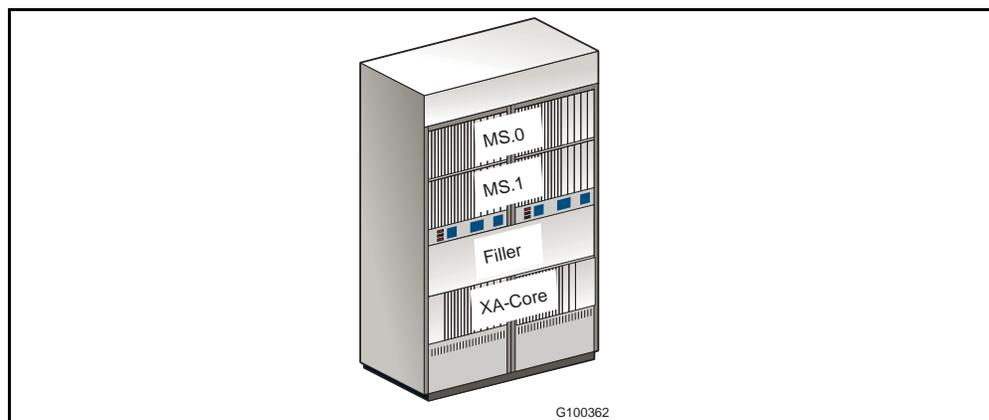
Meridian SuperNode for large applications

The Meridian SL-100 is a powerful communications system that combines advanced hardware architecture with premier PBX software features. The Meridian SL-100 is based on the highly successful technology Nortel Networks developed for Digital Multiplex System (DMS) central office switches. These switches have set worldwide standards for reliability. The built-in redundancy of all critical system components ensures system operations integrity. As the largest member of the Meridian 1 family of sophisticated business communications systems, the Meridian SL-100 has provided superior service in a variety of industries for more than a decade.

The Meridian SL-100 supports a wide range of voice, data, video and multimedia applications. The system can be flexibly configured to address both current and future capacity and applications requirements as a result of its 100,000 digital voice or data line capacity threshold. The Meridian SL-100 incorporates the Nortel Networks advanced Dual Plane Common Control (DPCC) design, which efficiently uses the system's processing power by providing distributed control over many processors. The system's modular design also allows easy upgrades as new processor technology becomes available.

Figure 63 shows an example of a Meridian SuperNode.

Figure 63
Meridian SuperNode

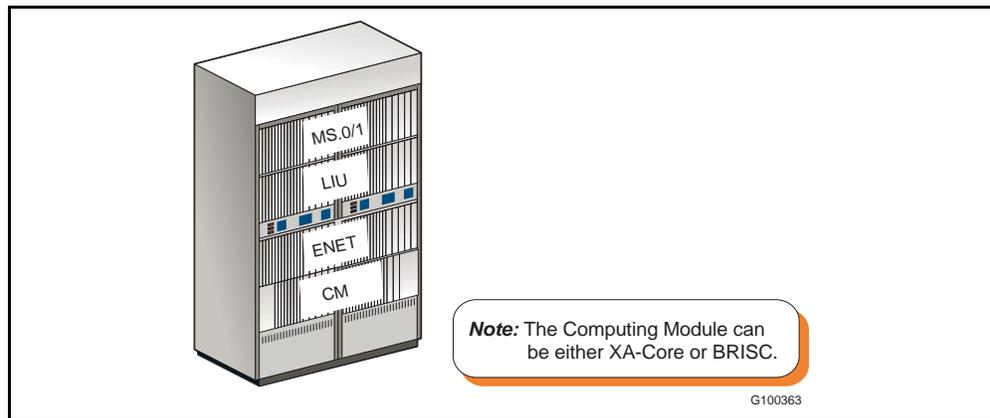


Meridian SuperNode SE (Space Enhanced) for smaller applications

As a smaller alternate solution to the Meridian SuperNode, the SuperNode SE (SNSE) is specifically designed for lower line-size (4,000 to 50,000) application-intensive requirements. The specific number of provisionable lines is dependent on the actual switch configuration, Centi-Call Seconds (CCS) per line and the actual mix of feature penetration.

The SNSE configuration provides the platform for current and future Meridian SL-100 applications and features required for the small switch market (see Figure 64).

**Figure 64
Meridian SuperNode SE**



The Meridian SuperNode SE offering combines the functionality of the DMS-Core, DMS-Bus, 16K ENET and a single-shelf Link Peripheral Processor (LPP) into one cabinet by providing the following:

- State-of-the-art processing capability of XA-Core.
- Duplex ENET configured for up to 16,000 channels on one shelf.
- A Link Interface Shelf (LIS) for additional 12 Interface Units (IUs) depending on provisioning rules.
- Available with optimal memory using block sparing.
- Duplicated, load-sharing Message Switch (DMS-Bus) on one shelf.

Meridian SL-100 cabinets and frames

Cabinet concept

The Meridian SL-100 system cabinet structure consists of basic hardware switching modules mounted in 1.8m (6 ft.) gray or brown cabinets.

Modular design

Modular design techniques are used in the development of both the software and hardware. Modularity can be thought of as the implementation of a complex system through a set of functional units or modules connected by well-defined interfaces. As a result of proper module and interface design, the various units can be connected, disconnected, modified, or improved without affecting either the operation of the other modules in the system or the system as a whole.

This modularity gives the system flexibility in physical layout and function, in providing special features and in system expansion. The cabinetized Meridian SL-100 can be adapted to specific customer line, trunk and service circuit requirements through additional engineering.

Advantages of the cabinet

The cabinetized Meridian SL-100 offers these benefits:

- Provides pre-cabled, factory-assembled, and tested cabinets; thus, reducing on-site installation or commissioning intervals.
- Provides a modular system that easily expands and accommodates variations in system size and feature choices and allows integration of future system enhancements.
- Eliminates the need for additional external earthquake bracing by using prebraced steel cabinets.
- Presents a modern, computer-style appearance, ideally suited for computer rooms having raised flooring and low, suspended ceilings.
- Shortens delivery time.
- Simplifies system expansions.

Dimensions

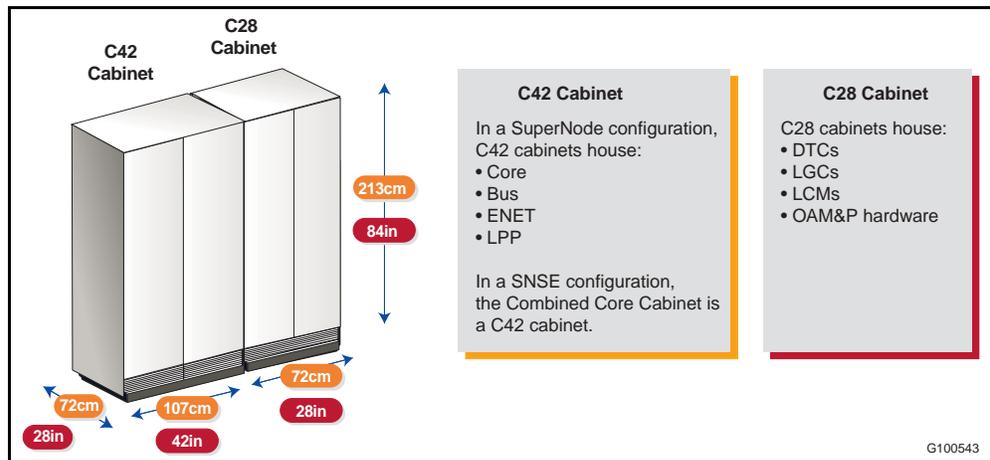
Current Meridian SL-100 hardware is housed in cabinets or frames with the following dimensions:

- C42 cabinet: 183 cm high x 107 cm wide x 72 cm deep (72" x 42" x 28")
- C28 cabinet: 183 cm high x 72 CM wide x 72 cm deep (72" x 27" x 28")
- Open frame: 213 cm high x 72 cm wide x 46 cm deep (84" x 28 x 18")

Each cabinet or frame contains four shelves with slots for equipment (for example, card slots for inserting circuit cards). Cabinets are equipped with double doors on both the front and rear to provide convenient access for maintenance personnel.

Figure 65 illustrates the dimensions of C42 and C28 cabinets and lists the hardware units that can be housed in each one. An open frame can house the same type of units as C28 cabinets.

Figure 65
Dimensions of current Meridian SL-100 cabinets



Note: Standard Meridian SL-100 frames are also used to house the Spectrum Peripheral Module. The dimensions of the Spectrum Peripheral Module hardware are smaller than those of equivalent XPM units, but to minimize costs adapter brackets are used to house Spectrum Peripheral Modules in existing frames. Overall footprint can still be reduced, because access to all cards in the Spectrum Peripheral Module double-height shelves is from the front of the frame, which means that parallel rows of Spectrum Peripheral Module frames can be arranged back to back.

References

Table 52 shows where you can find more detailed information about the Meridian SL-100 hardware platform and components.

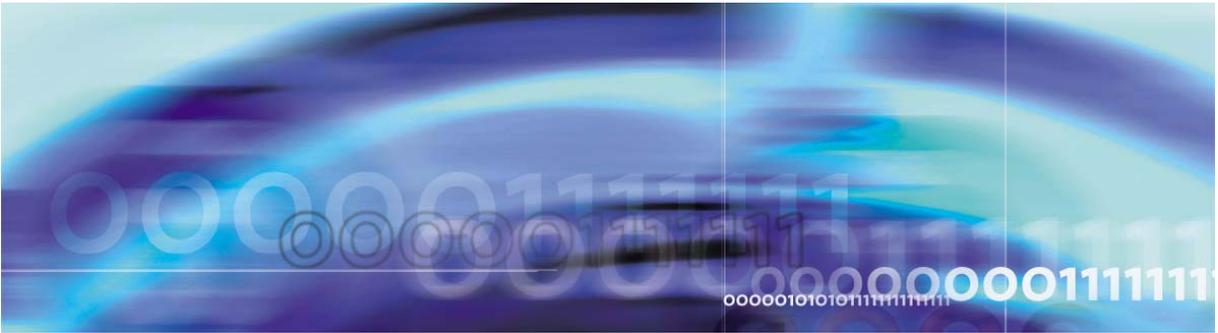
Table 52
References (Sheet 1 of 2)

Document	Number
<i>Meridian SL-100 Product Guide</i> (shows how Meridian SL-100 hardware components have evolved over the years, including replacement options. Provides details about the cabinet components and line-ups, including power requirements).	555-4001-103
<i>Enhanced MAP Workstation Product Guide</i>	555-4001-012
<i>Ethernet Interface Unit on LPP Services Guide</i>	555-4001-024
<i>Meridian 1 Interworking Services Guide</i>	555-4001-026
<i>Network Management for SPECTRUM Services Guide</i>	555-4001-027
<i>Digital Line Module (DLM) Reference Manual</i>	555-4001-101
<i>Remote Peripherals General Description</i>	555-4001-104
<i>ISDN Primary Rate Interface Reference Manual</i>	555-4001-106
<i>ASCII SMDR Data Access Description and Implementation</i>	555-4001-119
<i>Computer-to-PBX Interface General Description</i>	555-4001-125
<i>Asynchronous Interface Line Unit Reference Manual</i>	555-4001-126
<i>Intelligent Peripheral Equipment (IPE) Reference Manual</i>	555-4001-129
<i>Line Side T-1 Interface for IPE (LTI) Services Guide</i>	555-4001-022
<i>Peripheral Module Release Document (PM RELDOC)</i>	555-4001-599
<i>Getting Started with Optivity Telephony Manager User Guide</i>	555-4001-316
<i>Translations Guide</i>	555-4031-350
<i>Alarm Clearing Procedures</i>	555-4031-543
<i>Trouble Locating and Clearing Procedures</i>	555-4031-544
<i>Recovery Procedures</i>	555-4031-545
<i>Routine Maintenance Procedures</i>	555-4031-546
<i>Card Replacement Procedures</i>	555-4031-547

Table 52
References (Sheet 2 of 2)

Document	Number
<i>Service Order Reference Manual</i>	555-4031-808
<i>Operational Measurements Reference Manual</i>	555-4031-814
<i>Log Report Reference Manual</i>	555-4031-840
<i>Customer Data Schema</i>	555-4031-851
<i>Office Parameters Reference Manual</i>	555-4031-855

In addition, because the Meridian SL-100 is based on the DMS system, there are many useful DMS documents that are included on the fully-searchable Customer Documentation CD-ROM that ships with the system.



Meridian SL-100 general functions

The Meridian SL-100 system consists of the following functional areas:

- SuperNode and SuperNode SE system functionality
- Network Modules
- Peripheral Modules
- maintenance and administration area

The main functional areas of the Meridian SL-100 system are connected by links carrying speech samples and control messages in the form of serial digital data. Each link provides a two-way (four-wire) transmission path for 32 channels of Time Division Multiplexed (TDM) data.

The speech links have 30 channels for transmission of Pulse Code Modulation (PCM) speech samples and two channels for control messages. The message links have all 32 channels assigned exclusively to control messages.

This chapter contains the following sections:

- **System functionality**
- **Network modules**
- **XA-Core**
- **Enhanced Network (ENET)**
- **Link Peripheral Processor**
- **Peripheral Modules**

System functionality

Both the full-sized SuperNode and the SuperNode SE systems consist of two hardware elements (core and bus) and one software element (link), as illustrated in [Figure 66 on page 257](#) and [Figure 67 on page 258](#), and described in the following paragraphs.

Core

There are two Meridian SL-100 core processors currently in the field as follows:

- XA-Core see [“XA-Core” on page 261](#).
- Series 70 (BRISC)

Note: BRISC is still supported on existing systems, but is no longer shipped with new systems.

Series 70 Core functions

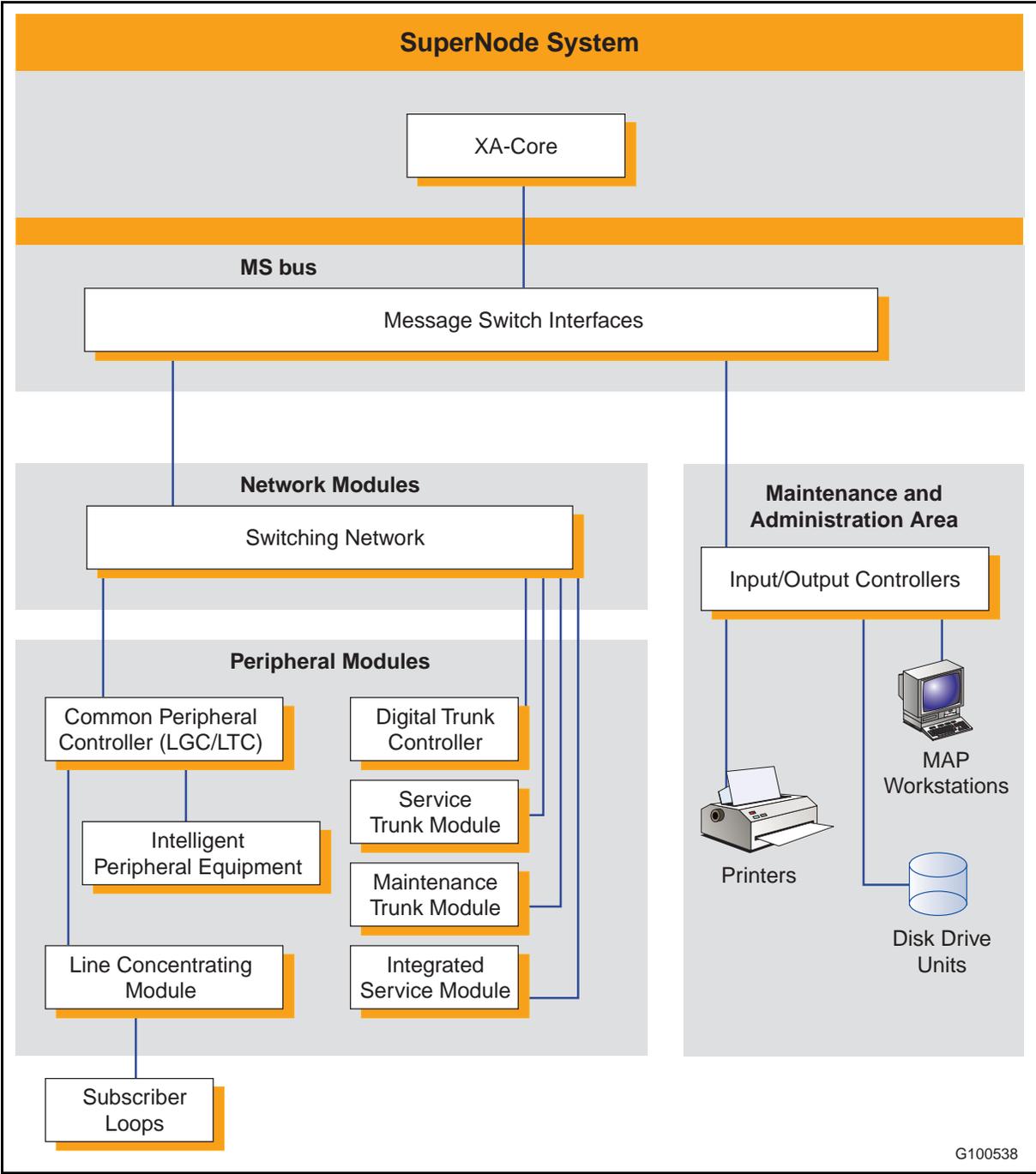
The SuperNode and SuperNode SE components are duplicated for reliability and operate as synchronized pairs. One plane is in-service (active) and performs call processing and other operations. The other plane (standby) performs the same operations, but checks for variations between itself and the active plane. Any difference between the two planes results in a maintenance interruption and a recovery action.

Each plane of the BRISC core consists of the following:

- Computing Module (CM)
- system memory
- System Load Module (SLM)
- call management processor
- Message Switch (MS) interfaces

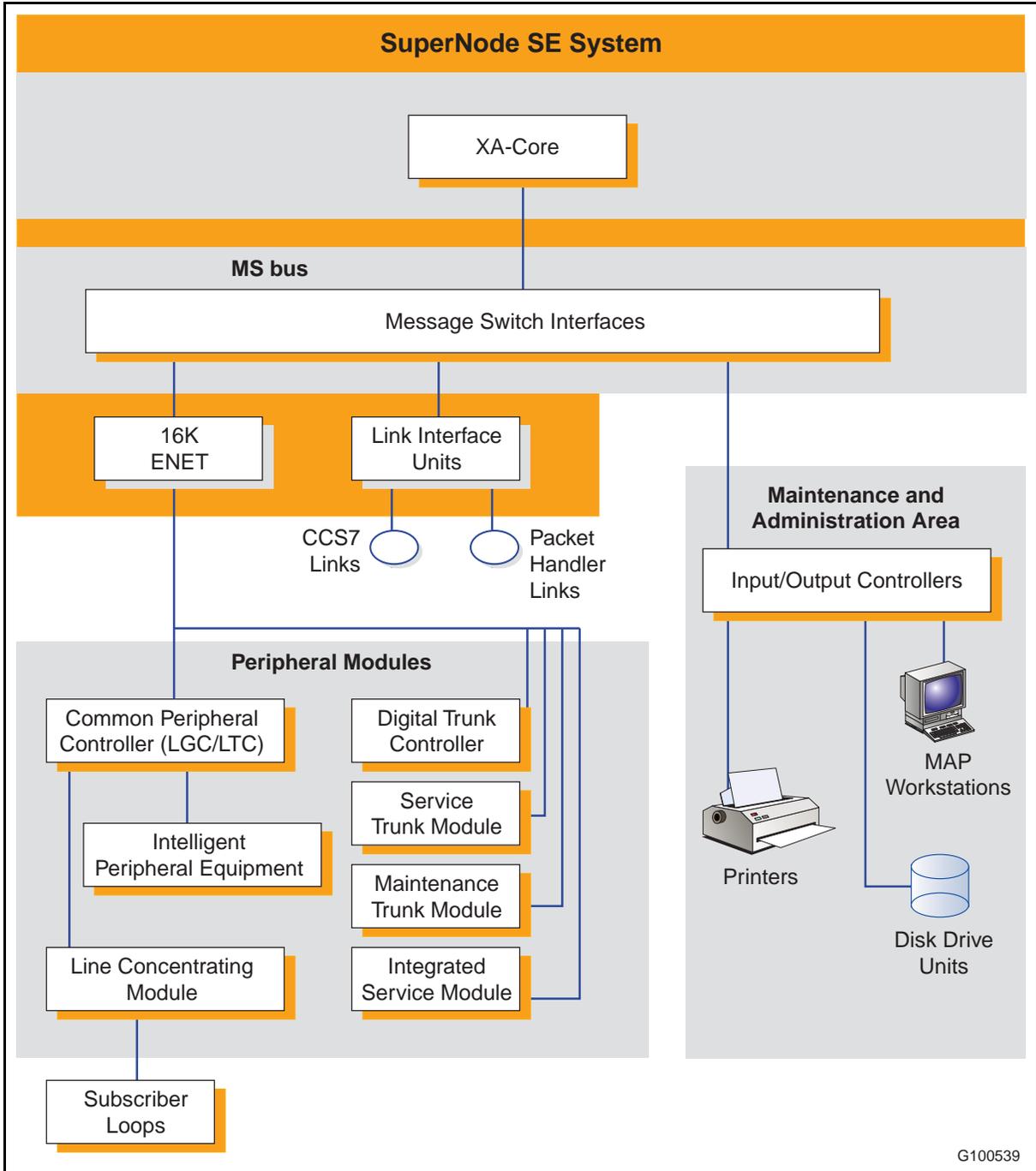
The core performs the call processing function, system management, system sanity checking, maintenance, and loading and downloading of programs. The core interacts with other components of the Meridian SL-100 through the MS bus, which supports multiple application modules.

Figure 66
Functional areas of the Meridian SuperNode system (one of duplicated planes)



258 Meridian SL-100 general functions

Figure 67
Functional areas of the Meridian SuperNode SE system with internal 16K ENET and optional LIUs (one of duplicated planes)



G100539

Bus functions

The MS bus supplies system messaging, allowing system peripherals and processors connected to the MS bus ports to communicate freely with one another.

The MS bus consists of the following:

- processor bus
- transaction bus
- control processor with supporting memory
- mapper
- processor transaction bus interface
- system clock
- port interface units

Link functions

The link is the software and protocol structure used on signaling links for SuperNode and SuperNode SE applications that interface with the telecommunications network. The link enables the networking of SuperNode systems, SuperNode SE systems and interfaces for customer programming applications. The link delivers a range of network signaling services based on public standards.

Protocol sets within the link include the CCS7 set for the following:

- transaction and trunk signaling
- ISDN access
- network operations protocols
- X.25 packet communications

The link also supports the DMS packet handler, which provides national ISDN-1 compliant packet service. DMS packet handler signaling includes the following:

- X.25 and X.75/X.75' protocols for packet processing
- ISDN Basic Rate Interface (BRI) access

Network modules

The Network Module (NM) is one of the main functional components of the Meridian SL-100 that connects to the MS bus. [Figure 68 on page 260](#) is an illustration of the NM using the Enhanced Network (ENET).

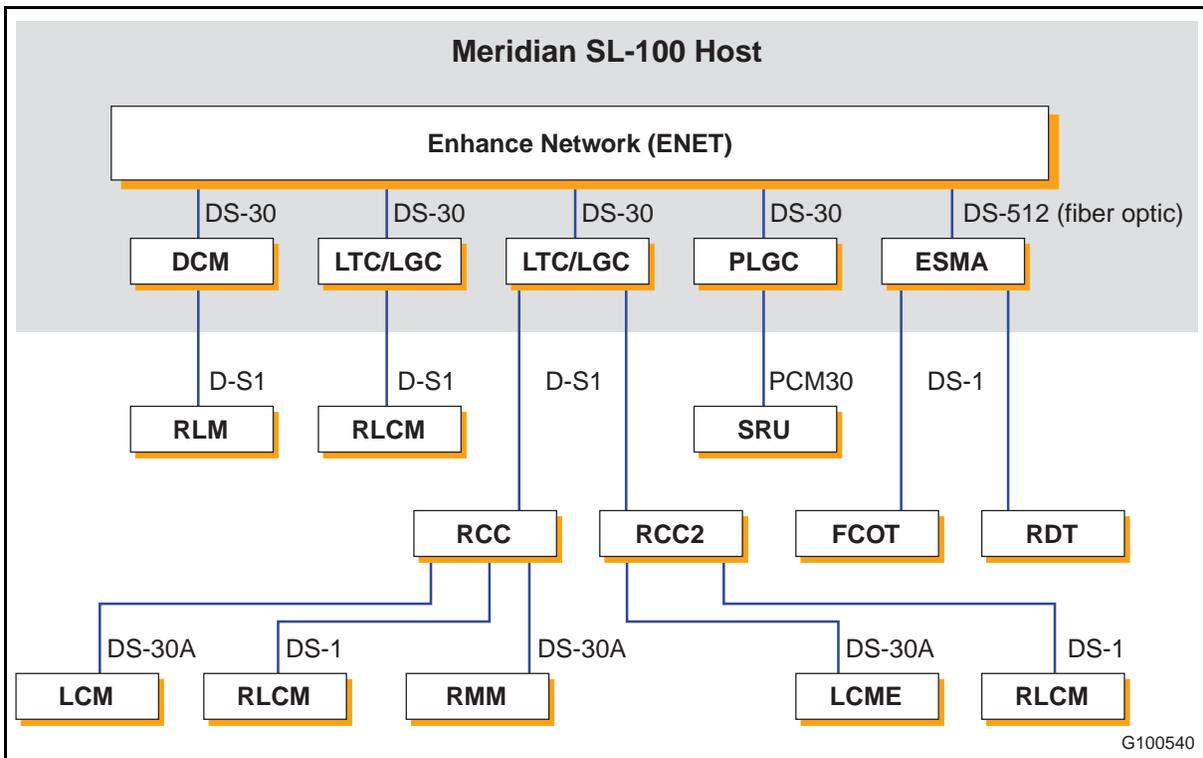
260 Meridian SL-100 general functions

The NMs are duplicated as two parallel sets (plane 0 and plane 1) of the two-way transmission paths for each connected channel between the Peripheral Modules (PMs). The duplicated parallel paths ensure that if one channel in a transmission path fails, the alternate channel is immediately available. Meanwhile, recovery action is taken to restore the failed channel.

Two types of networks are supported: Junctored Network (JNET) and Enhanced Network, although Nortel Networks recommends the upgrade to ENET for improved performance. ENET is a non-blocking, junctorless, single-stage time switch that is compatible with all Meridian SL-100 PMs. ENET is a replacement for JNET, therefore, the two networks cannot coexist in the same system. ENET hardware is either housed in an external ENET cabinet (for SuperNode systems) or a single ENET shelf located in the SuperNode SE cabinet. ENET is provisioned with new SuperNode systems and all SuperNode SE systems.

Note: JNET's last supported release will be SE07 and it will not be supported after December 31, 2005.

Figure 68
Functional areas of the Meridian SL-100 network module (ENET)



XA-Core

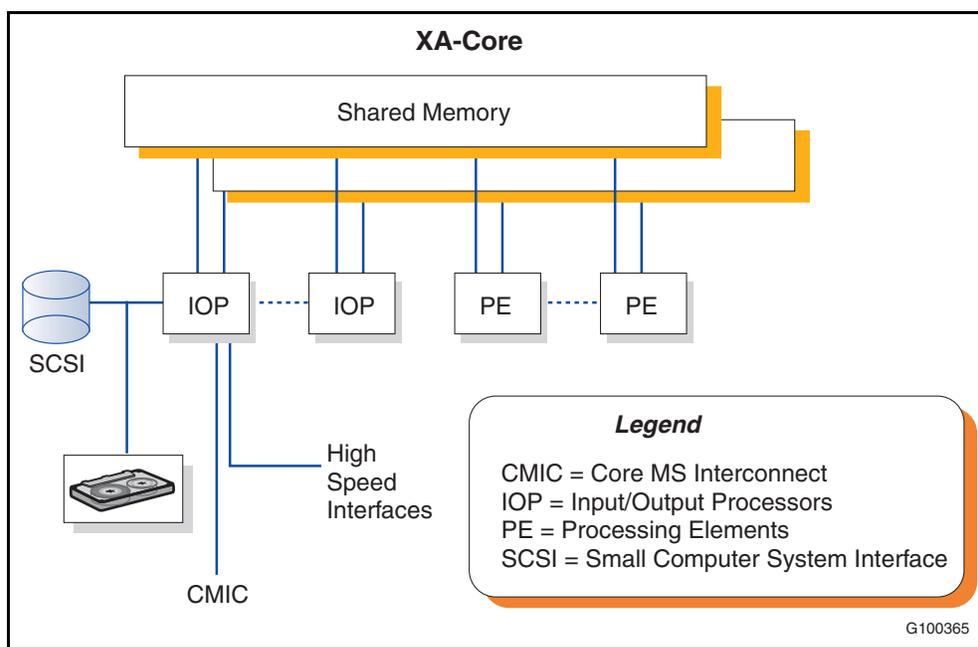
XA-Core is an architecture for achieving scalable computing power. XA-Core represents a fundamental paradigm shift in providing incremental capacity. With XA-Core, capacity growth is a function of both the speed of each processor and the number of processors. XA-Core is based on the PowerPC family of processors which provides the system with a powerful Central Processing Unit (CPU).

XA-Core's processing capability offers significant improvements in switching capacity through a multi-processor architecture using the following three elements:

- Shared Memory (SM)
- Multiple Processing Elements (PEs)
- I/O Processors (IOPs)

The DMS-bus processes and sends messages to nodes in the SuperNode and SuperNode SE switches. The DMS-bus has two load-sharing Message Switches (MS). The DMS-link allows the Meridian SL-100 core and DMS-bus to communicate in the SuperNode and SuperNode SE switches. The base core software establishes the signaling, which is then executed by the XPMs to the PSTN. The DMS-link is the connection path between the XA-Core and the rest of the system. Figure 69 illustrates the XA-Core architecture.

Figure 69
XA-Core architecture



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From a strategic perspective, XA-Core provides a key element in transitioning to the next-generation Communication Server 2100 in Nortel Networks multi-service, packet-switched IP telephony solution. All XA-Core components used in current TDM (circuit-switched) applications can be retained in the Communication Server 2100, which preserves network investments and simplifies transition.

XA-Core replaces the existing CM/SLM as the DMS-Core in both the SuperNode and SuperNode SE (SNSE) configurations of the central core. The XA-Core processing power and architecture allow switch capacity to both increase substantially and to be scalable to meet future requirements. Processing elements, memory, and I/O devices can be added or provisioned as needed.

Note: Installation of XA-Core requires the Enhanced Network (ENET).

XA-Core is comprised of a single shelf consisting of three cards as shown in Table 53.

Table 53
XA-Core card configuration

Card	Description
Processor Element (PE)	Power MPC7410/500 MHz. Duplicated per PE for fault detection. 512 MB on-board memory for Program Store. Scalable Real-time – in-service addition of PEs. Scalable Reliability – “n+m” reliability.
Input/Output Processors	Common Host I/O Processors (IOP). Individual personality “Packlets” – two per IOP. OC-3/ATM MS Links. Remote Terminal Interfaces (RS-232). Provisionable mass storage devices: >= 4 GB disks; 1.3-4 GB DAT. Fault Tolerant File System.
Shared Memory (SM)	Shared Data Store, Master Copy of Program Store. Duplex memory; independently mated 32 MB blocks. Hot spare for reliability. 192 MB granularity; 1728 MB capacity.

XA-Core features include the following:

- scalable capacity based on multiprocessing
- plug-in processors, memory and I/O port cards

- provides 2.3 times the capacity of SN70EM
 - three active processors, including hot spare
 - 768 MB of memory
- robust reliability through
 - fault detection and recovery
 - built-in self-test and diagnostics
 - auto identify, auto-configure, and auto-test
- capability for 10 times capacity of SN70EM
- Shared-Memory
- Parallel-Processing Machine
- Independent scalable sub-systems

The benefits of the XA-Core architecture include the following:

- Reduced cost of ownership.
- Scalable capacity.
- Software compatibility with both cross-threaded and non-cross-threaded call processing architectures.
- Hardware compatibility with Series I, Series II, and Series III peripherals.
- Order of magnitude improvement in core reliability, exceeding GR-512 requirements.
- Compatibility with the full line of DMS-100 family products and all existing software architectures.
- Simplified “plug-and-play” provisioning of processor elements, input/output processors and memory, allow this processor to enable the large enterprise to make incremental capacity adjustments easily and cost-effectively.
- The life-cycle of XA-Core components is significantly extended over the current single processor architecture. Instead of completing an upgrade by replacement of the entire processor set, new XA-Core components can be simply added alongside existing investments.
- With the XA-Core, spare processors can be used to share the call-processing load, as well as for “hot” backup. Instead of remaining in standby mode, these spares actively participate in the switch’s processing to broaden reliability and supplement capacity during short-term overload situations.

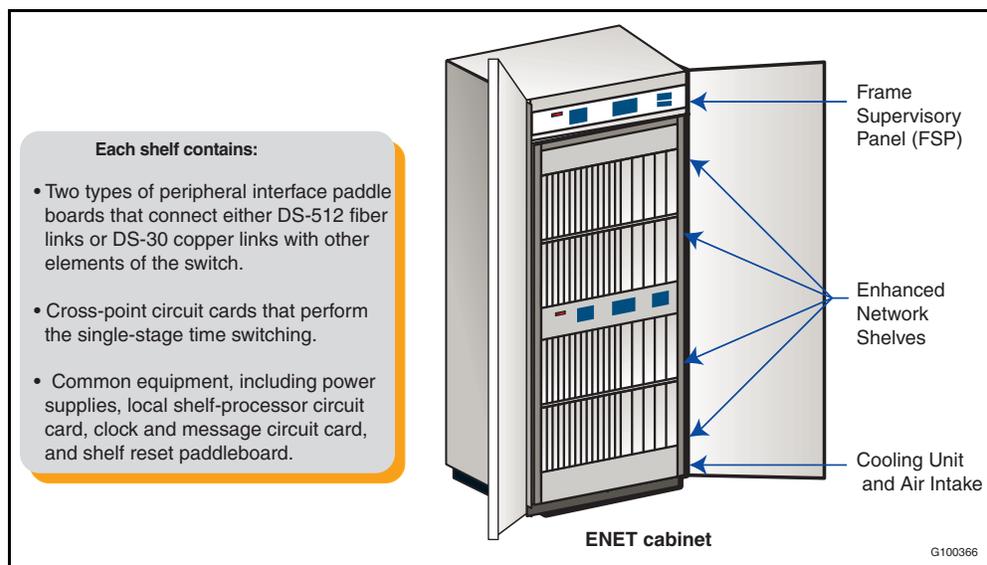
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- Auto provisioning of processor elements, enhanced fault detection and isolation, simpler extraction of failed cards and LED activity indicators are some of XA-Core's enhancements to Operations, Administration, Maintenance and Provisioning (OAM&P). These enhancements can contribute to significant savings in technician time spent on maintenance activities.
- Versatility – XA-Core can serve as a platform to boost capacity for organizations hosting large line sizes of feature-rich services such as Advanced Intelligent Network and National ISDN-2.
- DMS SuperNode system compatibility – Interfaces with components developed for the DMS SuperNode and DMS SuperNode SE systems, such as the Message Switch (MS), Enhanced Network (ENET) and Link Peripheral Processor (LPP).
- Abundant processing capacity – XA-Core can help make real-time concerns a thing of the past. In addition, dynamic call processing distribution and a 2-Gigabyte addressable memory range expand call processing capacity and speed, and favorably enhance life cycle costs.

Enhanced Network (ENET)

ENET is the switching platform for the Meridian SL-100. It is a key hardware element which supports a full range of wideband services. Figure 70 shows an ENET cabinet.

Figure 70
ENET cabinet



The Enhanced Network replaces the junctored network modules. It is a non-blocking, junctorless, single-stage time switch that can expand its capacity from 4k to 128k unidirectional channels. ENET is compatible with all Meridian SL-100 PMs, including the fiberized Series II PMs.

ENET is available in a 64 kbyte single-cabinet or 128 kbyte dual-cabinet configuration with four shelves per cabinet. The ENET cabinet uses the same hardware, power, electromagnetic interference and cooling design as the SuperNode cabinet.

Each ENET shelf is composed of the functional systems described in Table 54.

Table 54
ENET functional systems

System	Description
Processor and memory system	The processor and memory system provides operational and diagnostic control for the ENET shelf. The CPU card includes 4 MByte of RAM, which holds the operating software of the ENET. It also contains 128 kbytes of ROM firmware for bootloading and initialization procedures.
Clock and messaging system	The clock and messaging system consists of the clock and message card, which provides input/output control and the clock source for the ENET shelf. It also contains a DS512 fiber interface paddle board, which provides channelized fiber links to the DMS-bus for messaging. One of the links provides the clock source for synchronization with the DMS-bus.
Crosspoint system	The crosspoint system consists of cards that form the switching matrix. The cards are connected to the other cards on the same shelf, as well as cards on other shelves in the ENET cabinet.
Transmission and interface system	The transmission and interface system consists of the transmit and receive interfaces between the PMs and the crosspoint cards of the ENET. The interfaces supported are fiber (DS512) and copper (DS30) speech links. Series I PMs connect to the ENET through existing copper links, whereas Series II PMs connect to the ENET using DS512 fiber links.
Power system	The power is provided by two +5V-, 80-A power converters and two -5V-, 20-A power converters. One of each type is located at each end of an ENET shelf and provides power for one half of the shelf.

Table 55 describes the benefits of ENET.

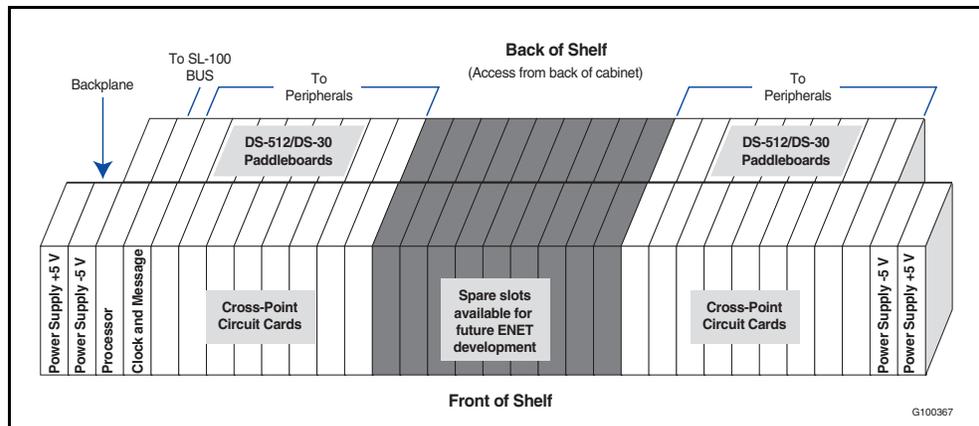
Table 55
ENET benefit summary

Benefit	Description
Easy modular growth	In the single-cabinet configuration, a fully duplicated ENET can increase to 64,000 channels in cost-effective increments. With the addition of a second cabinet, ENET capacity can be expanded up to 128,000 channels.
Simplified engineering	As a junctorless, non-blocking switching matrix, ENET does not require complicated engineering. Unconstrained by traffic and load balancing, its provisioning is based only on peripheral link terminations. ENET provides the platform for circuit-switched, channel-switched, cross-connect or nailed-up digital service.
Minimal footprint	ENET houses up to 64,000 one-way duplicated channels in the single cabinet configuration or 128,000 in two cabinets.
Junctorless architecture	Because ENET operates without junctored connections, a switch extension can be accomplished without redistributing junctored connections.

ENET is a single-stage, non-blocking, junctorless time switch. It offers superior performance, high capacity and efficient engineering and maintenance.

ENET has its own internal 32-bit processor based on the Motorola 68020, thus using common technology with the DMS SuperNode system. The basic network building block is a 16k x 16k time switch cross-point card (see Figure 71). Sixteen cross-point cards are matrixed to provide a 128k x 32k time switch that occupies one shelf in the ENET cabinet. Provisioning four shelves within the cabinet permits a matrix size of 64K x 64K, fully duplicated. A second cabinet can be added to support an ultimate capacity of 128K x 128K channels.

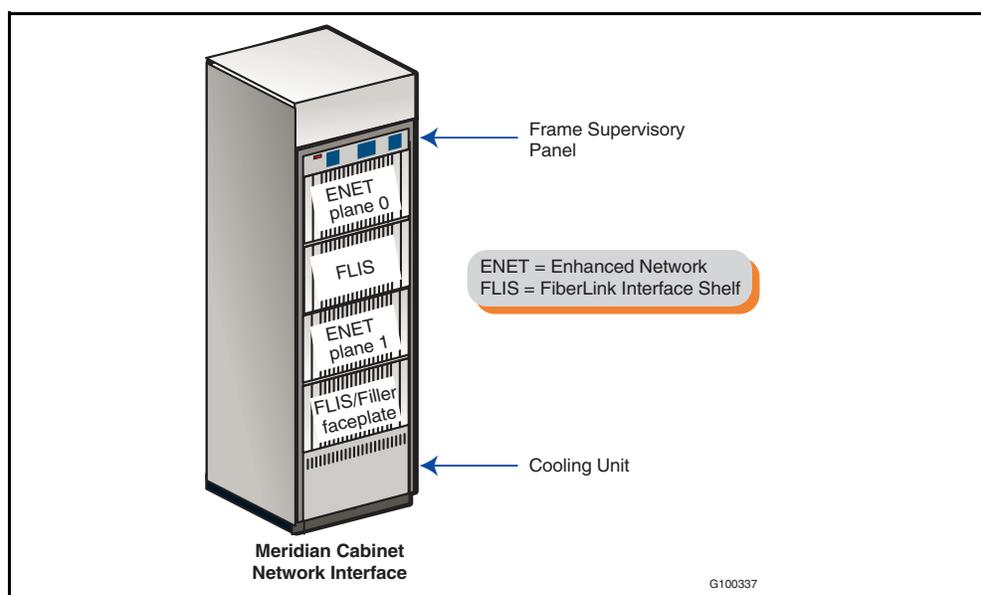
Figure 71
ENET shelf layout: top view



Meridian Cabinet Network Interface (MCNI)

The Meridian Cabinet Network Interface (MCNI) offers customers both the Enhanced Network (ENET) and the FiberLink Interface Shelf (FLIS) in a single cabinet (see Figure 72).

Figure 72
Meridian Cabinet Network Interface



The MCNI provides a reduced-footprint solution for businesses to take advantage of the advanced capabilities of the Enhanced Network. The MCNI meets the interface requirements of evolving server-based applications such as Symposium Call Center, Symposium CompuCALL TAPI Driver, Optivity Telephony Manager for Meridian SL-100 (OTM-MSL) and an array of applications using the Ethernet Interface Unit (EIU).

The MCNI answers the needs of the following two different customer groups:

- Customers who have up to a 32K ENET and wish to add a FLIS and the variety of features it makes possible. This product enhancement is executed in the field.
- Customers who wish to upgrade their manufacture discontinued Junctured Network (JNET) systems to up to a 32K ENET and acquire FLIS. This product is delivered to the customer from the factory.

Both product solutions combine up to a 32K ENET and up to two Link Interface Shelves (LIS) in the same frame. Therefore, neither requires the addition of a separate FLIS cabinet.

The MCNI provides the following flexibility:

- At those sites where ENET and FLIS already exist in two cabinets, a field conversion combines the existing FLIS and ENET into one cabinet to reduce footprint.
- At sites that have a Dual Plane Common Control (DPCC) SuperNode with JNET, but that do not have Link Peripheral Processor (LPP) or FLIS, an upgrade to up to a 32K ENET and up to two LIS shelves with EIU, CCS7 and other advanced applications is executed.
- At sites that have a Dual Plane Combined Core SuperNode with up to a 32K ENET, but that do not have LPP or FLIS, a field upgrade adds up to two LIS shelves into the 32K ENET cabinet.

Some of the features available with the MCNI are as follows:

- non-blocking network matrix supporting up to 32,000 redundant ports
- up to 24 Application Specific Units, including
 - Link Interface Unit (LIU7) supporting CCS7
 - Ethernet Interface Unit (EIU) supporting 10Base-T interface
 - Network Interface Unit (NIU) supporting Channelized Access delivery of CCS7 services
 - Enhanced Link Interface Unit (XLIU) providing X.25 packet handler services
 - Frame Relay Interface Unit (FRIU)

Link Peripheral Processor

The Link Peripheral Processor (LPP) is a multipurpose platform that serves as a strategic tool for economically introducing an array of network simplification applications. Provisioned with appropriate “personality cards” (referred to as interface units) and software, the Link Peripheral Processor supports the following:

- Common Channel Signaling (CCS7)
- Synchronous Digital Network (SDN) Packet Services (XLIU)
- Ethernet Interface Unit (EIU)

The Link Peripheral Processor allows a variety of interface units (up to 36) to occupy the same cabinet, and in many cases, the same shelf. Enterprises can introduce and administer new applications with minimal expense, mixing and matching as necessary to meet the requirements of each individual switch. The single-shelf Link Peripheral Processor, resident on the SuperNode SE, ensures low startup costs for applications that require 12 or fewer personality cards.

Table 56 describes the benefits of the Link Peripheral Processor.

Table 56
Link Peripheral Processor benefit summary

Benefit	Description
High reliability assured	The LPP has established a solid record of reliability. The Local Message Switch and Frame Bus (FBus) are fully duplicated and normally operate in load-sharing mode, but if necessary, either plane can carry the full messaging load alone. Duplication allows for uninterrupted communication from all components to, from, or within the LPP. For example, the Network Interface Units (NIUs) used for CCS7 and Packet Handler applications operate in a warm-spared mode, which allows the standby component to immediately take over if necessary.
Optimized system performance and multicomputing power	By preserving resources of the core and DMS-Bus, LPP applications optimize overall Meridian SL-100 system operations. Distributed-processing architecture means that each interface unit has its own high-performance processor to power an application, allowing the central processor to concentrate on call-processing and other computing functions of a feature-rich and function-rich telecommunications environment.
Channelized access	Using dedicated links between service applications and the Application Interface Units (AIUs), the LPP allows channelized access to an interface unit through the network. Application traffic entering the Meridian SuperNode (Option 211) system can be directed to DS-30 ports in the switching matrix. The DS-30 links transmit individual DS-0 channels to NIUs that control communication to and from the AIUs on the LPP. Channelized access offers important advantages for delivering new services from the LPP platform, including the following: <ul style="list-style-type: none"> • Reduced costs – eliminates the need for external channel banks or multiplexers in applications requiring DS-0 connections. • Increased efficiency – provides a direct path to the LPP that keeps traffic off the DMS-Bus. • Enhanced reliability – supports interface-unit “pooling”, which allows a spare AIU to take over in the event of failure of the active AIU.
Versatile platform	Meridian SL-100 users can provision new services and capabilities on the LPP platform with only an incremental increase in investment by simply adding application-specific interface units and any necessary Right-To-Use (RTU) software.

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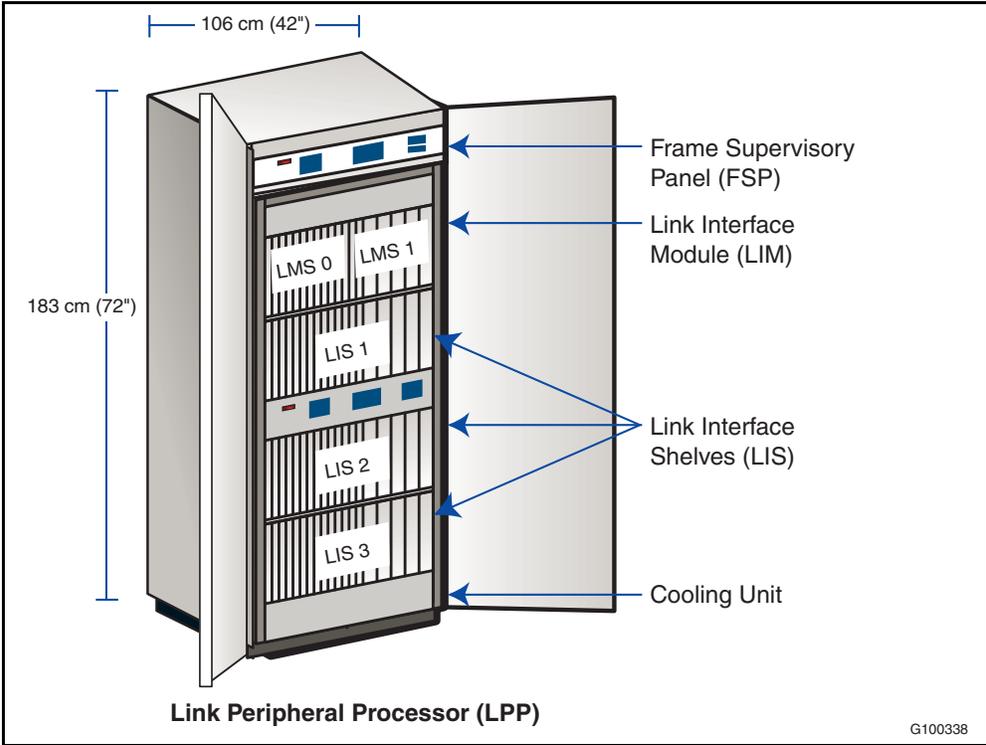
The LPP provides high-speed connectivity (up to 1.5 Mbps throughput) between an Ethernet LAN (Local Area Network) and the DMS-Bus. This high-speed connectivity allows for easy integration with an external LAN, remote access to the Maintenance and Administrative Position (MAP) from third-party computing equipment, support for attached computing resources, and support for industry-standard transport and access protocols such as Transmission Control Protocol/Internet Protocol (TCP/IP), Telnet and File Transfer Protocol (FTP). The EIU is also the standard interface to server-based applications such as Symposium Call Center, Call Pilot and Optivity Telephony Manager for Meridian SL-100.

The LPP is a unique modular hardware component providing advanced applications for the Meridian SL-100. [Figure 73 on page 271](#) shows an LPP.

The LPP cabinet is configured as follows:

- **Link Interface Module (LIM)** – The LIM controls messaging between the DMS-Bus and the LPP and between the LIUs in the LPP. It consists of two Local Message Switches (LMS) and two Frame Transport Buses (F-BUS).
- **Link Interface Shelves (LIS)** – There are three Link Interface Shelves in the LPP. The LIS holds the circuit cards and paddle boards which make up the different Application Interface Units. The LIS for the LPP can house up to 12 LIUs per shelf for a total of 36 LIUs per cabinet.

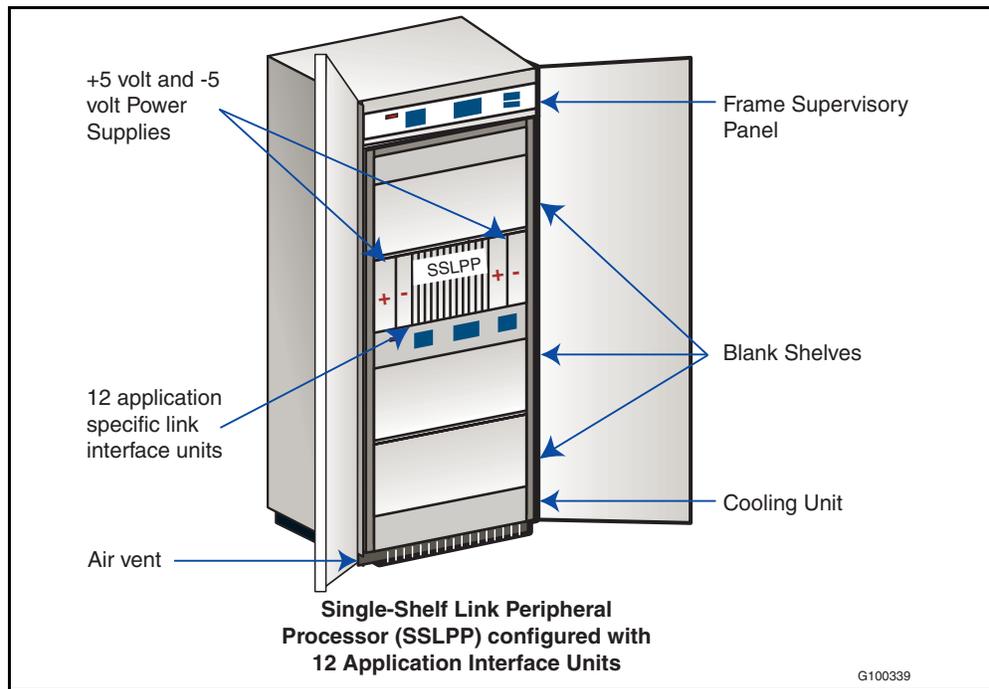
Figure 73
Link Peripheral Processor



Single-Shelf Link Peripheral Processor (SSLPP)

The Single-Shelf Link Peripheral Processor (SSLPP) was developed in response to customer demand for a lower priced/lower capacity version of the Link Peripheral Processor (LPP). It offers an economical LPP solution for the smaller-sized private network. [Figure 74 on page 272](#) shows an SSLPP.

Figure 74
Single-Shelf Link Peripheral Processor



Peripheral Modules

Peripheral Modules (PMs) are microprocessor-controlled units that connect to the network modules. Each Peripheral Module has a Peripheral Processor (PP) function that performs local processing and controls the flow of messages between itself and the Computing Module. This independent action by the Peripheral Processor relieves the Computing Module of routine local processing, which enables the Computing Module to concentrate on higher-level activities.

Peripheral Modules are responsible for the following functions:

- scanning the lines in the modules for changes of circuit state
- performing timing functions for call processing
- collecting and storing digits
- generating digital tones
- sending and receiving signaling and control information to and from the Computing Module
- checking the integrity of established voice or data paths through the network

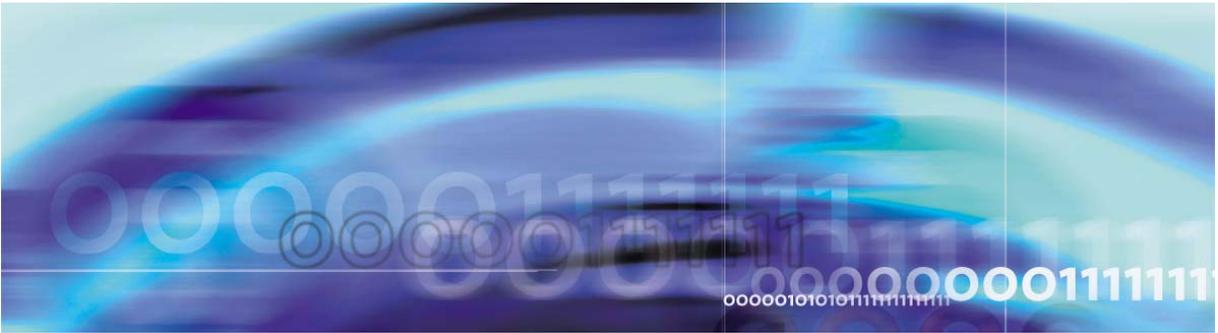
- Digital Recorded Announcement Machine (DRAM) or enhanced DRAM (EDRAM)
- conference circuits

Peripheral modules are categorized as Series I, Series II or Series III peripherals. Table 57 describes the three types of Meridian SL-100 Peripheral Modules.

Table 57
Peripheral Module series

Series	Description
Series I peripherals	<p>Series I peripherals are also called trunk module-type (TM-type) PMs. Series I peripherals have only one processor. The following is a list of Series I peripherals:</p> <ul style="list-style-type: none"> • Maintenance Trunk Module (MTM) • Service Trunk Module (STM) • Intelligent Peripheral Equipment (IPE)
Series II peripherals	<p>Series II peripherals are also called XMS-based PMs (XPMs). Series II peripherals have two processors and two separate operating units. The following is a list of Series II peripherals:</p> <ul style="list-style-type: none"> • Digital Trunk Controller (DTC, DTC-I) • Enhanced Line Concentrating Module (ELCM, LCM-E) • Digital Line Module (DLM) • Line Group Controller (LGCI) • Line Trunk Controller (LTCl) • Remote Cluster Controller (RCC, RCC2) • Subscriber Carrier Module-100 Access (SMA, ESMA)
Series III peripherals	<p>Series III peripherals are known as Link Peripheral Processor-based (LPP-based) peripherals. Series III peripherals include modules for the Link Peripheral Processor and the SuperNode Combined Core (SCC). The following is a list of Series III peripherals:</p> <ul style="list-style-type: none"> • Channel Frame Processor (CFP) • Ethernet Interface Unit (EIU) • Frame Relay Interface Unit (FRIU) • Link Interface Module (LIM) • Link Interface Unit for SS7 (LIU7) • Network Interface Unit (NIU) • X.25-X.75 Line Interface Unit (XLIU)

See “[Meridian SL-100 peripherals](#)” on page 275 for additional information about Peripheral Modules. For a detailed description about how Peripheral Modules have evolved over the years, see the *Meridian SL-100 Product Guide*, 555-4001-103.



Meridian SL-100 peripherals

Meridian SL-100 peripherals fall into the following categories:

- trunk peripherals – provide terminations of circuit-switched traffic to/from other switches or PBXs
- line peripherals – provide terminations for external lines to/from subscriber terminals and data devices

This chapter contains the following sections:

- **Trunk peripherals**

Note: The Communication Server 2100 does not directly support bearer channels and therefore does not support trunk traffic peripherals. Trunk traffic peripherals are used only used in Meridian SL-100 and hybrid Communication Server 2100 configurations.

- **Line peripherals**

Note: Line peripherals do not apply to the Communication Server 2100, which supports lines through line media gateways, not though proprietary line peripherals. Meridian SL-100 and hybrid Communication Server 2100 configurations use line peripherals.

- **Link Peripheral Processor-based peripherals**



FOR MORE INFORMATION

Refer to the *Peripheral Module Release Document (PM RELDOC)*, 555-4001-599, for detailed information about how to update the software in Meridian SL-100 Peripheral Modules and hardware types. This document provides load names, update procedures and other release-specific information.

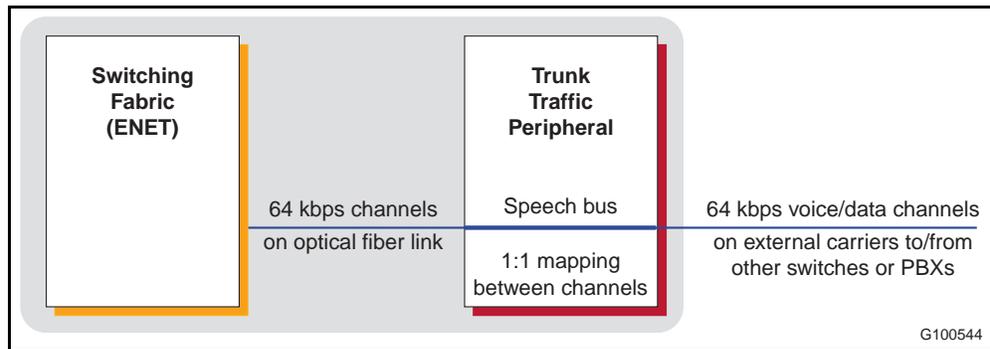
For a listing of the peripherals supported by the CS 2100 in a hybrid configuration, see [“Appendix B: Peripheral support” on page 359](#).

Trunk peripherals

Introduction

The primary purpose of a trunk traffic peripheral is to provide non-concentrated 1:1 mapping (through an internal speech bus) between 64 kbps bearer channels on external carriers and 64 kbps channels on optical fiber links to the ENET switching matrix, as illustrated in Figure 75.

Figure 75
The role of trunk traffic peripherals



The signaling that controls call establishment for the bearer channel is conveyed in separate signaling channels. Signaling terminations convert externally visible trunk signaling to/from internal Meridian SL-100 messages that can be understood by the Core. For CCS7 trunk interfaces, signaling channel terminations are housed in dedicated trunk signaling peripherals, such as the Link Peripheral Processor. For common channel signaling systems such as PRI, signaling channel terminations are housed in the same trunk traffic peripherals as the corresponding bearer traffic.

Digital Trunk Controller

Functional overview

Digital Trunk Controllers (DTCs) based on Extended Peripheral Module (XPM) technology have been the standard Meridian SL-100 trunk traffic peripheral since the introduction of the SuperNode architecture.

A Digital Trunk Controller terminates external carrier links to/from other switches and PBXs, and connects 64 kbps traffic channels provided by these external links with 64 kbps channels provided by internal DS-512 optical fiber links to the Meridian SL-100 switching matrix. There is no concentration at the Digital Trunk Controller. The maximum Peripheral-side (P-side) capacity is 480 trunks (16 PCM30 ports with 30 user channels each), and each is mapped 1:1 onto one of the 480 user channels provided by the DS-512 internal link.

Digital Trunk Controllers support the following types of copper carrier:

- T1 – 1.5 Mbps DS1 carriers with 24 64 kbps timeslots using u-law companding. T1s are standard in North America and are also used in Japan and Hong Kong.
- E1 – 2 Mbps PCM30 carriers with 32 64 kbps timeslots using A-law companding. E1s are standard in Europe and most other international markets.

Note: The DTC(I) does not support E1 trunks.

Within the Digital Trunk Controller, voice and data traffic is converted from serial form into a parallel form, to be conveyed using the Digital Trunk Controllers speech bus. The speech bus supports 640 10-bit-wide channels, 480 of which are reserved for the 64 kbps user channels routed through the Digital Trunk Controller. This make it possible for the Digital Trunk Controller to provide and detect in-band tones.

CCS7 trunk signaling is conveyed in dedicated 64 kbps signaling links on PCM30 carriers. Such signaling is not terminated in the Digital Trunk Controller. Instead, the signaling links are routed through the Digital Trunk Controller and the switching matrix to be terminated in a Link Peripheral Processor (see [“Link Peripheral Processor” on page 268](#)). ISDN trunk signaling channels are, however, terminated in the Digital Trunk Controller itself and the signaling is converted to an internal Meridian SL-100 equivalent to be conveyed to the Core. CCS7 trunks and ISDN PRI trunks cannot be mixed on a Digital Trunk Controller.

A Digital Trunk Controller is a twin-shelf unit, in which the active shelf and its components are fully duplicated by a second shelf operating in hot standby mode, ready to take over and maintain service continuity in the event of a failure.

Functional elements

Table 58 describes the functional elements that make up the Digital Trunk Controller.

Table 58
Digital Trunk Controller functional elements (Sheet 1 of 2)

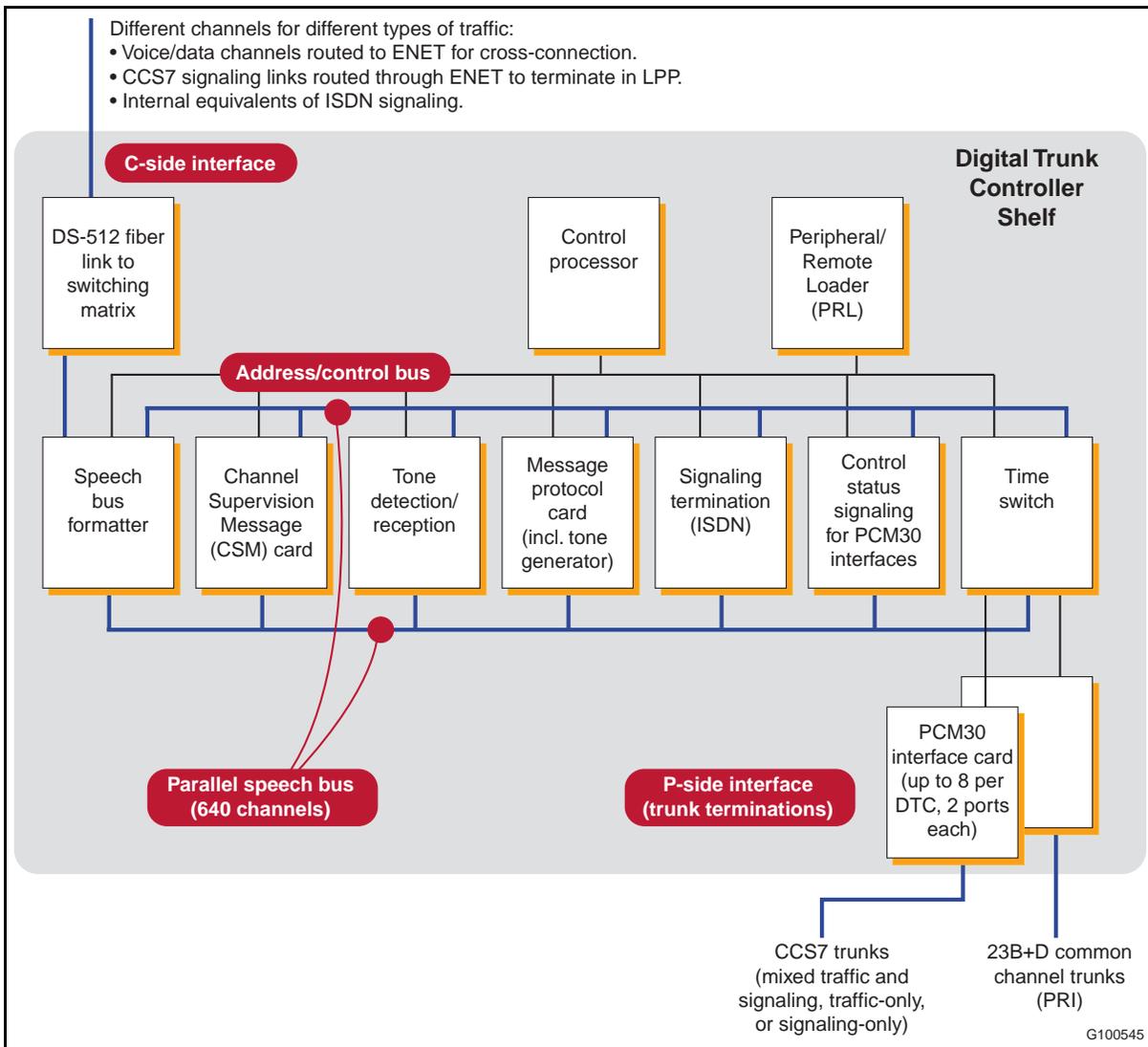
Element	Description
DTC Control Processor	<p>The control processor of the Digital Trunk Controller controls other Digital Trunk Controller components, including those that perform serial/parallel conversion and tone generation/reception. The SX05 PowerPC Control Processor is the standard processor for newly deployed Digital Trunk Controllers. It provides the following advantages over previous processors:</p> <ul style="list-style-type: none"> • significant performance improvements • 64 Mbytes on-board memory • 128 flash memory • optional on-board Peripheral/Remote Loader (PRL)
P-side interface components	<p>Terminations for P-side carriers support a variety of CCS7 and PRI trunk interfaces. T1 carriers are terminated on 6X50 cards. For a T1, the external bit-stream is All Bits Inverted (ABI) u-law.</p> <p>6X44 time switch, which makes connections between 64 kbps carrier channels and the timeslots on the Digital Trunk Controller's internal speech bus, converting serial bit stream on an external carrier to/from a parallel data stream on the speech bus.</p> <p>Signaling card providing control/status information for PCM30 interface.</p>
Core-side (C-side) interface components	<p>DS-512 optical fiber interface to the Meridian SL-100 switching matrix.</p> <p>The speech bus formatter and clock card performs serial-to-parallel conversions of encoded voice signals received on the DS-512 interface and parallel-to-serial conversion of encoded voice signals destined for the DS-512 interface. Each parallel data stream to/from the formatter is connected to the speech bus timeslot through the Channel Message Supervision (CSM) interface card. The clock selection of the formatter card provides the Digital Trunk Controller shelf clock.</p> <p>The Channel Supervision Message interface card performs parity checking on the parallel data streams to/from the formatter and monitors speech path integrity for each active call.</p>
Message Protocol Card (MPC) with downloadable tones	<p>The Message Protocol Card interfaces with the parallel speech bus to provide a C-side and P-side messaging interface using the DMSX protocol. In particular, it accepts control messages from the Core and relays them to other components. It also supports the provision of tones on the outgoing speech channels by means of a toneset downloaded to it as part of the static XPM data.</p>
Signaling termination cards	<p>The Enhanced ISDN Signaling Preprocessor (EISP) card terminates ISDN PRI signaling.</p>

Table 58
Digital Trunk Controller functional elements (Sheet 2 of 2)

Element	Description
Tone detection/reception	<p>The following optional cards are used to monitor speech bus channels for incoming tones and report detected tones to the control processor:</p> <ul style="list-style-type: none"> • Universal Tone Receiver (UTR) – A Universal Tone Receiver can monitor up to 30 channels for up to 128 different tones. • Global Tone Receiver (GTR) – A performance-enhanced version of the Universal Tone Receiver, which can detect either u-law or A-law tones. • Continuity Tone Detector (CTR) – Monitors incoming CCS7 trunks for continuity checking tone. <p>Note: As an alternative to a tone receiver in a DTC, the Meridian SL-100 can also make use of tone detection/reception capabilities provided by a card in an Maintenance Trunk Module (MTM) or Integrated Services Module (ISM) slot.</p>
Peripheral/Remote Loader	<p>The Peripheral/Remote Loader (PRL) is a 16-Mbyte flash memory card that stores Digital Trunk Controller static data and a backup image of the control processor, supporting rapid reload of the Digital Trunk Controller after a failure. Load files are transferred to the Peripheral/Remote Loader as a background task while the Digital Trunk Controller is at task level. The SX06BA 16-Mybte flash memory card is designed for use with peripherals based on the SX05AA processor.</p>

Figure 76 on page 280 shows the relationship between Digital Trunk Controller functional elements.

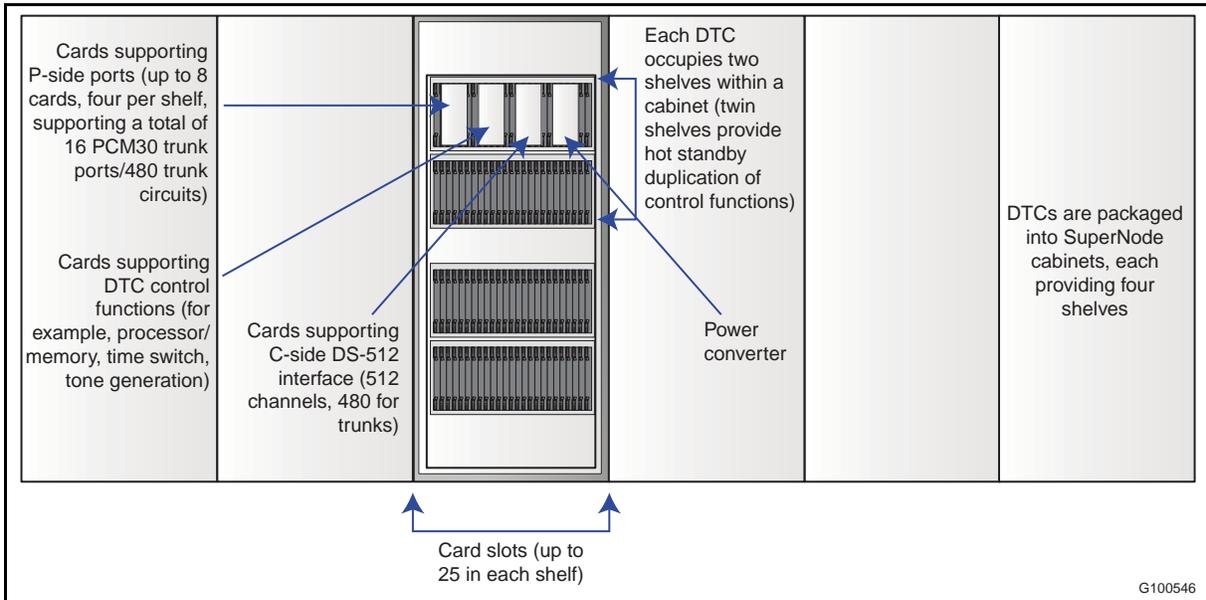
Figure 76
The architecture of an XPM-based Digital Trunk Controller



Digital Trunk Controller shelf contents

Figure 77 on page 281 illustrates how XPM-based Digital Trunk Controllers are packaged into SuperNode cabinets.

Figure 77
Digital Trunk Controller packaging



Spectrum Peripheral Module (SPM)

Functional overview

The Spectrum Peripheral Module (SPM) is an advanced trunk peripheral designed to support high-capacity applications by providing trunk terminations for optical carriers, rather than the copper carriers terminated by the Digital Trunk Controller. Spectrum Peripheral Modules and Digital Trunk Controllers are functionally complementary. A given Meridian SL-100 switch can support whatever combination of trunk peripherals best suits its network role. It is possible to add new Spectrum Peripheral Modules and/or Digital Trunk Controllers to existing switch configurations as required.

Like the Digital Trunk Controller, the primary purpose of the Spectrum Peripheral Module is to terminate external links to/from other switches and PBXs and to connect channels provided by these external links with channels provided by internal DS-512 optical fiber links in the Meridian SL-100 switching matrix.

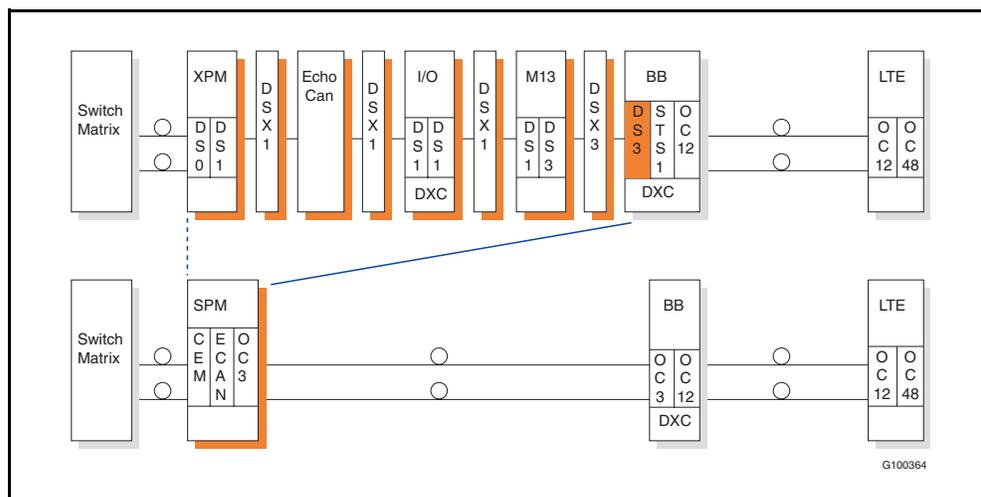
The main difference between the Spectrum Peripheral Module and the Digital Trunk Controller is that the Spectrum Peripheral Module supports the direct termination of high-speed external interfaces on OC-3 optical fiber.

The SPM architecture

- allows for multiple interfaces with network traffic
- performs integrated signal processing functions
- handles routine call processing in conjunction with the Meridian SL-100 host

Figure 78 shows a schematic of the evolution of SPM.

Figure 78
Schematic showing the evolution of SPM



For more information about how the Spectrum Peripheral Module can be upgraded for use in the Communication Server 2100, see [“Interworking Spectrum Peripheral Module IP”](#) on page 61.

Functional elements

Table 59 describes the functional elements that make up the Spectrum Peripheral Module.

Table 59
Spectrum Peripheral Module functional elements

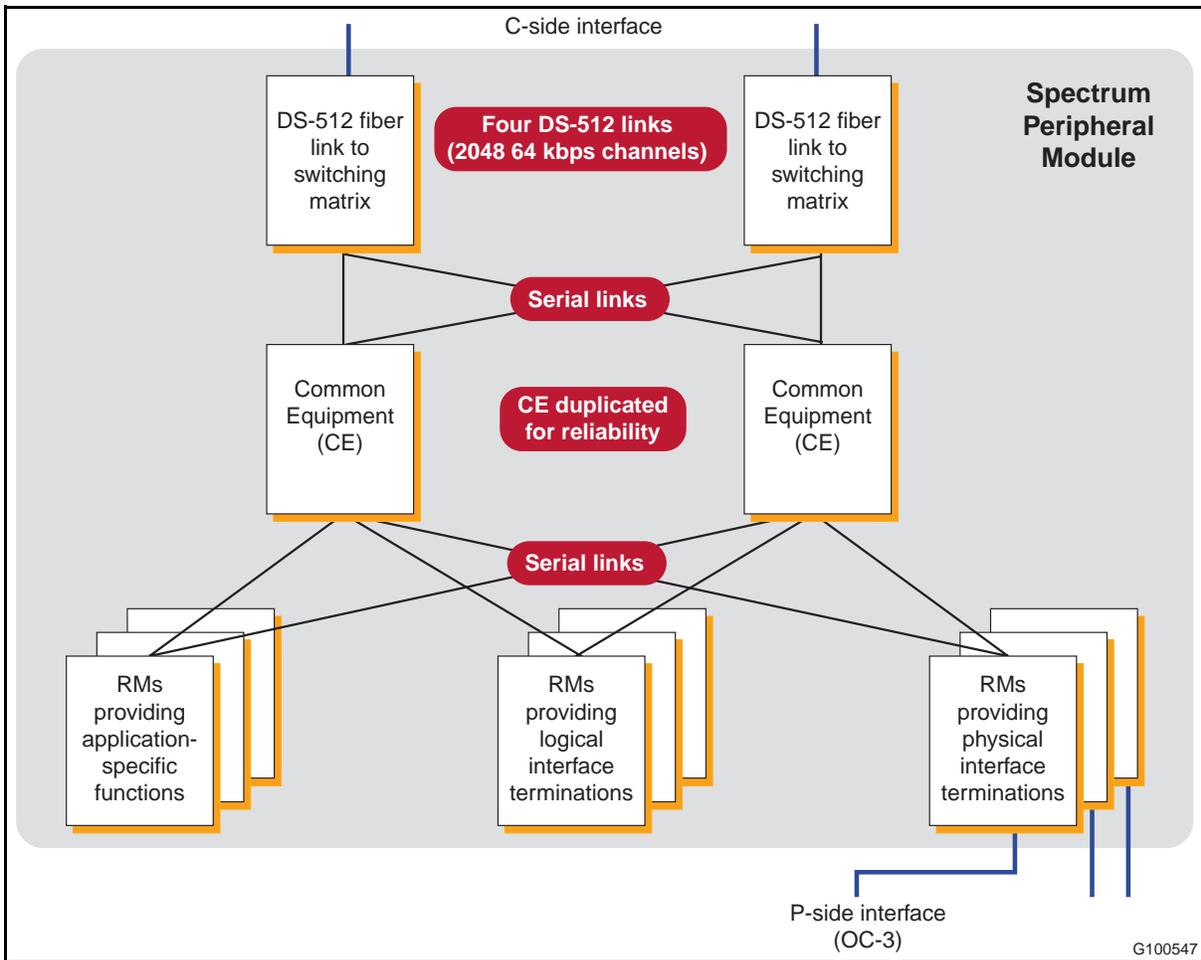
Element	Description
C-side links	Four DS-512 optical fiber links to/from ENET, supporting 2,048 kbps channels, four times as many as a Digital Trunk Controller.
Common Equipment (CE)	<p>A single-card module comprising the following:</p> <ul style="list-style-type: none"> • PowerPC 603 processor. • Time switch, with potential support for 12,000 64 kbps channels, for mapping channels from external interfaces on the Spectrum Peripheral Module's internal serial links. • Support for local call processing and maintenance. • 28 64 kbps channels available for messaging between the Spectrum Peripheral Module and the Core.
Internal serial links	There are internal serial links between the Common Equipment and Resource Modules. These are the logical equivalent of the Digital Trunk Controller's parallel speech bus, but with higher capacity.
Resource Modules (RMs)	<p>Up to 26 resource modules can be provisioned in a Spectrum Peripheral Module. A given Resource Module can combine several functions (for example, the OC-3 P-side interface Resource Module not only terminates the OC-3 carrier link, but also routes CCS7 signaling links to the Link Peripheral Processor through ENET). The functions supported by Spectrum Peripheral Module Resource Modules are as follows:</p> <ul style="list-style-type: none"> • Physical termination of P-side interfaces – OC-3 optical termination Resource Module terminating external links operating at nominal rate of 155 Mbps. Also supports routing of CCS7 signaling links to the Link Peripheral Processor through ENET. Technicians must provision at least two OC-3 Resource Modules in an SPM for protected link operation (only one is active). • Logical termination of trunk signaling for P-side interfaces – CCS7 signaling is groomed off by the OC-3 interface Resource Module and routed through the Spectrum Peripheral Module and ENET to terminate on the Link Peripheral Processor. Primary Rate Interface signaling is terminated on a Data Link Controller (DLC) card in the Spectrum Peripheral Module. • Digital Signaling Processors (DSPs) providing application-specific functionality – Digital Signaling Processors Resource Modules are logical equivalents of specialized Digital Trunk Controller cards such as the STR and GTR, but are more flexible and powerful. They support services such as tone generation and echo cancellation. They can interact with user channels through the Spectrum Peripheral Module to support applications, in the same way that the STR, for example, interacts with a specific Digital Trunk Controller channel to detect service-related tones. Specific Digital Signaling Processors Resource Modules include the following: <ul style="list-style-type: none"> — Digital Signaling Processors supporting tone generation — Voice Service Processor (VSP) — Echo Cancellers

A Spectrum Peripheral Module supports one active external OC-3 carrier link, plus another link provisioned to support protected link operation. This link provides connections to/from other switches and PBXs using an optical fiber backbone network. The Spectrum Peripheral Module connects the 64 kbps traffic channels provided by the external link with 64 kbps channels provided by four internal DS-512 optical fiber links to the Meridian SL-100 switching matrix.

There is no concentration at the Spectrum Peripheral Module. The maximum P-side capacity is 1,953 64 kbps trunks and each one of these is mapped 1:1 onto one of the 2,048 user channels provided by the DS-512 internal links. Two SPM units can be housed in a cabinet which doubles the above capacity resulting in four times the capacity provided by an XPM-based Digital Trunk Controller cabinet.

Figure 79 shows the relationship between SPM functional elements.

Figure 79
Spectrum Peripheral Module architecture



Benefits

The Spectrum Peripheral Module offers the following:

- a 1+1 redundant OC-3 trunking interface for the Meridian SL-100
- an equipment sparing STS-1 interface (redundant electronic modules)

The SPM provides an OC-3 interface directly into the Meridian SL-100 system. This flexible, multiple-application platform offers high-speed trunking technology to the Meridian SL-100 with a modular, scalable, world-class design.

Each SPM supports up to 2,016 DS-0s by using the OC-3 interface. Each frame houses two SPMs. This significantly simplifies the switching office by reducing the number of switching-peripheral frames and 3/1 multiplexers to help trim the trunking footprint from 4.2 to 6.5 times over current configurations. Users can recapture even more floor space by installing SPMs back-to-back or up to 15 cm (six inches) from walls.

The reduction in peripheral frames, batteries and rectifiers in the office can translate into lowering power expenses some five to ten times less than existing lineups. Engineering planning, and physical provisioning tasks associated with adding new trunks are cut by 48 times over a DS1 office, with the potential to reduce total cable termination by 14 times. And, with only a few card types, the SPM helps significantly lower ongoing expenses in office spares.

The consolidation of equipment in the office helps reduce the number of points of failure. Redundant optical switch links, impressive low bit error rate, and the absence of optical-to-electrical conversions, also contribute to improved in-service time.

The SPM's wide bandwidth, scalable processing, and flexible SONET payload mapping make this an ideal integrated platform for easy entry into data services, video (including video conferencing) and other high-bandwidth offerings. And the SPM's multiple application architecture enables users to deploy new services quickly, without increasing peripheral count which all translates into greater efficiency for your business.

The Spectrum Peripheral Module provides the following additional benefits:

- flexible, modular, scalable architecture with space-saving front access
- ANSI, GR-512 and NEBS compliant design

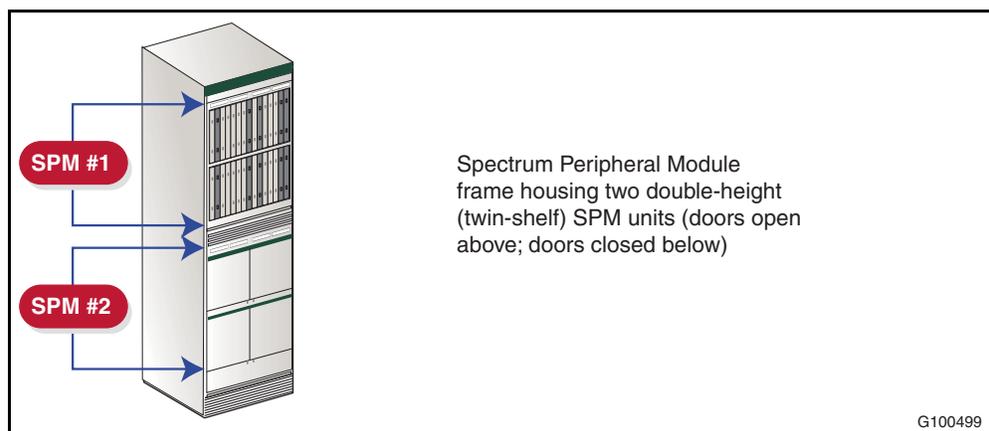
- hot insertion/hot extraction of modules
- supports both short-reach (2 km/1.2 miles) and intermediate reach (15 km/9.3 miles) optics
- spare hardware slots and processing capacity for future growth
- duplicated crossover links handle double fault conditions
- redundant processor and OC-3 trunking
- hot standby common equipment switches over without dropping current stable calls
- self-testing and advanced diagnostics
- enhanced fault detection and isolation down to a single card
- LEDs provide at-a-glance monitoring

Nortel Networks designed spare processing capacity and hardware slots (near 70% free shelf space in initial releases) to help make the SPM future ready for other trunk service to meet customer requirements.

Hardware packaging

The Spectrum Peripheral Module is a double-height shelf unit (in effect a twin-shelf unit like the Digital Trunk Controller) and is housed in a customized four-shelf system as shown in Figure 80. The dimensions of the SPM hardware are smaller than those of equivalent XPM units, but to minimize costs adapter brackets can be used to house SPMs in existing frames.

Figure 80
Spectrum Peripheral Module



Line peripherals

Introduction

This section describes Meridian SL-100 on-switch line peripherals which support the following three main functions:

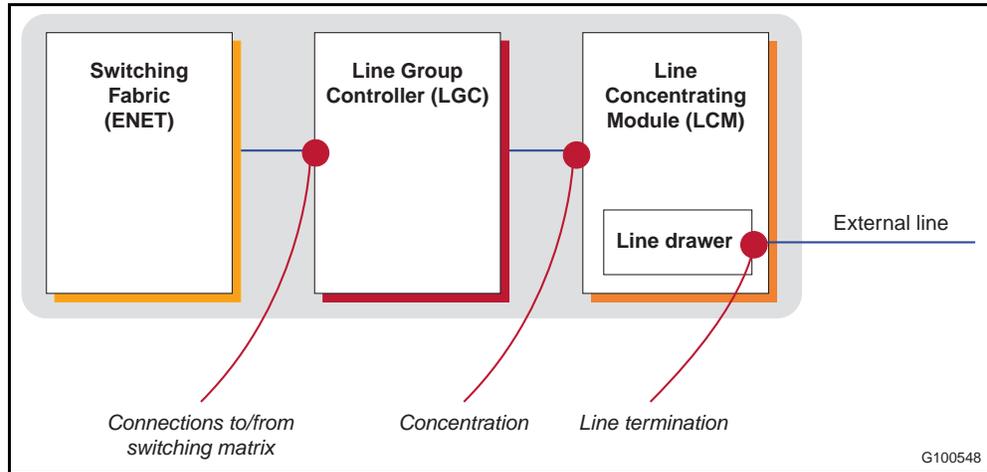
- Providing line terminations – Line peripherals provide terminations for external lines and low-capacity PBXs. An external line can be terminated directly on the switch (for example, a copper twisted pair terminated on a line card). Alternatively, the line can be terminated on an external multiplexer, in which case the physical connection is provided by a 64 kbps channel on a 2 Mbps PCM30 carrier between the switch and the multiplexer. Line signaling can be analog (in-band or out-of-band) or digital.
- Providing connections between external lines and internal channels – Setting up a call to/from an external line requires the Meridian SL-100 to through-connect the external line to the switching matrix through internal 64 kbps channels.
- Concentration – A primary distinction between line interfaces and trunk interfaces is that lines are concentrated (that is, there are fewer C-side traffic channels than P-side traffic channels). External lines (P-side channels) contend for the C-side channels available. The appropriate degree of concentration depends on the application. The aim is to provide an appropriate balance between maximum utilization of internal channels and the level of subscriber service (likelihood of getting dial tone). For example, typically lines in an residential environment such as a college dormitory are heavily concentrated (by factors up to 10:1), but business lines such as the college's administrative office are only lightly concentrated.

Traditionally, these three functions have been allocated to different units as follows:

- Line Group Controller (LGC) – Supports connections to/from the switching matrix for P-side carriers.
- Line Concentrating Module (LCM) – Supports levels of concentration. Level of concentration is determined by the number of lines (P-side) and the number of carrier links to/from the Line Group Controller (C-side).
- Line drawers – Provides physical terminations for external lines.

[Figure 81 on page 288](#) shows the allocation of line peripheral functions between the Line Group Controller, Line Concentrating Module and line drawers.

Figure 81
Allocation of line peripheral functions



This section also describes the Intelligent Peripheral Equipment module, which is a highly-specialized line peripheral that provides many value-added applications to large enterprises.

Line Group Controller

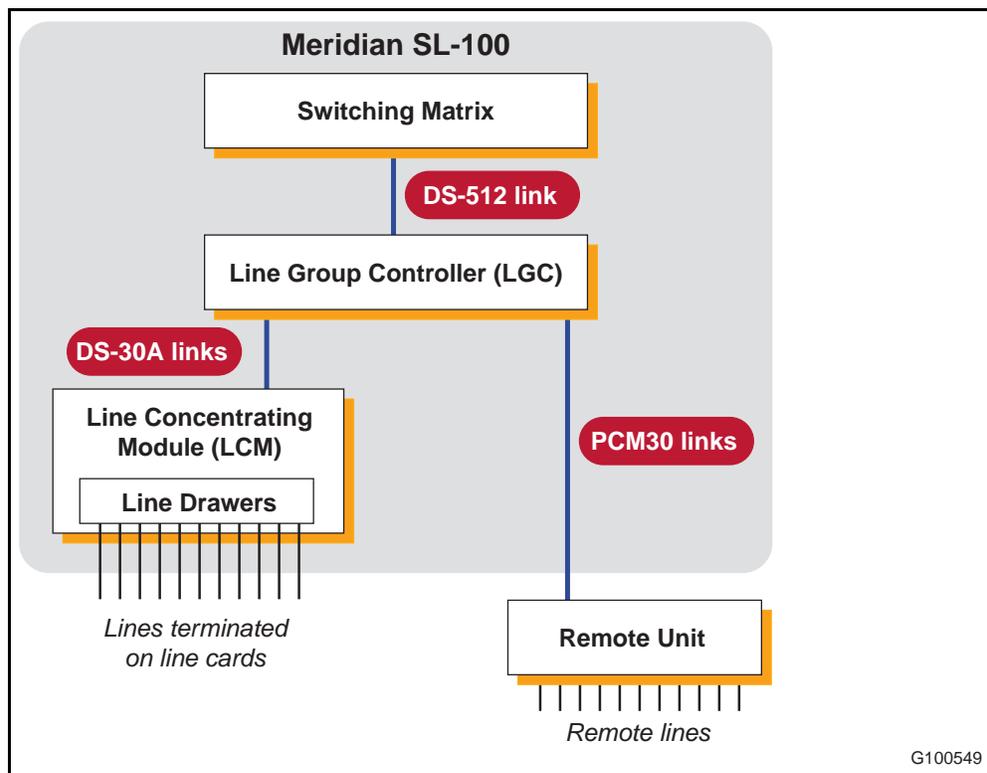
Functional overview

Line Group Controllers support Line Concentrating Modules (LCMs) and provide LCMs with access to the ENET switching matrix. A Line Group Controller interfaces with the ENET on the C-side using a single DS-512 optical fiber link. On the P-side, connections between the Line Group Controller and Line Concentrating Modules are supported using 2 Mbps links as follows:

- DS-30A links are used when interfacing with host Line Concentrating Modules (DS-30A is an internal Meridian SL-100 interface).
- PCM30 links are used for interfacing with remote unit Line Concentrating Modules. Control signaling uses either DMSX or the open High-Level Data Link Control (HDLC) protocol, depending on the messaging card in the Line Group Controller.

[Figure 82 on page 289](#) shows the relationship between the Line Group Controller and other components.

Figure 82
Line Group Controller links with other components



The Line Group Controller provides call processing and handling capabilities, tone circuits and a time switch that can connect individual 64 kbps P-side channels with C-side channels to/from ENET.

The Line Group Controller supports concentration for line interfaces to make sure that C-side capacity is not wasted (that is, there may be more P-side channels than C-side channels, in which case the P-side channels contend for the available C-side channels). Depending on the level of concentration required, there can be from two to six links between the Line Group Controller and a Line Concentrating Module. Physically, a Line Group Controller can support up to 20 P-side ports, giving a theoretical maximum of 10 LCMs supported using the minimum of two ports on the Line Concentrating Module. To avoid traffic congestion, however, Line Groups Controllers are engineered to support a maximum of 16 P-side ports for up to eight Line Concentrating Modules.

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Within the Line Group Controller, voice and data traffic is converted from serial form (as used for PCM30 and DS-512 channels) into parallel form, to be conveyed over the Line Group Controller's speech bus. The speech bus supports 640 10-bit-wide channels, 480 of which are reserved for the 64 kbps user channels routed through the Line Group Controller. This makes it possible for the Line Group Controller to provide and detect in-band tones.

A Line Group Controller is a twin-shelf unit, in which the active shelf and its components are fully duplicated by a second unit operating in hot standby mode, ready to take over and maintain service continuity in the event of failure.

Functional elements

Table 60 describes the functional elements that make up the Line Group Controller.

Table 60
Line Group Controller functional elements (Sheet 1 of 2)

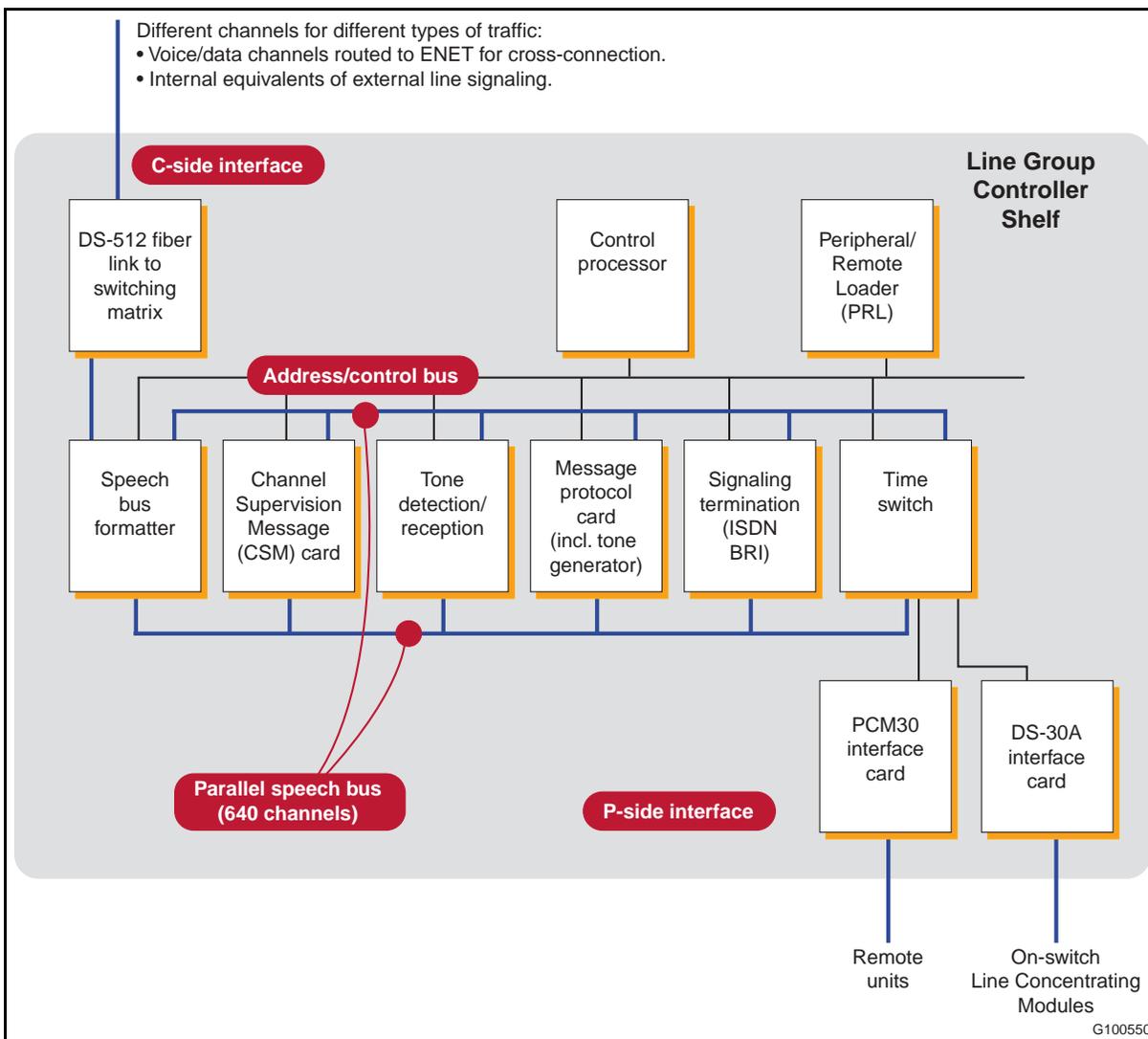
Element	Description
Control processor	<p>The control processor controls other Line Group Controller components, including those that perform serial/parallel conversion and tone generation/reception. The SX05 PowerPC control processor is the current standard for newly deployed Line Group Controllers. It offers the following advantages:</p> <ul style="list-style-type: none">• Significant performance improvements over previous types of control processor• 64 Mybytes on-board memory• 128 Mybytes flash memory• Optional on-board Peripheral/Remote Loader
P-side interface components	<p>P-side interface components include the following:</p> <ul style="list-style-type: none">• Cards terminating DS-30A internal links to on-switch Line Concentrating Modules.• Cards terminating 2 Mbps PCM30 external carrier links to Line Concentrating Modules in remote units.• Time switch that makes connections between speech bus timeslots and external carrier channels and converts the parallel data stream on the speech bus to/from a serial bit stream on a 64 kbps carrier channel.

Table 60
Line Group Controller functional elements (Sheet 2 of 2)

Element	Description
C-side interface components	<p>C-side interface components include the following:</p> <ul style="list-style-type: none"> • DS-512 optical fiber interface to Meridian SL-100 switching matrix. • Speech bus formatter and clock card that performs serial-to-parallel conversion of encoded voice signals received through the DS-512 interface. It also performs parallel-to-serial conversion of encoded voice signals destined for the DS-512 interface. Each parallel data stream to/from the formatter is connected to a speech bus timeslot through the Channel Supervision Message (CSM) interface card. The clock section of the formatter provides the Line Group Controller shelf clock. • Channel Supervision Message interface card that performs parity checking on the parallel data streams to/from the formatter and monitors speech path integrity for each active call.
Messaging card with downloadable tones	<p>The messaging card interfaces with the parallel speech bus to provide a C-side and P-side messaging interface using the DMSX protocol. In particular, it accepts control messages from the Core and relays them to other components. It also supports the provision of tones on outgoing speech channels by means of a toneset downloaded to it as part of the static XPM data.</p>
Signaling termination cards	<p>The Enhanced D-channel Handler (EDCH) card terminates ISDN Basic Rate Interface (BRI) signaling (that is, sends/receives messages to/from the signaling channel of BRI lines).</p>
Tone detection/reception	<p>The following optional cards are used to monitor speech bus channels for incoming tones and report detected tones to the control processor:</p> <ul style="list-style-type: none"> • Universal Tone Receiver (UTR) – A Universal Tone receiver can monitor up to 30 channels for event tones and digits. • Global Tone Receiver (GTR) – An enhanced version of the Universal Tone receiver that can detect up to 128 frequencies of u-law or A-law tones on 60 or 30 channels simultaneously. <p>Note: A Line Group Controller can also make use of tone detection/reception capabilities provided by a card in a Maintenance Trunk Module (MTM) or Integrated Services Module (ISM) slot.</p>
CLASS Modem Resource (CMR) card	<p>To support Custom Local Area Subscriber Services (CLASS) for analog lines, a Line Group Controller can house a CLASS Modem resource card. This card uses modem functionality to provide digital information over analog lines (for example, to provide caller name and number during silent intervals in the ringing cadence).</p>
Peripheral/Remote Loader (PRL)	<p>The Peripheral/Remote Loader is a 16-Mybte flash memory card that stores Line Group Controller static data and a backup image of the control processor, supporting rapid reload of the Line Group Controller after a failure. Load files are transferred to the Peripheral/Remote Loader as a background task while the Line Group Controller is at task level.</p>

Figure 83 on page 292 illustrates the relationship between Line Group Controller functional elements.

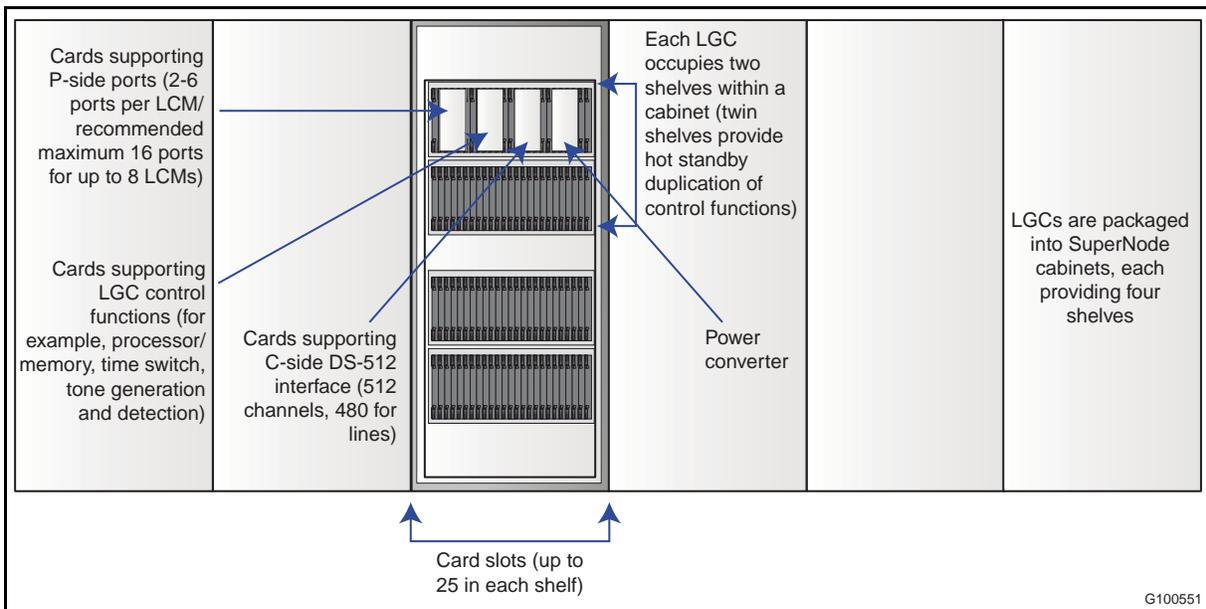
Figure 83
Line Group Controller architecture



Line Group Controller shelf contents

Figure 84 on page 293 illustrates how Line Group Controllers are packaged into SuperNode cabinets.

Figure 84
Line Group Controller packaging



Line Concentrating Modules

Functional overview

Line Concentrating Modules (LCMs) house line drawers and support communication between the Line Group Controller and the physical line terminations provided by those drawers. Line Concentrating Modules also provide whatever degree of concentration is appropriate for the application, maintaining a balance between maximum utilization of internal channels and level of subscriber service (likelihood of getting dial tone). Line Concentrating Modules can be located in the Meridian SL-100 itself or in remote units.

A Line Concentrating Module is a twin-shelf unit. Each shelf has its own control processor. The two processors normally operate in load-sharing mode, with each being responsible for the line drawers in its own shelf. In the event of failure, either processor can control all the line drawers in the unit, but at a lower rate of call traffic.

The main components of the Line Concentrating Module are as follows:

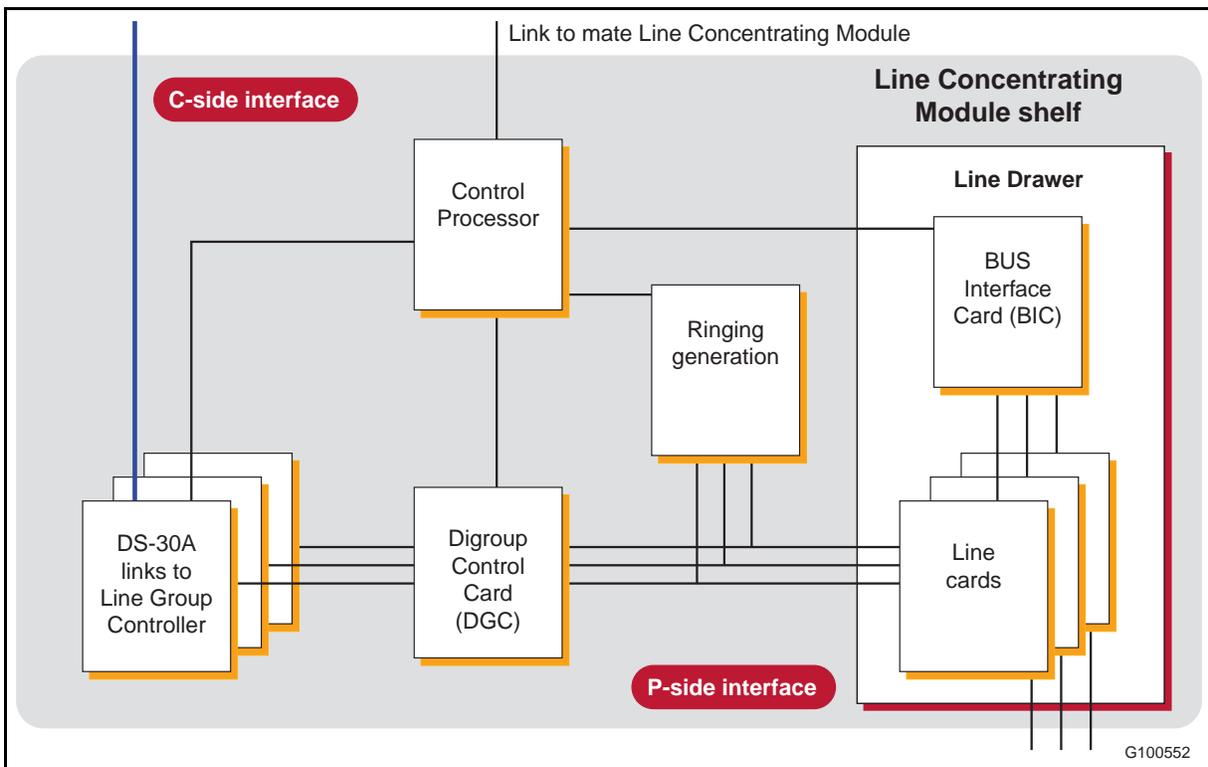
- Control processor – Controls the operation of other Line Concentrating Module components.
- Digroup Control Card (DCC) – Provides time-switched connections for speech/data channels between line drawer cards and the C-side links to the Line Group Controller.

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- Ringing generation – A ringing generator card provides the appropriate ringing cadence for outgoing line connections.
- Line drawers – These drawers, up to five per Line Concentrating Module shelf, house the cards that terminate subscriber line interfaces. Each drawer houses a Bus Interface Card (BIC), which supports access to the line drawer from the control processor.

Figure 85 illustrates the relationship between Line Concentrating Module functional elements.

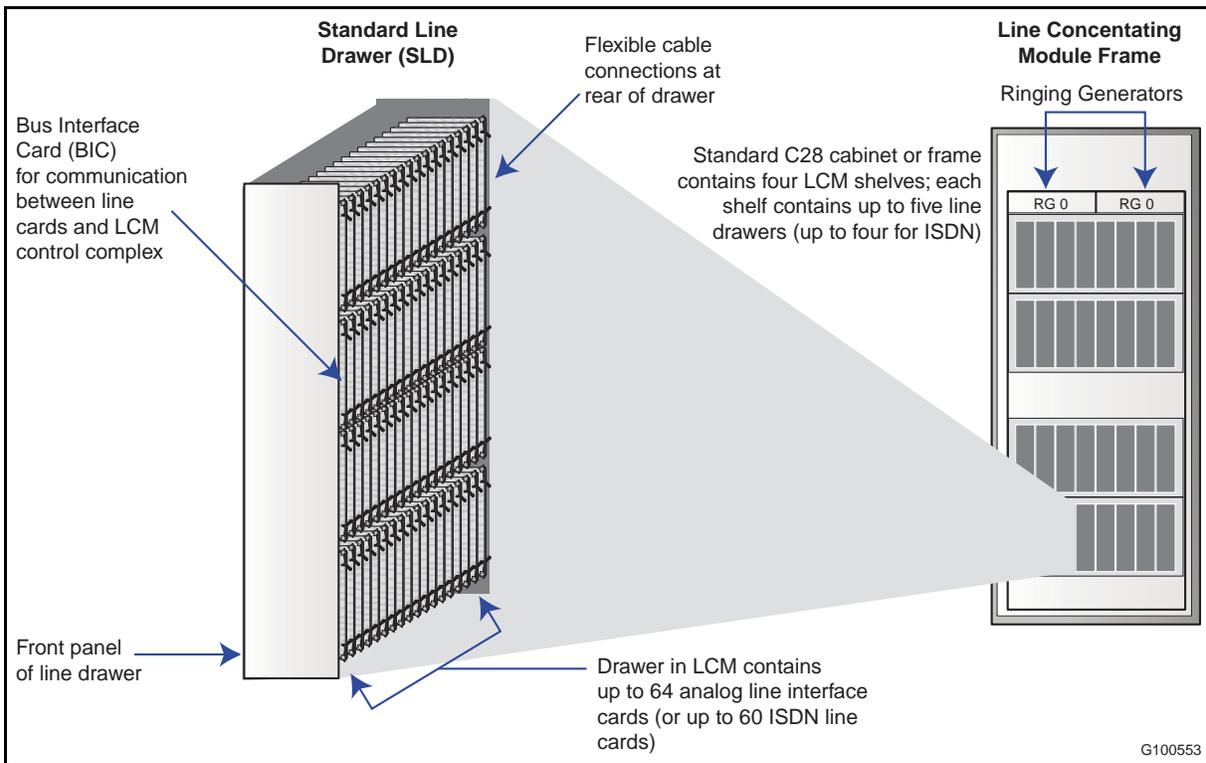
Figure 85
Line Concentrating Module architecture



Line Concentrating Module shelf contents

Standard Line Concentrating Modules are twin-shelf units housed in four-shelf cabinets or frames. Each Line Concentrating Module has up to 10 line drawers, five per shelf. Depending on the type of line terminations it contains, a Line Concentrating Module line drawer can terminate up to 64 analog line cards or 60 virtual lines. The maximum capacity of a complete Line Concentrating Module is therefore 640 line cards and that of a complete cabinet or frame is 1280 line cards. [Figure 86 on page 295](#) illustrates how line cards are housed in drawers and how line drawers are in turn housed in frames.

Figure 86
Packaging line cards in a line drawer



Depending on the level of concentration required, there can be from two to six 2 Mbps links between a Line Group Controller and Line Concentrating Module (up to 18 for an ISDN-enabled LCME). Each Line Group Controller has a theoretical maximum of 20 ports for 2 Mbps Line Concentrating Module links. Given the maximum of 2 Mbps links per Line Concentrating Module, a Line Group Controller can theoretically support up to 10 Line Concentrating Modules.

A primary purpose of the Line Concentrating Module is to provide the appropriate level of concentration between line interfaces, which are typically under utilized, with the internal LCG-LCM connections, which are heavily used. The maximum concentration (approximately 10:1) involves concentrating the Line Concentrating Module maximum of 640 line terminations onto the minimum two 2 Mbps links between the Line Group Controller and the Line Concentrating Module. This would be suitable for very lightly used lines (for example, those in a campus residence). The minimum concentration for a fully provisioned Line Concentrating Module (approximately 35:1) involves concentrating 640 line terminations onto the maximum six 2 Mbps links between the Line Group Controller and the Line Concentrating Module. This would be suitable for business lines.

Line Concentrating Modules support intra-switching (that is, the speech path between the two lines supported by the same Line Concentrating Module is through-connected at the Line Concentrating Module, not through the ENET switching matrix). Note, however, that call processing is still performed by the Core, so the Line Concentrating Module still needs to communicate with the Core through ENET and the Line Group Controller for call establishment and clearing.

Line Concentrating Modules contain a Ringing Generator card used to provide ringing to the subscriber lines. This is duplicated for reliability. An enhanced Ringing Generator card is available that has dipswitches that can be used to control the ringing cadence generated by the card.

Line Trunk Controller

The Line Trunk Controller is a peripheral module that is a combination of the Line Group Controller and the Digital Trunk Controller and provides all the services offered by both. It supports the Line Concentrating Module and AB trunks.

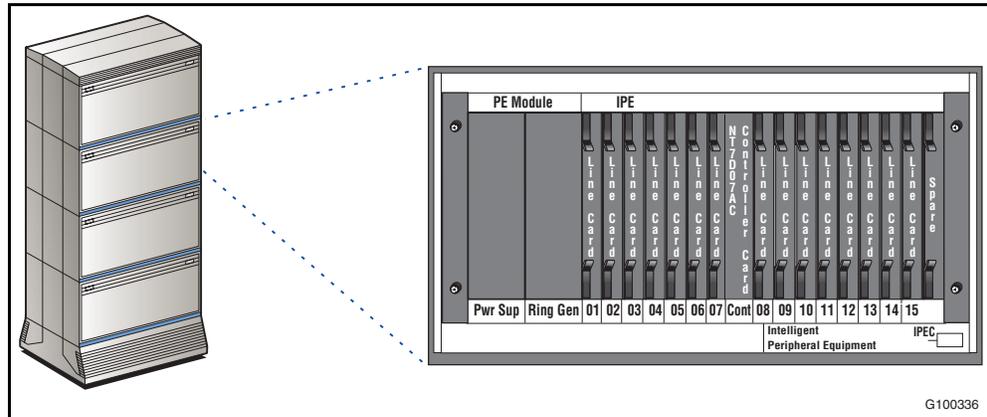
The Line Trunk Controller-ISDN (LTC-I) is a peripheral module that is a combination of the Line Group Controller and the Digital Trunk Controller and, like the LTC, provides all the services offered by both. The LTC-I is wired to support up to eight Line Concentrating Modules or Digital Line Modules (DLM) requiring up to 20 DS-30A trunk ports and 16 DS30 line ports.

Intelligent Peripheral Equipment (IPE)

The Intelligent Peripheral Equipment (IPE) Module on the Meridian SL-100 provides the capability for customers to use M3900 Series Telephones, Meridian Digital Telephones and line-side features and services. Since the IPE is common to both the Meridian 1 and Meridian SL-100 systems, users who move from Meridian 1 systems to the Meridian SL-100 are already familiar with telephone equipment and many of its features and services. In addition, customers who upgrade from Meridian 1 systems to Meridian SL-100 systems can capitalize on their initial investment in both terminals and peripheral equipment.

[Figure 87 on page 297](#) shows an IPE shelf.

Figure 87
IPE shelf



DC powered IPEs

DC power is required for the IPEs in Meridian SL-100 host and remote switching center offices.

DC powered IPEs have the following requirements:

- DC IPE shelf
- DC Powered Pedestal
- DC Power Card (NT6D40)
- DC Ring Generator (NT6D42) (optional)

AC powered IPE

An AC powered IPE can only be configured as a remote IPE behind the TSI TII product. In the AC-powered systems, power components external to the IPE are not required. AC systems perform a single conversion from the AC input voltage to the DC voltages required by circuit cards in each module. Optional reserve power requires an Uninterruptible Power Supply (UPS) and batteries. AC power supplies operate from a nominal input of 208 to 240 volts AC, single-phase. While the actual input range of the AC power supplies is 180-208 V, no restrapping the power supplies is required if the input line voltage is within 208-240V AC. AC-powered systems require one IG-LG 30 orange receptacle for each column within 2.4m (8 ft.) of the column's pedestal. Each column comes equipped with one 30 Amp cord and plug.

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IPE cards

Table 61 describes the Meridian SL-100 IPE cards

Table 61
IPE circuit cards

PEC Code	Description	Features
NT5D11XX	Line-Side T-1 Card	Connects compatible T-1 peripheral equipment such as Voice Mail systems, Voice Response Units, etc.
NT6D40XX	DC Power Card	DC power card performs a conversion from -52v DC nominal input to +5.1, +8.5, +10, -10, +15,-15v at a maximum output of 560 watts.
NT6D40XX	DC Power Card	DC power card performs a conversion from -52v DC nominal input to +5.1, +8.5, +10, -10, +15,-15v at a maximum output of 560 watts.
NT8D06XX	AC Power Card	AC power card performs a single conversion from the AC input voltage to the DC voltages required by circuit cards in each module.
NT8D21XX	AC Ring Generator	Supplies ringing current to Analog Line cards.
NT6D42XX	DC Ring Generator	Supplies ringing current to Analog Line cards.
NT7D07XX	EXPEC Circuit Card	IPE controller card that provides DC30A to DS30X protocol conversion.
NT8D02XX	XDLC Digital Line Card	Provides 16 channel digital ports with voice and data communication (replaces EB vintage card).
NT8D09XX	Message Waiting Analog Line Card	16 channel analog ports with voice communication and message waiting indication. The NT8009XX does not support CLASS and Attendant Consoles on the Meridian SL-100.
NTDF29XX	Meridian Home Office II Card	Allows remote access to teleworkers at home or small office, using M2616 or M2216 sets.
NT5D51XX	Meridian Integrated Conference Bridge	Provides 32 conference ports on the IPE. Expandable to 62 conferences using two cards.

Enhanced IPE Controller Card (EXPEC) The Enhanced Controller Card (NT7D07BA) is a single card that consists of a single board with a dual slot faceplate. The EXPEC provides enhanced capabilities compared with the NT7D07AC. NT7D07BA includes the following components:

- A new processor (MPU) within the controller.
- An increase in RAM to 8 megabytes (Mb).

- Communication with the EXPEC through an Ethernet port.
- Supports 4Mb of FLASH memory.
- Support 256 kilobytes (Kobe) of SRAM.

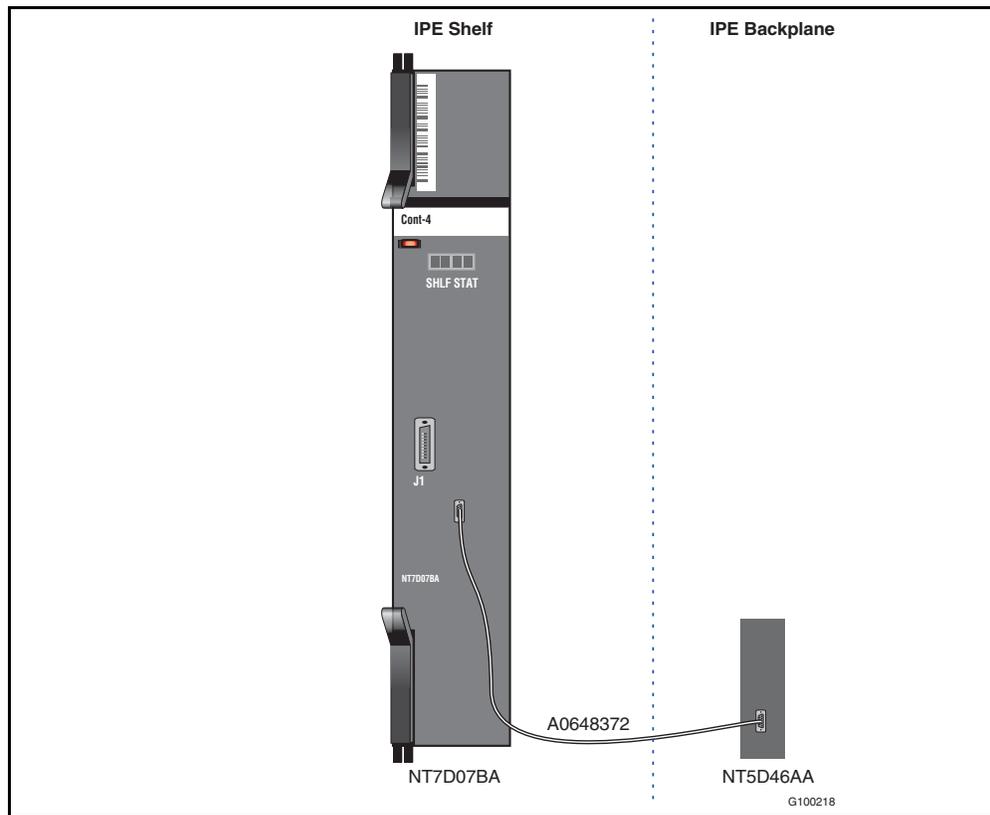
The Enhanced controller card gives the system added value by allowing the IPE system to remain in an INSV (in-service) condition while transferring the software into the flash memory from Optivity Telephony Manager for Meridian SL-100, and then booting the system from flash. This service results in less down-time and it allows more flexibility in the schedule for upgrading system software. In addition, this allows a customer to connect the IPE hardware into an enterprise data network using the Ethernet connection. This connection allows a software upgrade through the data network for quicker and more convenient loading. Finally, it offers an increase in DRAM, coupled with IPE version checking and an upgraded pSOS operating system.

Customers receive the new card with the latest software load delivered on the EXPEC card. The active IPE will be Manual Busy (Manb) then the old card is removed and the new card installed. An optional Ethernet cable and bulkhead adapter is available for connection to the LAN. This optional connection is desirable to provide minimal downtime when loading the IPE.

Datafill for Table IPEINV adds fields "XPECTYPE" as STANDARD (NT7D07AC) or ENHANCED (NT7D07BA). The field "STATE" was added to provide information on the Ethernet connection to the IPE. Datafill the tuple field either DISABLED when there is no Ethernet connection or ENABLED in which there is an Ethernet connection. When ENABLED is datafilled, enter datafill for three more fields: IPADDR to enter the IP address that will be used, SUBNET to add the subnet mask information and DFLT_GWY to provide the default gateway address that is required. Once the new IPE is Returned to Service (RTS'd) the IP address is configured. Access to the IPE from Optivity Telephony Manager for Meridian SL-100 becomes available at this time.

[Figure 88 on page 300](#) shows the IPE backplane connection.

Figure 88
IPE backplane connection



Line Side T1 Interface (LTI) The Line Side T1 IPE Interface (LTI) line card provides enhanced capabilities for the Intelligent Peripheral Equipment (IPE) product. T1 interfaces have become commonplace on today's Voice Mail and Voice Response Unit equipment. Up to this point in time, the only method available for a customer to attach these T1 interfaces to Nortel Networks equipment was through channel banks. This method is expensive, bulky, and provides poor performance due to the conversion from digital to analog and back to digital. The LTI product solves this problem.

The Line Side T1 IPE Interface supports the following applications:

- Voice Mail systems
- Interactive Voice Response (IVR) systems
- Voice Response Units (VRU) systems
- Turret systems (used in Financial and Stock Trading Companies)
- Automatic Call Distribution (ACD) systems
- Switches with Automatic Call Distribution (ACD) systems

- Interfacing Norstar systems to the Meridian SL-100 through the LTI
- With LTI at the host, interfacing to remote phones that are connected to Channel Banks

The LTI combines the system software interface of an Analog Line Card (XALC) with a T1 interface into a single IPE circuit card. The LTI is packaged as a standard IPE circuit card, capable of insertion into any of the left-most 15 IPE slots designated for line cards (the LTI requires two slots, so it cannot be inserted into slot 16).

The DS-30X interface converts the DS-30X time slots into the necessary format for transmission over the T1 link.

The MUX/Sequencer circuitry steers each DS-30X time slot to the correct T1 time slot.

The A/B bit control circuitry converts on-hook, off-hook, and ringer control messages from the DS-30X loop into A and B signaling bits in the T1 links.

The T1 interface circuitry provides the 1.544 Mbps interface to the T1 link. The T1 interface connects to the network through the 25 pair connection at the rear of the IPE shelf.

The LTI supports 24 circuits. Since the Analog Line Card, that the LTI emulates, can only support 16 ports, the LTI implements a daughterboard arrangement to access a second IPE card slot.

The LTI accommodates SF or ESF Framing and B8ZS or AMI line coding, using robbed-bit signaling.

Remote T1 IPE Interface (TII) The T1 IPE (TII), developed by Telecom Strategies, Inc. (TSI), allows Intelligent Peripheral Equipment (IPE) modules to be remotely located from the Meridian SL-100 host or Remote Switching Center (MCRM, MCRM-S), over standard T1 facilities to distances up to 112.5 km (70 miles).

The Remote T1 IPE Interface (TII) cost-effectively extends a Meridian SL-100 IPE module up to 112.5 km (70 miles) from a host or RSC over standard T1 facilities. A local TII circuit card converts up to three DS-30A loops from the host or RSC into T1 compatible format. A remote TII circuit card converts the T1 format signals back to DS-30A loops for attachment to a remote IPE module.

302 Meridian SL-100 peripherals

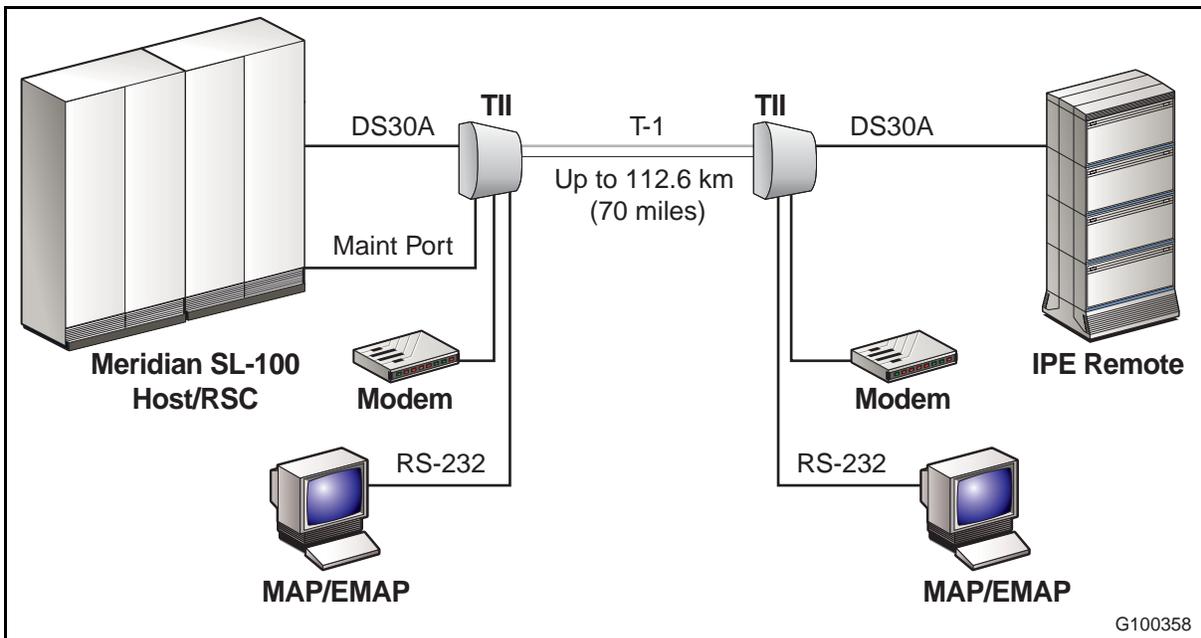
The TII can attach to standard network T1 facilities, private T1 facilities, T1-compatible microwave or infrared transmission equipment, or dry two-pair wiring. The T1 IPE Interface is compatible with both SF and ESF T1 framing, as well as B8ZS coding, and is fully DACS compatible.

Optional redundancy is available to protect against T1 failure. A full range of T1 link diagnostics and monitoring capability is provided in the product. The TII is packaged in a 48 cm or 58.5 cm (19 or 23) inch card cage, or a wall-mounted enclosure. Optional 48 volt DC is available, or 110 volts AC power is available.

Note: The IPE Remote can be powered by optional 48 volts DC or 220 volts AC.

Figure 89 shows the Remote T1 interface configuration.

Figure 89
Remote T1 IPE interface configuration



Since the TII is not included in the NTI Customer Premises Equipment Distributorship Agreement, TII equipment and support is provided direct from TSI Authorized Distributors. However, Nortel Networks engineering is required for delivery of the IPE and associated interface equipment.

All of the DS30A links from the TII must reside on the same XPM.

Downloading IPE software

Download of the IPE software using one of the following methods:

- Download the IPE software from the MAP. Normal downloading of the IPE is still supported.
- Download the IPE software from the Optivity Telephony Manager for Meridian SL-100 using the IPE Ethernet port. Optivity Telephony Manager for Meridian SL-100 provides the EXPEC with the information about where to retrieve the file (DISKUT or an FTP server). The EXPEC then retrieves the file through the EIU (if the file is in DISKUT) and provides the software load into flash memory. The customer can now set the ITOC table in the EXPEC to the load that will be put in-service. Loading is not necessary unless the flash load on the IPE card is corrupted. Removal of power does not affect the load in flash.

When user needs to RTS the IPE they can now use the command IPE menu command "RTS FLASH_". This command boots the IPE card from flash memory and puts the unit in-service.

Cutoff on Disconnect Controller

The CDC-12, developed in cooperation with Telecom Strategies Incorporated (TSI), is a compact, wall-mountable unit which allows people to more effectively use modems, paging equipment, Voice Mail systems, and other 2500-type devices, connected to an Intelligent Peripheral Equipment (IPE) module, which require a positive indication of distant end disconnect. The CDC-12 is cross-connected in series with up to 12 IPE-based 2500-type analog ports to provide a momentary interruption of line current when a distant-end disconnect occurs. This momentary interruption is recognized by the terminal equipment as a distant-end disconnect which allows the device to go on-hook and gracefully end the communication session.

A control port off the CDC-12 is connected to a digital port on the Meridian SL-100 to emulate an M2616 digital telephone. The Meridian SL-100 database is configured such that each of the twelve ports requiring cutoff on disconnect indication appears as a line on the digital control port. Either the Multiple Appearance Directory Number (MADN) feature, or Busy Lamp Field (BLF) feature, can be used to configure the digital control port.

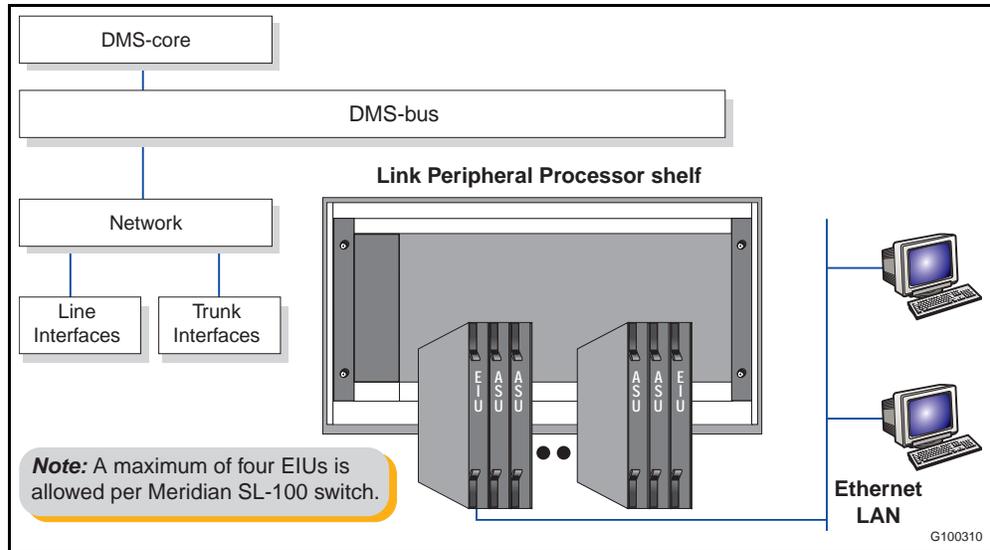
Since the CDC-12 is not included in the NTI Customer Premises Equipment Distributorship Agreement, CDC-12 equipment and support is provided direct from TSI Authorized Distributors. However, Nortel Networks engineering is required for delivery of the IPE and associated interface equipment.

Link Peripheral Processor-based peripherals

Ethernet Interface Unit (EIU)

The Ethernet Interface Unit (EIU) provides a link between a Meridian SL-100 switch and a Local Area Network (LAN) using Ethernet technology. Figure 90 simplifies this concept.

Figure 90
Ethernet Interface Unit block diagram



The Ethernet Interface Unit

- provides the physical connection between the switch and the LAN
- converts data from LAN-supported protocols to Meridian SL-100-supported protocols
- provides the primary interface to server-based applications including the following:
 - Symposium Call Center
 - Symposium TAPI Driver over Intelligent Call Management (ICM)
 - Telnet, MAP, and File Transfer Protocol (FTP) services
 - Transmission Control Protocol and Internet Protocol (TCP/IP) services
 - User Datagram Protocol (UDP) services
 - Integrated Voice Response
 - CompuCALL to TCP/IP
 - Station Message Detail Recording (SMDR)

- Optivity Telephony Manager for Meridian SL-100
- Simple Network Management Protocol (SNMP)
- Real-time Station Message Detail Recording

The Ethernet Interface Unit acts as a router between the Meridian SL-100 and an external Ethernet LAN. The EIU provides remote access to the MAP from third-party computing equipment (for example, workstations, terminals and printers) connected to the Meridian SL-100 through an Ethernet LAN. With the EIU, technicians can perform Operations, Administration, Maintenance and Provisioning (OAM&P) functions from the ease and convenience of the Local Area Network. The physical implementation of the EIU is standardized in the Institute of Electrical and Electronic Engineers (IEEE) 802.3 standard.

Benefits

Ethernet Interface Unit includes the following:

- High-speed Ethernet connectivity (up to 1.5 Mbps throughput between an Ethernet LAN and the DMS Bus) permitting easy integration with an external LAN.
- Support for attached computing resources such as computers, workstations and printers.
- Support for industry-standard transport and access protocols such as TCP/IP, UDP, Telnet and FTP.
- Enhanced OAM&P capabilities by drawing on the strength of state-of-the-art computing technologies.
- Simple Network Management Protocol interface for network management applications.
- Computer telephony message transport through the Intelligent Call Management link.
- Support for user requests from the server/switch and capability to evaluate, manipulate and process the information obtained. This saves time, increases productivity, and reduces investment in equipment and personnel.

EIU hardware requirements

EIUs reside within the Link Peripheral Processor (LPP) in a Meridian SL-100 SuperNode or SNSE cabinet, or in a Meridian Cabinet Network Interface (MCNI) cabinet. In all cases, they reside alongside other Application Specific Units (ASUs) such as the CCS7 Link Interface Unit (LIU7), Frame Relay Interface Unit (FRIU), Network Interface Unit (NIU), Enhanced Link Interface Unit (XLIU) providing X.25 packet handler services, and more.

The EIU can reside in the LPP cabinet or the SNSE Link Interface Shelf (LIS).

The EIU consists of a three-card set as follows:

- NTEX22BA/BB Integrated Processor FBus (IPF) card which houses the M68030 processor and 8Mb DRAM.
- NT9X84AA Ethernet Interface Card (EIC), which houses the local high-speed buffer and Media Access Control layer.
- NT9X85AA Ethernet Interface Paddleboard (EIP), which provides the physical link to the Local Area Network using the generic interface connection described below.

A single EIU is required for each LAN connection to the switch. However, two EIUs for each LAN connection are recommended. When operating in a hot-standby mode, the two EIUs provide fault-tolerant communications to the LAN. In hot standby, one EIU carries the full traffic load. If the active EIU fails, traffic is automatically shifted to the standby EIU.

The EIU uses two generic components, an Application Unit Interface (AUI) cable and a Media Access Unit (MAU), to physically link with the LAN. The AUI consists of four shielded twisted-pair wires, with a 15-pin D-type connector (DB 15) at each end. The MAU transfers packets from the medium supporting the Ethernet LAN (thick wire, thin coax, UTP, or fiber optic) to the AUI cable. Both of these units are LAN-based equipment and are commercially available.

IP Client Manager for the Meridian SL-100

Description

The IP Client Manager (IPCM) uses IP technology to deliver the full Meridian business features sets and capabilities to users connected to a managed IP network. The IP Client Manager 2.5 connects through a TDM T1 interface to a Line Trunk Controller ISDN (LTC-I) on the Meridian SL-100. The Meridian SL-100 supports the 2002 and 2004 Internet Telephones and the m6350 softphone through the IP Client Manager.

Note: The IP Client Manager can also be used with the Communication Server 2100. For more information, see [“IP Client Manager for the Communication Server 2100” on page 103](#).

The IP Client Manager consists of the following components:

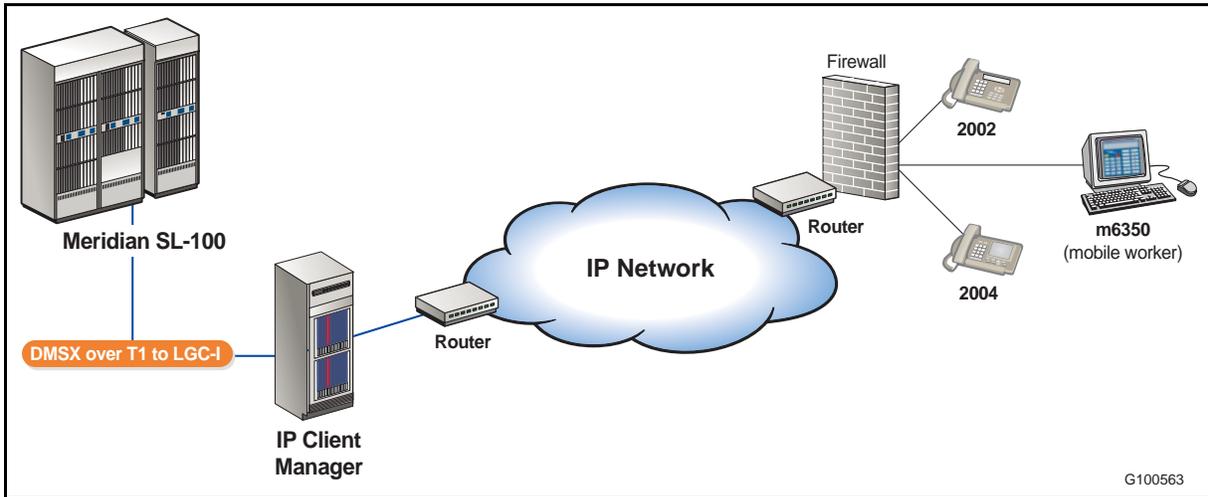
- One fully-loaded SAM16 chassis containing a pair of CPU cards and their associated TDM and Digital Signaling Processor (DSP) cards
- An Element Manager which provides the ability to configure and monitor one or more IP Client Manager and their clients
- An Ethernet Switch that connects the IP Client Manager to its client and Administration LANs
- Client hardware and software

The IP Client Manager provides many telephony functions, including the following:

- conversion between TDM and IP
- compression and decompression of digitized signals
- connection and negotiation
- configuration and administration functions

[Figure 91 on page 308](#) shows an example of the IP Client Manager Meridian SL-100 network configuration.

Figure 91
IP Client Manager and Meridian SL-100 network configuration



The IP Client Manager

- extends Meridian SL-100 services up to 2556 users per chassis
- retains investment in TDM services infrastructure, while evolving to IP services
- provides the following enterprise features over an IP network, anywhere, anytime, with no service compromises:
 - Custom Local Area Signaling Service (CLASS)
 - Computer Telephony Integration (CTI)
 - Call Center

The IP Client Manager combines the rich feature set and high reliability of the Meridian SL-100 with the next-generation capabilities of IP telephony. Delivering lower costs and enhanced services regardless of a user's location, IP Client Manager extends the reach of IP telephony to local and remote IP-based environments. Organizations using IP Client Manager can migrate to IP telephony through seamless integration with existing customer groups, Virtual Private Networks (VPNs), and Call Centers.

IP Client Manager gateway functionality

The IP Client Manager acts as a gateway when it interfaces with the Meridian SL-100 in that it provides an interface between the IP network and the PSTN. The IP Client Manager gateway provides the interface between the Meridian SL-100 and a managed IP network. A pair of CPU cards and the associated TDM and Digital Signaling Processor (DSP) cards make up the gateway.

The IP Client Manager connects to the Line Group Controller (LGC), Line/Trunk Controller (LTC)/Remote Cluster Controller (RCC) through a T1 link.

The IP Client Manager acts as a “lights out” server (that is, it has no monitor, keyboard or mouse). Once connected and powered up, technicians perform all maintenance remotely from a PC on the Administration LAN.

Supported clients

The IP Client Manager enables a user to initiate and make IP telephony calls and to use a wide range of features from a Meridian SL-100. In SE07, the IP Client Manager supports the following two types of clients:

- The m6350 Softclient application, which is an IP telephony software client installed on a PC, running a Windows 2000 operating system, attached to a LAN. The M6350 works with a headset and adapter which plugs into a Universal Serial Bus (USB) port on the PC.
- The Nortel Networks 200x Etherset telephones, which connect directly to a client LAN or a telephony switch module. Currently, the IP Client Manager supports the 2002 and 2004 models.

Ethernet switch

Ethernet switches connect the IP Client Manager to the Administration and Client LANs. Although the IP Client Manager requires only one Ethernet switch to operate, Nortel Networks recommend that you configure two Ethernet switches to provide Administration LAN redundancy.

Note 1: With one Ethernet switch, if there is a failure the two CPU cards will not communicate with each other through the Administration LAN. Each CPU card will then tell the Meridian SL-100 that its mate node is missing and the Meridian SL-100 will take both nodes out of service.

Note 2: This configuration does not provide Client LAN redundancy. If an Ethernet Switch is lost, the Ethersets active on the Ethernet switch will drop and then recover.

The enterprise must supply their own Ethernet Switches, which must provide support for 802.1Q VLANs. Nortel Network recommends the Nortel Networks BPS2000 Ethernet Switch.

Element manager

IP Client Manager ships with a Web-based element manager.

The Web-based element manager interface provides all of the functionality necessary for configuring and monitoring an IP Client Manager and its clients. The interface uses a series of web pages hosted on the element manager and runs on any platform that supports Microsoft Internet Explorer, version 5.0 or later.

The web-based gateway configuration interface consists of the following:

- A home page that has links to
 - A gateway overview page that provides a summary of the gateway and its components
 - Detailed status pages for each gateway element
- A collection of pages that report the configuration states of the gateway elements.
- A Gateway Configuration Wizard for performing initial setup and configuration of the gateway, as well as making changes to the IP Client Manager.
- Pages for configuring user profiles.
- Pages for configuring users.
- Pages for configuring client terminals.

Protocol support

The IP Client Manager supports the following protocols:

- H.248 protocol for connections to Communication Servers
- UNISim for PC Client and IP Phone control (a Nortel Networks proprietary protocol)
- G.711, G.723.1, and G.729 codecs
- DMS-X for connections to the Meridian SL-100

Security

The IP Client Manager has built-in user authentication and Network Address Translation (NAT).

Hardware requirements

The following major components make up the IP Client Manager:

- PTE2000 frame
- Service Application Module (SAM) 16 chassis
- Element Manager (running windows 2000 with terminal access)

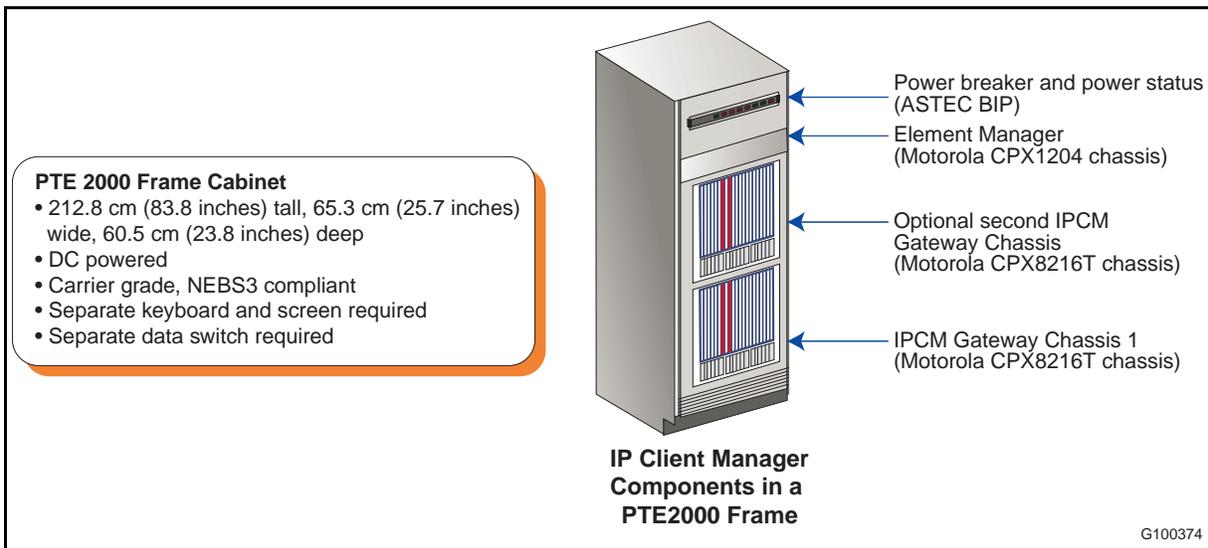
- CPV5370 Central Processing Unit (CPU) cards running Windows NT 4.0 Embedded.

Note: NT 4.0 Embedded is not subject to the Windows NT 4.0 product retirement schedule.

- TDM and DSP cards.

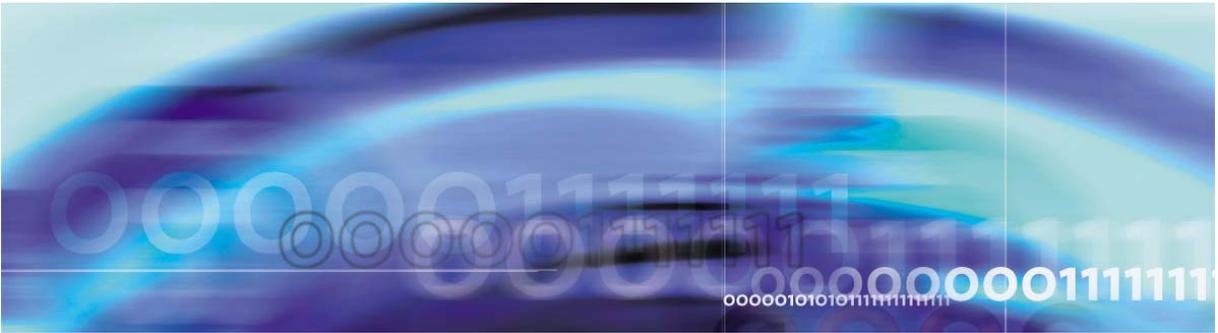
Figure 92 shows an IP Client Manager sample cabinet configuration.

Figure 92
IP Client Manager cabinet configuration



Features

A client connected through the IP Client Manager appears to the Meridian SL-100 as a conventional Meridian Business Set (MBS) line agent. Most call types and traditional Meridian SL-100 enterprise features that you can provision on an M5216 business set are supported by an IP Client Manager client, with a few exceptions.



Meridian SL-100 remote units

This chapter contains the following section:

- **Remote Switching Center (RSC)**

Remote Switching Center (RSC)

At greater and greater distances from the host switch, demand is growing for high-bandwidth services, ranging from teleconferencing to multimedia communications. Network migration to support new services in remote locations comes in stages presenting a major challenge for the an organization with distributed campuses, which must deploy various access vehicles to provide distributed services.

The Meridian SL-100 Remote Access family offers cost-effective solutions for this changing environment. Copper and fiber-based interfaces extend the range of Meridian SL-100 features and services including voice, data, Automatic Call Distribution (ACD) and ISDN to subscribers in remote locations.

Remote Switching Center family

The Remote Switching Center (RSC) family of products delivers a full range of host Meridian SL-100 services to remotely-located subscribers or customers currently served by analog switches. This substantially increases an organization's communication options by extending deeper into the network the delivery of CLASS, voice, data, ISDN, ACD and other advanced digital services. In addition, the RSC minimizes outside-plant expenditures and conserves host resources by providing the following:

- Centralized Operations, Administration, Maintenance and Provisioning (OAM&P) at the host Meridian SL-100 Maintenance and Administration Position (MAP).
- Reduced expenses for training and spares inventories through commonality with the host and with other Meridian SL-100 remote access vehicles.

- Reduced operating expenses through intraswitching, which allows calls originating and terminating on the RSC to be switched without using host links or host resources during a call, after call set up.
- Simplified network planning and conservation of host resources through “back-door” dynamic trunking, which links the RSC to subtending PBXs and supports remotes off the RSC.

MCRM-S (RSC-S)

The Remote Switching Center-Second series (RSC-S) provides a maximum of 54 peripheral ports, in addition to ISDN capabilities. The Meridian SL-100 packaging combines the RCC2 shelf, EXT shelf and the Power Distribution Panel (PDP) into one cabinet.

The RSC-S lowers the costs per line over the lifetime of the equipment while delivering advanced digital services to remote subscribers. Like the MCRM, the MCRM-S can grow to meet increasing line demand through the addition of MCLM's (ELCM's), MCLM-E's (ISDN LCMs) and Intelligent Peripheral Equipment Columns (IPEC), as needed.

The MCRM-S is also capable of supplying power to three Intelligent Peripheral Equipment (IPE) columns. This helps reduce the power equipment costs for the remote.

In a dual model, the RSC-S supports up to 10,000 lines (POTS at 3.0 CCS with 30% intraswitching). This provides organizations with the ability to maximize the services available from the Meridian SL-100 at an extended location.

Extended distance on MCRM-S

Enterprises deploying the MCRM-S can reach farther than ever into the network with Extended Distance Capability (EDC; BAS00009). With this package, the MCRM-S can be deployed at distances greater than 240 km (150 miles) from the host, depending on transmission characteristics of the host links. Revenue-generating services, such as CLASS, ISDN, and ACD, can penetrate significantly deeper into the network.

The specific distance depends on the transmission facilities being used, as well as traffic levels the switch has been engineered to meet. Verification office activities have tested MCRM-S installations with EDC that serve approximately 1,300 POTS subscribers at a simulated distance of 800 km (500 miles) from the host office, looping a combined transmission path of copper, fiber and radio.

This feature requires the NTMX76AB messaging circuit card.

20 C-Side DS1 Links on RCC2/MCRM-S

This feature provides support for a RCC2-to-host LTC/LGC interface with 20 DS1 C-side links. Increasing the number of supported RCC2 C-side links from 16 links to 20 increases the number of speech channels from 382 to 478. This development accommodates increased traffic needs, expanding the C-side traffic capacity by 25%.

The RCC2 shelf requires hardware to support the expansion to RCC2 C-side links. These hardware items are listed below:

- The NTMX87BA pentium (packlet) carrier, which holds five of the NTMX81 packlets.
- The NTMX81 packlets, which are smaller than the existing packlets.
- A matrix pack card (NTMX75DA), which supports the configuration, is required. This NTMX75DA matrix card maps the DS1 links (both new and existing) to the DS-30 links.

The RCC2 shelves with the expanded C-side configuration (holding 20 links) can co-exist with 16 C-side link RCC2 shelf configurations in the same office.

The hardware is supported in software version XPM05 and up.

The RCC2 shelves with the expanded C-side configuration (holding 20 links) can co-exist with 16 C-side link RCC2 shelf configurations in the same office.

When provisioning for 20 C-side DS1s from RCC2 to host, note that the host must have a dedicated controller for the 20 RCC2 ports.

Upgrading to MSL11 with RCC2's also require a hardware change from NTMX77 to NTAX74 when going to the MSL11 load, prior to the PM Software Upgrade. The NTMX77 is no longer available in MSL11 for the RCC2.

Emergency Stand Alone

Emergency Stand Alone (ESA) provides the RSC remote peripherals with the intelligence to allow continued service for intraswitched calls, when communication to the Meridian SL-100 host is lost. This includes support of basic station-to-station calls within the remote. Because they require the use of a modem in the host, Attendant Consoles are not supported during ESA operation.

When communication is lost on the primary DS1 links to the Meridian SL-100 host office, the remote automatically enters the ESA mode. ESA operation continues until communication is restored over at least one of the primary DS1 links. During entry of the ESA mode established calls are not dropped.

There are two ways to exit ESA:

- 1 Fast Cold Exit – All calls are dropped and new calls can be established in approximately one minute.
- 2 Warm Exit – Established calls are not dropped, but the time to establish new calls is extended by two to four minutes.

Calls in the process of being established are dropped during ESA entry and exit.

During ESA, calls to subscribers outside the remote site receive overflow tone. Emergency and operator calls are routed to specified lines in the remote. Requests for special features are ignored or receive reorder tone. Calls to subscribers within the remote site from outside receive reorder or busy tone.

Meridian Cabinet Remote Unit (MCRU)

The MCRU serves as an interface between remotely located subscriber lines and the Meridian SL-100 host. The MCRU is connected to the host either directly through DS1 links, or through a Meridian Cabinet Remote Module-Second series (MCRM-S) connected to the host.

Each MCRU supports up to 640 lines (depending on traffic), providing the same line quality as the Meridian SL-100 host. The MCRU provides an interface for the following types of equipment:

- 500/2500-type telephone sets
- Electronic Telephone Sets (ETS)
- Low-Speed Data Units (LSDU)
- High-Speed Data Units (HSDU)

These devices connect to the MCRU by plug-in line circuit cards. Each telephone set or data device has its own line card in the MCRU. This allows replacement of a faulty card without interruption of service to another line. The MCRU sends control data and digitized voice information from the subscriber to the Line Group Controller (LGC) at the host site.

The MCRU supports Emergency Stand Alone (ESA). If the link between the host and the MCRU is interrupted, telephone calls which originate and terminate within the MCRU will be completed; however, calls to or from the host are not possible.

Note: For sites with MSL15 or above, the requirement for sites with software load MSL15 is the Global ESA processor card (NTMX45AA) for Meridian SL-100 single cabinet MCRU/RLCMs. It provides the Emergency Standalone (ESA) capability in the event that host-to-remote communication is lost. Additionally, this processor card is intended to replace two existing circuit cards previously provisioned to support ESA in the MCRU. These two cards are the NT6X45AF (processor) and the NT6X45AFAB/AC (memory card). The NTMX45AA card supports downloadable firmware where the NT6X45AF did not, therefore there is no longer a need for the NT6X47AB/AC and it is replaced in the Host Interface Equipment (HIE) slot with an NT0X50AA filler faceplate.

Remote off Remote (MCRU off of MCRM-S)

A range of from two to 32 RCC2 (Remote Cluster Controller) ports can provide DS1 interfaces. These ports can be connected to DS1 transmission facilities to another remote site. The RCC2 P-side can be provisioned with all DS-30A links, all DS1 links, or a combination of both.

An MCRU can be located at a remote-off-remote site. The MCRU can support a maximum of 640 local analog lines.

The remote-off-remote configuration allows subscribers connected to an MCRU to share DS1 facilities to the host Meridian SL-100 with subscribers connected to the MCRM-S.

In a remote-off-remote configuration, the combined distance between the host and the furthest remote is normally 240 km (150 miles). However, the distance between the MCRM-S and the MCRU cannot exceed 80 km (50 miles).

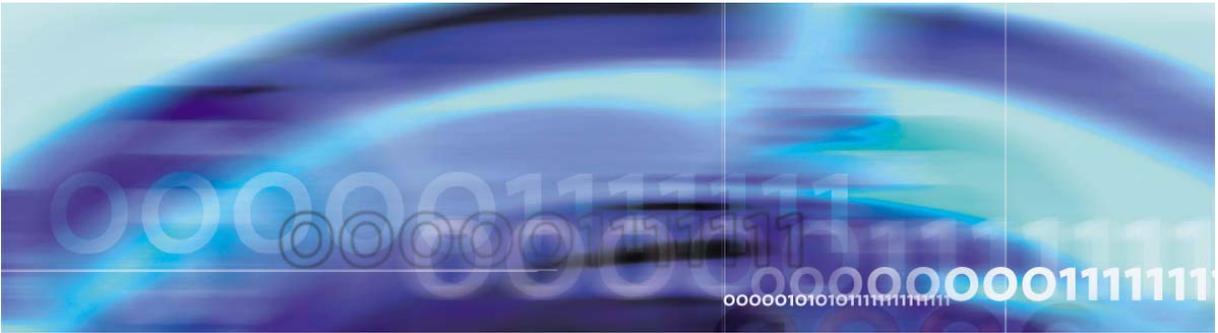
Trunking off of Remote Switching Center

The Remote Switching Center is capable of line to trunk calls within the RSC. This allows for trunking capability without tying up facilities to the remote and back to an external at the remote locality. This saves facility charges, as well as long distance charges. Also available is limited trunking capabilities while a remote is in the Emergency Stand Alone mode.

PRI trunking off the RSC-S

The RSC-S platform supports NTNA and NI-2 PRI trunking. Up to 20 PRI spans can be provisioned off the RSC-S. The full suite of NI-2 features supported through MSL11 are supported in active mode on the RSC-S. For ESA mode, basic call, as well as D-channel back-up are provided.

The ability to support PRI off the RSC-S provides feature transparency between host and remote, and greater trunking efficiencies from remote sites.



OAM&P for Meridian SL-100 networks

This chapter contains the following sections:

- **Maintenance and Administration Position**

Maintenance and Administration Position

Overview

The Maintenance and Administration Position (MAP) provides an interface between telecommunications personnel and the Meridian SL-100 system. This section provides an overview of the following MAP workstation tasks:

- general maintenance
- line maintenance
- trunk maintenance
- administration

General maintenance

The Meridian SL-100 maintenance system provides complete maintenance of the hardware and software by monitoring key functional areas and by detecting, analyzing, correcting and reporting errors occurring in these areas.

User interface

To perform the various maintenance tasks, a sequence of commands is entered on the MAP workstation keyboard. The technician is prompted by responses displayed on the video display unit.

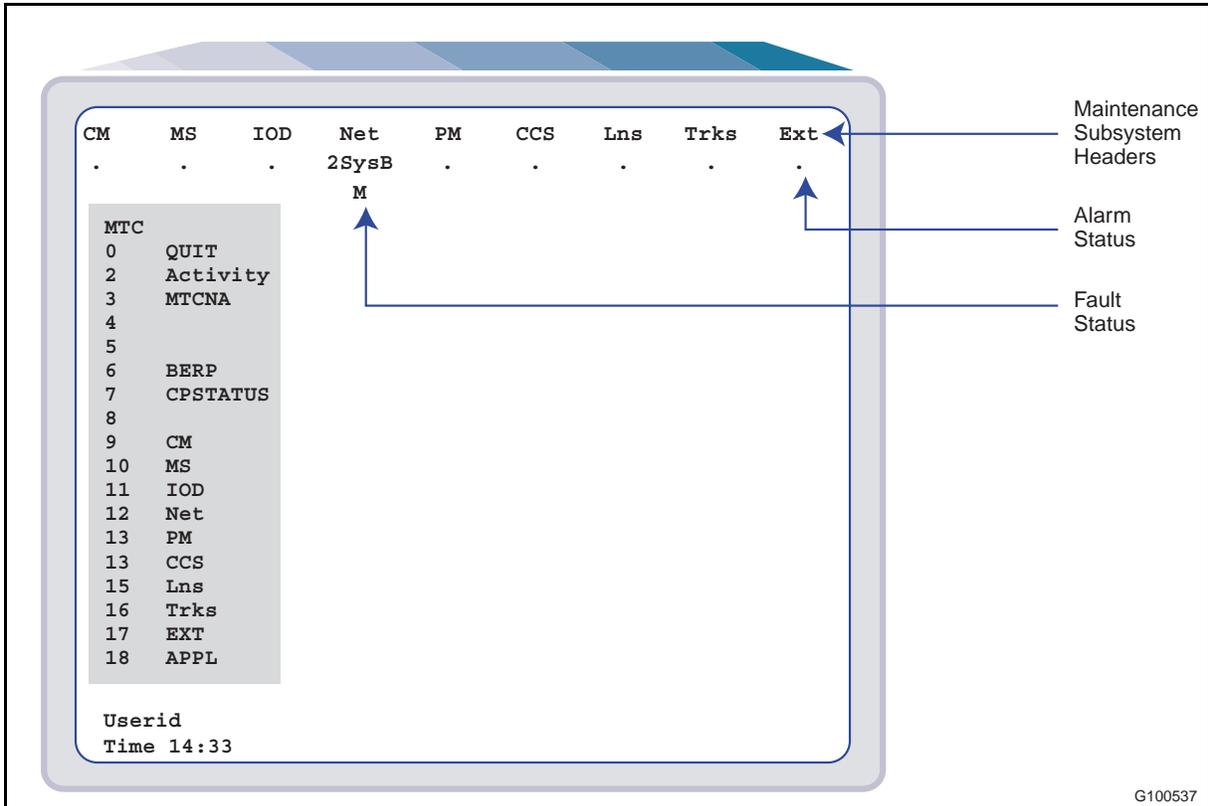
The maintenance system uses menu hierarchies to examine the operation of the Meridian SL-100 system. A hierarchy of menus presented on the MAP workstation permits details to be obtained about system status or trouble. Displays start at the maintenance subsystem (top) level and descend to lower levels, until the fault is eventually traced to a replaceable component or system malfunction.

320 OAM&P for Meridian SL-100 networks

Figure 93 shows a sample MAP workstation display screen at the first maintenance level on the Meridian SL-100 with SL-100 core.

Note: Maintenance headings shown in the figure are for documentation example purposes only. The headings on another MAP workstation display screen may be different.

Figure 93
MAP maintenance (MTC) system status display



A dot beneath a header indicates that the status of the subsystem is satisfactory. Any other code indicates that an out-of-service or alarm condition exists.

In the example above, the code shown under the “Net” heading indicates that two network modules are out-of-service (busy), because of faults that originated in the Meridian SL-100 system (2SysB) and that a major alarm (M) condition exists.

To examine the problem in the Net subsystem, enter the Net maintenance level by selecting Option 12 on the input position at the bottom of the screen. Using the appropriate user interface and command menus, proceed from menu level to menu level until the

reference, location and status of the defective network element are displayed. Problems occurring in any of the other maintenance subsystems are handled similarly.

Maintenance subsystems

Table 62 describes the areas of responsibility covered by the various maintenance subsystems.

Table 62
Descriptions of maintenance subsystems

Subsystem header	Description of maintenance subsystem
CM	The Computing Module (CM) is the part of the core that performs the call processing function.
MS	The Message Switch (MS) subsystem monitors the Message Controller (MC) and the message links to the Network Module and Input/Output Controller (IOC).
IOD	The Input/Output Device (IOD) subsystem monitors the IOC, including the device controller, the input/output devices and the recording devices.
Net	The Network (Net) subsystem monitors the Network Module and the speech links to the Peripheral Modules.
PM	The Peripheral Module (PM) subsystem monitors all types of Peripheral Modules up to, but not including, the line or trunk voice circuits.
CCS	The Common Channel Signaling (CCS) subsystem monitors the independent signaling network for transmitting telephony messages related to groups of speech circuits.
Lns	The lines (Lns) subsystem monitors the Line Concentrating Module (LCM) line circuits and the transmission facilities (lines) to the station sets.
Trks	The Trunks (Trks) subsystem monitors the Digital Trunk Controller (DTC) DS-1 circuits and the transmission facilities over the DS-1 carrier equipment and monitors service circuits for receivers, senders and modems.
Ext	The External (Ext) subsystem monitors the alarm circuits of all outside equipment connected to the Meridian SL-100 system. This subsystem sends alarm indications to the visual display unit and to the alarm hardware.

Alarm system

The alarm system consists of hardware and software elements that monitor key points in the system and audible or visual indicating devices. The indicating devices respond to alarm inputs detected by the monitoring elements.

Detected trouble conditions are classified in decreasing order of severity, such as critical, major and minor. Indications of current alarm classes existing in the various maintenance subsystems are displayed on the MAP workstation. Usually only critical and major alarm classes activate visual or audible alarm devices.

The alarm class is also printed on any log message concerning maintenance occurrences. If no alarm is associated with the log, the “information only” classification is printed.

The alarm system can also be affected by commands given as input at the MAP workstation. For example, the SIL command can be input to silence an audible alarm while troubleshooting is in progress.

Log system

The log system records and prints messages concerning maintenance-related events. As output reports are generated, they are stored in the Meridian SL-100 log system in log buffers. Each subsystem has a log buffer dedicated to it. Logs stored in these buffers can be displayed on the MAP workstation or printed.

For more information about logs, refer to the *Meridian SL-100 Log Report Reference Manual*.

Line maintenance

The MAP can also be used to perform line testing. These tests are performed by entering the Line Test Position (LTP) menu. There is a short and a long diagnostic for Line Concentrating Module (LCM) line circuits. The short diagnostic performs a transmission test that is designed to detect 85 percent of the failures, whereas the long diagnostic detects virtually 100 percent of the failures.

The tests that can be performed fall under the following categories:

Line Test Position

The LTP provides the tools and functions required to locate and verify faults and checks that corrective action is successful.

The LTP consists of the following four MAP workstation levels:

- LTP – line circuit oriented
- LTPLTA – facility tests
- LTPDATA – line transmission test tools for ISDN BRI lines
- LTPMAN – line transmission test tools

Automatic Line Test

The Automatic Line Test (ALT) provides a simple method for testing a large numbers of lines. There are four tests available as follows:

- transmission hybrid loss test
- line card diagnostic
- line insulation test
- on-hook balance network

These tests can be run immediately or scheduled for daily operation over a specified range of lines identified by a Line Equipment Number (LEN). No technician-active MAP workstation is required during scheduled operation.

For more information about line maintenance, see the *Meridian SL-100 Routine Maintenance Procedures*.

Trunk maintenance

Trunk maintenance has two main areas: diagnostics and test lines. Diagnostics are procedures that do the following:

- check whether diagnostics exist for the circuit in question
- check to see if test equipment is required
- format the information into a message that is sent to one of the diagnostic processes
- wait for the resulting message

When the test line process is invoked by the Trunk Test Position (TTP) or Automatic Trunk Test (ATT) module, a call is made to run a test line. The modules called to perform specific functions are described in the following paragraphs.

Trunk Test Position

The TTP handles the following four levels of testing:

- diagnostic test, performed by the diagnostic test process
- monitor level test, which allows all trunks to be monitored in both talk path directions
- test line tests, performed by the test line process
- manual test connections, performed by the TTP process

Automatic Trunk Test

The ATT is the prime method for detecting operational failures during light or no-traffic periods when per-call failure detection is inactive.

The objective of automatic trunk testing is to generate sufficient test calls during low traffic periods so that failures can be detected in the voice or data path modules, such as Peripheral Modules, Network Modules, facility routes (cable and carrier) and the distant switching system.

For more information about trunk maintenance, see the *Meridian SL-100 Routine Maintenance Procedures*.

Administration subsystems

The MAP can also be used in administration modes to perform Meridian SL-100 system management through the following subsystems:

- Automatic Message Accounting (AMA)
- Station Message Detail Recording (SMDR)
- Network Management (NWM)
- Operational Measurements (OMs)

The data from these sources are filed on magnetic recording devices. Data from Automatic Message Accounting, Station Message Detail Recording and Operational Measurements subsystems is routed to an appropriate device (disk or tape) by a software module called the Device Independent Recording Package (DIRP).

Automatic Message Accounting

The AMA subsystem collects the necessary call data and automatically records it on a data storage device. Periodically this stored data is extracted from the data files for retrieval of the information necessary for accounting purposes, call analysis, or both.

Station Message Detail Recording

SMDR records details of billable and non-billable calls for each business group.

SMDR is similar to AMA, but operates independently using its own recording format. If a Meridian SL-100 is equipped with AMA and SMDR, two records are generated: one in AMA format and one in SMDR format.

Network management

NWM provides controls that can be applied through the MAP to maintain optimum transmission capacity and to offset the effects of

traffic variations or component failures. Network management controls are either expansive or protective as follows:

- Expansive controls manipulate routing patterns to use alternate capacities not normally selected as the shortest route pattern in a switch hierarchy.
- Protective controls restrict certain kinds of traffic to prevent system degradation (NET delays) resulting from overload.

Note: Matching loss is defined as the average probability of a call not being completed due to congestion in the NET or in the line concentration.

Operational Measurements

System performance is constantly and automatically recorded by the Operational Measurement (OM) system. The measurements are stored in OM registers, either individually every time an event occurs (a peg count) or on the basis of a scan that is conducted at regular intervals, regardless of the time of occurrence of the event (a usage measurement).

Using a computer system, the recorded OM data can be manipulated in various ways to generate statistics on aspects of Meridian SL-100 system performance, such as the following:

- office maintenance
- provisioning new equipment
- analysis of traffic through trends on marginal conditions
- balancing of traffic load through operable equipment
- determining fluctuating service capacities
- testing line and trunk performance and transmission

For more information about Operational Measurements, see the *Meridian SL-100 Operational Measurements Reference Manual*.

Access control system

Access to the Meridian SL-100 system data through the MAP is controlled, for security purposes, through logon procedures and access rights according to user class.

Logon

Each authorized user is assigned a user name and password. No user interface activity can be performed until the proper identification has been entered and acknowledged by the MAP workstation. User names

and passwords can only be changed by the proper level of authorized user.

Command and terminal access

Authorized users are divided into user classes, depending on the functions that these users are required to perform. For example, one user may do trunk maintenance and another may do network management. Each user can only access the menus of commands associated with that user's particular function and can only use those terminals associated with that user's user class.

System configuration

Although Meridian SL-100s in an enterprise's network can be managed from MAPs co-located with each switch, organizations with multiple Meridian SL-100s at distributed campuses can co-ordinate OAM&P activities from a central location. MAP pass through allows an administrator at a remote MAP terminal to log on to one or more Meridian SL-100 switches simultaneously, and be presented with the standard MAP CI interface for access to switch capabilities in the same way as a directly-connected MAP terminal.

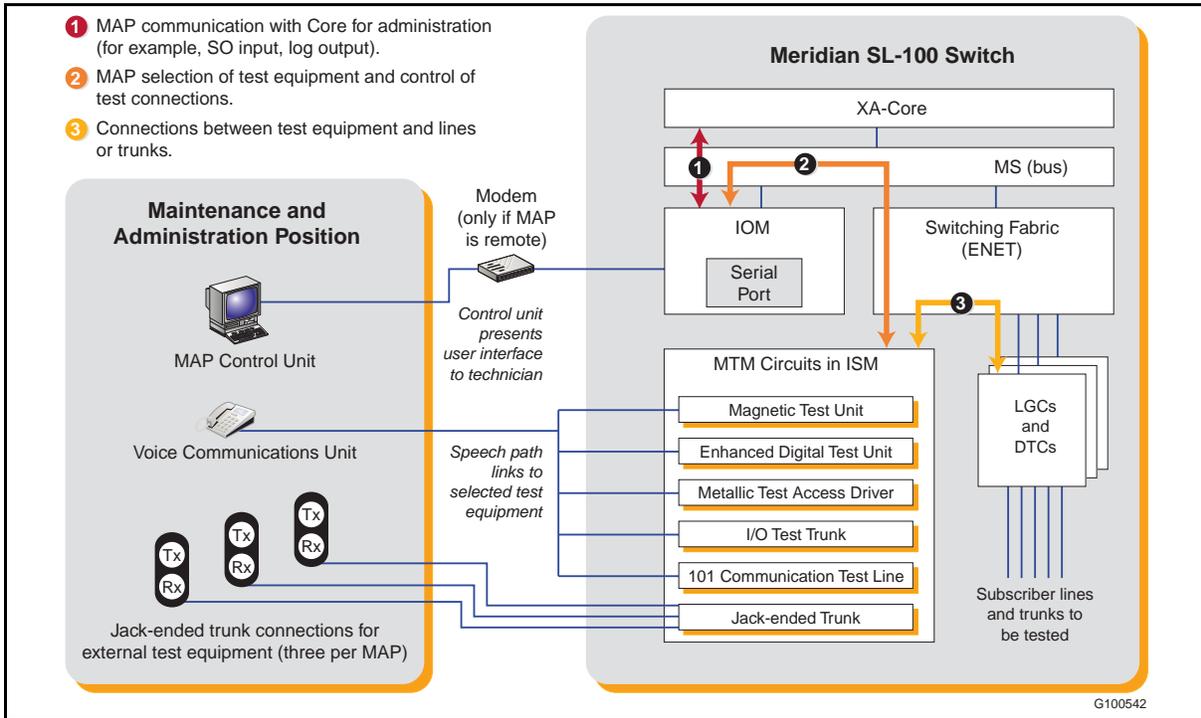
For the Meridian SL-100, terminal access is usually further enhanced by using GUI applications as a front end to the MPA CI interface, making it easier to use the capabilities of underlying menus. Once logged on, a technician or administrator can use the MAP CI to communicate with the Core.

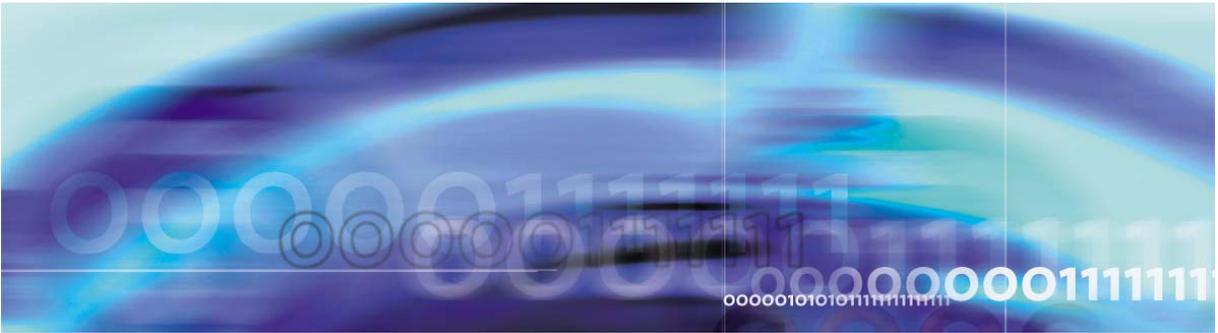
Testing can also be initiated by a remote user. The special circuit cards used in Meridian SL-100 line and trunk testing are installed in the ISM to provide a common pool of test equipment. A given circuit is selected through the MAP CI when required, and is connected to the line or trunk to be tested. When the test is complete, the circuit is released and returned to the common pool.

For the Communication Server 2100, the equivalent of the MAP CI capabilities are provided by GUIs. Access to equipment for testing trunks and lines is not relevant to the Communication Server 2100 configuration, because the Communication Server 2100 does not directly handle any bearer channels. In a hybrid Communication Server 2100 configuration, however, Meridian SL-100 test circuits can be connected to the packet network bearer paths by means of loop around trunks.

[Figure 94 on page 327](#) illustrates the MAP interfaces and their use.

Figure 94
MAP interfaces and their use





TDM telephones

The Meridian SL-100 and Communication Server 2100 support a wide range of traditional TDM telephones, each of which offers the end user a rich set of telephony features. The Communication Server 2100 supports TDM terminals when it is configured as a hybrid that supports both circuit-switched and packet-switched capabilities.

The Meridian SL-100, Communication Server 2100 Compact and Communication Server 2100 XA-Core support the same large family of TDM terminals. In addition, the Communication Server 2100 supports IP terminals, or Ethersets, through the use of the IP Client Manager (see [“Internet terminals” on page 205](#)).



FOR MORE INFORMATION

The hybrid Communication Server 2100, and the Meridian SL-100, support 802.11-based wireless handsets. For more information about this mobility application, see the *SE07 Application Planning Guide*.

Overview

This section describes the traditional TDM telephones supported on hybrid Communication Server 2100 soft switches and legacy Meridian SL-100 switches. It also describes some of the unique time and cost-saving applications that operate on TDM sets, as well as various accessories designed to provide additional functionality or key capacity.

The Communication Server 2100 hybrid supports two types of TDM terminals: terminals that work off of an Intelligent Peripheral Equipment (IPE) Module; and terminals that work off of DMS-based Line Peripheral Modules.



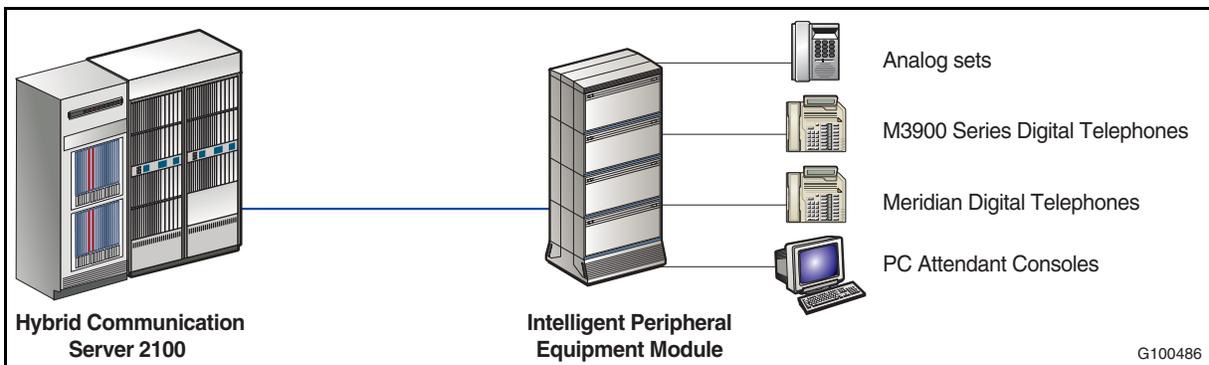
FOR MORE INFORMATION

This section provides a brief summary of TDM sets. For more detailed information, see the *Meridian SL-100 MSL17 Application Planning Guide*.

IPE telephones

Figure 95 shows the telephones that work off an Intelligent Peripheral Equipment Module.

Figure 95
IPE telephones network configuration



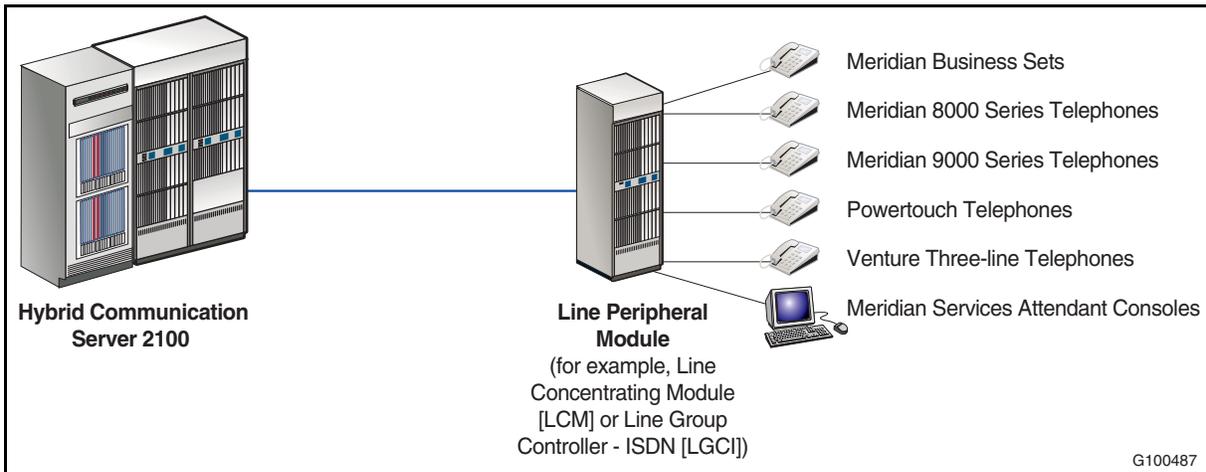
Supported IPE telephones can be broken down into the following families:

- [“M3900 Series Digital Telephones” on page 331](#)
- [“Meridian Digital Telephones” on page 339](#)

Line Peripheral Module telephones

Figure 96 shows the sets that work off an a DMS-based Line Peripheral Module.

Figure 96
Line Peripheral Module telephones network configuration



Supported Line Peripheral Module telephones can be broken down into the following families:

- [“Meridian Business Sets” on page 344](#)
- [“Additional analog sets” on page 347](#)

M3900 Series Digital Telephones

The Nortel Networks M3900 Series Digital Telephones include five digital telephones for use on hybrid Communication Server 2100s. This portfolio establishes a standard for a display-based user interface, enhancing the users' experience with a wide choice of features and capabilities.

The M3900 series offers a full range of features that can significantly enhance day-to-day productivity. The portfolio also includes a full range of accessories, providing the flexibility to add new features and capabilities easily and cost-effectively. Both the telephones and accessories are available in two colors: dark charcoal and platinum.

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Directory services makes calling easier and finding numbers faster. Ultra-large displays on the M3904 and M3905 deliver the best in class display-based interface. The Smart Mute feature ensures that calls are muted regardless if the user is on their handset, headset or handsfree, which ensures privacy when needed. User-friendly options such as customized key labels, the flexibility to change local set options, and a user-selectable ring tone, are easily initiated at the desktop. Ten languages are available for the display-based sets.

With simplified administration and management, the M3900 series contributes to an overall lower cost of system ownership. Self-labeling keys and snap-in cartridge style accessories reduce set installation time and administrative charges. In addition, the telephones are shipped from the factory with pre-installed and threaded handset and line cords. The M3900 portfolio also provides investment protection with software downloadable firmware that offers new features and services as they continue to be introduced.

The M3900 series is supported on software release MSL11 and above with XPM13 and existing Intelligent Peripheral Equipment (IPE) Digital Line Cards (NT8D02) for the hybrid CS 2100 and Meridian SL-100 switches. The IPE should be upgraded with the Enhanced XPEC (EXPEC) (NT7D07BA) card. Optivity Telephony Manager for Meridian SL-100 (2.0) software is needed for software downloadable firmware.

Table 63 describes the available M3900 models.

Table 63
M3900 Series Digital Telephone summary (Sheet 1 of 3)

Terminal	Description
<p>M3901(Entry)</p> 	<ul style="list-style-type: none">• Single-line set with four fixed keys and five programmable features.• An economical, entry-level digital telephone that is suited for lobbies, cafeterias and public hallways.• Supports Feature Access Codes (FACs) and message waiting indication with visual ringing.• Minimum required firmware: N/A.

Table 63
M3900 Series Digital Telephone summary (Sheet 2 of 3)

Terminal	Description
<p>M3902 (Basic)</p> 	<ul style="list-style-type: none"> • Single-line set with six fixed feature keys and three self-labelled, programmable feature keys. • Provides a two-line by 24-character display, self-labelled keys, handsfree, Smart Mute and snap-in accessories beyond M2006 capabilities. • Provides a graphical status icon, one accessory port and message waiting indication with visual ringing. • Is well suited to lobbies, manufacturing floors, warehouses and conference rooms. • Minimum required firmware: Version 4.0.
<p>M3903 (Enhanced)</p> 	<ul style="list-style-type: none"> • Multi-line set with 10 fixed feature keys and two self-labelled, programmable line/feature keys (four with the second page functionality). • Provides four context-sensitive softkeys to access the context sensitive softkey features. • Provides a three-line by 24-character display. • Provides handsfree, self-labelled keys, Smart Mute, snap-in accessories, call log and redial list, access to Corporate Directory and a direct connect headset beyond M2008 capabilities. • Provides a graphical status icon, two accessory ports, message waiting indication with visual ringing, a user-selectable ring tone and Quit and Copy keys for applications. • Is suited for customers that require moderate to heavy voice communications, such as office professionals and technical specialists. • Minimum required firmware: Version 5.2.
<p>M3904 (Professional)</p> 	<ul style="list-style-type: none"> • Multi-line set with 10 fixed feature keys and six self-labelled, programmable line/feature keys (12 with the second page functionality). • Provides four context-sensitive softkeys to access the context sensitive softkey features. • Provides a five-line by 24-character display, which is the largest display in its class. • Provides handsfree, self-labelled keys, Smart Mute, snap-in accessories, call log and redial list, expansion modules, personal directory, access to Corporate Directory and a direct connect headset beyond M2008 and M2616 capabilities. • Provides a graphical status icon, two accessory ports, message waiting indication with visual ringing, a user-selectable ring tone and Quit and Copy keys for applications. • Is suited for customers that require heavy voice communications, such as managers, executives and administrative assistants. • Minimum required firmware: Version 4.6.

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Table 63
M3900 Series Digital Telephone summary (Sheet 3 of 3)

Terminal	Description
<p>M3905 (Call Center)</p> 	<ul style="list-style-type: none"> • Call center set with six Automatic Call Distribution (ACD) fixed feature keys and eight self-labelled, programmable line/feature keys (one key pre-assigned as Options key). • Provides four context-sensitive softkeys to access the context sensitive softkey features. • Provides a four-line by 24-character display, pre-programmed call center keys, self-labelled keys, snap-in accessories and a supervisor plug-in key beyond M2216 capabilities. • Provides a graphical status icon, two accessory ports, message waiting indication with visual ringing, a user-selectable ring tone, Quit and Copy keys for applications, access to Corporate Directory and dual headset jacks. • Is suited to call center applications (both agents and supervisors). • Minimum required firmware: Version 4.8.

Table 64 lists the features that work with the M3900 Series Digital Telephones.

Table 64
M3900 Series Digital Telephone features (Sheet 1 of 2)

Function	M3901	M3902	M3903	M3904	M3905
Power (see Note 1)	L	L	L	L	L
Handsfree	N	Y	Y	Y	Y
Display	N	Y	Y	Y	Y
Message Waiting Lamp	Y	Y	Y	Y	Y
Americans with Disabilities Act (ADA) Compliant	Y	Y	Y	Y	Y
Hearing Aid Compatible	Y	Y	Y	Y	Y
Programmable Feature/DN keys	5	3	4	12	8
CLASS Compatible	Y (see Note 2)	Y (see Note 3)			
Call Waiting Display	N	N	N	N	N
Volume Control	Y	Y	Y	Y	Y

Table 64
M3900 Series Digital Telephone features (Continued) (Sheet 2 of 2)

Function	M3901	M3902	M3903	M3904	M3905
Analog Display Services Interface (ADSI) Compatible	N	N	N	N	N
Cordless	N	N	N	N	N
Call Logging (Entries)	N/A	N/A	10	100	100 (see Note 4)
Single-line telephone	Y	Y	N	N	N
Multi-line telephone	N	N	Y	Y	Y
Personal Directory (Entries)	N/A	N/A		100	100 (see Note 4)
Corporate Directory	N	N	Y	Y	Y
<p>Note 1: L = Loop Powered, A = AC powered, AL = AC powered and Loop powered set. Note 2: Supports CLASS features except Calling name and Number Display and CLASS Message Waiting. Note 3: Supports a limited set of CLASS features Note 4: Available with M3900 Release 3 firmware</p>					

Table 65 shows where you can find additional information about M3900 Series Digital Telephones.

Table 65
References

Document title	Document number
<i>M3900 Series Meridian Digital Telephones Reference Manual</i>	555-4001-316
Aastra Telecom now manufactures these telephones. Aastra Telecom can be reached at 905-760-4200, or their web site at www.aastra.com . For a listing of user guides and quick reference cards, see the <i>Enterprise Documentation Catalog</i> that is available at Nortel Networks.com .	Varies by set.
<i>Getting Started with Optivity Telephony Manager User Guide</i> (technicians use Optivity for firmware downloads and maintenance operations).	555-4001-316

M3900 Series Digital Telephones accessories

Table 66 describes the accessories that are available with M3900 Series Digital Telephones.

Table 66
M3900 Series Digital Telephones accessories (Sheet 1 of 2)

Accessory	Description
<p>Accessory Connection Module (ACM)</p> 	<p>The ACM is an optional hardware module that installs into the telephone footstand. The ACM provides a port(s) to connect to the accessory cartridge interface.</p> <p>The M3902 set has one accessory port. The M3903, M3904, and M3905 have two accessory ports. The plug-in cartridge allows the M3900 series sets to use the following accessories:</p> <ul style="list-style-type: none"> • Analog Terminal Adapter • external alerter and recording interface • personal directory PC utility (M3904 and M3905) • full duplex handsfree cartridge (M3904 Release 3)
<p>Alternate Key Caps</p>	<p>The M3905 set provides an alternate key cap kit to customize the telephone. Use the Key Cap Tool with the M3905 set to remove the four middle programmable keys and replace them with alternate keys.</p>
<p>Analog Terminal Adapter (ATA)</p>	<p>The ATA connects an analog device such as a fax machine or modem to the telephone. This allows simultaneous use of the telephone and the analog device.</p>
<p>Display-based Expansion Module (DBA)</p>	<p>The DBA is an optional add-on module for the M3904 and M3905 sets exclusively. The module attaches to a set to increase the number of programmable feature keys on the set by 24 for a total of 56 keys.</p>
<p>Meridian External Alerter/Recorder Interface (MEARI)</p>	<p>The MEARI provides a remote ringer device installed in a location separate from the telephone. The MEARI provides access to a standard, off-the-shelf remote ringer, call status relay, audio recorder or visual indicator.</p> <p>Program the MEARI interface to activate a ringer (or light) when the telephone rings or activate a recorder when the telephone is in use. The MEARI requires an Accessory Connection Module (ACM).</p>
<p>Key-based Expansion Module</p> 	<p>The KBA has 22 keys which function as additional keys to the physical and self-labeled programmable feature keys on the M3900 series sets. You can use these additional keys as DN or feature keys. The sets and modules attach in such a way as they look and feel like one integrated unit. Only the M3904 and M3905 sets use the KBA.</p>

Table 66
M3900 Series Digital Telephones accessories (Sheet 2 of 2)

Accessory	Description
Personal Directory PC Utility	The Personal Directory PC Utility provides a faster, easier way to create or modify a personal directory. Enter names and numbers into a personal directory file on a PC. Download the file directly from the PC to the M3904 or M3905 telephone. Upload a directory from the M3904 or M3905 set to a PC to modify the directory.
Full Duplex Handsfree Accessory	The Full Duplex Handsfree Accessory (simultaneous two-way conversation) is a cartilage accessory that provides full duplex handsfree capability for the M3904 Release 3 (NTMN34GA or later) telephone set. You insert the cartridge into the M3904's ACM.

Table 67 lists the optional hardware accessories available for each M3900 Series Digital Telephone.

Table 67
M3900 Series Digital Telephone optional hardware accessories

Accessory	M3901	M3902	M3903	M3904	M3905
Accessory Connection Module	N/A	Supports	Supports	Supports	Supports
Alternate Key Caps	N/A	N/A	N/A	N/A	Supports
Amplified Headset Accessory connected through Handset Jack (except connected through headset jack on M3905)	Supports	Supports	Supports	Supports	Supports
Analog Terminal Adapter	N/A	Supports	Supports	Supports	Supports
Display-based Expansion Module	N/A	N/A	N/A	Supports	Supports
External Alerter/Recorder Interface	N/A	Supports	Supports	Supports	Supports
Handset	Standard	Standard	Standard	Standard	Optional
Key-based Expansion Module	N/A	N/A	N/A	Supports	Supports
Non-amplified Headset Accessory connected through Headset Jack	N/A	N/A	Supports	Supports	Supports
Personal Directory PC Utility	N/A	N/A	N/A	Supports	Supports
Full Duplex Handsfree Accessory	N/A	N/A	N/A	Release 3 Supports	N/A

Table 68 shows where you can find additional information about M3900 Series Digital Telephone accessories.

Table 68
References

Document title	Document number
<i>M3900 Series Meridian Digital Telephones Reference Manual</i>	555-4001-316
User Guides and quick reference cards (ship in box with the accessory). For more information see the <i>Enterprise Documentation Catalog</i> that is available at Nortel Networks.com.	Varies by set.

Corporate Directory Application

With the Corporate Directory Application, M3903, M3904, and M3905 users have the ability to access and query corporate directory entries from their own terminal. Once the user finds the desired entry, the entry’s name, department number (or other identifier) and DN are displayed. If the user chooses, the entry can be dialed by pressing the “Dial” softkey, which is displayed when an entry is found, and the entry can be copied to the user’s personal directory.

The Corporate Directory Application provides the following benefits and values for users with a M3903, M3904 or M3905 telephone set:

- Ability to access and query Corporate Directory entries.
- Convenience to dial directly from the Corporate Directory Application.
- Time savings with the capability to copy corporate directory entries to their personal directory

[Figure 97 on page 339](#) shows a Corporate Directory Application sample network configuration.

Figure 97
Corporate Directory Application configuration

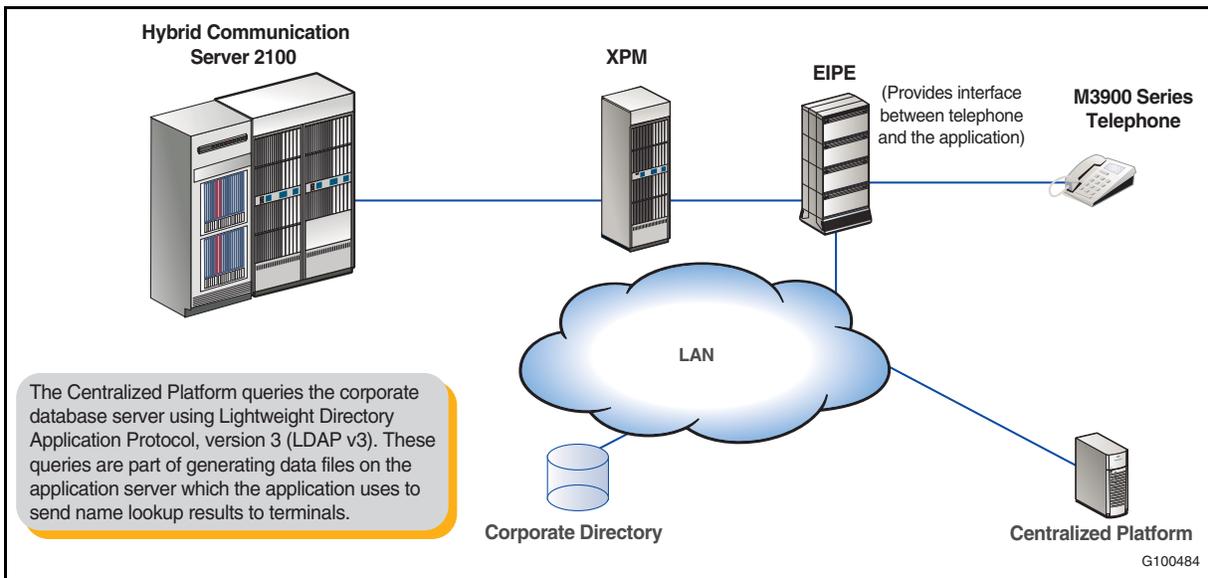


Table 69 shows where you can find additional information about the Corporate Directory Application.

Table 69
References

Document title	Document number
<i>Corporate Directory Application User Guide</i>	555-4001-131

Meridian Digital Telephones

The Meridian Digital Telephones, or M2000 Series Telephones, are designed to provide cost-effective Integrated Voice and Data (IVD) communications capability. These telephone sets communicate with the switch using digital transmission over standard twisted-pair wiring. The telephones interface with the hybrid CS 2100 using the Enhanced Digital Port Card (EDPC), which has 16 ports that support 16 digital telephones and data units. No additional hardware is required in the loop circuit to provide data communications. Analog-to-digital and digital-to-analog conversion of voice signals are accomplished at the telephone set by a codec.

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Meridian Digital Telephones connect to the system through a two-wire loop carrying two independent 64-kbps Pulse Code Modulation (PCM) channels with two associated 8-kbps signaling channels. One of the two PCM channels is dedicated to voice and the other channel is dedicated to data traffic. Line cords and handset cords on all Meridian Digital Telephones are equipped with snap-in TELADAPT connectors for easy and quick connection.

Asynchronous ASCII terminals and personal computers can be connected through an RS-232-C interface directly to any Meridian Digital Telephone at speeds from 110 bps to 19.2 kbps asynchronous and 56 or 64 kbps synchronous to allow for data calls. Data capability is provided by the optional Meridian Communication Adapter (MCA), which is a single Printed Circuit Pack (PCP) mounted within the telephone and works in conjunction with the digital interface chip also residing in the telephone. The firmware in the MCA serves as an interface between the user and the CS 2100 hybrid for establishing data calls.

Table 70 describes the Meridian Digital Telephones that the hybrid Communication Server 2100 supports.

Table 70
Meridian Digital Telephones summary (Sheet 1 of 2)

Terminal	Description
 <p>M2006</p>	<p>Single line telephone with five programmable feature keys and a Primary Directory Number (PDN) key.</p>
 <p>M2008 and M2008HF</p>	<p>Multiline telephone with seven programmable feature keys and a PDN key.</p> <p>The M2008HF is a multiline digital telephone with the same features, functionality, and attributes as the M2008 set, plus the addition of a built-in two-way speakerphone. On the M2008HF, key seven functions as the Handsfree/Mute key.</p>

Table 70
Meridian Digital Telephones summary (Sheet 2 of 2)

Terminal	Description
 <p>M2216</p>	Multiline digital set for Automatic Call Distribution (ACD) applications with 15 feature keys and a PDN key, a factory-installed display module and two RJ-32 jacks for modular electret headsets.
 <p>M2317</p>	The M2317 (NT1F21) is designed for managers and executives who need a performance orientated telephone. The heart of the M2317 is a context sensitive (meaning features appear in the display at the precise time you'll want to use them) LCD display that guides you through a variety of calling routines.
 <p>M2616</p>	High performance multiline telephone with 15 programmable feature keys, a PDN key and an integrated handsfree unit.

Table 71 lists the features that work with the Meridian Digital Telephones.

Table 71
Meridian Digital Telephone features (Sheet 1 of 2)

Function	M2006	M2008	M2008HF	M2216	M2317	M2616
Power (see Note 1)	L	L	L	L	L	L
Handsfree	N	N	Y	N	Y	Y
Display	N	Y	Y	Y	Y	Y
Message Waiting Lamp	Y	Y	Y	Y	Y	Y
ADA Compliant	Y	Y	Y	Y	Y	Y

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Table 71
Meridian Digital Telephone features (Sheet 2 of 2)

Function	M2006	M2008	M2008HF	M2216	M2317	M2616
Hearing Aid Compatible	Y	Y	Y	Y	Y	Y
Programmable Feature/DN keys	6	8	8	16	12	16
CLASS Compatible	Y (see Note 3)					
Call Waiting Display	N	N	N	N	Y	N
Volume Control	Y	Y	Y	Y	Y	Y
ADSI Compatible	N	N	N	N	N	N
Cordless	N	N	N	N	N	N
Single-line telephone	Y	N	N	N	N	N
Multi-line telephone	N	Y	Y	Y	Y	Y
<p>Note 1: L = Loop Powered, A = AC powered, AL = AC powered and Loop powered set. Note 2: Supports CLASS features except Calling name and Number Display and CLASS Message Waiting. Note 3: Supports a limited set of CLASS features.</p>						

Table 72 shows where you can find additional information about Meridian Digital Telephones.

Table 72
References

Document title	Document number
<i>Meridian Modular Telephones Reference Manual</i>	555-4001-114
<p>Aastra Telecom now manufactures these telephones. Aastra Telecom can be reached at 905-760-4200, or their web site at www.aastra.com.</p> <p>For a listing of user guides and quick reference cards, see the <i>Enterprise Documentation Catalog</i> that is available at Nortel Networks.com.</p>	Varies by set.

Meridian Digital Telephone accessories

Table 73 describes the accessories that are available with Meridian Digital Telephones.

Table 73
Meridian Digital Telephone accessories

Accessory	Description
Meridian Communications Adapter (MCA)	The Meridian Communications Adapter (MCA) is an option available on the Meridian Digital Telephones that is used for data access from the telephone using the built-in RS232 connector to ASCII terminals, PC, Macintosh, or video equipment. The MCA fits into the base of all models of the Meridian Digital Telephones.
Meridian Programmable Data Adapter (MPDA)	This MPDA circuit card mounts in a Meridian Modular Telephone and provides integrated voice and data. Users can access all MPDA call processing functions, and feature activations or deactivations through keypad or keyboard dialing.
Analog Terminal Adapter (ATA)	<p>The Analog Terminal Adapter (ATA) is offered as a purchasable option on all M2006, M2008, M2008HF, M2216, and M2616 telephones. The ATA provides an analog link to the desktop or laptop computer users (with modems) in the digital telephone environment.</p> <p>A typical office worker who has a PC and digital phone can use the ATA to connect their high speed, off-the-shelf modem to the analog (voice) network. For Meridian Digital Telephones (M2000 series), the ATA connects to the digital telephone through its serial interface connector (same connector as used for the MCA) by a flat RJ-45 cable. The ATA module resides inside the footstand housing unit.</p>

Table 74 lists the optional hardware accessories available for each Meridian Digital Telephone set.

Table 74
Meridian Digital Telephone optional hardware accessories (Sheet 1 of 2) (Sheet 1 of 2)

Accessory	M2006	M2008	M2008HF	M2216	M2317	M2616
2x24 Display	No	Yes	Yes	Standard	Yes	Yes
MCA (AC Power)	Yes	Yes	Yes	Yes	Yes	Yes
External Alerter Interface (AC Power)	Yes	Yes	Yes	No	Yes	Yes
Power Supply Board (MCA and External Alerter Interface)	Yes	Yes	Yes	Yes	Yes	Yes

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Table 74
Meridian Digital Telephone optional hardware accessories (Sheet 2 of 2) (Sheet 2 of 2)

Accessory	M2006	M2008	M2008HF	M2216	M2317	M2616
AC Transformer (MCA and External Alerter Interface)	Yes	Yes	Yes	Yes	Yes	Yes
Meridian Key Expansion Module	No	No	No	Yes	Yes	Yes

Table 75 shows where you can find additional information about Meridian Digital Telephone accessories.

Table 75
References

Document title	Document number
<i>Meridian Communications Adapter (MCA) Reference Manual</i>	555-4001-123
<i>Meridian Programmable Data Adapter (MPDA) User Guide</i>	555-4001-122

Meridian Business Sets

The M5000 series of Meridian Business Sets, available in ash, gray and black, is a comprehensive line of featured voice telephones offering solutions for businesses. Table 76 describes the Meridian Business Sets that the hybrid Communication Server 2100 supports.

Table 76
Meridian Business Set summary (Sheet 1 of 3)

Terminal	Description
M5008 	<ul style="list-style-type: none">• Includes eight programmable line/feature keys.• Has conveniently placed, color-coded Hold and Release keys for improved efficiency and better call processing.• Has a built-in speaker that permits on-hook dialing and makes it easy to access voice mail.• Is perfect for a reception area, construction floor, secondary department phone or other low-volume calling applications where a display is unimportant, but reliability and ease of use are priorities.

Table 76
Meridian Business Set summary (Sheet 2 of 3)

Terminal	Description
<p>M5208</p> 	<ul style="list-style-type: none"> • Provides the same capabilities as the M5008, but includes a two-line by 24-character display. • Is suitable when occasional call coverage and exceptional reliability are important. • Is designed to maximize the use of business features.
<p>M5216</p> 	<ul style="list-style-type: none"> • Is recommended for ACD support and Enhanced Answering Position (EAP) applications. • Has 14 programmable line/feature keys. • Offers unique functionality, making it the perfect solution for call centers or other high-volume calling applications. • Combined with the M522 Meridian Mate add-on units, can also function as a mini-console. The M5216 supports up to two M522 add-on units. • Is headset compatible. It is designed especially for the Nortel Networks Liberation headset, but will also work with Electret-equivalent compatible headsets from other manufacturers. • Has a two-line by 24-character display that delivers call information such as call progress, queue status, and calling name and number. • Is suited for agents or the attendant who can use the displayed data to greet callers and speed transactions.
<p>M5316</p> 	<ul style="list-style-type: none"> • Features a display, 16 line/feature keys, handsfree and the capability to add up to two Meridian Mate 22 add-on units. • Can also be used in combination with the M522 Meridian Mate add-on unit as a mini-console or answering position. • Gives the user one-button access to the business features used most, including Speed Call. • Has a built-in Call Timer making it easy to monitor calls. • Has a speaker that allows convenient on-hook dialing and access to voice mail. • Has a two-line by 24-character display that ensures easy access to call information, including date and time.
<p>M522 Add-on Unit</p> 	<ul style="list-style-type: none"> • Is a 22-button expansion unit, with associated LCD indicators. • Is compatible with both the M5216 and M5316. • Provides additional keys for lines or features. Up to two expansion units can be used, for a total of 44 extra programmable buttons.

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Table 76
Meridian Business Set summary (Sheet 3 of 3)

Terminal	Description
 <p>M5317TDE ISDN</p>	<ul style="list-style-type: none"> • Has EKTS Virtual Keys to allow customized call flow to increase call handling speed. • Offers high speed asynchronous data up to 230.4 kbps. • Offers powerful features such as directory dialing, call forward enhancements (such as call forward reminder notification), calling name and number delivery, privacy, and automatic call back and recall. • Is National ISDN-compatible and can work with the switches of other vendors, allowing more flexibility in the choice of equipment. Using the M5317TDE telephone and Nortel Networks ISDN services off the robust and proven CS 2100 hybrid platform can reduce costs and the need to maintain expensive equipment. • Single-line telephone with multi-line functionality; extra wide, two-line by 40-character display. • Async circuit switched data with multilink Point-to-Point Protocol (PPP) for Internet access. • Call directory and caller list up to 100 locations. • Single or shared DN for packet and circuit services.

Table 77 lists the features that work with the Meridian Business Sets.

Table 77
Meridian Business Set features (Sheet 1 of 2)

Function	M5008	M5208	M5216	M5316	M5317TDE
Power (see Note 1)	L	L	L	L	L
Handsfree	N	N	N	Y	Y
Display	N	Y	Y	Y	Y
Message Waiting Lamp	N	Y	Y	Y	Y
ADA Compliant	N	N	Y	Y	Y
Hearing Aid Compatible	Y	Y	Y	Y	Y
Programmable Feature/DN keys	8	8	16	16	11
CLASS Compatible	N	Y	Y	Y	N
Call Waiting Display	N	N	N	N	N
Volume Control	Y	Y	Y	Y	Y

Table 77
Meridian Business Set features (Sheet 2 of 2)

Function	M5008	M5208	M5216	M5316	M5317TDE
Analog or Digital	A	A	A	A	A
ADSI Compatible	N	N	N	N	N
Cordless	N	N	N	N	N
Single-line telephone	N	N	N	N	N
Multi-line telephone	Y	Y	Y	Y	Y

Note 1: L = Loop Powered, A = AC powered, AL = AC powered and Loop powered set.

Table 78 shows where you can find additional information about Meridian Business Sets.

Table 78
References

Document title	Document number
<i>M5008 Meridian Business Set Description, Installation, Operation, and Maintenance Manual</i>	297-2011-207
<i>M5208 Meridian Business Set Description, Installation, Operation, and Maintenance Manual</i>	297-2011-213
<i>M522 Add-On Module Description, Installation, Operation, and Maintenance Manual</i>	297-2011-208
<i>M5316 Meridian Business Set Description, Installation, Operation, and Maintenance Manual</i>	297-2011-214

Additional analog sets

Aastra Telecom manufactures a range of analog sets for use on the Meridian SL-100/Communication Server 2100. Additional information about these sets is available at www.aastra.com.

Meridian Services Attendant Console

A number of third-party vendors provide compatibility-tested, direct replacements for Nortel Networks manufacture discontinued Meridian Services Attendant Console (MSAC). These Attendant Consoles provide the same functionality as the MSAC, but operate on the screen of a PC.

Appendices





Appendix A: Technical specifications

This chapter contains the following sections:

- **Communization Server 2100**
- **Meridian SL-100**

Communization Server 2100

Operating environment

Ceiling height

A minimum clear ceiling height of 3m (10 feet) is required for the Communication Server 2100 cabinets and frames. The recommended clear ceiling height is 3.4m (11 feet).

Floor loading

The floor loading of fully-equipped Communication Server 2100 bays, including frame supporting cabling, averages 3.38 kilonewtons per square meter (80 pounds per square foot). You should include an allowance of 0.423 kilonewtons per square meter (10 pounds per square foot) for ceiling-supported cabling of the floor below in multi-floor buildings. Add a further allowance of 0.423 kilonewtons per square meter (10 pounds per square foot) for personnel and transient loads. The total loading in a multi-floor building is, therefore, 4.2 kilonewtons per square meter (100 pounds per square foot).

Environmental specifications

Communication Server 2100 equipment will remain functional and operate as expected under the environmental consolidations that Table 79 shows.

Table 79
Environmental conditions

Condition	Value
Ambient temperature	In the range of 10°C to 30°C (with short-term variations in the range of 5°C to 49°C) <small>(see note)</small>
Relative humidity	In the range of 22% to 55% (with short-term variations in the range of 20% to 80%) <small>(see note)</small>
Atmospheric pressure	423mmHg (69.2KPa), corresponding to 3,048m (10,000 feet) of altitude.
Ambient air	With cleanliness \leq class 100,000 (number of particles \geq 0.5 microns per cubic foot)
Note: Short-term means not more than 72 consecutive hours and no more than 15 days in one year.	

Temperature and humidity should be measured 1.254m (5 feet) above floor level and 381mm (15 inches) in front of the equipment. Rate of temperature change must not exceed 6.7°C (15°F) per hour.

Heat dissipation

The heat dissipation of a Communication Server 2100 configuration averaged over the equipment room floor and over 24 hours should not exceed 861 watts per square meter (80 watts per square foot).

Audio emissions

Maximum sound levels produced by equipment to be located in power rooms, or special sound tested areas, should not exceed 85 dBA. Maximum sound levels for all other equipment should not exceed 75 dBA.

Storage and shipping conditions

General storage conditions are in accordance with ISO R14. Transportation and intermediate storage conditions are in accordance with ISO O22. You can ship the Communication Server 2100 by truck, rail, sea or air when packed for transportation. Table 80 shows the environmental conditions that should not be exceeded during transportation.

**Table 80
Storage and shipping conditions**

Condition	Value
Ambient temperature	-40°C to 71°C (-40°F to 160°F)
Humidity	10% to 95%; maximum water vapor pressure not to exceed 25 mmHg
Vibration	Up to 3.5g at 5Hz to 500Hz
Shock	Equivalent to a 152mm (six inch) drop for a 454Kg (1000lb) equipped bay

You can store Communication Server 2100 equipment in a sheltered environment under the same ambient temperature and humidity conditions detailed for transportation.

Compliance with standards

Communication Server 2100 equipment is compliant with the following North American softswitch standards for telecommunication equipment:

- FCC part 15, Class A
- UL 1950/CSA 950
- Telcordia NEBS Level 3 criteria (GR-63-CORE, GR-1089-CORE)

The inherent strength and stability of the Communication Server 2100 cabinets provide Zone 4 earthquake protection without additional bracing. They meet industry isolated grounding and requirements and feature connectors to facilitate testing.

Communication Server 2100 cabinets and frames

SE07 supports the following two types of Communication Server 2100 configurations:

- Communication Server 2100 XA-Core
- Communication Server 2100 Compact

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Both types of configuration support the same range of call processing agents, protocols and telephony features. The main differences between them are that the Communication Server 2100 Compact uses a different processor complex, has a significantly smaller footprint and delivers reduced call processing capacity.

Table 81 describes the cabinets that can house the Communication Server 2100 components.

Table 81
Communication Server 2100 cabinet summary

Cabinet	Dimensions	Used to house
C42 equipment cabinet	107 cm wide x 183 cm high x 71 cm deep (42 inches x 72 inches x 28 inches)	<ul style="list-style-type: none"> • XA-Core • Message Switch • ENET
C28 equipment cabinet	71 cm wide x 183 cm high x 71 cm deep (28 inches x 72 inches x 28 inches)	<ul style="list-style-type: none"> • SuperNode Data Manager • Integrated Service Module/Input/Output Module
PTE2000 equipment cabinet	61 cm wide x 213 cm high x 61 cm deep (24 inches x 84 inches x 24 inches)	<ul style="list-style-type: none"> • SAM21 shelves with Call Agent, Network File System and Gateway Controllers • SAM16 shelf configured as Universal Audio Server • Sun Netra servers for Device Managers and OAM&P applications <p>Note: In Communication Server 2100 Compact configurations, the main PTE cabinet houses a SAM16 Universal Audio Server shelf, as well as two SAM21 shelves. A second PTE2000 frame is required to house Element Managers for Communication Server 2100 Compact components.</p>

Each cabinet, or frame, contains equipment shelves that provide slots for the installation of circuit cards and/or space to house specialized units that, in turn, contain circuit cards.

Communication Server 2100 cabinets meet industry requirements for isolated grounding and feature connectors to facilitate testing. They provide greater physical and electrostatic discharge damage protection for the enclosed equipment than open frames. They also are compliant with electromagnetic compatibility requirements and provide Zone 4 earthquake protection without additional bracing.

Power consumption examples

Table 82 provides examples of the power requirements for Communication Server 2100 cabinets.

Note: Power consumptions vary depending on the actual components housed in each cabinet.

Table 82
Power consumption examples

Item	Call Control Frame	OAM&P cabinet	SuperNode Data Manager cabinet
Power	2500 watts 8,540 BTU/hour	1650 watts 5,640 BTU/hour	870 watts 3980 BTU/hour
Current drain	56.2A	32.5A	17.2A
Nominal voltage	-50.25V	-50.25V	-50.25V

Meridian SL-100

This section describes the requirements for the following Meridian SL-100 system performance factors:

- power consumption
- floor loading
- temperature and humidity environment

This chapter also describes the features that require special provisioning and the features that require minimal customizing.

Power consumption

The Meridian SuperNode cabinets operate in the voltage range, 42 to 56 V dc. Table 83 shows the typical power requirements for the cabinet modules.

Table 83
Typical power requirements for cabinets (Sheet 1 of 2)

Module	Current at -48 V dc
<i>SuperNode cabinet:</i> Dual Plane Combined Core (DPCC)	46 A
<i>SuperNode SE cabinet:</i> SuperNode Combined Core (SCC)	48 A
<i>Trunk cabinets:</i> Meridian Cabinet Trunk Module-ISDN (MCTM-I) Cabinetized Integrated Services Module (CISM) (see note)	30 A 0 A
<i>Line cabinets:</i> Meridian Cabinet Line Module (MCLM) Meridian Cabinet Line Module-ISDN (MCLM-E) Meridian Cabinet Digital Module (MCDM) (see note) Intelligent Peripheral Equipment Column (IPEC) (see note)	30 A 30 A 30 A 27 A
<i>Link peripheral processor cabinet:</i> Link Peripheral Processor (LPP)	64 A
Note: The MCDM is manufacture discontinued (MD) and is replaced by the IPEC. The MCPM is MD and is replaced by the MCAM3. The MCGM is MD and is replaced by the MCAM3 and the CISM. The MCSS is MD and is replaced by the CMSS.	

Table 83
Typical power requirements for cabinets (Sheet 2 of 2)

Module	Current at -48 V dc
<i>Cabinetized Multi-Vendor Interface:</i> Cabinetized Multi-Vendor Interface (CMVI)	30A
<i>Network cabinets:</i> Meridian Cabinet Network Module (MCNM) Enhanced Network (ENET) Meridian Cabinet Network Interface (MCNI)	20 A 95 A 100 A
<i>Spectrum peripheral module cabinet:</i> Spectrum Peripheral Module (SPM)	64 A
<i>International peripheral equipment cabinet:</i> Cabinetized International Peripheral Equipment (CIPE)	64 A
<i>Maintenance and administration cabinets:</i> Meridian Cabinet Power Module (MCPM) (see note) Meridian Cabinet Service Module (MCSM) Meridian Cabinet Auxiliary Module phase 3 (MCAM3) Meridian Cabinet General Module (MCGM) (see note) Meridian Cabinet Spares Storage (MCSS) (see note) Cabinetized Miscellaneous Spares Storage (CMSS) (see note)	16 A 16 A 11 A 15 A 0 A 0 A
Note: The MCDM is manufacture discontinued (MD) and is replaced by the IPEC. The MCPM is MD and is replaced by the MCAM3. The MCGM is MD and is replaced by the MCAM3 and the CISM. The MCSS is MD and is replaced by the CMSS.	

Typical lineup current drains can be calculated.

Floor loading

The increased area of the cabinet base reduces spot floor loading by 25 percent in comparison to equivalent standard equipment frames. For a cabinet weighing 1200 lb, floor loading is 240 lb/sq ft., if resting on the base instead of the leveling feet.

Environmental requirements

The temperatures and relative humidity conditions listed in [Table 84 on page 358](#) and [Table 85 on page 358](#) are based on a maximum duration of 72 continuous hours and a total duration of 15 days per year.

The maximum rate of temperature excursion should not exceed 1 degree Celsius per minute.

Table 84
Temperature and humidity specifications (Meridian SuperNode cabinets)

Temperature range	Relative humidity
<i>Minimum:</i> 41° F (5° C)	<i>Minimum:</i> 20% (noncondensing)
<i>Maximum:</i> 120° F (48° C)	<i>Maximum:</i> 80% (noncondensing)
<i>Recommended:</i> 50° to 86° F (10° to 30° C)	<i>Recommended:</i> 20% to 50% (noncondensing)

Table 85
Temperature and humidity specifications (IPEC)

Temperature range	Relative humidity
<i>Minimum:</i> 40° F (4° C)	<i>Minimum:</i> 20% (noncondensing)
<i>Maximum:</i> 113° F (45° C)	<i>Maximum:</i> 80% (noncondensing)
<i>Recommended:</i> 59° to 86° F (15° to 30° C)	<i>Recommended:</i> 20% to 50% (noncondensing)



Appendix B: Peripheral support

Table 86 lists the Meridian SL-100 peripherals that are supported on the TDM side of the Communication Server 2100 hybrid.

Table 86
Supported Meridian SL-100 peripherals (Sheet 1 of 2)

Peripheral	Abbreviation
Series I	
Conference Trunk Module	CTM
Digital Trunk Module	DTM
Input/Output Controller	IOC
Input/Output Module	IOM
Integrated Services Module	ISM
Intelligent Peripheral Equipment	IPE
Maintenance Trunk Module	MTM
Packaged Trunk Module	PTM
Remote Maintenance Module	RMM
Service Trunk Module	STM
Trunk Module, 8-Wire	TM8
Series II	
Digital Trunk Controller	DTC
Digital Trunk Controller-ISDN	DTC(I)
Enhanced D-channel Handler	EDCH
Enhanced Line Concentrating Module	ELCM

Table 86
Supported Meridian SL-100 peripherals (Sheet 2 of 2)

Peripheral	Abbreviation
Line Concentrating Module	LCM
Line Concentrating Module-Enhanced	LCME
Line Group Controller	LGC
Line Group Controller-ISDN	LGC-I
Line Trunk Controller	LTC
Line Trunk Controller-ISDN	LTC-I
Remote Cluster Controller	RCC
Remote Cluster Controller 2	RCC2
Remote Line Concentrating Module	RLCM
Subscriber Carrier Module-100 Access	SMA
Subscriber Carrier Module-100 Access, Second Version	SMA2
Series III	
CCS7 Link Interface Unit (requires 32M processor)	LIU7
Ethernet Interface Unit Note: Not supported on the CS 2100 Compact.	EIU
Enhanced network	ENET
Link Peripheral Processor	LPP
Message Switch	MS
Spectrum Peripheral Module	SPM



FOR MORE INFORMATION

Refer to the *Peripheral Module Release Document (PM RELDOC)*, 555-4001-599, for detailed information about Meridian SL-100 Peripheral Modules.



List of terms

3WC	Three-Way Calling
AAL5	ATM Adaption Layer for lightweight VBR real-time traffic.
ABI	Access Bridging Interface
ABI	All Bits Inverted
ac	alternating current
AC	Announcement Controller
AC	Access Point
ACD	Automatic Call Distribution
ACD-ACDNR	Automatic Call Distribution Not Ready
ADSL	Asymmetrical Digital Subscriber Loop
AEM	Accessory Expansion Module
AG	Application Gateway
AIU	Application Interface Unit
ALOM	Advanced Lights Out Management
ALT	Automatic Line Test
AMA	Automatic Message Accounting
AMADNS	Automatic Message Accounting Data Networking System
AMATEST	Automatic Message Accounting Test Call Capability
APD	Address and Port Discovery
API	Application Programming Interface
APS	Audio Provisioning Server
ASCII	American Standard Code for Information Interchange
ASF	Alteon Switched Firewall
ASG	Analog Station Gateway
ASIC	Application-Specific Integrated Circuit

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ASU	Application Specific Unit
ATC	Automatic Time and Charges
ATM	Autovon Trunk Module
ATM	Asynchronous Transport Mode
ATMF UNI	ATM Forum Unidirectional
ATT	Automatic Trunk Test
AUI	Application Unit Interface
BCT	Bearer Channel Tandeming
BHCA	Busy Hour Call Attempts
BIC	Bus Interface Card
BIP	Breaker Interface Panel
BML	Business Management Layer
BOOTP	Bootstrap Protocol
BRI	Basic Rate Interface
BRISC	BNR Reduced Instruction Set Computing
CA	Call Agent
CAC	Connection Admission Control
CALEA	Communications Assistance for Law Enforcement Act
CallIP	Call Processing
CBM	Core and Billing Manager
CCF	Call Control Frame
CCS	Centi-Call Seconds
CDN	Called Party Number
CE	Common Equipment
CEM	Common Equipment Module
CFB	Call Forward Busy
CFD	Call Forward Do Not Answer
CFNA	Call Forward No Answer
CFP	Channel Frame Processor
CFU	Call Forward Universal
CLAN	Customer Local Area Network
CLASS	Custom Local Area Signaling Service
CLI	Command Line Interface
CLI or CLID	Calling Line Identification

CM	Computing Module
CNF	Station Controlled Conference
COAM	Cabinetized Operations Administration and Maintenance
CONF	Preset Conference
CORBA	Common Object Request Broker Architecture
CoS	Class of Service
CP	Control Processor
cPCI	compact Peripheral Component Interconnect
CPE	Customer Premises Equipment
CPU	Central Processing Unit
CPU	Call Pickup
CR	Centralized Replicator
CS	Communication Server
CS 2100	Communication Server 2100
CS LAN	Communication Server LAN
C-side	Core-side
CSISG	Contivity Secure IP Services Gateway
CSM	Channel Supervision Message
CSV	Comma-Separated Value
CTI	Computer Telephony Integration
CTM	Conference Trunk Module
CTR	Continuity Tone Detector
CWT	Call Waiting
CXR	Call Transfer
DAT	Digital Audio Tape
dc	direct current
DCC	Digroup Control Card
DCC	Data Control Card
DCE	Distributed Computing Environment
DCM	Digital Carrier Module
DCPK	Directed Call Park
DCPU	Directed Call Pickup
DDMS	DMS Data Management System
DHCP	Dynamic Host Configuration Protocol

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DiffServ	Differentiated Services
DIRP	Device Independent Recording Package
DLC	Data Link Controller
DLM	Digital Line Module
DMS	Digital Multiplex System
DN	Directory Number
DNS	Domain Name System
DPCC	Dual Plane Common Control
DPT	Dynamic Packet Trunk
DRAM	Digital Recorded Announcement Machine
DS0	Digital Signal, Level 0
DS1	Digital Signaling Level 1
DS3	Digital Signaling Level 3
DSP	Digital Signaling Processor
DTC	Digital Trunk Controller
DTC(I)	Digital Trunk Controller-ISDN
DTC7	SS7 Digital Trunk Controller
DTE	Data Terminating Equipment
DTM	Digital Trunk Module
DTMF	Dual-tone Multifrequency
DVD	Digital Video Disk
DWDM	Dense Wave Division Multiplexing
EBAF	Extended Bellcore Automatic Message Accounting Format
EBIP	Electrical Breaker Interface Panel
ECAN	Echo Cancellation
EDC	Extended Distance Capability
EDCH	Enhanced D-channel Handler
EDRAM	Enhanced Digital Recorded Announcement Machine
EIA	Electronic Industries Association
EIC	Ethernet Interface Card
EIP	Ethernet Interface Paddleboard
EIPE	Enhanced Intelligent Peripheral Equipment
EISP	Enhanced ISDN Signaling Preprocessor
EIU	Ethernet Interface Unit

ELCM	Enhanced Line Concentrating Module
EM	Element Manager
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EML	Element Management Layer
EMS	Element Management System
EMW	Network Executive Message Waiting
ENET	Enhanced Network
ENUM	E.164 Numbering
ESA	Emergency Stand Alone
ESD	Electrostatic Discharge
ESMA	Expanded Subscriber Carrier Module Access
ETS	Electronic Telephone Sets
ETSI	European Telecommunications Standards Institute
EXPEC	Enhanced IPE Controller
FBus	Frame Bus
FCAPS	Fault, Configuration, Accounting, Performance, and Security
FCC	Federal Communications Commission (United States)
FE	far end
FLIS	FiberLink Interface Shelf
FLPP	Fiber Link Peripheral Processor
FP	Function Processor
FRIU	Frame Relay Interface Unit
FRLS	Force Release
FTP	File Transfer Protocol
FX	Foreign Exchange
FXS	Foreign Exchange Service
GBIC	Gigabit Interface Converter
GEM	Gig Ethernet Resource Module
Gig-E	Gigabit Ethernet
GPS	Global Positioning System
GPS	Global Product Support
GTR	Global Tone Receiver
GUI	Graphic User Interface

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GWC	Gateway Controller
HDLC	High-Level Data Link Control protocol
HIE	Host Interface Equipment
HIOP	High-capacity Input/Output Processor
HLM	High-Level Management
HR	Human Resources
HSC	Hot Swap Controller
HSDU	High-Speed Data Unit
HTTP	Hyper-Text Transfer Protocol
HVAC	Heating, Ventilation and Air Conditioning
IAD	Integrated Access Device
IBIP	Intelligent Bay Interface Panel
ICM	Intelligent Call Management
IE	Information Element
IEEE	Institute of Electrical and Electronic Engineers
IEMS	Integrated Element Management System
IETF	Internet Engineering Task Force
IGW	Integrated Gateway Access (Generation 1 IP-enabled is supported from an LTCI)
INTPIC	International Primary Carrier
IOC	Input/Output Controller
IOM	Input/Output Module
IOP	Input/Output Processor. A card that occupies one or two slots in the XA-Core shelf.
IP	Internet Protocol
IPCM	IP Client Manager
IPCM-EM	IP Client Manager Element Manager
IPDR	Internet Protocol Detail Recording
IPE	Intelligent Peripheral Equipment
IPEC	Intelligent Peripheral Equipment column
IPF	Integrated Processor FBus card
IPSec	IP Security Protocol
IS	In Service
ISA	Integrated Services Access
ISDN	Integrated Services Digital Network

ISM	Integrated Services Module. A replacement for the Maintenance Trunk Module (MTM).
IT	Information Technology
ITP	Internet Telephony Processor
ITU	International Telecommunications Union
ITX	Internet Telephony Extender
IU	Interface Unit
IVR	Interactive Voice Response
IW SPM-IP	Interworking Spectrum Peripheral Module Internet Protocol
JNET	Junctored Network
JWS	Java Web Start
kbps	Kilobits per second
KEM	Key Expansion Module
LAN	Local Area Network. A network that connects computers to share data storage devices and printers.
LBL	Limited Bandwidth Link
LCAP	Local Craft Access Panel
LCC	Line Class Code
LCD	Liquid Crystal Display
LCM	Line Concentrating Module
LCME	Line Concentrating Module-Enhanced
LDAP	Lightweight Directory Access Protocol
LEA	Law Enforcement Agency
LED	Light Emitting Diode
LEN	Line Equipment Number
LGC	Line Group Controller
LGC(I)	Line Group Controller ISDN
LIM	Link Interface Module
LIS	Link Interface Shelf
LIU7	SS7 Link Interface Unit (requires 32M processor)
LM	Line Module
LMM	Line Maintenance Manager
LMM	Line Management and Maintenance
LMS	Local Message Switch

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LNR	Last Number Redial
LPP	Link Peripheral Processor
LSDU	Low-Speed Data Unit
LTC	Line Trunk Controller
LTC(I)	Line Trunk Controller ISDN
LTI	Line Side T1 IPE Interface
LTM	Line Test Manager
LTP	Line Test Position
MADN (MCA)	Multiple Appearance Directory Number (MADN) Multiple Call Arrangement (MCA)
MADN (SCA)	Multiple Appearance Directory Number (MADN) Single Call Arrangement (SCA)
MAN	Metropolitan Area Network
MAP	Maintenance and Administration Position
MAPCI	Maintenance and Administration Position Command Interpreter
MAU	Media Access Unit
Mbps	Megabits per second
MCNI	Meridian Cabinet Network Interface
MCS 5100	Multimedia Communications Server 5100
MDM	Multi-Service Data Manager
MDP	Management Data Provider
MF	Multi Frequency
MFIO	Multi-Function Input/Output
MG 9000	Media Gateway 9000
MGC	Media Gateway Controller
MGCP	Media Gateway Control Protocol
MGCP+	Enhanced Media Gateway Control Protocol
MIB	Management Information Base
MIS	Miscellaneous Equipment Frame
MLT	MultiLink Trunking
MPLS	Multiprotocol Label Switching
ms	micro-second
MS	Message Switch
MS 2010	Media Server 2010
MSB	Make Set Busy
MSR	Message Storage and Retrieval

MTBF	Mean Time Between Failures
MTM	Maintenance Trunk Module
MTM OAU	Maintenance Trunk Module Office Alarm Unit
MWI or MWIDC	Message Waiting Indication
MWT	Message Waiting
MX	Multimedia Exchange
NACD	Network Automatic Call Distribution
NAPT	Network Address and Port Translator
NAT	Network Address Translation
NE	Network Element
NE	near end
NEBS	Network Equipment Building Standard
NEL	Network Element Layer
NEMW	Network Executive Message Waiting
NFS	Network File System
NI-1	National ISDN 1 (also known as NTNA)
NI-2	National ISDN 2
NIC	Network Interface Card
NIU	Network Interface Unit
NM	Network Module
NML	Network Management Layer
NMS	Network Management System
NMWI	Network Message Waiting Indicator
NPM	Network Patch Manager
NRAG	Network Ring Again
NSF	Network Specific Facilities
nsswitch	Name Service Switch
NWM	Network Management
OAM&P	Operations, Administration, Maintenance and Provisioning
OAU	Office Alarm Unit
OC-3	Optical Carrier Level 3: the SONET transmission rate of 155.52 Mbps.
OM	Operational Measurement
OMD	Operational Measurement Delivery
ONP	One Night Process

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OOS	Out of Service
OPAC	Outside Plant Access Cabinet
OPM	Outside Plant Module
OSS	Operations Support System. Carrier equivalent of Network Management System.
PAM	Pluggable Authentication Module
P-Bus	Processor Bus
PBX	Private Branch Exchange
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCL	Product Computing-module Load
PCM	Pulse Code Modulation
PDP	Power Distribution Panel
PDS	Persistent Data Storage
PDTC	PCM-30 Digital Trunk Controller
PE	Processor Element
PEEL	Protel Environment Emulation Layer
PIM	Personal Information Manager
PIU	Port Interface Unit
PLC	Packet Loss Concealment
PM	Performance Management
PM	Peripheral Module
PMC	Peripheral Message Controller
PMDM	Preside Multi-service Data Manager
POTS	Plain Ordinary Telephone Service
PP	Peripheral Processor
PPVM	Peripheral Processor Virtual Machine
Preside MSS	Preside Management for Succession Solutions
PRI	Primary Rate Interface
PRK	Call Park
PRL	Peripheral/Remote Loader
PRL	Privacy Release
P-side	Peripheral-side
PSTN	Public Switched Telephone Network
PTE2000	Packet Telephony Equipment 2000

PTM	Packaged Trunk Module
PVC	Permanent Virtual Connection
PVG	Packet Voice Gateway
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Service
RAG	Ring Again
RAID	Redundant Array of Inexpensive Disks
RCC	Remote Cluster Controller
RCC2	Remote Cluster Controller 2
RDT	Remote Digital Terminal
RLCM	Remote Line Concentration Module
RLM	Remote Line Module
RLT	Release Line Trunk
RM	Resource Module
RMM	Remote Maintenance Module
RND	Redirecting Number Delivery
RSC	Remote Switching Center
RSC-S	Remote Switching Center-Second series
RTCP	Real-time Control Protocol
RTOS	Real Time Operating System
RTP	Real-time Transport Protocol
RTU	Right-To-Use
RW	Read/Write
SAM16	Service Application Module 16
SAM21	Service Application Module 21
SAM21 EM	SAM21 Element Manager
SAN	Storage Area Network
SBA	SuperNode Billing Application
SBC	Single Board Computer
SC	Shelf Controller
SCOCS	Selective Class of Call Screening
SCSI	Small Computer System Interface
SCTP	Stream Control Transmission Protocol
SCU	Speed Calling User

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SDM	SuperNode Data Manager
SDN	Synchronous Digital Network
SDP	Session Description Protocol
SERVORD	Service Order
SID	Silence ID
SIM	Serial Interface Module
SIMRING	Simultaneous Ringing
SLG	SuperNode Data Manager Log Generation
SLM	System Load Module
SM	Shared Memory
SMA2	Subscriber Carrier Module-100 Access, Second Version
SMDR	Station Message Detail Recording
SML	Service Management Layer
SMS-R	Subscriber Carrier Module Remote
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SNPA	Serving Numbering Plan Area
SNSE	SuperNode Size Enhanced
SONET	Synchronous Optical Network
SPCS	Stored Program Control Switch
SPM	Spectrum Peripheral Module
SPVC	Switched Permanent Virtual Connection
SS7	Signaling System # 7
SSH	Secure Shell
SSL	Secure Sockets Layer
SSLPP	Single-Shelf Link Peripheral Processor
SSO	Single Sign On
SSPFS	Succession Server Platforms Foundation Software
STM	Service Trunk Module
STM-1	Synchronous Transport Mode 1
STORM	Storage Management
SVC	Secure Voice Zone
SVP	SpectraLink Voice Priority protocol
SWACT	Switch Activity

TAPI	Telephony Application Programming Interface
T-Bus	Transaction Bus
TCP	Transmission Control Protocol
TDM	Time Division Multiplexing
TFTP	Trivial File Transfer Protocol
TM	Transition Module
TM8	Trunk Module, 8-Wire
TMM	Trunk Maintenance Manager
TMM	Trunk Management and Maintenance
TMN	Telecommunications Management Network
TOD	Time of Day
TP	TrunkPack
TSP	TAPI Service Provider
TTP	Trunk Test Position
UA	User Agent
UAS	Universal Audio Server
UDP	User Datagram Protocol
UME	Unit Manager Express (Mediatrix)
UMN	Unit Manager Network (Mediatrix)
UNIStim	Unified Network Stimulus protocol
UPS	Uninterruptible Power Supply
UPSR	Unidirectional Path-Switched Ring
USB	Universal Serial Bus
USP	Universal Signaling Point
UTR	Universal Tone Receiver
V	volt(s)
VLAN	Virtual Local Area Network
VMG	Virtual Media Gateway
VoIP	Voice over IP
VoP	Voice over Packet
VPN	Virtual Private Network
VRRP	Virtual Router Redundancy Protocol
VRU	Voice Response Unit
VSP	Voice Service Processor

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WAN	Wide Area Network
Wi-Fi	Wireless Fidelity
WLAN	Wireless LAN
XA-Core	Extended Architecture Core
XAI	Extended Architecture Interconnect
XLIU	Enhanced Link Interface Unit
XML	Extensible Markup Language
XPM	Extended Peripheral Module
XTS	Extreme Thin Server



Meridian SL-100/Nortel Networks Communication Server 2100

Product Guide

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Publication number: 555-4001-806
Product release: SE07
Document release: Standard 02.06
Date: January 2005
Printed in the United States of America.

