



Nortel Communication Server 1000

Communication Server 1000E Overview

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May 2007

Standard 01.01. This document is issued to support Nortel Communication Server 1000 Release 5.0. This document contains information previously contained in the following legacy document, now retired: *Nortel Communication Server 1000E: Overview (553-3041-010)*.

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.

4 Revision history

Contents

How to get help 7

- Getting help from the Nortel Web site 7
- Getting help over the telephone from a Nortel Solutions Center 7
- Getting help from a specialist by using an Express Routing Code 7
- Getting help through a Nortel distributor or reseller 8

About this document 9

- Subject 9
- Applicable systems 9
- Intended audience 10
- Conventions 10
- Related information 10

Features 11

- Contents 11
- Introduction 11
 - Key Attributes 12
- Key features 12
 - IP-based switching with TDM capability 12
 - Flexible architecture 13
 - Redundant architecture 14
 - Industry-standard interworking and interoperability 15
 - Enhanced system management capabilities 15
 - Software applications and features 17
 - Desktop clients 18

System architecture 21

- Contents 21
- Main components 21
- CS 1000E Call Server 23
 - Main role 23
 - Physical description 23
 - Hardware components 23
 - Functional description 24
 - Operating parameters 25

Media Gateway	25
Main role	25
Physical description	25
Hardware components	26
Media Gateway Expander	29
Main role	29
Physical description	30
Operating parameters	31
Security Devices	31
Network Connections	31
Functional description	32
Operating parameters	33
Signaling Server	34
Main role	34
Nortel Common Processor Pentium Mobile server	34
International Business Machines X306m server	35
Hewlett Packard DL320-G4 server	35
Software applications	35
Functional description	39
Operating parameters	39
Terminal Server	40
Main role	40
Physical description	40
Hardware components	40
Operating parameters	40
Layer 2 switch	41
Main role	41
Physical description	41
Operating parameters	42

Configuration options

43

Contents	43
Introduction	43
Option 1: Standard Availability Configuration	44
Option 2: Campus-distributed MG 1000E	44
Option 3: Campus Redundancy	45
Option 4: Branch Office	46
Option 5: Geographic Redundancy	47

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:

www.nortel.com/callus

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 Communication Server (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 Fundamentals (NN43001-260)*.

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 5.0 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 (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 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 Reference (NN43001-111)*
- *Converging the Data Network with VoIP Fundamentals (NN43001-260)*
- *IP Peer Networking Installation and Commissioning (NN43001-313)*
- *Branch Office Installation and Commissioning (NN43001-314)*
- *Features and Services Fundamentals (NN43001-106)*
- *IP Line Fundamentals (NN43100-500)*
- *Telephones and Consoles Fundamentals (NN43001-567)*
- *IP Phones Fundamentals (NN43001-368)*
- *Communication Server 1000E Planning and Engineering (NN43041-220)*
- *Communication Server 1000E Installation and Commissioning (NN43001-310)*
- *Communication Server 1000E Upgrades (NN43041-458)*
- *Communication Server 1000E Maintenance (NN43041-700)*

Online

To access Nortel documentation online, click the **Technical Documentation** link under **Support & Training** on the Nortel home page:

www.nortel.com

CD-ROM

To obtain Nortel documentation on CD-ROM, contact your Nortel customer representative.

Features

Contents

"Introduction" (page 11)

"Key features" (page 12)

Introduction



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 Fundamentals (NN43001-260)*.

The Communication Server (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 Attributes

- **Adaptable to meet current and future needs**
 - Delivers investment protection and evolution path to next-generation multimedia communications
- **Superior IP Telephony experience**
 - More open platform to take advantage of innovative applications, and feature-rich next generation clients
- **Improved reliability and security**
 - Business continuity improvement from a reliable and secure environment
- **Simplified convergence solution**
 - Product portfolio simplified for easier deployment, configuration and management

Key features

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

- ["IP-based switching with TDM capability" \(page 12\)](#)
- ["Flexible architecture" \(page 13\)](#)
- ["Industry-standard interworking and interoperability" \(page 15\)](#)
- ["Enhanced system management capabilities" \(page 15\)](#)
- ["Software applications and features" \(page 17\)](#)
- ["Desktop clients" \(page 18\)](#)

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.

Flexible architecture

The CS 1000E supports flexible, distributed architecture across a QOS-managed IP network. With its dual, redundant Call Processor Pentium Mobile (CP PM) processors, the CS 1000E supports up to 22,000 IP Phones. To support more IP Phones, multiple CS 1000E systems can be installed across the QOS-managed IP network.

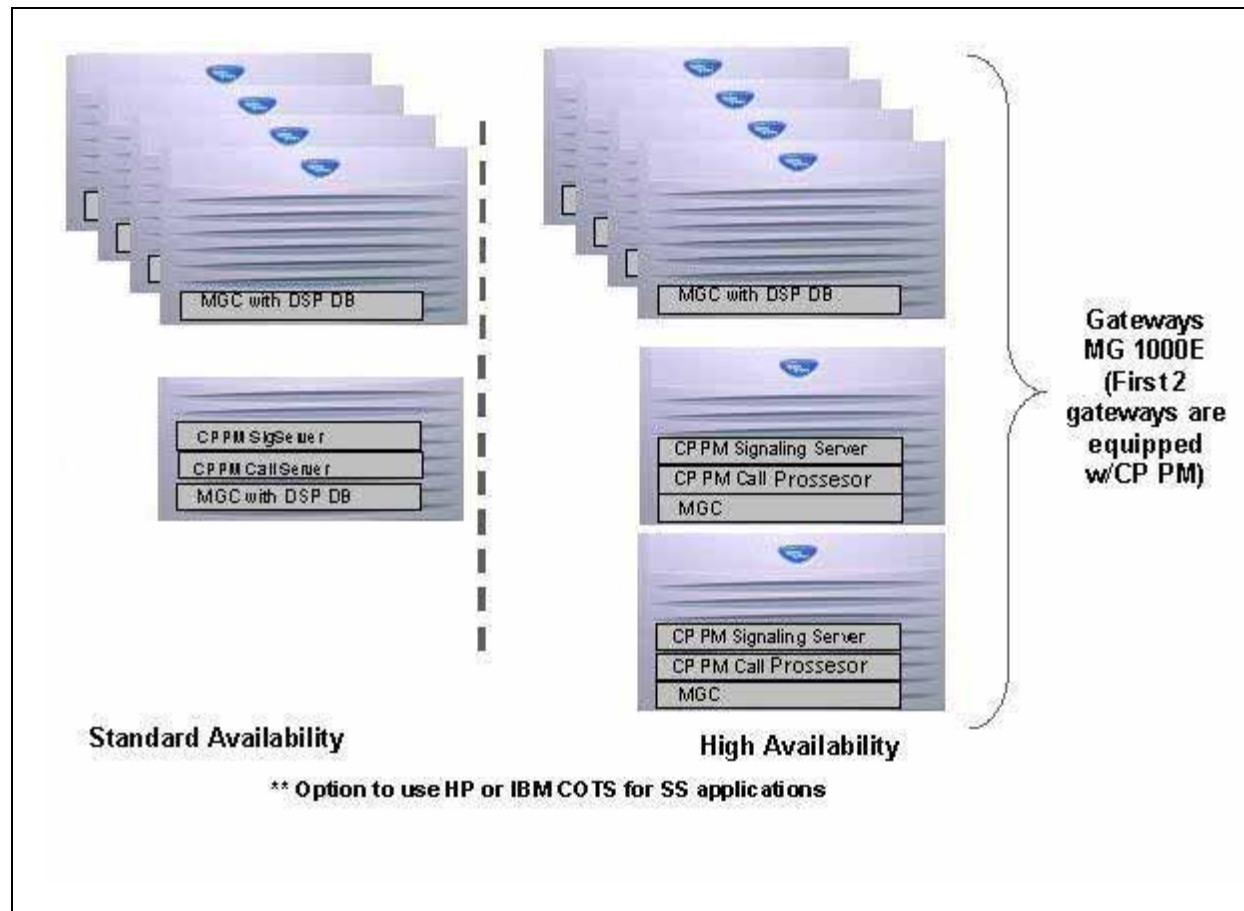
In terms of physical size, the CS 1000E is much smaller than other Large Systems, and its components are rack-mountable in industry-standard 19-inch racks.

Standard Availability and High Availability

CS 1000E architecture offers options for single and redundant processors. With CS 1000 Release 5.0, a customer can deploy existing or new cabinets or chassis' as Media Gateway 1000 (MG 1000). A new CP PM is available which occupies a slot in a MG 1000 cabinet or chassis. This new processor may be deployed as a single call processor (Standard Availability CS 1000E) or in a redundant processor configuration (High Availability CS 1000E). The redundant CP PIV processor configuration is also still available as a High Availability CS 1000E system.

The CS 1000E Standard Availability replaces CS 1000S, CS 1000M Chassis, and CS 1000M Cabinet system types. The Standard Availability (SA) system can be upgraded to a High Availability (HA) system with the addition of a second CP PM call processor and by enabling the software package 410: HIGH_AVAIL HIGH AVAILABILITY.

Figure 1
Standard Availability CS 1000E and High Availability CS 1000E



Branch Office

The CS 1000E also supports the Branch Office (MG 1000B) 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.

You can use an Option 11C Cabinet or an Option 11C Mini Chassis as a MG 1000B.

Redundant architecture

The CS 1000E (HA) 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 separate the inactive Call Server from the active Call Server using a dedicated 100 Meg bit pipe between cores 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 increases the reliability of CS 1000E systems by providing a remote system to serve as a backup for a local system. Depending on the configuration, the remote backup system ensures continued service for resources in case of a catastrophic failure (for example, as a result of floods or fire). 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.

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) 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 Enterprise Common Manager (ECM), Network Routing Service Manager (NRS), Element Manager (EM), Telephony Manager (TM), and traditional Command Line Interfaces (CLI).

Enterprise Common Manager framework

The Nortel Enterprise Common Manager (ECM) framework provides:

- Private Certificate Authority.
- Secure Shell (SSH) access to the Command Line Interface.
- Centralized point of access for the management of users, passwords, system access, and security.
- ECM navigator provides an overview of network components from the host's perspective.
- Single point of access to manage the entire network. Element Manager and NRS Manager are components of ECM.

Network Routing Service Manager

Network Routing Service Manager (NRS) is a web-based configuration interface. You can perform the following NRS configuration functions using NRS Manager:

- configure a numbering plan
- add, modify, or delete preconfigured endpoint data
- add, modify, or delete numbering plan entries on a per-endpoint basis
- retrieve the current configuration database
- interwork with a preconfigured database
- revert to the standby database
- change system passwords

Element Manager

CS 1000E supports Element Manager (EM), 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

Telephony Manager

CS 1000E supports Telephony Manager (TM) 3.1, 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 CLIs, 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.
- **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.** Contact Center applications are fully supported.
- **Wireless applications.** CS 1000E supports Nortel WLAN IP Telephony Manager 2245 and Nortel WLAN Application Gateway 2246. Support is also provided for Nortel Integrated DECT (DECT).
- **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 with CS 1000 Release 5.0 software 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 5.0 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 1000E requires an MCS 5100 to be in the network. This interfaces to the CS 1000E by means of SIP trunks.

CS 1000 Release 5.0 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 Fundamentals* (NN43001-368). For more information on analog and digital telephones, see *Telephones and Consoles Fundamentals* (NN43001-567).

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

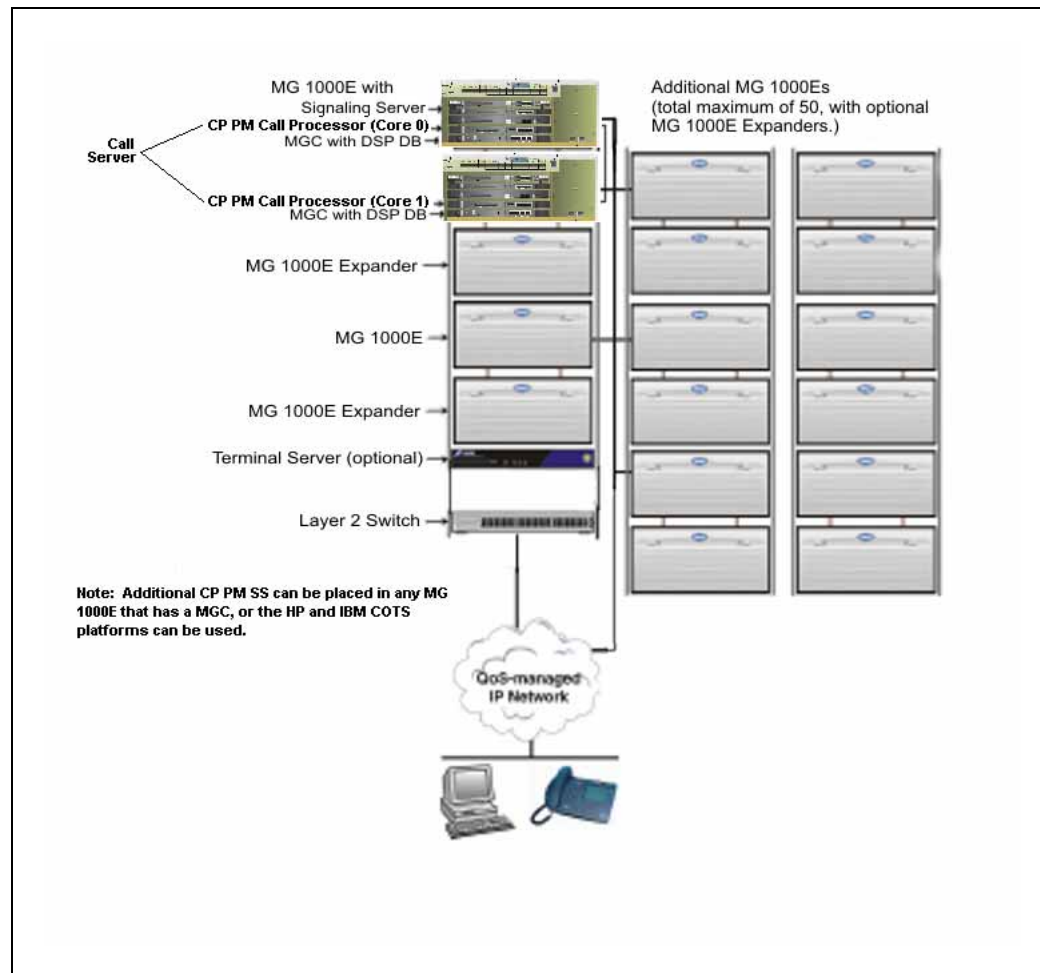
Contents

- "Main components" (page 21)
- "CS 1000E Call Server" (page 23)
- "Media Gateway" (page 25)
- "Media Gateway Expander" (page 29)
- "Signaling Server" (page 34)
- "Terminal Server" (page 40)
- "Layer 2 switch" (page 41)

Main components

Figure 2 "CS 1000E High Availability" (page 22) shows the main components of a typical CS 1000E High Availability system. The remainder of this section discusses each component in further detail.

Figure 2
CS 1000E High Availability



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

- Call Server containing dual CS 1000E Call Processors (Core 0 and Core 1)
- 1 to 50 Media Gateway 1000Es (MG 1000E) and optional MG 1000E Expanders
- Signalling Servers (total number required depends on capacity and survivability levels)
- an MRV Terminal Server (optional)
- Ethernet Switches

The CS 1000E uses the Large System Terminal Number (TN) format of the Loop, Shelf, Card, Unit (l s c u). The system software is based on the core software of the CS 1000M Large Systems. Each Call Server in the CS

1000E has a Common Processor Pentium Mobile (CP PM) card. A Call Server does not have an external System Utility (SUTL) card. The CP PM card provides functionality similar to that provided by the SUTL card in a Call Processor Pentium IV system without requiring any external hardware.

CS 1000E Call Server

Main role

The CS 1000E Call Server hosts one call processor in the Standard Availability configuration and two call processors in the High Availability configuration for the CS 1000E system.

Physical description

Figure 3 "CS 1000E Call Server " (page 23)(without cover) with CP PM processor and MGC installed.

Figure 3
CS 1000E Call Server



Hardware components

Each Call Server contains the following:

- CP PM processor
- Media Gateway Controller

Common Processor Pentium Mobile processor

The CP PM card (NTDW61AA) 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 PM card provides the following connectors:

- **Port 0** is used for maintenance access.
- **Port 1** is for an external modem connection. It 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" \(page 40\)](#).) **Port 1** can also be directly connected to a system terminal for system access.
- **LAN 0** is an unassigned 10/100 BaseT spare.
- **LAN 1** connects the Call Server to an Embedded LAN (ELAN) subnet through an ELAN Layer 2 switch to provide IP connections between the Call Server, Signaling Servers, and MG 1000Es.
- **LAN 2** connects Call Server 0 to Call Server 1 over a 10/100/1000 BaseT high speed pipe (HSP) to provide communication and database synchronization.
- The **USB 2.0 port** is not supported by the CS 1000E system and cannot be used.

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 Server provides 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 (HA) has dual call processors (core 0 and core 1) to provide a fully redundant system.

Call processors (core 0 and core 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 Server can control up to 50 MG 1000Es.

Note: The Call Server provides connectivity to telephony devices using IP signaling through MG 1000Es rather than by direct physical connections.

Media Gateway

Main role

The Media Gateway functions as a gateway controller under the control of a CS 1000E call server.

The Media Gateway houses circuit cards and connectors to support the functionality of an MG 1000E and 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.

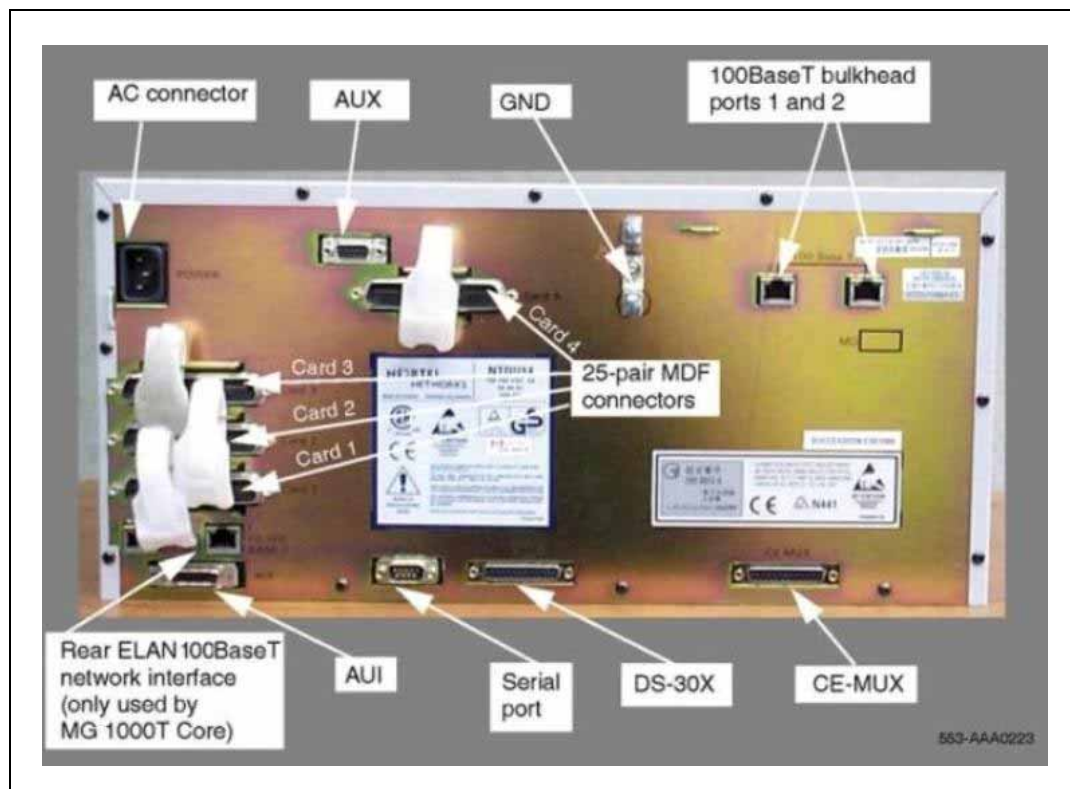
Note: The MG 1000B also uses the same base Media Gateway hardware as the MG 1000E. (For more information, see *Branch Office Installation and Commissioning* (NN43001-314).

Physical description

Figure 4 "Media Gateway" (page 26) shows the Media Gateway (NTDU14).

- 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 ports to the MDF.

Figure 5
Rear components in the Media Gateway



Circuit cards

Each Media Gateway can house the following circuit cards:

- Media Gateway Controller card
- Media Card and Voice Gateway Media card
- Intelligent Peripheral Equipment (IPE) cards

Media Gateway Controller Card The Media Gateway Controller (MGC) card occupies the system controller slot 0 in the Media Gateway Chassis. MGC is an upgrade over the NTDK20 Small System Controller (SSC).

The NTDW60 MGC card provides a gateway controller for Media Gateways in a CS 1000E system. The MGC only functions as a gateway controller under control of a CS 1000E (CP PII, CP PIV or CP PM) Call Server.

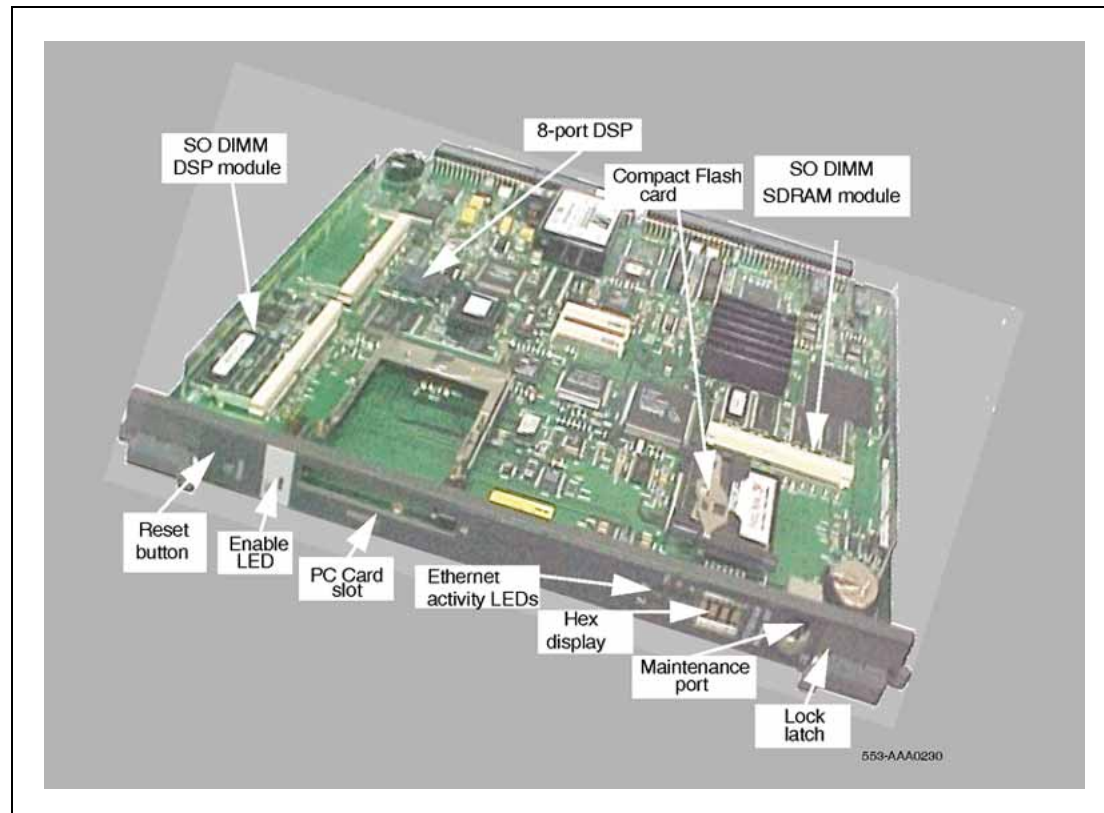
Figure 6 "Media Gateway Controller card (NTDW60)" (page 28) shows the MGC faceplate and MGC circuit card (with both DSP daughterboards installed).

Figure 6
Media Gateway Controller card (NTDW60)



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 "Media Card" \(page 29\)](#) shows faceplate connectors and indicators on the Media Card. For more information on Media Card features, refer to *IP Line Fundamentals (NN43100-500)*.

Figure 7
Media Card



Voice Gateway Media Card Voice Gateway Media Card is a term used to encompass any Media Card that runs the IP Line application. A Voice Gateway Media Card provides Digital Signal Processor (DSP) ports to transcode between IP and TDM. Voice Gateway Media Cards can provide up to 32 DSP ports. These following cards are supported and plug into any Intelligent Peripheral Equipment (IPE) slot in either a Media Gateway 1000E or Media Gateway 1000E Expander:

- Media Card 32-port card
- ITG-P 24-port line card
- Media Card 32S card.

For additional information on the IP Line application, see *IP Line Fundamentals (NN43100-500)*.

Media Gateway Expander

Main role

The Media Gateway Expander supports up to four circuit cards.

Physical description

Figure 8 "Media Gateway Expander (NTDU15)" (page 30) shows the Media Gateway Expander (NTDU15).

Figure 8
Media Gateway Expander (NTDU15)

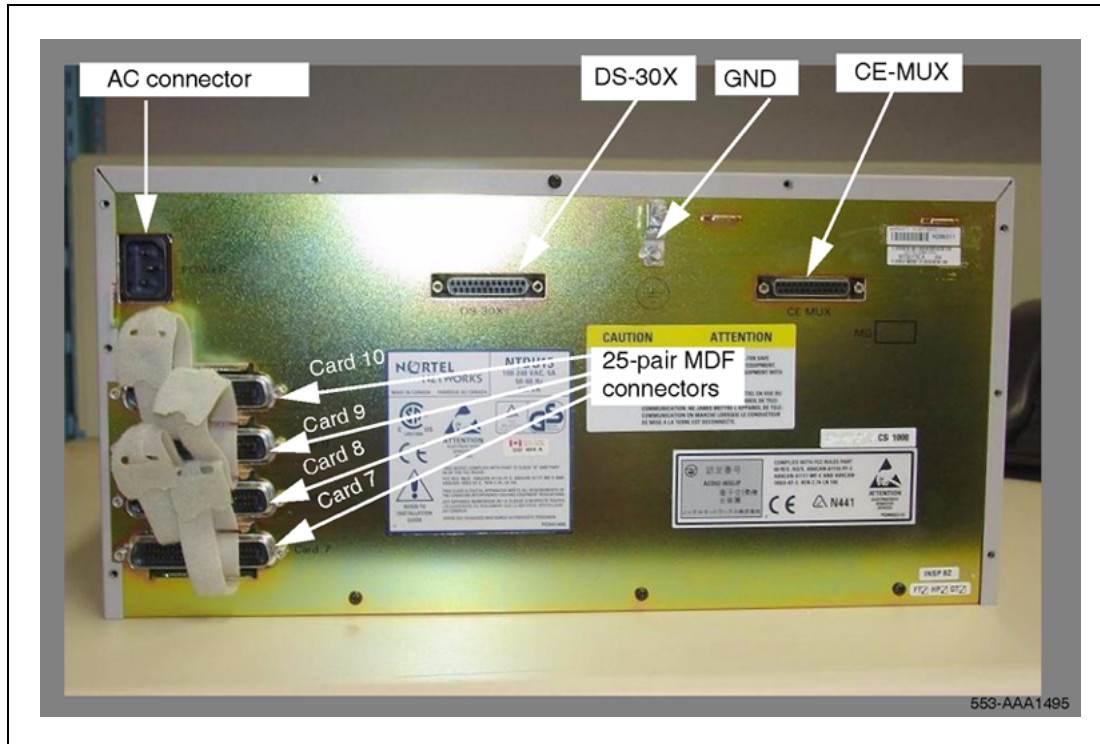


Rear components

Figure 9 "Rear components in the Media Gateway Expander" (page 31) 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 ports to the MDF.

Figure 9
Rear components in the Media Gateway Expander



Operating parameters

Each Media Gateway supports one optional Expander.

Security Devices

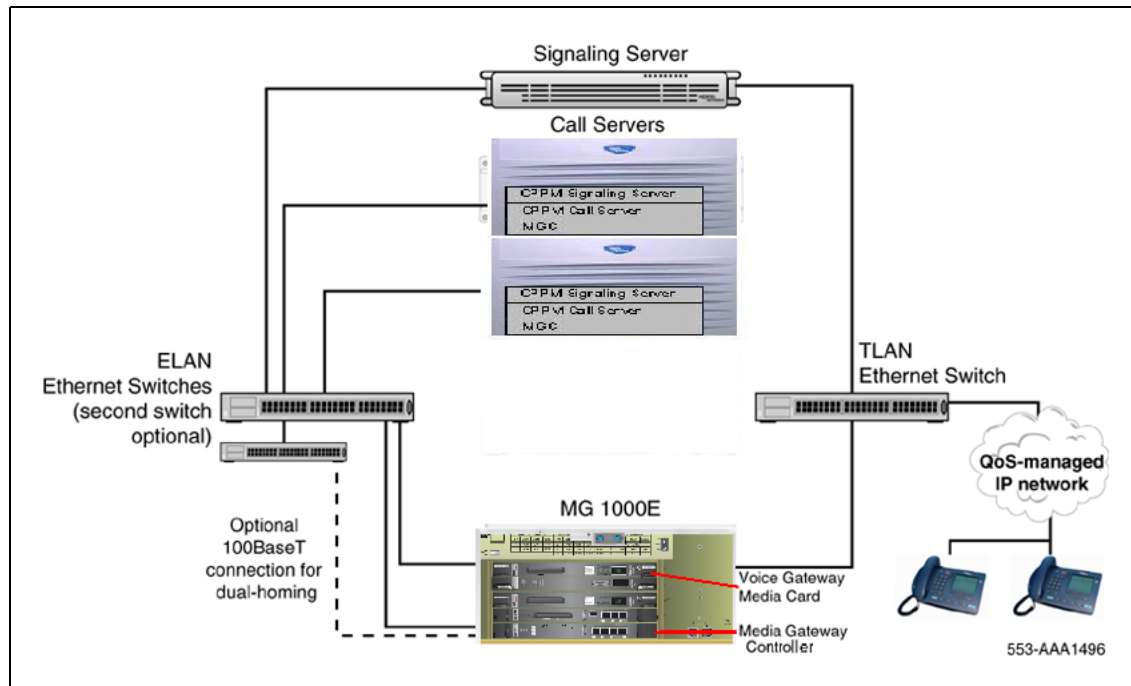
The security device on the Media Gateway Controller card is a generic security device that allows the MG 1000Es to register with the CS 1000E Core Call Servers.

Control for the activation of features assigned to the CS 1000E system, including MG 1000E, is provided by the security device on the CP PM call processor .

Network Connections

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

Figure 10
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.

Functional description

The MG 1000E provides the following functionality:

- provides digital trunks to the PSTN and trunking to other PBX systems using E1, T1, ISDN PRI, and ISDN BRI circuit cards
- supports Voice Gateway Media Cards for transcoding between IP and TDM
- 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
- supports the DECT application

Operating parameters

The MG 1000E operates under the direct control of the Call Server. Up to 50 MG 1000Es can be configured on the Call Server.

To allow IP Phones to access digital media services, the MG 1000E 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
- Service cards: provide services such as Music or Recorded Announcements (RAN)
- DECT Mobility cards
- Digital PSTN Interface Cards, including E1, T1, ISDN PRI, and ISDN BRI: provide access to PSTN
- Analog interfaces to lines and trunks: support analog (500/2500-type) phones and fax, 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

Signaling Server

Main role

The Signaling Server provides a central processor to drive Session Initiation Protocol (SIP), and H.323 signaling, IP Phone signaling, and IP Peer Networking in the CS 1000E system. The Signaling Server has both an ELAN and a TLAN network interface, and communicates with the Call Server through the ELAN subnet.

The Signaling Server provides signaling interfaces to the IP network using the following software components that run on the VxWorks™ real-time operating system:

- SIP/H.323 Signaling Gateways
- IP Phone Terminal Proxy Server (TPS)
- Network Routing Service (NRS)
- Element Manager
- Application Server for Personal Directory, Redial List, and Callers List for IP Phones

Nortel Common Processor Pentium Mobile server

The Nortel Common Processor Pentium Mobile (CP PM) server is a high performance, circuit card-based server that can be configured as a Call Server or a Signaling Server in a CS 1000 Release 5.0 system. The NTDW61 – can be configured as a Call Server or Signaling Server in a CS 1000E system.

Configured as a Signaling Server, the NTDW61 model is installed in a Media Gateway chassis or cabinet (MG 1000E) in a CS 1000E system.

The Nortel CP PM Signaling Server delivers capacity improvement by providing flexible scaling from 0 to 22,000 IP phones and a 70% increase in power for Signaling Server applications. The increased application power and capacity, coupled with the reduction in foot print and power consumption, means a lower cost of ownership.

The Nortel CP PM Signalling Server has the following components:

- Intel Pentium M processor (1.4 Ghz)
- Internal hard drive
- hot-pluggable Compact Flash (CF) card slot in the faceplate
- 2 Gb of SDRAM
- One 1 Gb/s Ethernet port
- Two 100BaseT Ethernet ports
- Two serial ports

- One USB port

International Business Machines X306m server

The International Business Machines (IBM) X306m 1U server is a rack-mounted, Pentium 4, PC-based, industry-standard, commercial off-the-shelf (COTS) server.

The IBM X306m 1U server has the following components:

- Intel Pentium 4 processor (3.6 GHz)
- Two 80 GB simple swap Serial ATA hard drives (1 drive configured)
- 8 GB of RAM PC4200 DDR II by means of 4 DIMM slots (2 GB configured)
- Two 1 Gb/s Ethernet ports
- One DVD-COMBO (DVD/CD-RW) drive
- One serial port
- Four USB ports

Hewlett Packard DL320-G4 server

The Hewlett Packard (HP) DL320-G4 1U server is a rack-mounted, Pentium 4, PC-based, industry-standard, commercial off-the-shelf (COTS) server.

The HP DL320-G4 1U server has the following components:

- Intel Pentium 4 processor (3.6 GHz)
- Two 80 GB SATA Hard drives (1 configured)
- 4 GB PC2-4200 ECC DDR2 SDRAM (2 GB configured)
- Two 10/100/1000BaseT Ethernet ports
- One CD-R/DVD ROM drive
- One serial port
- Three USB ports

Software applications

The Signaling Server runs the following software applications:

- ["Terminal Proxy Server \(TPS\)" \(page 36\)](#)
- ["SIP/H.323 Signaling Gateways" \(page 36\)](#)
- ["Network Routing Service \(NRS\)" \(page 36\)](#)
- ["Element Manager" \(page 38\)](#)
- ["Application Server for Personal Directory, Callers List, and Redial List" \(page 39\)](#)

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 in a CS 1000E system the Call Server must be associated with Signaling Servers that run SIP/H.323 Signaling Gateway software (see *IP Peer Networking Installation and Commissioning (NN43001-313)* for details). The number of Signaling Servers required depends on the capacity and level of redundancy required.

Network Routing Service (NRS)

NRS for CS 1000 Release 5.0 software is offered in two versions: a SIP Redirect Server NRS and a SIP Proxy NRS.

The SIP Redirect Server NRS is hosted either co-resident with Signaling Server applications, or in a stand-alone mode on a dedicated Common Processor Pentium Mobile (CP PM) server running the VxWorks™ real-time operating system. There are no changes to the SIP Redirect Server NRS in CS 1000 Release 5.0.

The SIP Proxy NRS is hosted in a stand-alone mode on a dedicated commercial off the shelf server running the Linux™ real-time operating system. The SIP Proxy NRS is referred to as the Linux-based 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. 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 in an IP Peer network must register to the NRS. The NRS software identifies the IP addresses of PBXs 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.

SIP Proxy

Communication Server (CS) 1000 Release 5.0 adds a transaction stateful SIP Proxy to the IP Peer Network.

A SIP Proxy acts as both a server and a client. A SIP Proxy receives requests, determines where to send the requests, and acting as a client on behalf of SIP endpoints, passes requests to another server.

A SIP Proxy makes the following features and functionality, which are provided by CS 1000 Release 5.0, possible:

1. Transport Layer Security (TLS).

TLS provides the NRS with private, secure signaling, message authentication, confidentiality, and integrity through end-to-end encryption of media exchanged between two SIP endpoints.

2. Mixed transport layer protocol.

A mixed transport layer protocol enables gateways using TCP, TLS over TCP, or UDP to interoperate.

3. Network features.

By default the SIP Proxy and Redirect Server functions as a SIP Proxy. However, an endpoint can request transaction by transaction that the SIP Proxy act as a SIP Redirect Server.

A SIP Redirect Server receives requests, but does not pass the requests to another server. Instead, a SIP Redirect Server sends a response back to the SIP endpoint, indicating the IP address of the called user.

4. Post-routing SIP URI modification.

5. Transaction forking.

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 throughout multiple overlays.

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

- Call Servers
- Media Gateway (MG 1000E, Expander)
- MG 1000B
- Signaling Servers
- Voice Gateway Media Cards

NRS Manager

NRS Manager is a web-based management application used to configure, provision, and maintain the NRS. Key usability improvements introduced in the Linux-based NRS Manager are:

- Enhanced searching and sorting capabilities including wild cards and selectable scope of the search
- Capability to copy and move routing entries

- Simplified configuration for geographic redundancy
- Routing tests are fully integrated with endpoint and routing entry configuration
- SIP phone context mapping tools are fully integrated with endpoint and routing entry configuration
- Security infrastructure provided by the Enterprise Common Manager framework

For more information, see *Network Routing Service Installation and Commissioning (NN43001-564)*

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
- supports key software components (see ["Software applications" \(page 35\)](#))

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

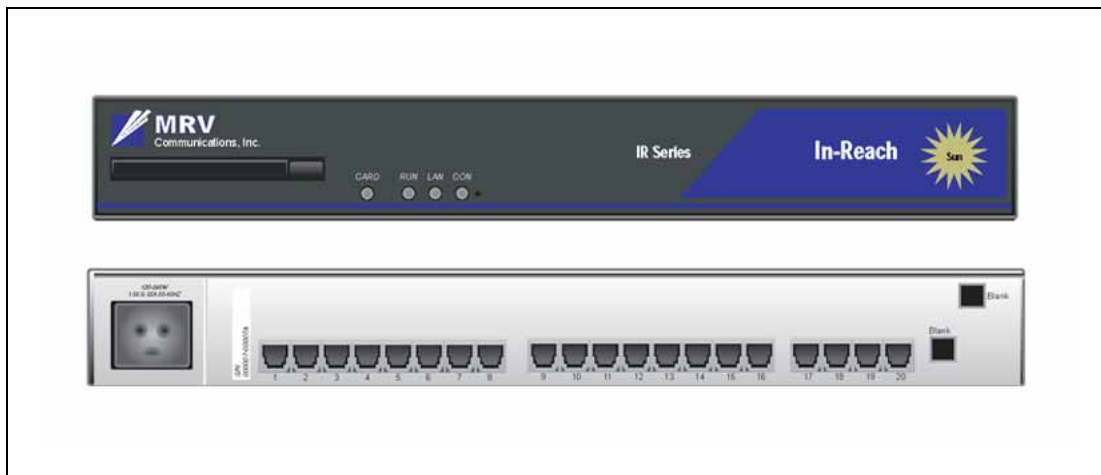
Main role

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

Physical description

Figure 11 "Terminal Server" (page 40) shows the Terminal Server.

Figure 11
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.

ATTENTION

IMPORTANT!

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

Layer 2 switch

Main role

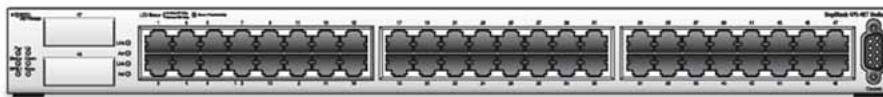
The Layer 2 switch transmits data packets to devices interconnected by Ethernet to the ELAN or TLAN subnets. The switch only directs data to the target device, rather than to all attached devices.

Physical description

ELAN Layer 2 switch

Figure 12 "ELAN Layer 2 switch (BayStack 470-48T)" (page 41) shows an example of an ELAN Layer 2 switch.

Figure 12
ELAN Layer 2 switch (BayStack 470-48T)



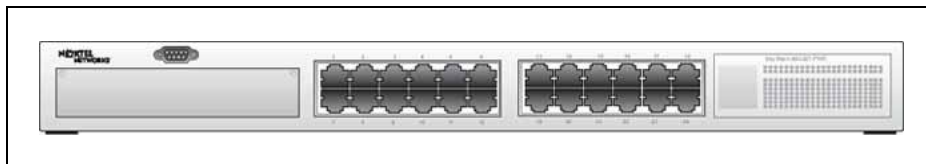
TLAN Layer 2 switch

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 13 "TLAN Layer 2 switch (BayStack 460)" (page 42) shows the BayStack 460 Layer 2 switch.

Figure 13
TLAN Layer 2 switch (BayStack 460)



Operating parameters

These components must be supplied by the customer. See *Converging the Data Network with VoIP Fundamentals (NN43001-260)* for further details.

Configuration options

Contents

- "Introduction" (page 43)
- "Option 1: Standard Availability Configuration" (page 44)
- "Option 2: Campus-distributed MG 1000Es" (page 44)
- "Option 3: Campus Redundancy" (page 45)
- "Option 4: Branch Office" (page 46)
- "Option 5: Geographic Redundancy" (page 47)

Introduction

The IP-distributed architecture of the CS 1000E enables flexibility when it comes to component location.

The new Call Processor platform (CP PM) occupies a slot in a MG 1000 cabinet or chassis. This new processor may be deployed as a single call processor (Standard Availability CS 1000E) or in a redundant processor configuration (High Availability CS 1000E).

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:

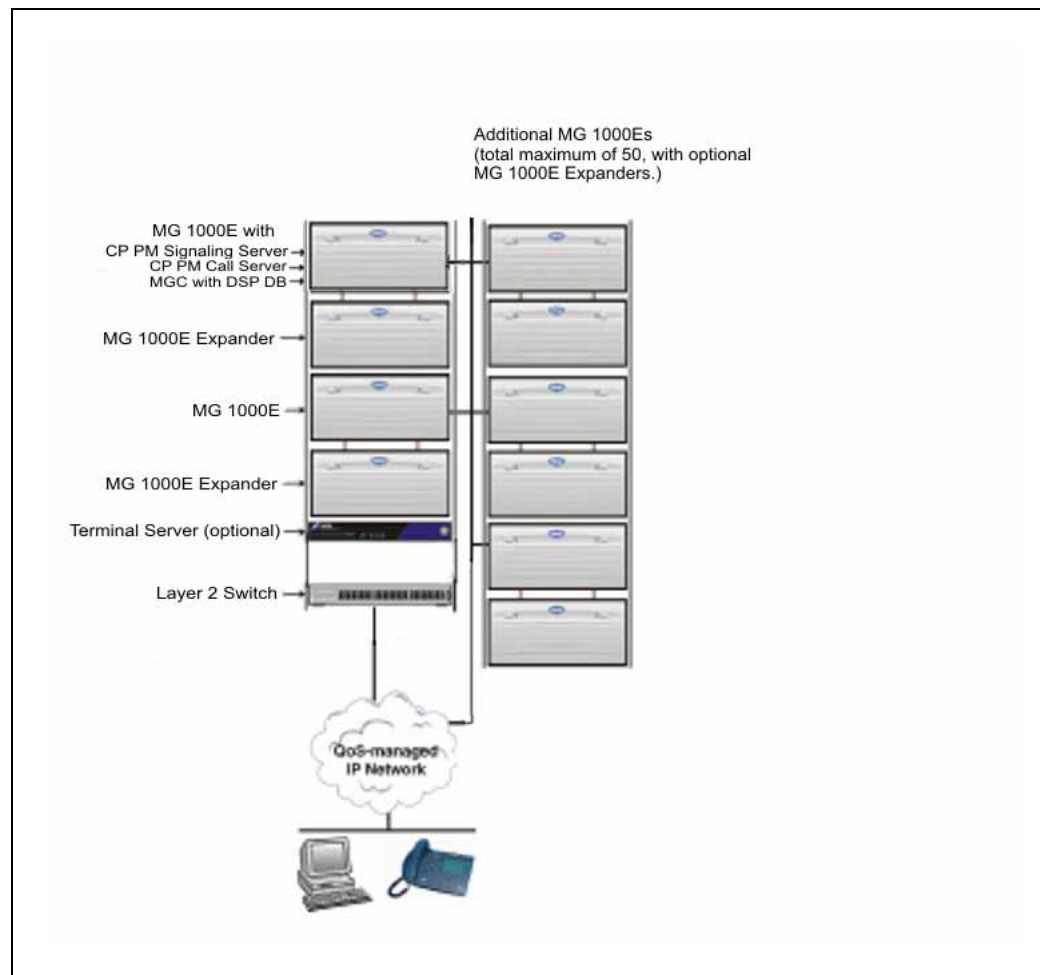
- Multiple buildings in a campus
 - Campus-distributed MG 1000E
 - Campus Redundancy
- Multiple sites
 - Central Call Server with Branch Office
 - Geographic Redundancy

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: Standard Availability Configuration

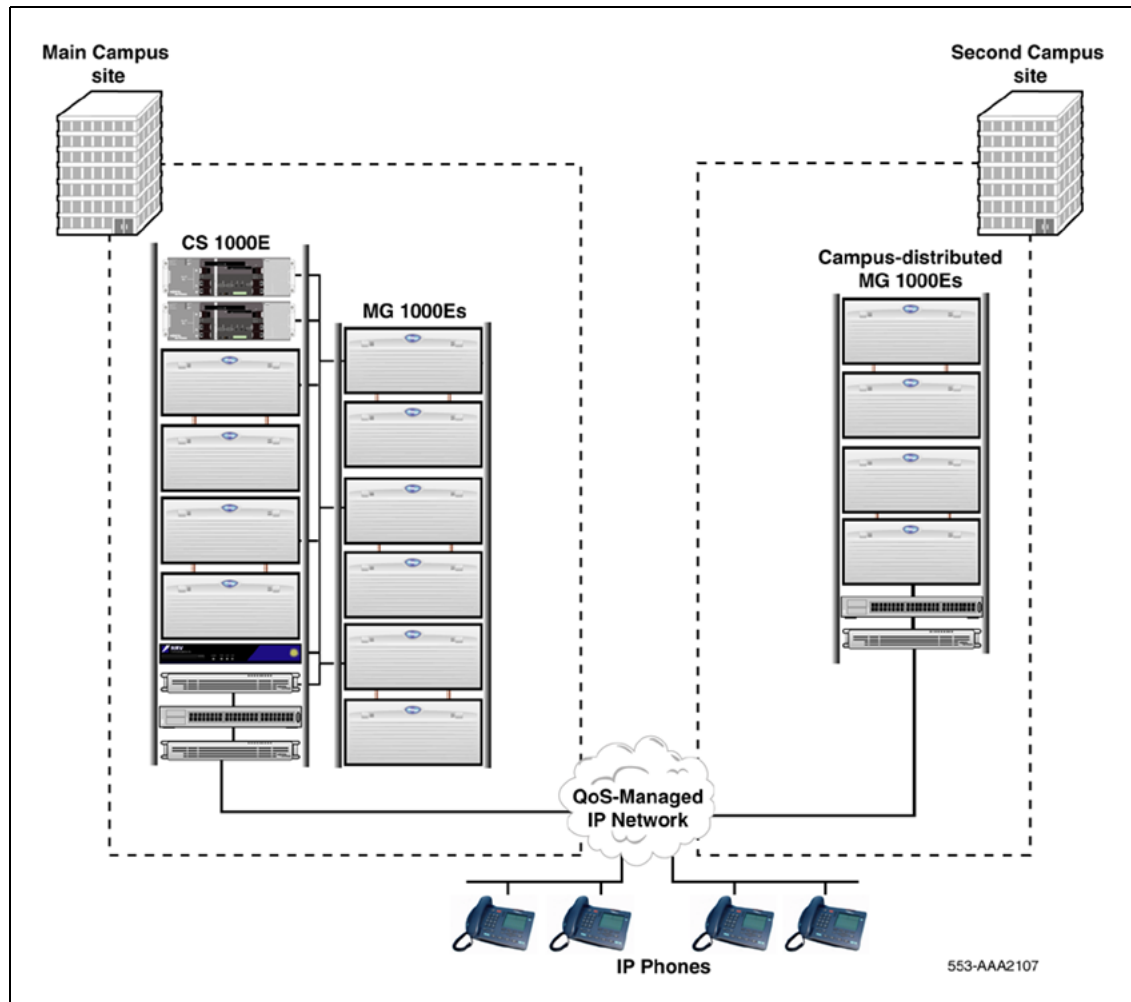
A CS 1000E system configured with one call processor (Standard Availability).



Option 2: Campus-distributed MG 1000E

With multiple buildings in a campus, you can distribute MG 1000E across a campus IP network. [Figure 14 "Campus-distributed MG 1000E" \(page 45\)](#) shows MG 1000Es distributed across multiple buildings in a campus setting.

Figure 14
Campus-distributed MG 1000E



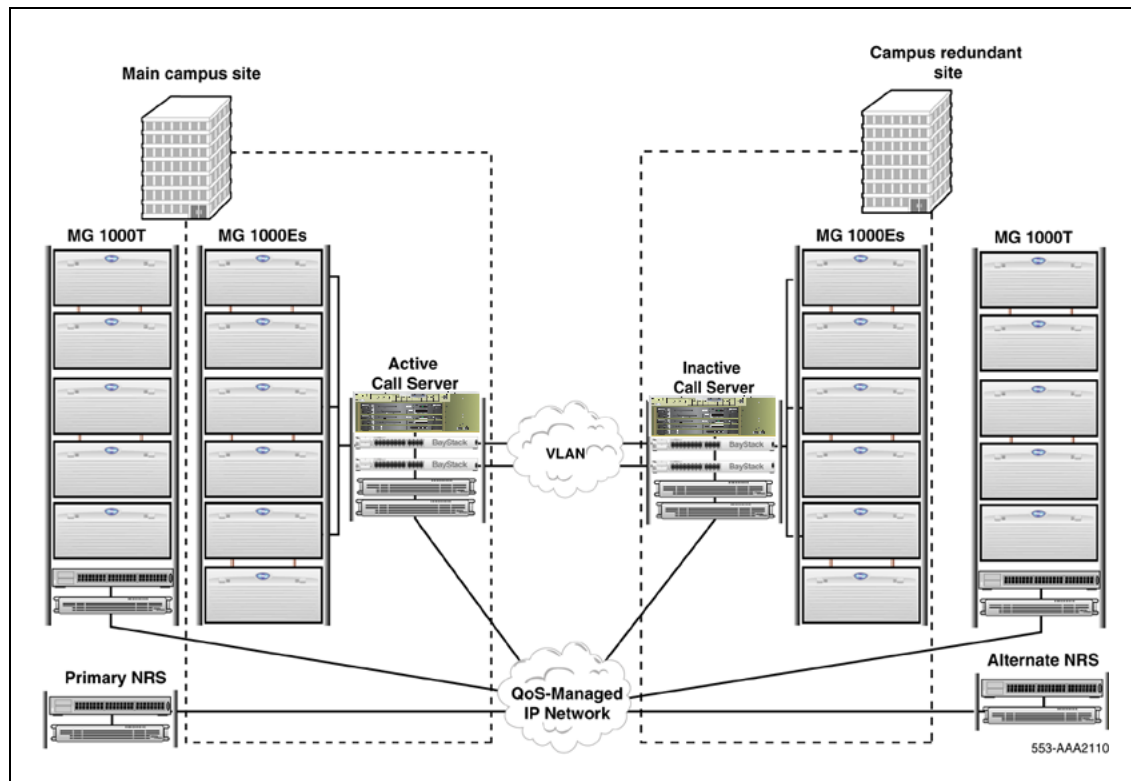
In this configuration, a CS 1000E system is installed at the main site, and additional MG 1000Es and an optional Signaling Server are installed at a second campus site. All IP Phones are configured and managed centrally from the main site.

Option 3: Campus Redundancy

With Campus Redundancy, customers can separate Call Server core 0 and core 1 across a campus IP network. This provides additional system redundancy within a local configuration. The Call Server function normally and the inactive Call Processor assumes control of call processing if the active Call Processor fails.

To do this, the ELAN subnet and the subnet of the High Speed Pipe (HSP) are extended between the two Call Processor using a dedicated Layer 2 Virtual LAN configured to meet specified network parameters. [Figure 15 "Campus Redundancy configuration" \(page 46\)](#) shows a CS 1000E system in a Campus Redundancy configuration.

Figure 15
Campus Redundancy configuration

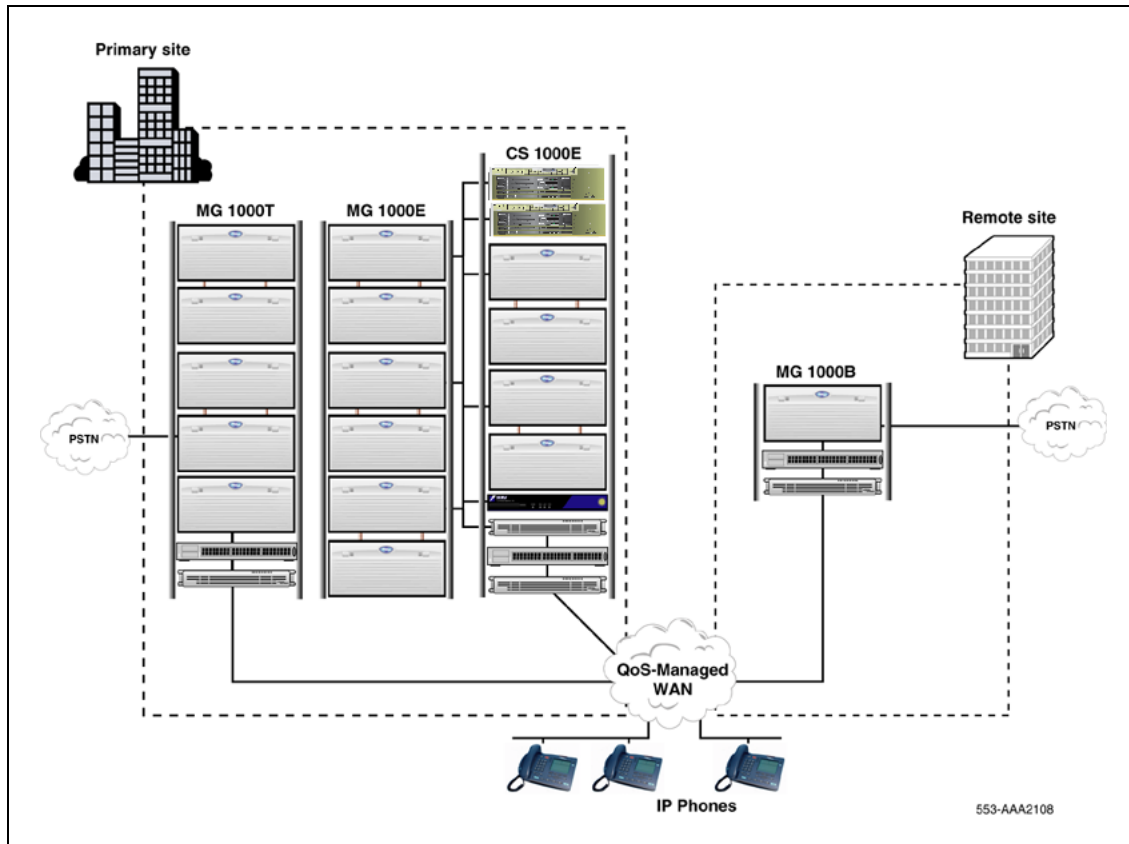


For more information on *Campus Redundancy*, see *System Redundancy Fundamentals (NN43001-507)*.

Option 4: Branch Office

The CS 1000E system supports the Branch Office feature, which provides central administration of Media Gateway 1000B (MG 1000B) at remote sites. [Figure 16 "Branch Office configuration" \(page 47\)](#) shows a CS 1000E system with an MG 1000B installed at a remote branch office.

Figure 16
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 Commissioning* (NN43001-314).

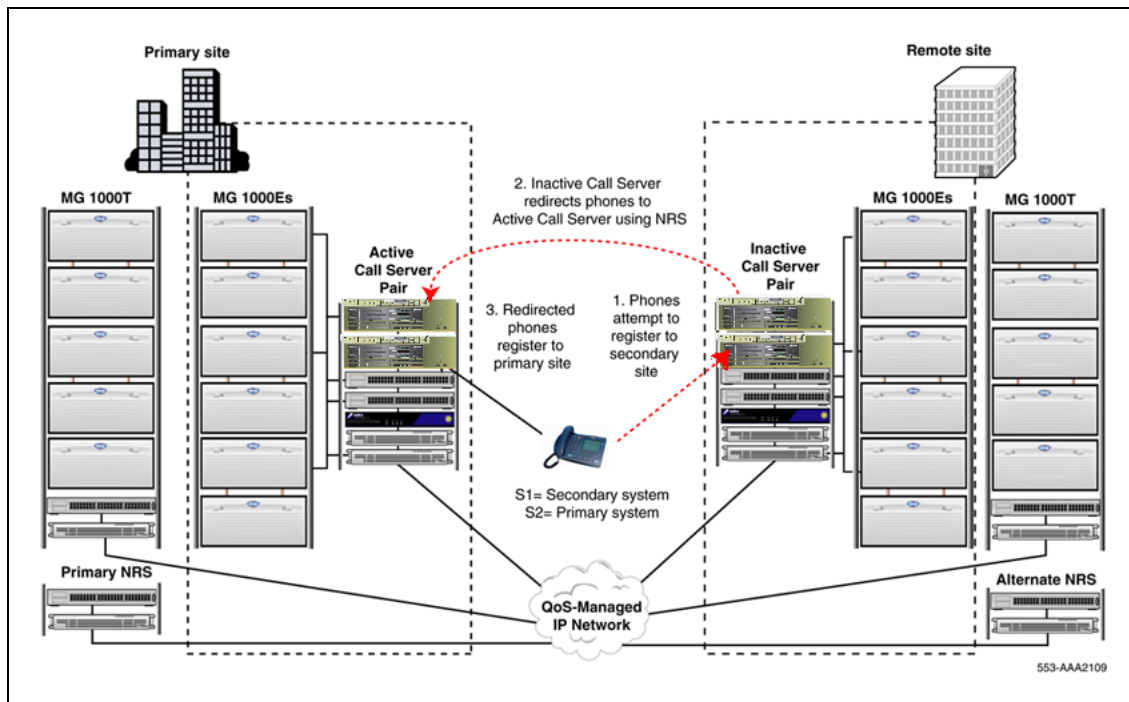
Option 5: Geographic Redundancy

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 16 "Branch Office configuration" (page 47) shows an inactive CS 1000E system backing up an active system using Geographic Redundancy.

Note: Geographic Redundancy provides redundancy for IP Phones only.

Figure 17
Geographic Redundancy



For more information on Geographic Redundancy, see *System Redundancy Fundamentals (NN43001-507)*.

Nortel Communication Server 1000

Communication Server 1000E Overview

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