Nortel Communication Server 1000

Nortel Communication Server 1000 Release 4.5

Communication Server 1000E

Overview

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Revision history

July 2006

Standard 3.00 This document is up-issued to reflect change in technical content on page 46 due to CR Q01324850.

August 2005

Standard 2.00. This document is up-issued to support Communication Server 1000 Release 4.5.

September 2004

Standard 1.00. This document is issued for Communication Server 1000 Release 4.0.

Contents

How to get help

This chapter explains how to get help for Nortel products and services.

Getting help from the Nortel web site

The best way to get technical support for Nortel products is from the Nortel Technical Support web site:

www.nortel.com/support

This site provides quick access to software, documentation, bulletins, and tools to address issues with Nortel products. From this site, you can:

- download software, documentation, and product bulletins

- search the Technical Support Web site and the Nortel Knowledge Base for answers to technical issues

- sign up for automatic notification of new software and documentation for Nortel equipment

- open and manage technical support cases

Getting help over the telephone from a Nortel Solutions Center

If you do not find the information you require on the Nortel Technical Support web site, and you have a Nortel support contract, you can also get help over the telephone from a Nortel Solutions Center.

In North America, call 1-800-4NORTEL (1-800-466-7835).

Outside North America, go to the following web site to obtain the telephone number for your region:

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Getting help from a specialist by using an Express Routing Code

To access some Nortel Technical Solutions Centers, you can use an Express Routing Code (ERC) to quickly route your call to a specialist in your Nortel product or service. To locate the ERC for your product or service, go to:

www.nortel.com/erc

Getting help through a Nortel distributor or reseller

If you purchased a service contract for your Nortel product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller.

About this document

This document is a global document. Contact your system supplier or your Nortel representative to verify that the hardware and software described are supported in your area.

Subject

> **WARNING**
>
> Before a CS 1000E system can be installed, a network assessment **must** be performed and the network must be VoIP-ready.
>
> If the minimum VoIP network requirements are not met, the system will not operate properly.
>
> For information on the minimum VoIP network requirements and converging a data network with VoIP, refer to *Converging the Data Network with VoIP* (553-3001-160).

This document describes CS 1000E system architecture, software and hardware requirements, components, and network connections.

Note on legacy products and releases

This NTP contains information about systems, components, and features that are compatible with Nortel Communication Server 1000 Release 4.5 software. For more information on legacy products and releases, click the

Technical Documentation link under **Support & Training** on the Nortel home page:

www.nortel.com

Applicable systems

This document applies to the Communication Server 1000E (CS 1000E) system.

Note: When upgrading software, memory upgrades may be required on the Signaling Server, the Call Server, or both.

Intended audience

This document is intended serve as an introductory overview for individuals responsible for the sale, acquisition, planning, or installation of CS 1000E systems.

Conventions

In this document, the CS 1000E system is referred to generically as "system."

Related information

This section lists information sources that relate to this document.

NTPs

The following NTPs are referenced in this document:

- *Feature Listing* (553-3001-011)

- *Converging the Data Network with VoIP* (553-3001-160)

- *IP Peer Networking: Installation and Configuration* (553-3001-213)

- *Branch Office: Installation and Configuration* (553-3001-214)

- *Features and Services* (553-3001-306)

- *IP Line: Description, Installation, and Operation* (553-3001-365)

- *Telephones and Consoles: Description, Installation, and Operation* (553-3001-367)

- *IP Phones: Description, Installation, and Operation* (553-3001-368)

- *Communication Server 1000E: Planning and Engineering* (553-3041-120)

- *Communication Server 1000E: Installation and Configuration* (553-3041-210)

- *Communication Server 1000E: Upgrade Procedures* (553-3041-258)

- *Communication Server 1000E: Maintenance* (553-3041-500)

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Features

Contents

Introduction

> **WARNING**
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The Communication Server 1000E (CS 1000E) is a robust and highly scalable IP PBX that supports traditional Meridian features as well as new IP telephony features, including Session Initiation Protocol (SIP).

With the CS 1000E, customers can evolve from a traditional TDM network to a converged IP network. Deployment is seamless because the CS 1000E integrates with existing PBX systems from Nortel and third parties. This enables customers to expand the size and functionality of their networks while preserving their investment in legacy equipment, such as Meridian 1, Option 11C, and Succession 1000 systems.

Being IP-based, the CS 1000E supports distributed architecture. This enables customers to locate systems and components where they fit best. For example, using the Branch Office feature, customers can establish Media Gateway 1000Bs (MG 1000B) in remote sites to extend complete feature sets across multiple locations and time zones. Customers can also configure the CS 1000E to support Campus Redundancy and Geographic Redundancy to increase system availability.

Like other Enterprise Solutions from Nortel, the CS 1000E delivers business-grade availability, security, reliability, and scalability. And as always, CS 1000E customers receive industry-leading support services from Nortel to ensure successful implementation.

Key features

Key features of the CS 1000E system are as follows:

- IP-based switching with TDM capability (p. 17)
- Large system capacity, small system size (p. 17)
- Flexible architecture (p. 17)
- Industry-standard interworking and interoperability (p. 18)
- Enhanced system management capabilities (p. 19)
- Software applications and features (p. 20)
- Desktop clients (p. 21)

The following sections describe these features in detail.

IP-based switching with TDM capability

The CS 1000E is an IP PBX that supports TDM PBX capabilities. Unlike traditional, circuit-switched PBX systems, the IP-based CS 1000E Core Call Server has no dedicated switching infrastructure. All voice communication between network elements uses a Telephony LAN (TLAN) subnet.

Evolving to the CS 1000E and a converged IP network provides several advantages. For example, it enables the customer to deliver a consistent set of services to all locations, whether large or small. It also eliminates separate voice wiring.

What's more, customers need not compromise voice quality or features by selecting a CS 1000E system. That's because the CS 1000E enables customers to route calls over their circuit-switched networks or over their QOS-managed IP network, according to their own rules and requirements.

Large system capacity, small system size

With its dual, redundant CP PIV processors, the CS 1000E supports up to 15 000 IP Phones. To support more IP Phones, multiple CS 1000E systems can be installed across the QOS-managed IP network.

In terms of physical size, the CS 1000E is much smaller than other Large Systems, and its components are rack-mountable in industry-standard 19-inch racks.

Flexible architecture

The CS 1000E supports flexible, distributed architecture across a QOS-managed IP network. In combination with a CS 1000E system, a Media Gateway 1000T (MG 1000T) provides PSTN access, which the customer can configure as centralized or distributed to reduce toll costs.

Branch Office

The CS 1000E also supports the Branch Office configuration, which enables a user at a remote location to access the same features available at the main site. This allows customers to extend complete feature sets across multiple locations and time zones and reduce operating costs.

With a CS 1000E system, a customer can convert an Option 11C system to an MG 1000B.

Redundant architecture

The CS 1000E comes configured with fully redundant Call Servers, similar to the dual CPUs used in CS 1000M and Meridian 1 Large Systems. The sections below describe key configuration options.

Campus Redundancy

With Campus Redundancy, a customer can install the inactive Call Server from the active Call Server using a dedicated fiber connection configured to meet specified network parameters. When this configuration is implemented, a major failure of the active Call Server (for example, due to fire or flood) does not disable the remote Call Server.

Geographic Redundancy

Geographic Redundancy enables a customer to duplicate the redundant Call Server Core at a remote location over the customer WAN. The duplicate Core can take over processing if the primary system fails for any reason. Geographic Redundancy also offers automatic database replication between main and backup systems to promote a smooth transition. When this configuration is implemented, the customer enhances the disaster recovery capability of their network and further secures ultra-high reliability.

Note: Geographic Redundancy capabilities only apply to IP Phones. They do not apply to analog (500/2500-type) or digital telephones.

Industry-standard interworking and interoperability

The CS 1000E supports interworking and interoperability with other enterprise PBX systems from Nortel and third parties. This enables customers to smoothly migrate from traditional TDM-based telephony products to IP-based telephony products.

The CS 1000E supports interworking with many Nortel products, including Business Communications Manager (BCM), CS 1000S, and CS 1000M, using standard SIP and H.323 protocols with Meridian Customer Defined Networking (MCDN) extensions to provide more complete feature transparency. The CS 1000E also uses industry-standard SIP and H.323 protocols to support interworking with third-party products.

For existing Meridian 1 and Succession 1000 customers, the CS 1000E supports reuse of equipment. Reuse means faster deployment, reduced cost, and lower training costs. For example, customers can reuse circuit cards and Media Gateways from Meridian 1 and Succession 1000 systems in a CS 1000E system.

Enhanced system management capabilities

The CS 1000E provides enhanced system management capabilities through an integrated set of interfaces. These interfaces increase configuration capability and reduce operating cost, in part by centralizing services and service provisioning.

Management interfaces supported by the CS 1000E include Element Manager, Optivity Telephony Manager (OTM), and traditional Command Line Interfaces.

Element Manager

CS 1000E supports Element Manager, a web-based GUI that offers an alternative to traditional overlays and CLIs. Element Manager simplifies overall management of items like Network Routing Service (NRS), IP services, IP Peer configuration, and software downloads.

Optivity Telephony Manager (OTM)

CS 1000E supports Optivity Telephony Manager (OTM) 2.2, which enhances system management simplicity and control. This includes LDAP-based directory integration, station administration, call accounting, call tracking, traffic analysis, disaster recovery tools, and more. These features save time and facilities costs, simplifying management of a complex network.

Traditional Command Line Interfaces

CS 1000E fully supports traditional Command Line Interfaces (CLI), including overlays.

Software applications and features

The CS 1000E system provides access to the full suite of Meridian software applications and features. It also provides access to an emerging suite of IP-based applications and features that increase operational efficiency while lowering costs through convergence and user mobility.

In brief, the CS 1000E supports the following features and applications:

- **Traditional telephony applications**. Traditional telephony features (Call Waiting, ACD, CDR, and so on) are fully supported.

- **Networking applications**. ISDN PRI, ISDN BRI, ESN, and other Meridian 1 networking applications are fully supported.

- **Voicemail applications**. CallPilot 2.0 and CallPilot 1.5 Mini are fully supported. Meridian Mail is not supported.

- **Multimedia Communication Server 5100 (MCS 5100) applications**. The MCS 5100 portfolio of multimedia applications for the enterprise and other standards-based SIP applications are supported.

- **Call Center applications**. Symposium applications are fully supported, including Symposium Call Center Server (SCCS), Symposium Express Call Center (SECC), Symposium TAPI Server, Symposium Agent, and Symposium Web Center Portal.

- **Wireless applications**. CS 1000E supports Nortel WLAN IP Telephony Manager 2245 and Nortel WLAN Application Gateway 2246 for use with the Nortel WLAN Handsets 2210 and 2211. Support is also provided for Nortel Integrated DECT (DECT) (on the MG 1000T platform only).

- **Integrated applications**. The complete suite of Integrated applications is supported, including:

  — Nortel Integrated Conference Bridge

  — Nortel Integrated Call Assistant

— Nortel Integrated Call Director

— Nortel Integrated Recorded Announcer

— Nortel Hospitality Integrated Voice Services

SIP support

The CS 1000E is compatible with CS 1000 Release 4.5 software, which supports the H.323 protocol as well as the Session Initiation Protocol (SIP) on the same Signaling Server hardware.

SIP is used to establish, modify, and terminate telephony sessions in IP networks. A session can be a simple two-way telephone call or a multimedia session that integrates voice, data, and video. SIP's text-based architecture speeds access to new services with greater flexibility and more scalability.

CS 1000 Release 4.5 software supports SIP Gateway and SIP Services. SIP Gateway offers an industry-standard, SIP-based, IP Peer solution that delivers a SIP interface for interoperability with standard SIP-based products, including Nortel SIP products. SIP Services, through a Converged Desktop, provides the CS 1000 telephony features as well as Multimedia Communication Server (MCS) 5100 applications.

The Converged Desktop capabilities of CS 1000 Release 4.5 require an MCS 5100 to be in the network. This interfaces to the CS 1000E by means of SIP trunks.

CS 1000 Release 4.5 capacity enhancements and SIP-related interoperability enhance the positioning of large-sized networks and enable users to access multimedia when MCS 5100 servers and services are added.

Desktop clients

The CS 1000E supports many new IP telephony devices, including IP Phones, SIP phones, and soft clients for desktop, tablet, and PDA devices. The CS 1000E also supports a wide range of traditional desktop clients, including analog (500/2500-type) telephones, digital telephones, and attendant consoles.

For more information on IP Phones, see *IP Phones: Description, Installation, and Operation* (553-3001-368). For more information on analog and digital telephones, see *Telephones and Consoles: Description, Installation, and Operation* (553-3001-367).

IP Phones

The CS 1000E supports Nortel IP Phones, which convert voice into data packets for transport over IP. The functionality and call features of IP Phones are similar to those on a standard digital telephone, such as the M2616.

UNIStim phones

The CS 1000E supports the following UNIStim IP Phones: Nortel IP Phone 2001, IP Phone 2002, IP Phone 2004, IP Phone 2007, IP Audio Conference Phone 2033, and IP Softphone 2050. The CS 1000E system also supports the Meridian IP Phone adapter package for the M26xx and M39xx telephones. The IP Phone adapter package is intended for local deployment and does not support analog PSTN fallback.

Digital telephones

The CS 1000E system supports the M3900 series Meridian Digital Telephones. This includes the M3901 Entry Level Telephone, the M3902 Basic Telephone, the M3903 Enhanced Telephone, the M3904 Professional Telephone, and the M3905 Call Center Telephone.

The CS 1000E also supports other digital telephones, including the M2006, the M2008, the M2008HF, the M2616, the M2016S, the M2216ACD, and the M2317 Telephone.

Attendant consoles

The CS 1000E also supports the Attendant PC software console and the M2250 attendant console.

The Attendant PC software enables users to perform attendant console and call processing functions on a Windows® PC using a mouse or keyboard. The Attendant PC combines the call-processing power of the M2250 attendant console with the processing power and storage capacity of a PC to enhance attendant services.

Analog (500/2500-type) telephones and fax

The CS 1000E supports analog line cards that support analog
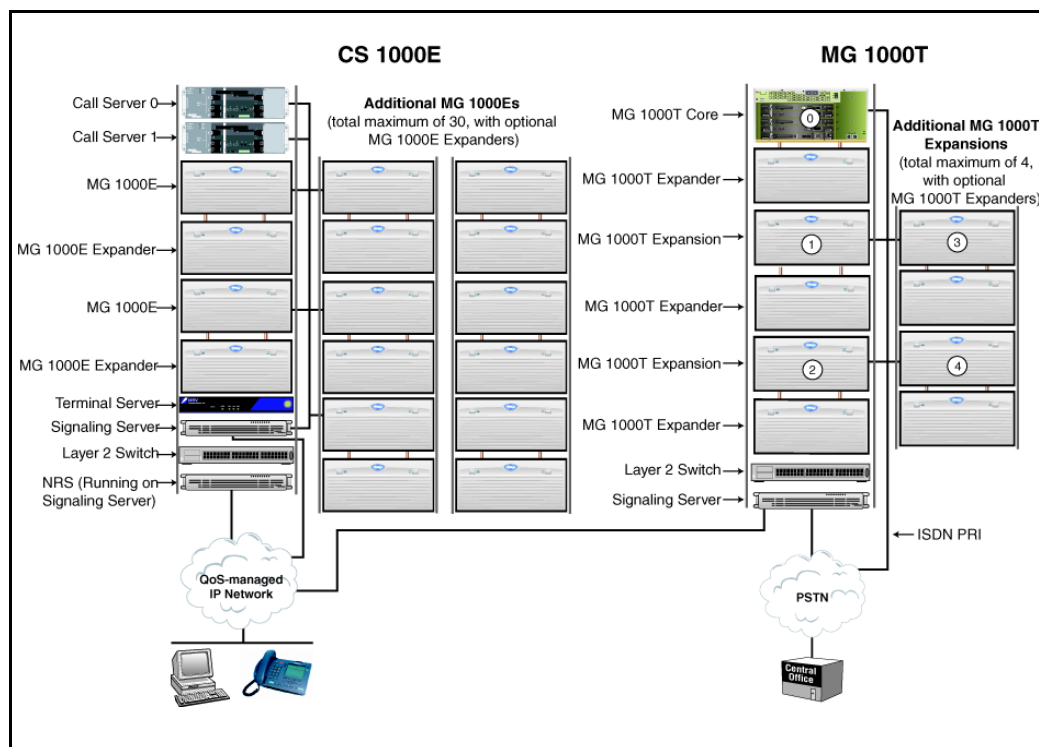(500/2500-type) telephones and T.38 fax interfaces.

System architecture

Contents

Main components

Figure 1 shows the main components of a typical CS 1000E solution. The remainder of this chapter discusses each component in further detail.

Figure 1
Basic CS 1000E solution

A typical CS 1000E solution is comprised of a Communication Server 1000E (CS 1000E) system and a Media Gateway 1000T (MG 1000T) platform.

- The **CS 1000E** system provides core processing capability and IP functionality. It includes:

  — dual CS 1000E Core Call Servers (0 and 1) (see)

  — 1 to 30 Media Gateway 1000Es (MG 1000E) and optional MG 1000E Expanders (see)

— Signaling Servers (total number required depends on capacity and survivability levels) (see page 48)

— an MRV Terminal Server (see page 54)

— Layer 2 switches (see page 63)

The CS 1000E system software is based on the core software of the CS 1000M Large Systems. Each Call Server in the CS 1000E has two circuit cards: a CP PIV Call Processor card and a System Utility card — a similar set to that used in CS 1000M Large Systems.

Another key element in the CS 1000E is the Network Routing Service (NRS), a software application that provides network-based routing capability. The NRS runs on a Signaling Server, with other applications or as a stand-alone component.

• The **MG 1000T** platform provides the CS 1000E system with digital trunk and PRI access to the PSTN and to other PBX systems. It includes:

— an MG 1000T Core (MG 1000T 0) and optional MG 1000T Expander (see page 56)

— an additional 1 to 4 MG 1000T Expansions and optional MG 1000T Expanders that are controlled by the MG 1000T Core (see page 56)

— Signaling Servers (total number required depends on capacity and survivability levels) (see page 48)

— Layer 2 switches (see page 63)

The MG 1000T software is based on the core software of the CS 1000S systems. The main controller in the MG 1000T Core is the Small System

Controller (SSC) card, the same card used in CS 1000M Small Systems and CS 1000S systems.

Software on the MG 1000T supports a Clock Controller; software on the CS 1000E does not. This means that only the MG 1000T can support the following features (because they use a Clock Controller):

— ISDN PRI and BRI applications (D-channel functionality)

— DECT

As well, given its main role as a trunking gateway, the MG 1000T cannot be provisioned with User Licenses (with the exception of DECT User Licenses).

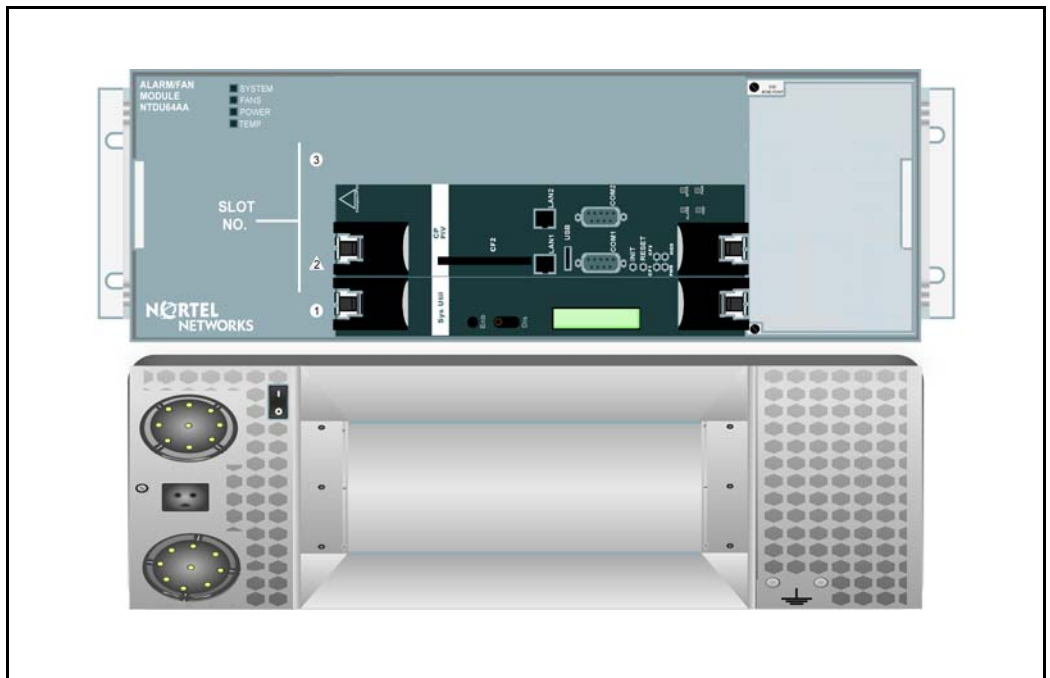# CS 1000E Core Call Server

Main role

The CS 1000E Core Call Servers serve as the core processors for the CS 1000E system, including the MG 1000Es.

Physical description

Figure 2 shows the front (without cover) and rear of one Call Server.

Figure 2
CS 1000E Core Call Server (front and rear)

Hardware components

Similar to the set of core circuit cards used in CS 1000M Large Systems, each Call Server contains the following:

- CP PIV Call Processor card

- System Utility card

In addition, each Call Server is equipped with the following modules:

- Power supply module

- Alarm/fan module

CP PIV Call Processor card

The CP PIV Call Processor card (NT4N39AA) is the main processor for the Call Server, controlling all call processing and telephony services. It also provides the system memory required to store operating software and customer data.

The CP PIV Call Processor card provides the following connectors:

- The **Com 1 port** connects to an IP-based Terminal Server, which provides standard serial ports for system maintenance and third-party applications (for more information, see "Terminal Server" on). The Com 1 port can also be directly connected to a system terminal for system access.

- The **Com 2 port** can be used as an additional RS-232 port (for system maintenance only).

- The **LAN 1 network interface** connects the Call Server to the Embedded LAN (ELAN) subnet through an ELAN Layer 2 switch to provide IP connections between the Call Server, Signaling Servers, and MG 1000Es.

- The **LAN 2 network interface** connects Call Server 0 to Call Server 1 over a 100BaseT high-speed pipe (HSP) connection to provide communication and database synchronization.

- The **USB port** is not supported by the CS 1000E system and cannot be used.

System Utility card

The System Utility card (NT4N48) provides auxiliary functions for the Call Server.

Note: The minimum vintage for the System Utility card with CS 1000E is NT4N48BA.

System Utility card functions include:

- LCD display for system diagnostics

- interface to the Call Server alarm monitor functions

- Core-selection DIP switches to specify Call Server 0 or Call Server 1

- software security device holder

Note: The software security device enables the activation of features assigned to the CS 1000E system. The security device for a CS 1000E Core Call Server is similar to the one used on a CS 1000M Large System.

Power supply module

The AC power supply module (NTDU65) is the main power source for the Call Server and is field-replaceable.

Alarm/fan module

The alarm/fan module (NTDU64) provides fans for cooling the Call Server and provides status LEDs indicating the status of Call Server components. The alarm/fan module is field-replaceable.

Functional description

The Call Servers provide the following functionality:

- provide main source of call processing

- process all voice and data connections

- control telephony services

- control circuit cards installed in MG 1000Es

- provide resources for system administration and user database maintenance

Operating parameters

The CS 1000E has dual Call Servers (0 and 1) to provide a fully redundant system.

Call Servers 0 and 1 operate in redundant mode: one runs the system while the other runs in a "warm standby" mode, ready to take over system control if the active Call Server fails.

The system configuration and user database are synchronized between the active and inactive Call Servers. This allows the inactive Call Server to assume call processing in the event of failure of the active Call Server.

The Call Server uses a proprietary protocol to control the MG 1000Es. This proprietary protocol is similar to industry-standard Media Gateway Control Protocol (MGCP) or H.248 Gateways.

The Call Servers can control up to 30 MG 1000Es.

Note: The Call Servers provide connectivity to telephony devices using IP signaling through MG 1000Es rather than by direct physical connections.
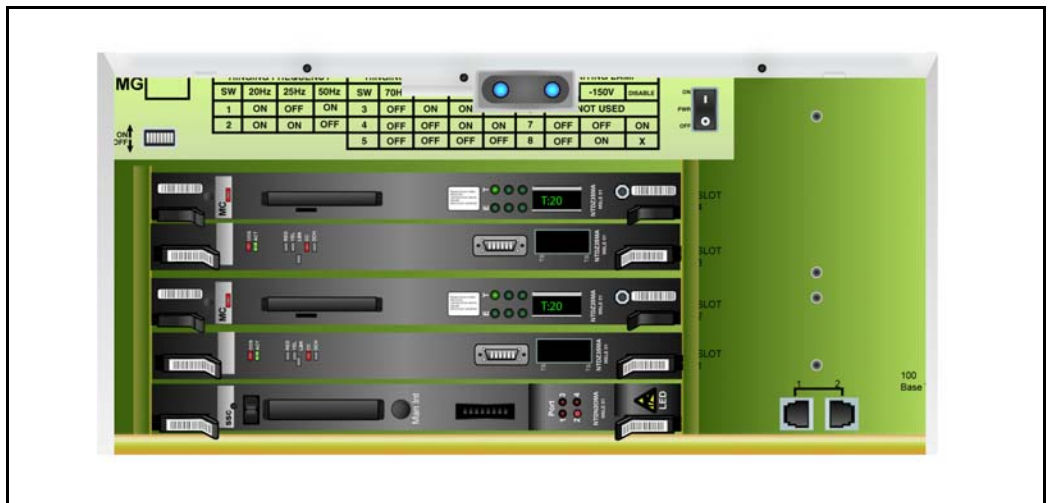
Media Gateway

Main role

The Media Gateway houses circuit cards and connectors to support the functionality of an MG 1000E or MG 1000T. The ultimate role of any Media Gateway is determined by its use as either an MG 1000E or MG 1000T (see "Media Gateway 1000E" on and "Media Gateway 1000T" on for details).

Note: The MG 1000B and MG 1000S also use the same base Media Gateway hardware as the MG 1000E and MG 1000T. (For more information, see *Branch Office: Installation and Configuration* (553-3001-214) and *Communication Server 1000S: Overview* (553-3031-010).)

Physical description

Figure 3 shows the Media Gateway (NTDU14).
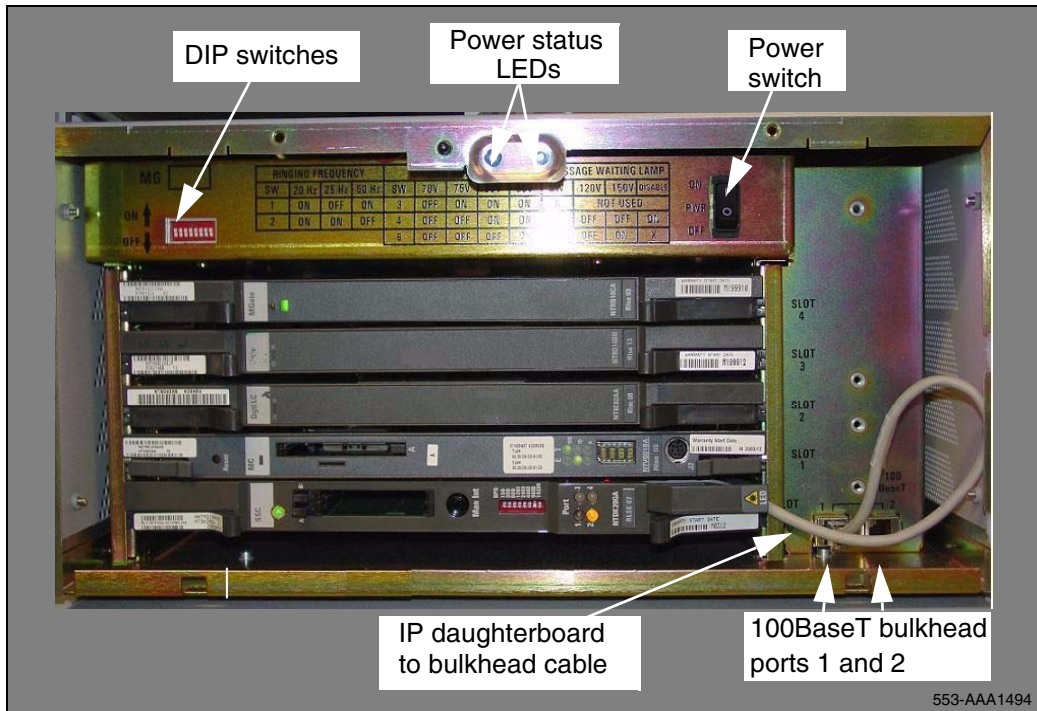
Figure 3
Media Gateway

Hardware components

Front components

Figure 4 shows the Media Gateway with the front cover removed. Note the following:

- The DIP switches set ringing voltages, ringing frequencies, and message waiting voltages.

- The 100BaseT bulkhead ports 1 and 2 provide SSC daughterboard ports with connections to rear bulkhead ports.

Figure 4
Front components in the Media Gateway (NTDU14)

Rear components

Figure 5 on shows the rear components on the Media Gateway. Note the following:

- The AC power cord connector provides AC connection to the Media Gateway.

- AUX extends Power Failure Transfer Unit (PFTU) signals to the Main Distribution Frame (MDF).

- GND is used for ground cable termination.

- 100BaseT bulkhead ports 1 and 2 provide connections from IP daughterboard ports on the SSC card to other system components as follows:

  — On MG 1000Es, these ports provide connections to the Call Server through an ELAN Layer 2 switch.

  — On MG 1000T Expansions, these ports provide direct connections to the MG 1000T Core.

- The rear ELAN network interface (10BaseT) provides communication between the MG 1000T Core SSC card and the ELAN subnet (this network interface is not used with MG 1000Es).

- The Attachment Unit Interface (AUI) is used with SSC cards that require a Media Access Unit (MAU).

- The serial port connects to maintenance terminals.

- DS-30X and CE-MUX interconnect the Media Gateway to the Media Gateway Expander.

- 25-pair connectors extend the IPE card data to the MDF.

Figure 5
Rear components in the Media Gateway

553-AAA0223
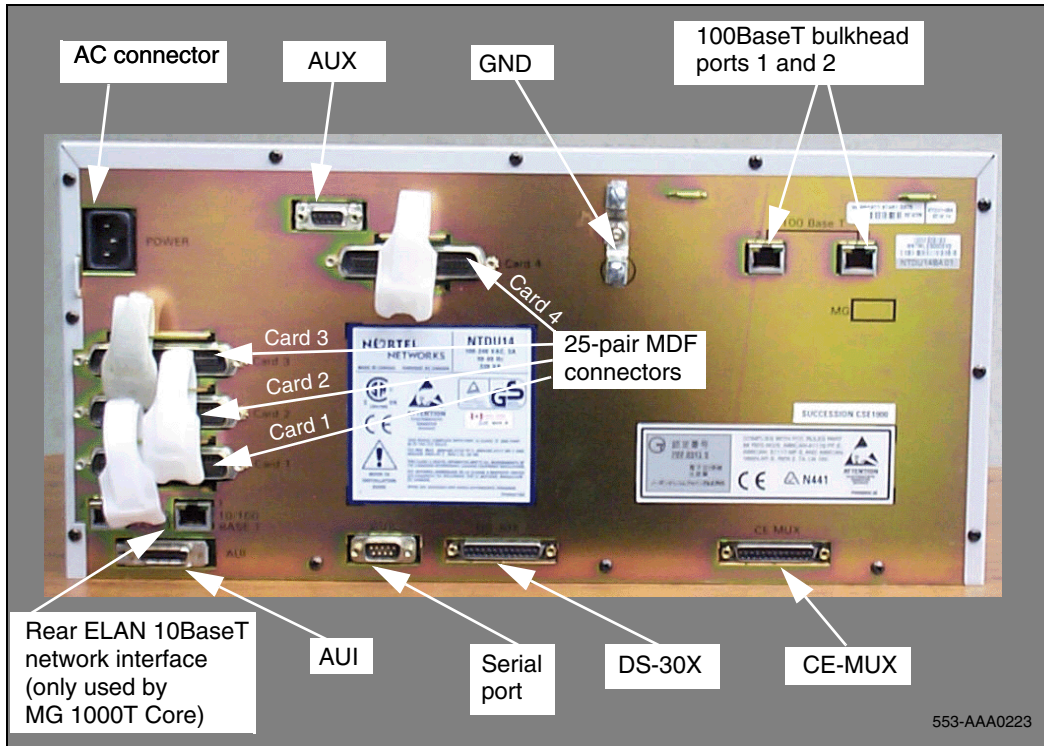
Circuit cards

Each Media Gateway can house the following circuit cards:

• SSC card (not used in the Expander)

• Media Card and Voice Gateway Media Card

• Intelligent Peripheral Equipment (IPE) cards (see "Media Gateway 1000E" on page 42 and "Media Gateway 1000T" on page 56 for specific cards supported on each Media Gateway type)

Small System Controller (SSC) card

The SSC card (NTDK20) contains software that controls interface cards and application cards in the Media Gateway. The SSC card hardware resources provide 32 channels of conferencing and 60 channels of tone generation.
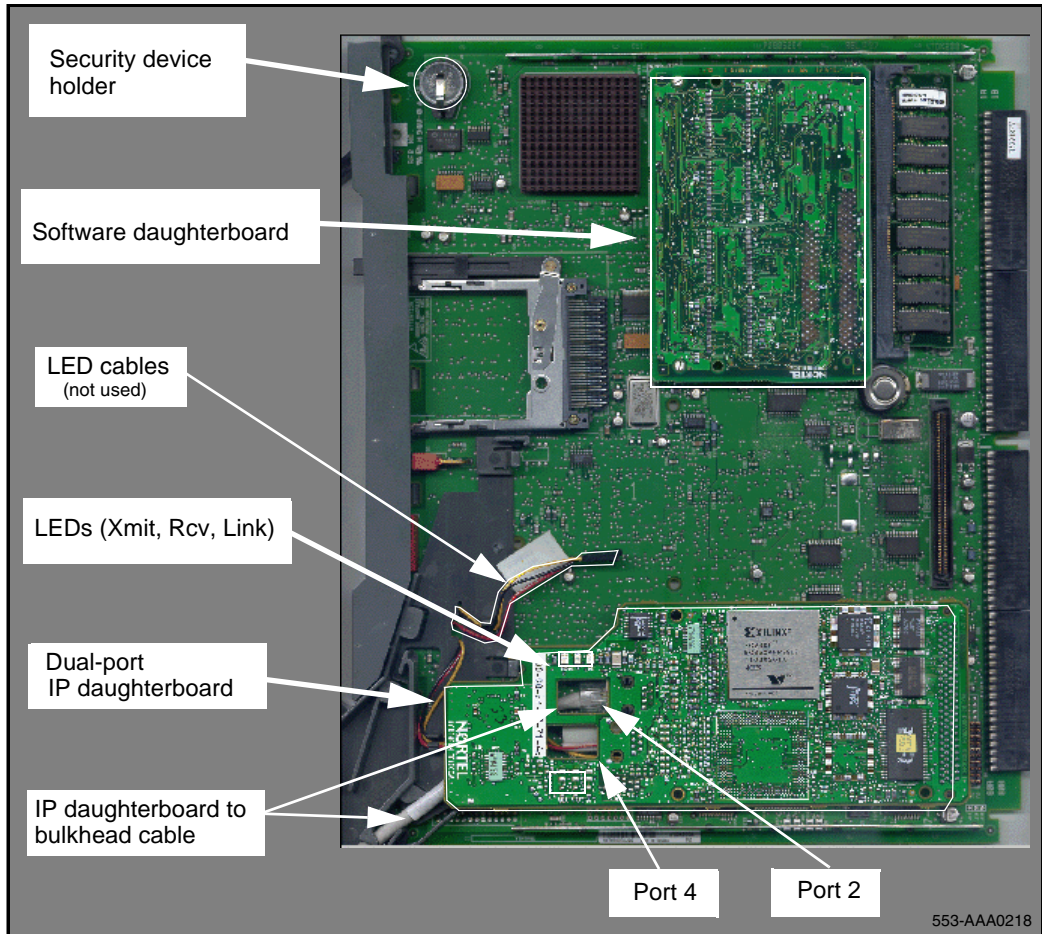
The SSC card is also equipped with IP daughterboards that provide 100BaseT IP interfaces to the ELAN subnet. Each IP daughterboard connected to the SSC also provides an additional 16 conference channels per port (16 channels with each single-port daughterboard and 32 channels with each dual-port daughterboard).

The SSC card also houses the software security device for the Media Gateway.

> *Note:* A specific type of security device is required for each type of Media Gateway: MG 1000E, MG 1000T Core, or MG 1000T Expansion. For details, see "Media Gateway 1000E" on and "Media Gateway 1000T" on .

shows the components in the SSC card.

Figure 6
Small System Controller card (NTDK20)

Security device holder

Software daughterboard

LED cables
(not used)

LEDs (Xmit, Rcv, Link)

Dual-port
IP daughterboard

IP daughterboard to
bulkhead cable

Port 4

Port 2

553-AAA0218

Media Card

The Media Card provides interfaces that connect to the Telephony Local Area
Network (TLAN) and Embedded Local Area Network (ELAN) subnets. The
Media Card can also run various applications. Figure 7 on page 39 shows
faceplate connectors and indicators on the Media Card. For more information
on Media Card features, refer to *IP Line: Description, Installation, and
Operation* (553-3001-365).

Figure 7
Media Card
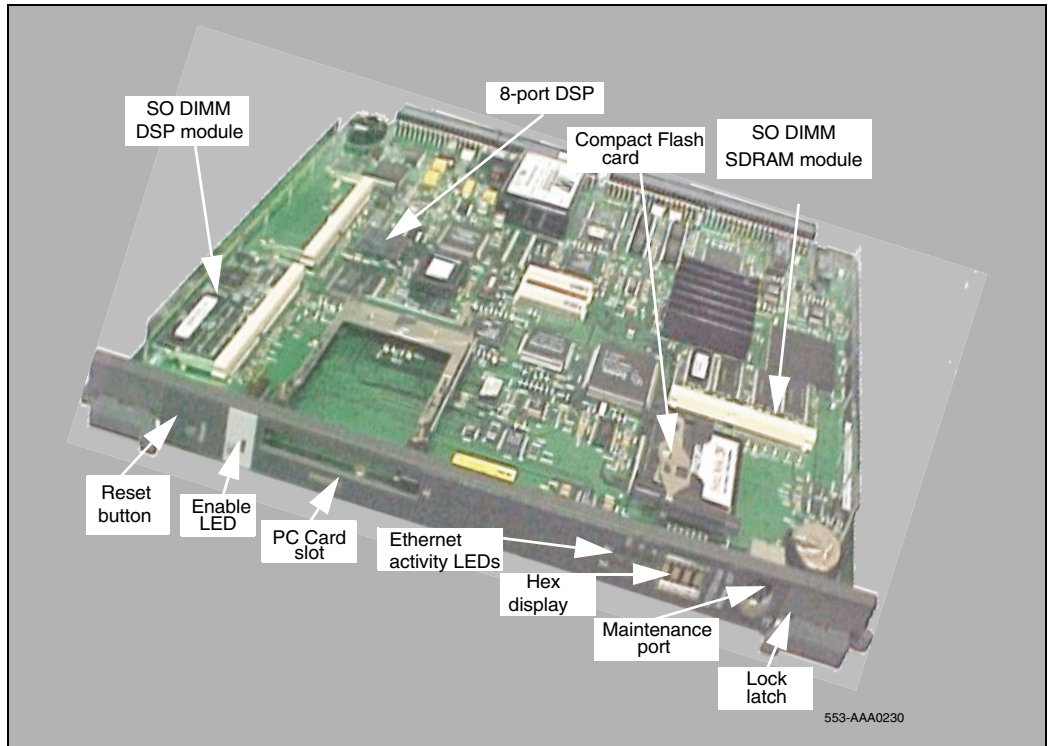
Voice Gateway Media Card

A Voice Gateway Media Card is any Media Card that runs the IP Line application. A Voice Gateway Media Card provides Digital Signal Processor (DSP) ports to translate between IP and TDM. Each Voice Gateway Media Card provides 32 DSP ports. For additional information on the IP Line application, see *IP Line: Description, Installation, and Operation* (553-3001-365).

Media Gateway Expander

Main role

The Media Gateway Expander supports up to four circuit cards. It does not house an SSC card and does not support Clock Controller cards. The SSC card in the corresponding MG 1000E or MG 1000T controls each card in an Expander.

Physical description

Figure 8 shows the Media Gateway Expander (NTDU15).

Figure 8
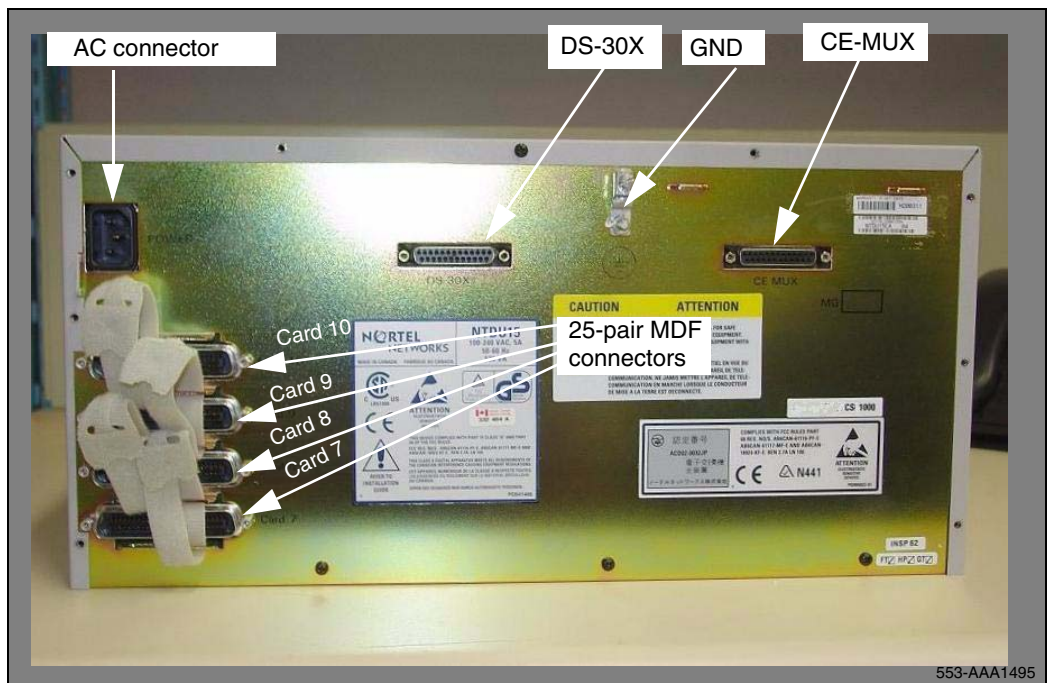**Media Gateway Expander (NTDU15)**
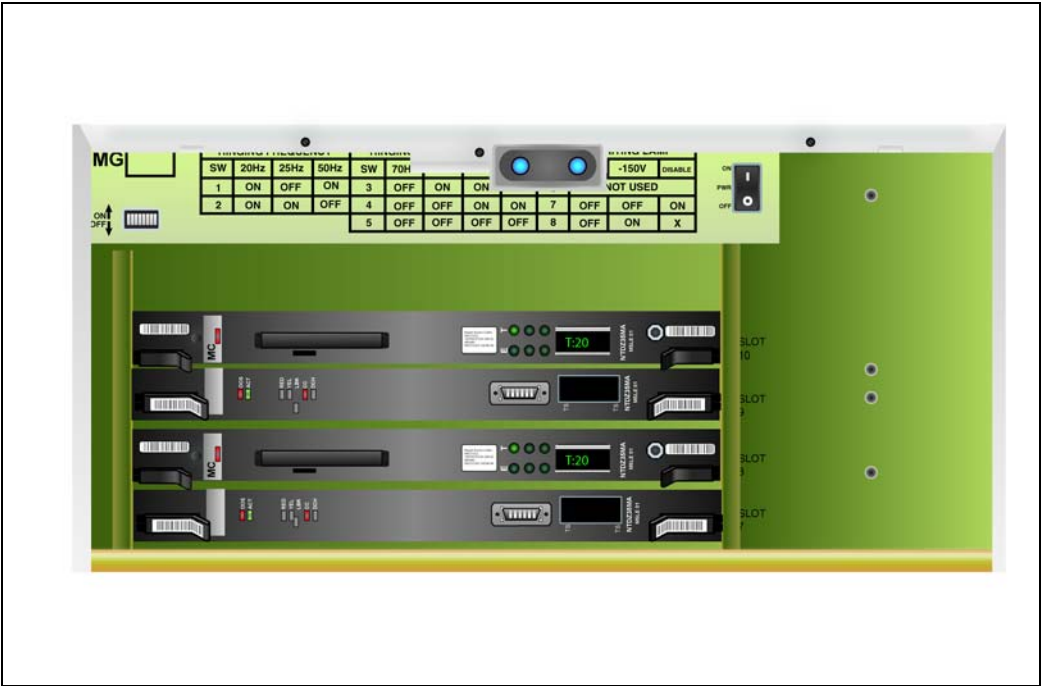
Rear components

Figure 9 shows the rear components in the Expander. Note the following:

- The AC power cord connector provides an AC connection to the Expander.

- GND is used for ground cable termination.

- DS-30X and CE-MUX are used to interconnect the Media Gateway and the Expander.

- 25-pair connectors are used to extend IPE card data to the MDF.

Figure 9
Rear components in the Media Gateway Expander

553-AAA1495

Operating parameters

Each Media Gateway supports one optional Expander.
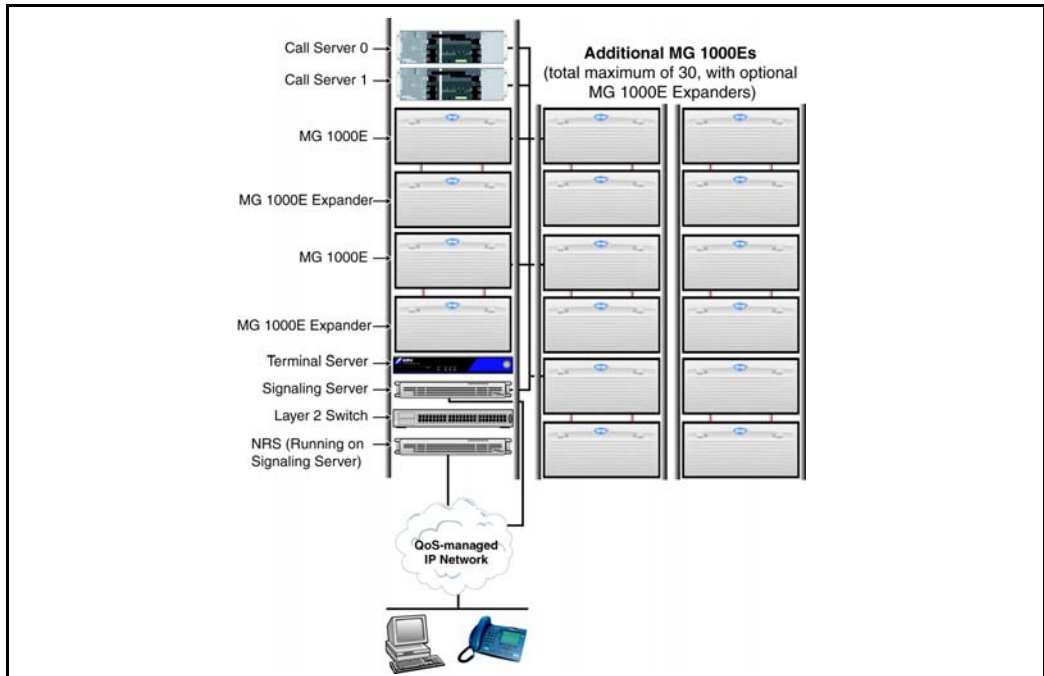
Media Gateway 1000E

Main role

The Media Gateway 1000E (MG 1000E) provides basic telephony media services, including tone detection and generation and conference, to CS 1000E telephones. The MG 1000E also supports Nortel Integrated Applications, including Integrated Recorded Announcer. It can also provide connectivity for digital and analog (500/2500-type) telephones as well as analog trunks for telephone and fax.

Physical description

Figure 10 shows the MG 1000Es controlled by the Core CS 1000E Call Servers and connected to the IP network.

Figure 10
Media Gateway 1000Es

Hardware components

The MG 1000E houses an SSC card and contains four slots for IPE cards. Each MG 1000E supports an optional MG 1000E Expander through copper connections. For more details, see "Media Gateway" on page 33 and "Media Gateway Expander" on page 40.

Security device

The security device on the MG 1000E SSC card is a generic security device that allows the MG 1000Es to register with the CS 1000E Core Call Servers.

Control for the activation of features assigned to the CS 1000E system, including MG 1000Es, is provided by the security device on the System Utility card in the Call Servers.

Network connections

Figure 11 shows a schematic representation of the typical network connections for one MG 1000E.

Figure 11
Network connections on MG 1000E
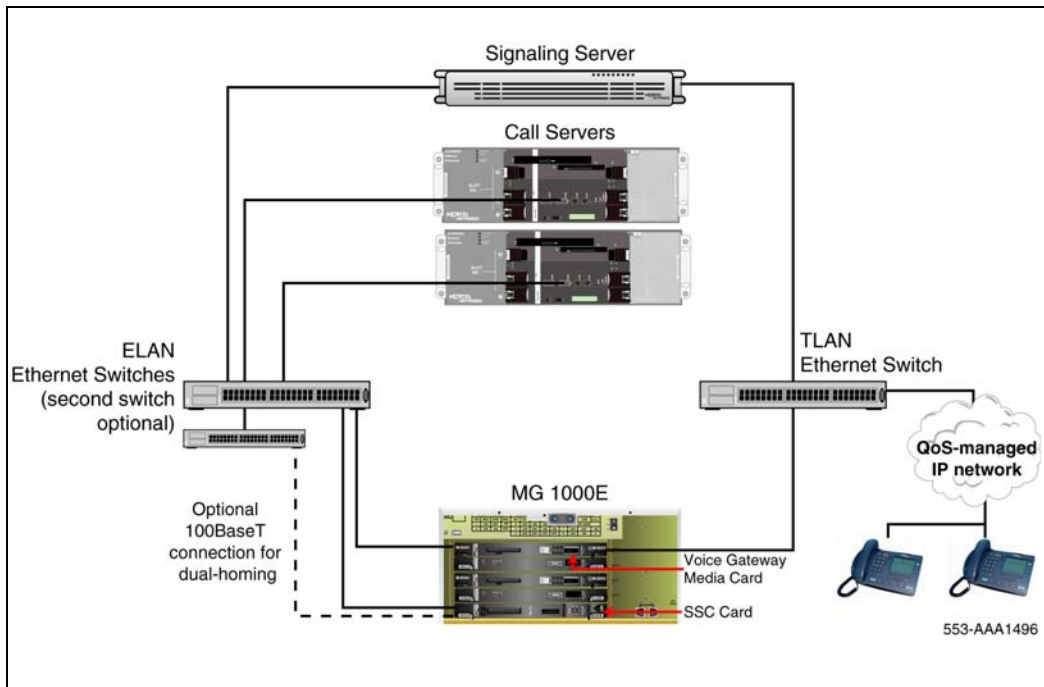
The separate LAN subnets that connect the MG 1000E and the Call Server to the customer IP network are as follows:

- **ELAN subnet**. The ELAN subnet (100BaseT, full-duplex) is used to manage signaling traffic between the Call Server, Signaling Server, and MG 1000Es. The ELAN subnet isolates critical telephony signaling between the Call Servers and the other components.

- **TLAN subnet**. The TLAN subnet (100BaseT, full-duplex) is used to manage voice and signaling traffic. It connects the Signaling Server and Voice Gateway Media Cards to the enterprise IP network. It also isolates the IP Telephony node interface from broadcast traffic.

The dual-port IP daughterboard on the SSC card in the MG 1000E provides two 100BaseT ports for communication with the Call Server. In the basic configuration, Port 2 must connect to the ELAN subnet through an ELAN Layer 2 switch.

To provide additional redundancy for the MG 1000E, the 100BaseT Port 4 can connect to a second Layer 2 switch to provide a dual-homed connection to the ELAN subnet. This allows the MG 1000E to remain operational if the Port 2 connection fails (see Figure 11 on)

Functional description

The MG 1000E provides the following functionality:

- provides tones, conference, and digital media services (for example, Music and Recorded Announcement) to all phones

- provides support for CallPilot and Nortel Integrated Applications

- provides direct physical connections for analog (500/2500-type) phones, digital phones, and fax machines

- provides direct physical connections for analog trunks

Operating parameters

The MG 1000E operates under the direct control of the Call Server. Up to 30 MG 1000Es can be configured on the Call Server.

To allow IP Phones to access digital media services, the MG 1000Es must be equipped with Voice Gateway Media Cards.

The MG 1000E supports the following circuit cards and applications:

- Voice Gateway Media Cards: transcode between the IP network and digital circuit cards

- Service cards: provide services such as Music or Recorded Announcements (RAN)

- Analog interfaces to lines and trunks: support analog (500/2500-type) phones and fax, analog PSTN trunks, and external Music or RAN sources

- Digital line cards: support digital terminals, such as attendant consoles, M2000/M3900 series digital phones, and external systems that use digital line emulation, such as CallPilot Mini

- CLASS Modem card (XCMC)

- Nortel Integrated Applications, including:

  — Integrated Conference Bridge

  — Integrated Call Assistant

  — Integrated Call Director

  — Integrated Recorded Announcer

  — Hospitality Integrated Voice Services

- MGate cards for CallPilot

- CallPilot IPE

IMPORTANT!

Currently, the CS 1000E only supports Recorded Announcement Broadcast and Music Broadcast.

IMPORTANT!

The MG 1000E does not support digital trunks or PRI. Digital trunk and PRI access to the PSTN and other PBXs is provided by the MG 1000T.

The MG 1000E does not support cards and applications that require a clock controller and a T1/E1 interface. This includes DECT Mobility cards, the Nortel Remote Gateway 9150 application, and the 802.11 Wireless IP Gateway

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Signaling Server

Main role

The Signaling Server provides SIP/H.323 signaling between components in a CS 1000E system.

The Signaling Server is a standard hardware platform used to run multiple applications, including:

- SIP/H.323 Signaling Gateways

- Terminal Proxy Server (TPS)

- Network Routing Service (NRS)

- Element Manager

- Application Server for Personal Directory, Redial List, and Callers List for UNIStim IP Phones

Physical description

Figure 12 shows the Signaling Server.

Figure 12
Signaling Server front and rear
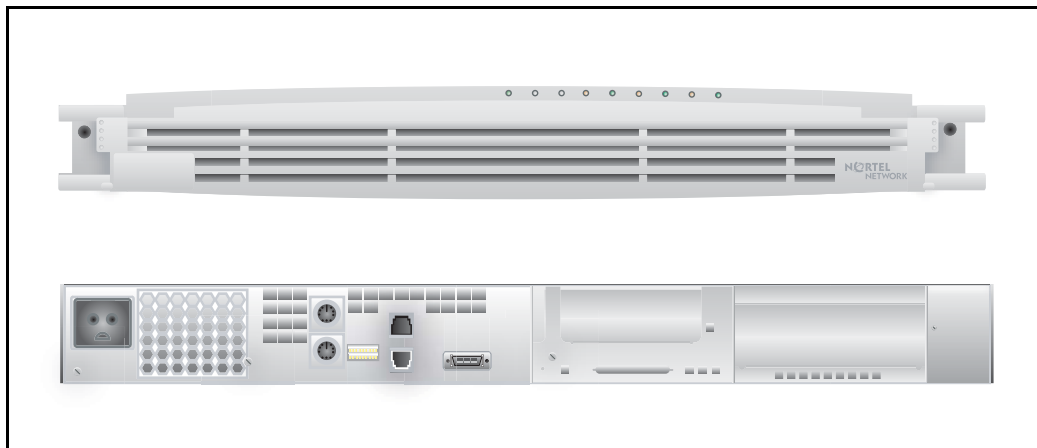
Hardware components

The front of the Signaling Server has the following components:

- A CD-ROM drive to load software files for the Signaling Server, Voice Gateway Media Cards, and IP Phones.

- A floppy disk drive if the CD-ROM is not bootable.

- A Maintenance port for a login session for Command Line Interface (CLI) management. (It does not provide system messages.)

    Note: Maintenance ports are on the front and back of the Signaling Server. Do not use both ports at once. The rear port is the recommended primary maintenance port.

The rear of the Signaling Server has the following components:

- The AC power cord connector provides an AC connection to the Signaling Server.

- The 100BaseT TLAN network interface is used for telephony signaling traffic.

- The 100BaseT ELAN network interface connects the Signaling Server to the Call Server and to the other CS 1000E components on the ELAN subnet.

- The rear maintenance port is the primary port for maintenance and administration terminals.

- The remaining ports are not used for any system functions. Do not plug any device into these ports.

Software applications

The Signaling Server runs the following software applications:

- Terminal Proxy Server (TPS)

- SIP/H.323 Signaling Gateways

- Network Routing Service (NRS)

- Element Manager

- Application Server for Personal Directory, Callers List, and Redial List

Terminal Proxy Server (TPS)

The Terminal Proxy Server (TPS) acts as a signaling gateway between the IP Phones and the Call Servers using the UNIStim protocol. It performs the following functions:

- Converts the IP Phone UNIStim messages into messages the Call Server can interpret.

- Allows IP Phones to access telephony features provided by the Call Server.

  Note: UNIStim stands for the Unified Networks Internet protocol Stimulus.

The TPS also controls the IP Phone registration.

SIP/H.323 Signaling Gateways

SIP/H.323 Signaling Gateways are software components configured on virtual loops, similar to IP Phones. SIP/H.323 Signaling Gateways bridge existing call processing features and the IP network. They also enable access to the routing and features in the MCDN feature set.

Note 1: The SIP/H.323 Signaling Gateway must register with the Network Routing Service (NRS).

Note 2: Virtual TNs enable you to configure service data without hardwiring IP Phones to the CS 1000E system. Virtual TNs are configured in LD 97.

To support IP Peer Networking to the MG 1000T and other systems, the Call Servers in a CS 1000E must be associated with Signaling Servers that run SIP/H.323 Signaling Gateway software (see *IP Peer Networking: Installation and Configuration* (553-3001-213) for details). The number of Signaling Servers required depends on the capacity and level of redundancy required.

Network Routing Service (NRS)

The NRS application provides network-based routing, combining the following into a single application:

- **H.323 Gatekeeper**: The H.323 Gatekeeper provides central dialing plan management and routing for H.323-based endpoints and gateways.

- **SIP Redirect Server**: The SIP Redirect Server provides central dialing plan management and routing for SIP-based endpoints and gateways.

- **NRS Database**: The NRS database stores the central dialing plan in XML format for both the SIP Redirect Server and the H.323 Gatekeeper. The SIP Redirect Server and H.323 Gatekeeper both access this common endpoint and gateway database.

- **Network Connection Service (NCS)**: The NCS is used only for Virtual Office, Branch Office, and Geographic Redundancy solutions.

- **NRS Manager web interface**: The NRS provides its own web interface to configure the SIP Redirect Server, the H.323 Gatekeeper, and the NCS.

The NRS application provides routing services to both H.323- and SIP-compliant devices. The H.323 Gatekeeper can be configured to support H.323 routing services, while the SIP Redirect Server can be configured to support SIP routing services.

The H.323 Gatekeeper and the SIP Redirect Server can reside on the same Signaling Server. Examples of H.323- and SIP-compatible endpoints needing the services of the NRS are CS 1000E and IP Trunk 3.0 endpoints. The NRS also supports endpoints that do not support H.323 Registration, Admission, and Status (RAS) or SIP registration with the NRS.

Note: Systems that do not support H.323 RAS procedures and H.323 Gatekeeper procedures are referred to as non-RAS or static endpoints.

Each CS 1000E and MG 1000T in an IP Peer network must register to the NRS. The NRS software identifies the IP addresses of PBXs and MG 1000Ts based on the network-wide numbering plan. NRS registration eliminates the need for manual configuration of IP addresses and numbering plan information at every site.

Element Manager

Element Manager is a software application that provides a web interface to support administration of system components, including the Signaling Server. With Element Manager, single web pages provide access to information traditionally spread across multiple overlays.

Element Manager provides tools to configure and maintain the following components:

- Call Servers and MG 1000Ts
- Media Gateway (MG 1000E, MG 1000T, Expander)
- MG 1000Bs
- Signaling Servers
- Voice Gateway Media Cards

Application Server for Personal Directory, Callers List, and Redial List

The Application Server maintains the database for the Personal Directory, Caller's List, and Redial List features for UNIstim IP Phones. These features provide the following functionality.

- **Personal Directory**: stores up to 100 entries per user of user names and DNs.
- **Callers List**: stores up to 100 entries per user of caller ID information and most recent call time.
- **Redial List**: stores up to 20 entries per user of dialed DNs and received Call Party Name Display with time and date.

Functional description

The Signaling Server provides the following functionality:

- provides IP signaling between system components on the LAN
- enables the Call Server to communicate with IP Phones and MG 1000Ts
- supports key software components (see "Software applications" on page 49)

Operating parameters

The Signaling Server provides signaling interfaces to the IP network using software components that run on the VxWorks operating system.

The Signaling Server can be installed in a load-sharing, survivable configuration.

The total number of Signaling Servers that you require depends on the capacity and redundancy level that you require.
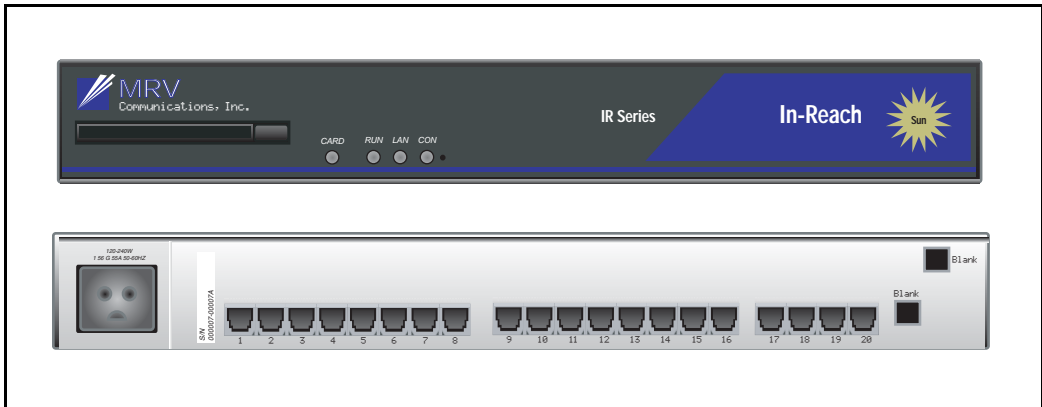
Terminal Server

Main role

The MRV IR-8020M IP-based Terminal Server provides the Call Server with standard serial ports for applications and maintenance.

Physical description

Figure 13 shows the Terminal Server.

Figure 13
Terminal Server

Hardware components

The MRV Terminal Server provides 20 console ports for modular RJ-45 connectors. It is also equipped with one RJ-45 10BaseT connection for network interface to the ELAN subnet and an internal modem to provide remote access.

Operating parameters

Traditionally, serial ports are used to connect terminals and modems to a system for system maintenance. As well, many third-party applications require serial port interfaces to connect to a PBX. Because the Call Server provides only two local serial ports for maintenance purposes, an IP-based Terminal Server is required to provide the necessary serial ports.

The Terminal Server provides standard serial ports for applications. These applications include billing systems that analyze Call Detail Recording (CDR) records, Site Event Buffers (SEB) that track fault conditions, and various legacy applications such as Property Management System (PMS) Interface and Intercept Computer applications. In addition, serial ports are used to connect system terminals for maintenance, modems for support staff, and printers for system output.

The Terminal Server is configured to automatically log in to the active Call Server at start-up. For this reason, each Call Server pair requires only one Terminal Server. Customers can configure up to 16 TTY ports for each Call Server pair.

The Terminal Server can be located anywhere on the ELAN subnet. However, if the Terminal Server is used to provide local connections to a Com port on the Call Server, it must be collocated with the system.

The Terminal Server can also be used as a central point to access and manage several devices through their serial ports.

IMPORTANT!

Currently, the CS 1000E only supports the MRV IR-8020M commercial Terminal Server.


Media Gateway 1000T

Main role

The Media Gateway 1000T (MG 1000T) platform provides the CS 1000E with digital trunk and PRI access to the PSTN and to other PBX systems. It functions as an independent resource on the network and is therefore accessible by any peer node on the network using the NRS. Given its main role as a trunking gateway, the MG 1000T cannot be provisioned with User Licenses (with the exception of DECT User Licenses).

Physical description

Figure 14 shows the MG 1000T Core controlling the MG 1000T Expansions through connections to the SSC cards.

Figure 14
Media Gateway 1000T
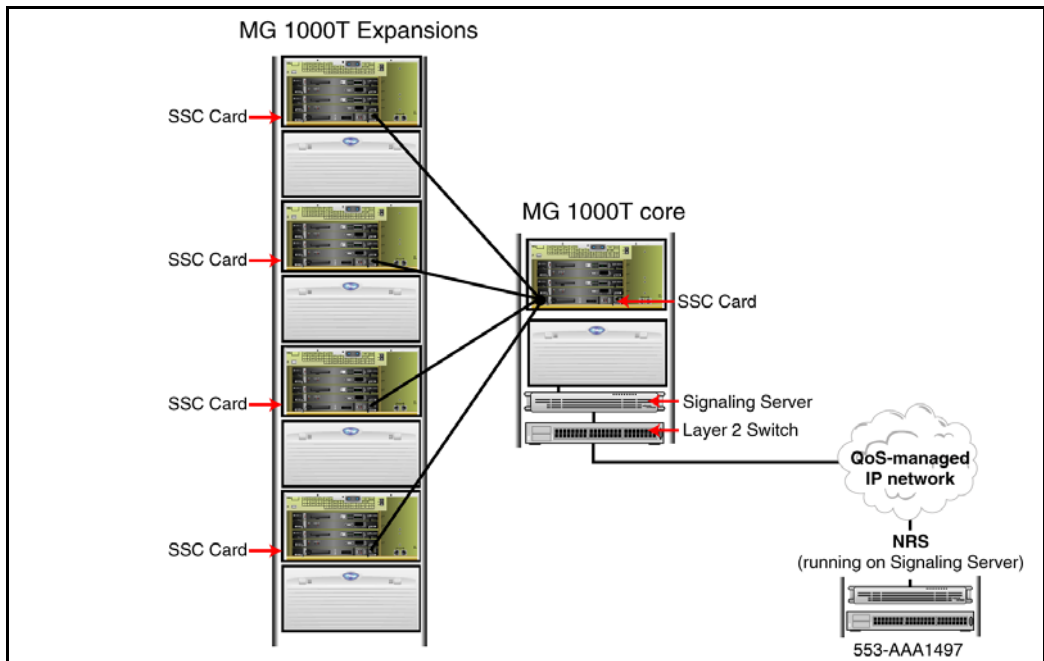
Hardware components

The MG 1000T Core and Expansions each house an SSC card and contain four slots for IPE cards. They also each support an optional MG 1000T Expander through copper connections.

The MG 1000T Core and Expansions use the same base hardware as the MG 1000E. For more information, see "Media Gateway" on page 33.

MG 1000T Core

Unlike the MG 1000Es, the MG 1000T platform does not operate under the direct control of the CS 1000E Core Call Servers. Instead, the MG 1000T Core (MG 1000T 0) provides the primary processing for the MG 1000T platform. The MG 1000T Core SSC card controls the circuit cards in the MG 1000T Core and all cards in up to four MG 1000T Expansions.

The MG 1000T Core SSC card can be equipped with two dual-port IP daughterboards, providing a total of four IP ports for connections to the SSC cards on the MG 1000T Expansions. As a result, each MG 1000T Core can support up to four MG 1000T Expansions with optional MG 1000T Expanders.

Figure 15 shows the MG 1000T Core SSC card components. The 100BaseT cables connect the dual-port IP daughterboard ports 1, 3, 2, and 4 to the MG 1000T Expansion SSC cards.

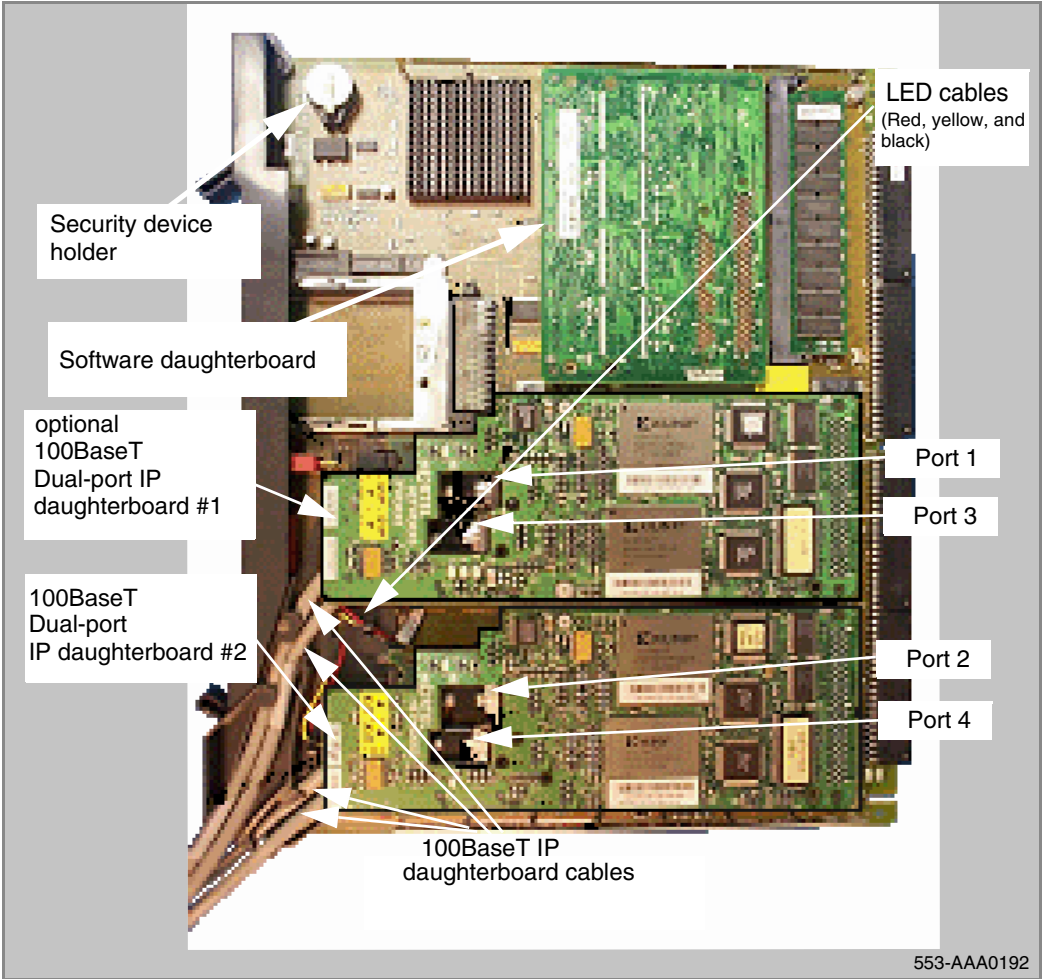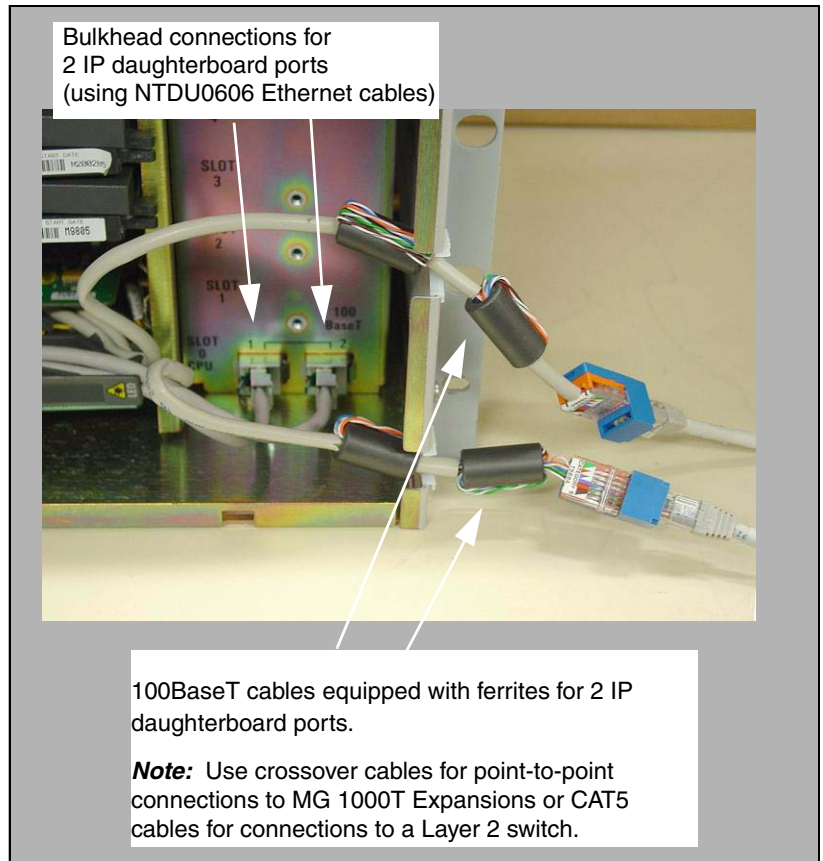**Figure 15**
MG 1000T Core SSC card components

553-AAA0192

Figure 16 shows the cabling from the SSC card on the MG 1000T Core.

Figure 16
MG 1000T Core cabling

Bulkhead connections for
2 IP daughterboard ports
(using NTDU0606 Ethernet cables)

100BaseT cables equipped with ferrites for 2 IP
daughterboard ports.

Note: Use crossover cables for point-to-point
connections to MG 1000T Expansions or CAT5
cables for connections to a Layer 2 switch.

Two IP daughterboard ports on the MG 1000T Core SSC connect to the
bulkhead, providing rear bulkhead connections to two MG 1000T
Expansions. The other two IP daughterboard ports on the SSC connect
directly to the remaining two MG 1000T Expansions.

Note: SSC cards on the four MG 1000T Expansions are equipped with
single-port IP daughterboards.

Connections between the MG 1000T Core and the MG 1000T Expansions can be made through directly connected 100BaseT crossover cable or through a Layer 2 switch.

Security devices

The security device on the MG 1000T Core SSC card enables the activation of the software and features assigned to the MG 1000T.

The security device on the MG 1000T Expansion SSC cards are directly associated with the MG 1000T Core security device.

Network connections

Figure 17 shows a detailed view of typical network connections between the MG 1000T Core, an MG 1000T Expansion, and the QOS-managed IP network.

Figure 17
Network connections on MG 1000T
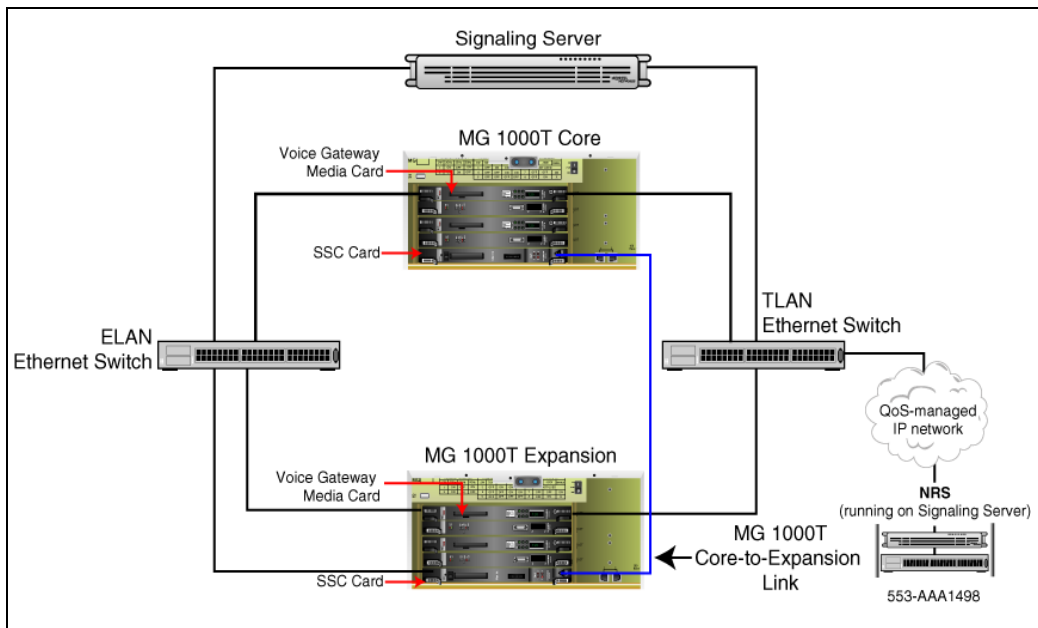
The separate LAN subnets that connect the MG 1000T to the customer IP network are as follows:

- **Core-to-Expansion Link (SLAN subnet)**. Each MG 1000T Expansion directly connects to the MG 1000T Core through a special IP link (point-to-point or through a Layer 2 switch). This IP link carries signaling and telephony traffic.

- **ELAN subnet**. The ELAN subnet (10/100/1000 auto negotiate port) can belong to, or be separate from, the main CS 1000E ELAN subnet. The ELAN subnet provides management and signaling functions for MG 1000T components.

- **TLAN subnet**. The TLAN subnet (10/100/1000 auto negotiate port) provides voice and signaling traffic and isolates the IP Telephony node from broadcast traffic.

The MG 1000T communicates with the CS 1000E using IP Peer Networking with Signaling Servers. The Signaling Servers run SIP and H.323 Signaling Gateway software.

As a result, the MG 1000T platform can be separated from the CS 1000E across the network to provide PSTN access wherever needed. With IP Peer Networking, any CS 1000E system in the network can access the MG 1000T using the NRS for numbering plan resolution and least cost routing.

The MG 1000T can be collocated with the CS 1000E system to provide a configuration that is similar to that of a traditional PBX.

Functional description

The MG 1000T provides the following functionality:

- provides digital trunks to the PSTN and trunking to other PBX systems using E1, T1, and ISDN BRI circuit cards

- supports analog trunks

- supports Voice Gateway Media Cards for transcoding between IP and TDM

- supports the DECT application

Operating parameters

The MG 1000T functions as an independent resource on the network. It is therefore accessible by any peer node on the network in addition to the CS 1000E.

To provide IP Phones with access to digital trunking, the MG 1000T must use Voice Gateway Media Cards. The Voice Gateway Media Cards provide DSP ports to translate between IP and TDM.

The MG 1000T uses a Signaling Server to communicate with the Call Server across the IP network. The Signaling Server runs SIP/H.323 Signaling Gateway software. Signaling between the Call Server and the MG 1000T uses the SIP protocol or the H.323 protocol, with MCDN extensions to provide more complete feature transparency.

The MG 1000T supports the following circuit cards:

- Media Cards: transcode between the RTP media streams on the IP network and the interface cards within the gateways

- Digital PSTN Interface Cards, including E1, T1, and ISDN Basic Rate interfaces: provide access to PSTN

- Analog trunk cards

- Service cards: provide services such as Music or Recorded Announcements (RAN)

- DECT Mobility cards

    Note: As an alternative to installing an MG 1000T, the CS 1000E can obtain PSTN access by using IP Peer Networking with other systems in the network, such as a pre-existing CS 1000M Large System, a CS 1000S, or an MG 1000B.
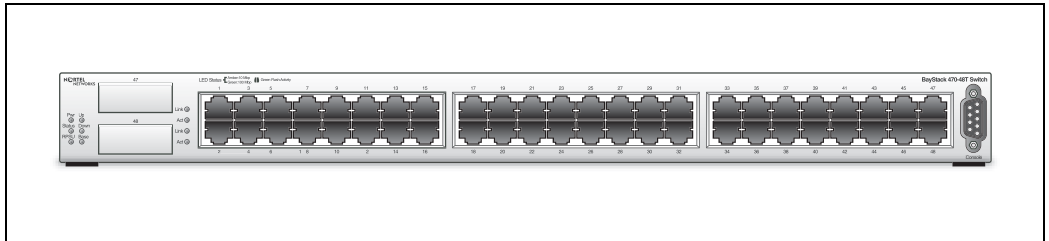
Layer 2 switch

Main role

The Layer 2 switch transmits data packets to devices interconnected by Ethernet to the ELAN or TLAN subnets. The switch only directs data to the target device, rather than to all attached devices.

Physical description

ELAN Layer 2 switch

Figure 18 shows an example of an ELAN Layer 2 switch.

Figure 18
**ELAN Layer 2 switch (BayStack 470-48T)**

TLAN Layer 2 switch

To provide Layer 2 connections on the TLAN subnet, Nortel recommends the BayStack 460 Ethernet switch, which has embedded Power-over-LAN capabilities for powering IP Phones.

Optionally, other Power-over-LAN units can also be used to provide power to IP Phones.

Figure 19 shows the BayStack 460 Layer 2 switch.

Figure 19
TLAN Layer 2 switch (BayStack 460)
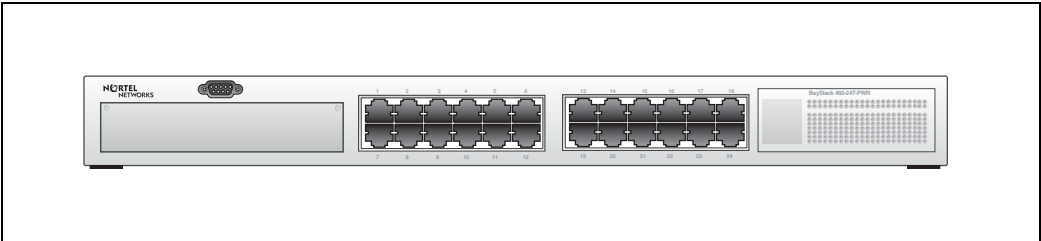
Operating parameters

These components must be supplied by the customer. See *Converging the Data Network with VoIP* (553-3001-160) for further details.

Configuration options

Contents

Introduction

The IP-distributed architecture of the CS 1000E enables flexibility when it comes to component location. Given this flexibility, the CS 1000E offers many configuration options to support increased system redundancy.

The CS 1000E can be deployed in many ways in LAN and WAN environments. Although many different installations are possible, most fall into one of the following categories:

- Multiple buildings in a campus

    — Campus-distributed MG 1000Es

    — Campus Redundancy

- Multiple sites

    — Central Call Server with Branch Office

    — Geographic Redundancy

The following sections describe each of these configuration options.

Note: These configurations provide CS 1000E systems with many options for redundancy and reliability. Careful planning is required to determine which configuration is right for your needs.

Option 1: Campus-distributed MG 1000Es

With multiple buildings in a campus, you can distribute MG 1000Es across a campus IP network. Figure 20 shows MG 1000Es distributed across multiple buildings in a campus setting.

Figure 20
Campus-distributed MG 1000Es
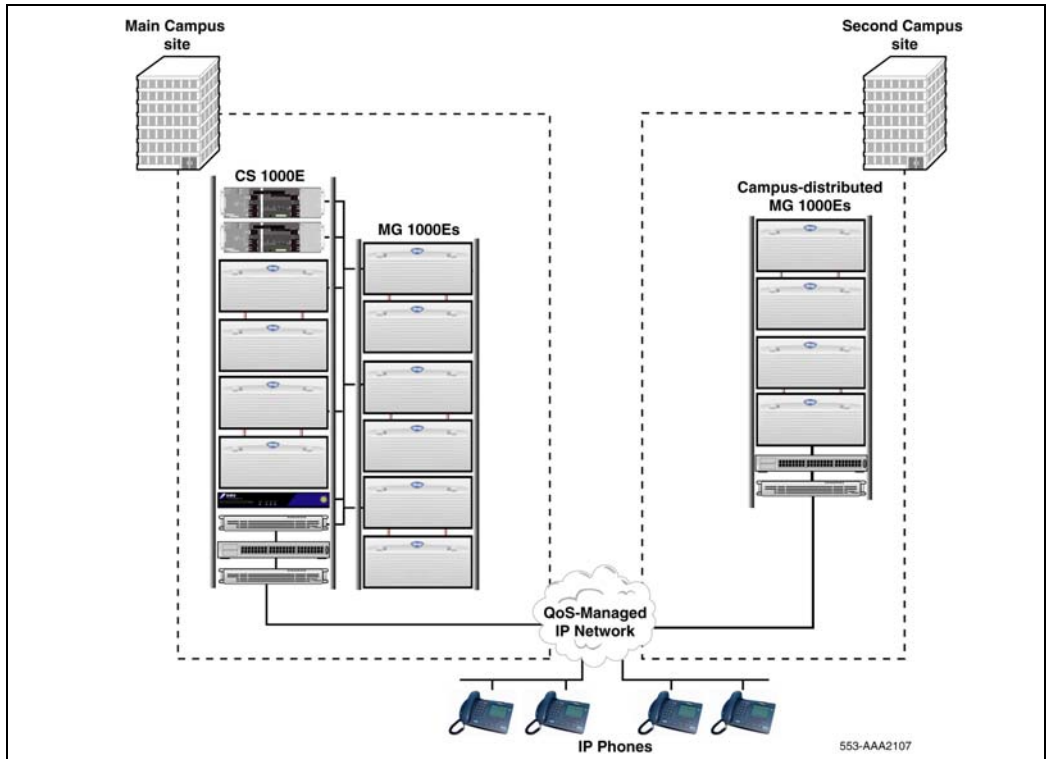
In this configuration, a CS 1000E system is installed at the main site, and additional MG 1000Es and an optional Signaling Server are installed at a second campus site. All IP Phones are configured and managed centrally from the main site.

Option 2: Campus Redundancy

With Campus Redundancy, customers can separate the Call Server pair across a campus IP network. This provides additional system redundancy within a local configuration. The Call Servers function normally and the inactive Call Server assumes control of call processing if the active Call Server fails.

To do this, the ELAN subnet and the subnet of the High Speed Pipe (HSP) are extended between the two Call Servers using a dedicated Layer 2 Virtual LAN configured to meet specified network parameters. Figure 21 shows a CS 1000E system in a Campus Redundancy configuration.

Figure 21
**Campus Redundancy configuration**
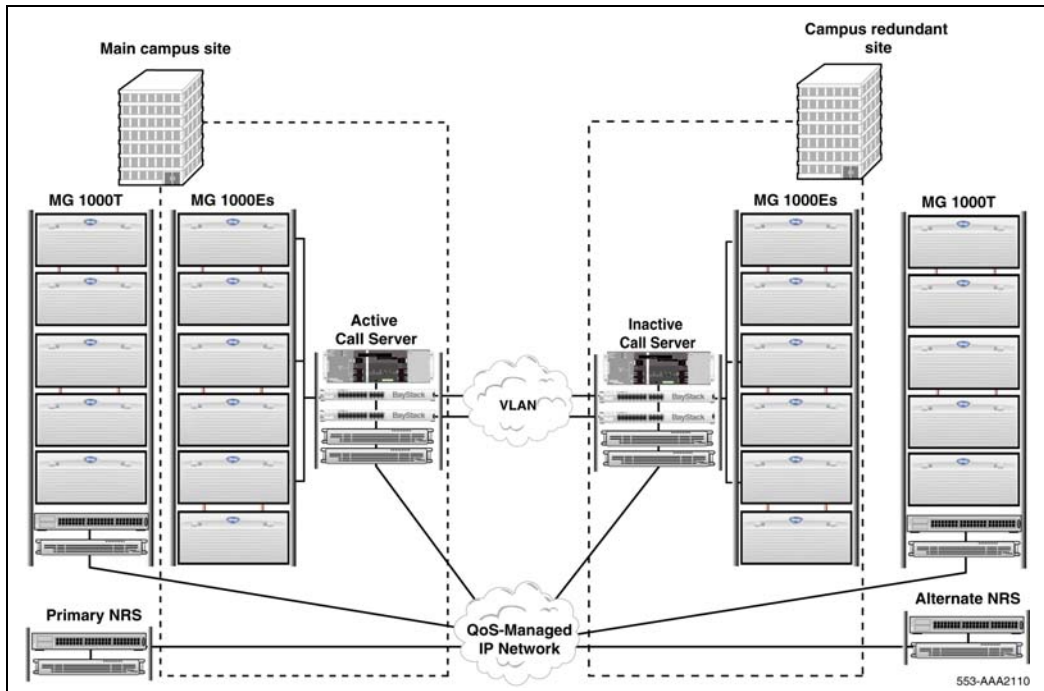
For more information on Campus Redundancy, see *Communication Server 1000: System Redundancy* (553-3001-307).

Option 3: Branch Office

The CS 1000E system supports the Branch Office feature, which provides central administration of Media Gateway 1000Bs (MG 1000B) at remote sites. Figure 22 shows a CS 1000E system with an MG 1000B installed at a remote branch office.

Figure 22
Branch Office configuration
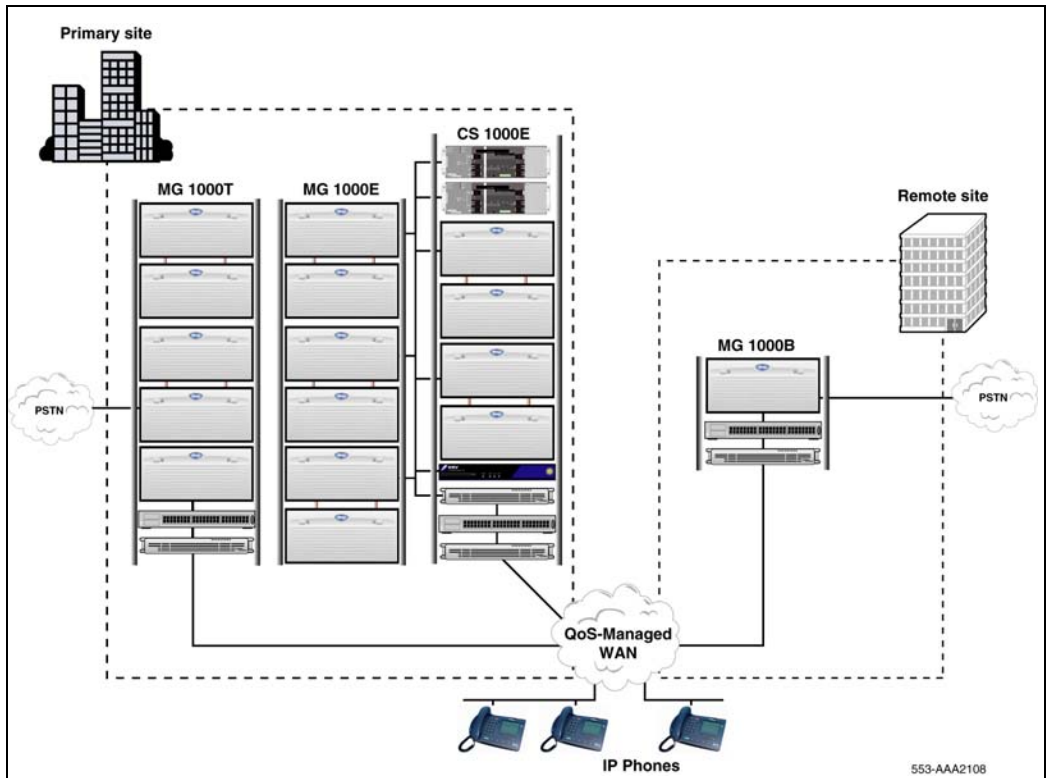
In this configuration, the MG 1000B is survivable. This ensures that telephone service remains available if the main office fails. For more information, refer to *Branch Office: Installation and Configuration* (553-3001-214).

Option 4: Geographic Redundancy

Geographic Redundancy provides an additional layer of system redundancy. It allows a customer to locate a secondary backup system at a distance from a primary system. This ensures redundancy in the event of catastrophic failure of the primary site. With Geographic Redundancy, the configuration and user database of the primary system can be replicated across the WAN.

Figure 22 shows an inactive CS 1000E system backing up an active system using Geographic Redundancy.

Note: Geographic Redundancy provides redundancy for IP Phones only.

Figure 23
Geographic Redundancy
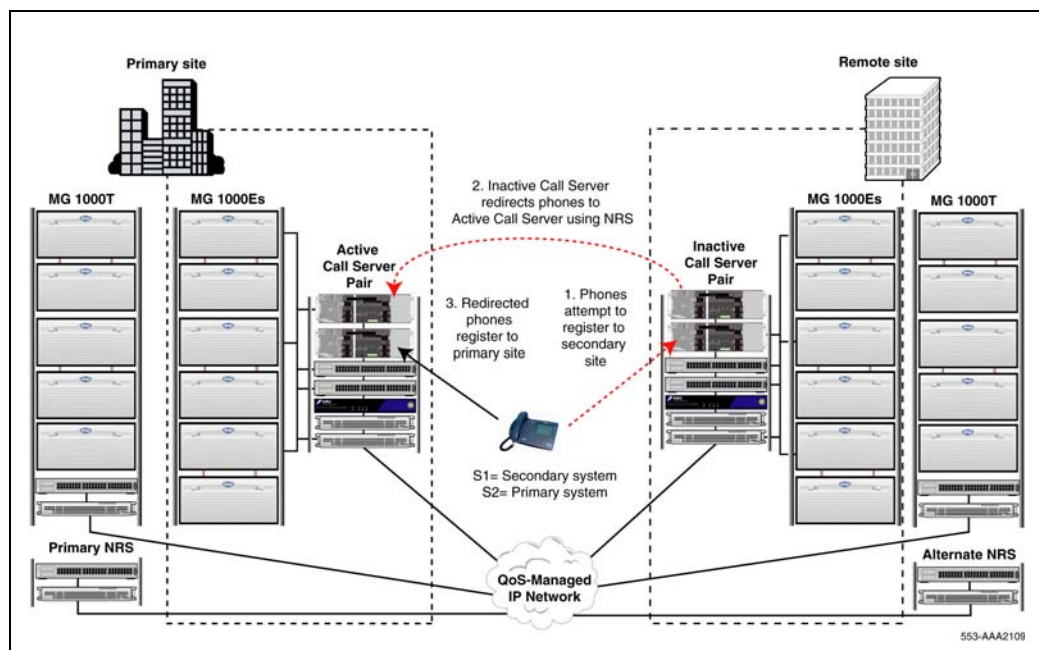
For more information on Geographic Redundancy, see *Communication Server 1000: System Redundancy* (553-3001-307).

Nortel Communication Server 1000
Communication Server 1000E
Overview

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