Communication Server 1000M and Meridian 1 Large System Overview Avaya Communication Server 1000

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Chapter 1: New in this release

The following section details what is new in *Avaya Communication Server 1000M and Meridian 1 Large System Overview, NN43021-110* for Avaya Communication Server 1000 Release 7.6.

Navigation

- Features on page 7
- Other changes on page 7

Features

There are no updates to the feature descriptions in this document.

Other changes

See the following section for information about changes that are not feature-related.

Revision History

March 2013	Standard 06.01. This document is up-issued to support Avaya Communication Server 1000 Release 7.6.
February 2011	Standard 05.03. This document is up-issued to remove legacy feature and hardware content that is no longer applicable to or supported by Communication Server 1000 systems.
November 2010	Standard 05.01 and 05.02. These documents were issued to support Avaya Communication Server 1000 Release 7.5.
June 2010	Standard 04.01. This document is up-issued to support Avaya Communication Server 1000 Release 7.0.

May 2009	Standard 03.02. This document is up-issued to include a task flow graphic for Communication Server 1000 Release 6.0.
May 2009	Standard 03.01. This document is issued to support Communication Server 1000 Release 6.0.
September 2008	Standard 02.05. This document is up-issued to add content about FIJI redesign in System modules chapter.
September 2008	Standard 02.04. This document is issued to support Communication Server 1000 Release 5.5.
July 2008	Standard 02.03. This document is issued to support Communication Server 1000 Release 5.5.
December 2007	Standard 02.02. This document is issued to support Communication Server 1000 Release 5.5.
June 2007	Standard 1.02. This document is up-issued to remove the Nortel Networks Confidential statement.
May 2007	Standard 1.01. This document is issued to support Communication Server 1000 Release 5.0. This document contains information previously contained in the following legacy document, now retired: *Communication Server 1000M and Meridian 1: Large System Overview, (553-3021-010)*.
August 2005	Standard 3.00. This document is up-issued to support Communication Server 1000 Release 4.5.
September 2004	Standard 2.00. This document is up-issued for Communication Server 1000 Release 4.0.
October 2003	Standard 1.00. This document is a new NTP for Succession 3.0. It was created to support a restructuring of the Documentation Library. This document contains information previously contained in the following legacy document, now retired: *System Overview* (553-3001-100).

Chapter 2: Customer service

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Navigation

- Getting technical documentation on page 9
- Getting product training on page 9
- Getting help from a distributor or reseller on page 9
- Getting technical support from the Avaya Web site on page 10

Getting technical documentation

To download and print selected technical publications and release notes directly from the Internet, go to www.avaya.com/support.

Getting product training

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Chapter 3: Introduction

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

Subject

⚠ Warning:

Before a Large 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 *Avaya Converging the Data Network with VoIP , (NN43001-260)*.

This document provides an overview of the general design and features of Avaya Communication Server 1000M (Avaya CS 1000M) and Meridian 1 Large Systems.

Note on legacy products and releases

This document contains information about systems, components, and features that are compatible with Avaya CS 1000 software. For more information on legacy products and releases, click the **Technical Documentation** link under **Support & Training** on http://www.avaya.com.

Applicable systems

This document applies to the following systems:

- Communication Server 1000M Single Group (CS 1000M SG)
- Communication Server 1000M Multi Group (CS 1000M MG)

System migration

When particular Meridian 1 systems are upgraded to run CS 1000 software and configured to include a Signaling Server, they become CS 1000M systems. Table 1 lists each Meridian 1 system that supports an upgrade path to a CS 1000M system.

Table 1: Meridian 1 systems to CS 1000M systems

This Meridian 1 system...	Maps to this CS 1000M system
Meridian 1 Option 61C	Communication Server 1000M Single Group
Meridian 1 Option 81C	Communication Server 1000M Multi Group

For more information, see *Avaya Communication Server 1000M and Meridian 1 Large System Upgrades Overview, (NN43021-458)*.

Intended audience

This document is intended to be an introductory overview for individuals responsible for the sale, acquisition, planning, or installation of Communication Server 1000M and Meridian 1 Large Systems.

Terminology

In this document, the following systems are referred to generically as "system":

- Communication Server 1000M (Communication Server 1000M)
- Meridian 1

The following systems are referred to generically as "Large System":

- Communication Server 1000M Single Group (Communication Server 1000M SG)
- Communication Server 1000M Multi Group (Communication Server 1000M MG)
- Meridian 1 Option 61C
- Meridian 1 Option 81C

In this document, the following hardware platforms are referred to generically as Server.

- Call Processor Pentium IV (CP PIV)
- Common Processor Pentium Mobile (CP PM) card
- Commercial off-the-shelf (COTS) servers
    - IBM x360m server (COTS1)
    - HP DL320 G4 server (COTS1)
    - IBM x3350 server (COTS2)
    - Dell R300 server (COTS2)

In this document, the generic term COTS refers to all COTS servers. The term COTS1 or COTS2 refers to the specific servers in the preceding list.

Communication Server 1000 task flow

This section provides a high-level task flow for the installation or upgrade of a Communication Server 1000 system. The task flow indicates the recommended sequence of events to follow when configuring a system and provides the document number that contains the detailed procedures required for the task. For more information refer to the following documents, which are referenced in the task flow diagram:

- *Avaya Linux Platform Base and Applications Installation and Commissioning, NN43001-315*
- *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning, NN43021-310*
- *Avaya Communication Server 1000M and Meridian 1 Large System Upgrades Overview, NN43021-458*

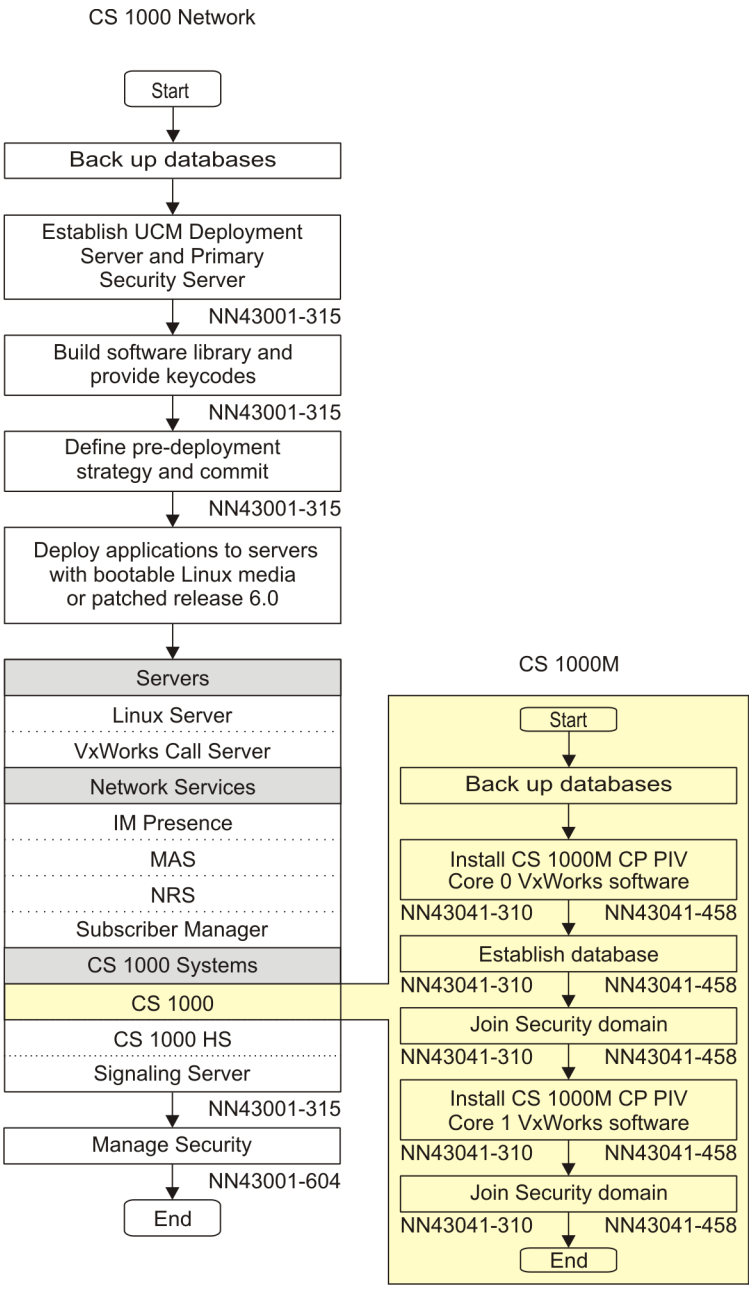

Figure 1: Communication Server 1000 task flow

Related information

This section lists information sources that relate to this document.

Publications

The following publications are referenced in this document:

- *Avaya IP Peer Networking Installation and Commissioning, (NN43001-313)*
- *Avaya Converging the Data Network with VoIP Fundamentals , (NN43001-260)*
- *Avaya Branch Office Installation and Commissioning , (NN43001-314)*
- *Avaya System Redundancy Fundamentals, (NN43001-507)*
- *Avaya Telephones and Consoles Fundamentals, (NN43001-567)*
- *Avaya IP Phones Fundamentals, (NN43001-368)*
- *Avaya Communication Server 1000M and Meridian 1 Large System Planning and Engineering , (NN43021-220)*
- *Avaya Fiber Remote IPE Fundamentals, (NN43021-554)*
- *Avaya Carrier Remote IPE Fundamentals, (NN43021-555)*
- *Avaya Fiber Remote Multi-IPE Interface Fundamentals, (NN43021-556)*
- *Avaya WLAN Handsets Fundamentals, (NN43001-505)*
- *Avaya DECT Fundamentals, (NN43120-114)*
- *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*
- *Avaya Network Routing Service Fundamentals, (NN43001-130)*
- *Avaya SIP Line Fundamentals, (NN43001-508)*
- *Avaya Unified Communications Management Common Services Fundamentals, NN43001-116)*
- *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)*

Chapter 4: Product description

Contents

This section contains information on the following topics:

Introduction on page 17

System options on page 18

- Communication Server 1000M SG and Meridian 1 Option 61C CP PIV on page 19
- Communication Server 1000M MG and Meridian 1 Option 81C CP PIV on page 21

System modules on page 24

- NT4N41 Core/Network module on page 24
- NT8D35 Network module on page 26
- Fiber Network Fabric on page 27
- NT8D37 Intelligent Peripheral Equipment module on page 28
- Fiber Remote IPE module on page 29
- Carrier Remote IPE on page 29

Introduction

⚠ Caution:

Before a Large 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 *Avaya Converging the Data Network with VoIP Fundamentals, (NN43001-260)*.

All Large Systems consist of Universal Equipment Modules (UEM) stacked one on top of another to form a column. Each column contains a pedestal, a top cap, and up to four modules. A system can have one column or multiple columns.

Each UEM is a self-contained unit that houses a card cage and backplane, power and ground cabling, power units, input/output (I/O) panels, circuit cards, and cables. When the card cage is installed, the function of the UEM is established and the module is no longer "universal." The system modules are as follows:

- NT4N41 Core/Network module for Avaya Communication Server 1000M (Avaya CS 1000M) MG, Avaya CS 1000M SG, Meridian 1 Option 81C CP PIV, and Meridian 1 Option 61C CP PIV
- NT8D35 Network module required for CS 1000M MG and Meridian 1 Option 81C CP PIV
- NT8D37 Intelligent Peripheral Equipment (IPE) module (required for Large Systems)
- Fiber Remote IPE module (optional for Large Systems Multi Group)
- Carrier Remote IPE module (optional for Large Systems)

The pedestal generally houses a blower unit, air filter, Power Distribution Unit (PDU), and System Monitor.

The top cap provides airflow exits, I/O cable entry and exit, and overhead cable-rack mounting. Thermal sensor assemblies for the column are attached to a perforated panel on top of the highest module in the column, under the top cap.

A system can have one column or multiple columns. To comply with FCC and CSA standards for containing electromagnetic interference and radio frequency interference (EMI/RFI), spacer kits connect the columns in a multiple-column system. If a Signaling Server is added to a previously CISPR Class B system (previously used in some specific countries), the system is now Compliant to Class A.

System options

This document includes information on the following Large Systems:

- Communication Server 1000M SG and Meridian 1 Option 61C CP PIV: enhanced common control complex, dual CPU, and one full-network group
- Communication Server 1000M MG and Meridian 1 Option 81C CP PIV: enhanced common control complex, dual CPU, and multiple-network groups

These systems are available in AC- and DC-powered versions.

Communication Server 1000M SG and Meridian 1 Option 61C CP PIV

The Communication Server 1000M SG and Meridian 1 Option 61C CP PIV are dual-CPU systems with standby processing capability, fully redundant memory, and a full-network group. Two cPCI Core/Network modules and one IPE module are required. Additional IPE modules and application modules can be used.

Figure 2: Meridian 1 Option 61C CP PIV on page 19 illustrates a Meridian 1 Option 61C CP PIV.

With the addition of a Signaling Server, a Meridian 1 Option 61C CP PIV becomes a Communication Server 1000M SG. Figure 3: Communication Server 1000M SG on page 20 illustrates a Communication Server 1000M SG.

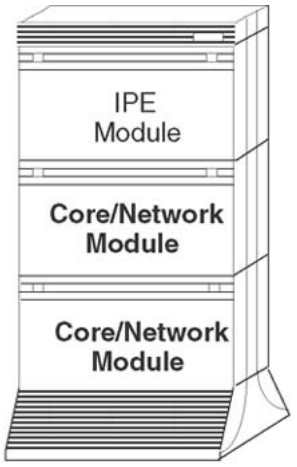

Figure 2: Meridian 1 Option 61C CP PIV

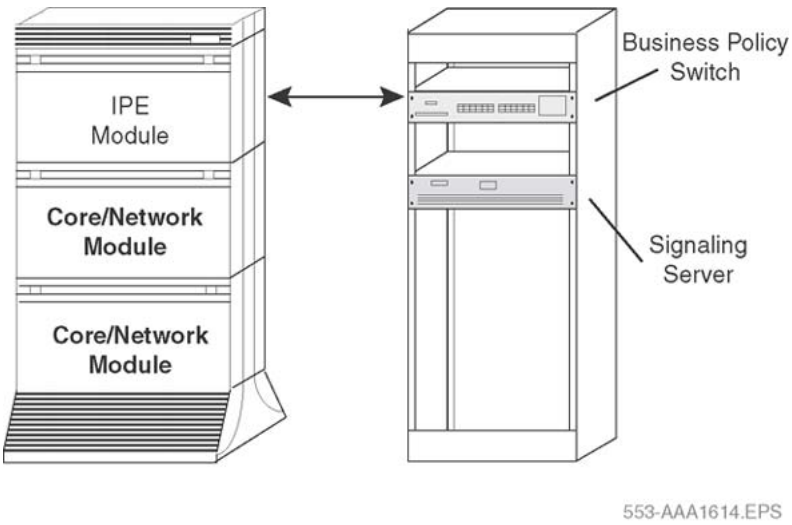

Figure 3: Communication Server 1000M SG

Table 2: Specifications for Communication Server 1000M SG and Meridian 1 Option 61C CP PIV on page 20 lists the specifications for Communication Server 1000M SG and Meridian 1 Option 61C CP PIV.

Table 2: Specifications for Communication Server 1000M SG and Meridian 1 Option 61C CP PIV

System characteristics:	
Maximum number of ports	• 2000
Input voltage	• 208 V AC or –48 V DC
Number of CPUs	• 2 (redundant) CP PIV NT4N39
Number of network loops	• 32
Software generic	• 2911
Base hardware:	
Core/Network module (two)	Required per system: • SDI-type card Required per module: • Call Processor Pentium IV (CP PIV) card • System Utility (Sys Util) card • Core to Network Interface (cCNI) card

	• 3-Port Extender (3PE) card • Peripheral Signaling card (PS) • Network cards • Superloop Network cards • Conference/TDS card • CE power supply • Hybrid Bus Terminators
IPE module	Cards in the back of the module: • System Utility Transition (Sys Util Trans) card • cCNI Transition (cCNI Trans) card • IPE power supply • IPE cards • Controller card
Pedestal (one per column)	• System Monitor • PDU • Blower unit
Top cap (one per column)	• Thermostat harness • Air probe harness

Communication Server 1000M MG and Meridian 1 Option 81C CP PIV

The Communication Server 1000M MG and Meridian 1 Option 81C are dual-CPU systems with standby processing capabilities, fully-redundant memory, and up to eight full network groups. These systems are equipped with two redundant input/output processor and disk drive unit combination packs.

The following modules are required:

- two Core/Network modules (provides one network group)
- a minimum of two Network modules (provides one network group)
- a minimum of one IPE module

Additional Network and IPE modules are required for additional network groups. Application modules can also be used.

Figure 4: Meridian 1 Option 81C CP PIV on page 22 shows a typical configuration for eight full network groups. Additional columns can be added, and there can be more than one row of columns.

With the addition of a Signaling Server, Meridian 1 Option 81C or Meridian 1 Option 81C CP PIV becomes a Communication Server 1000M MG. Figure 5: Communication Server 1000M MG on page 22 illustrates the Communication Server 1000M MG.

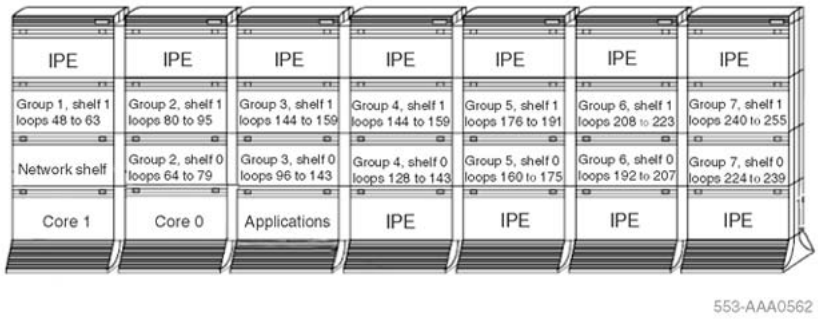

Figure 4: Meridian 1 Option 81C CP PIV

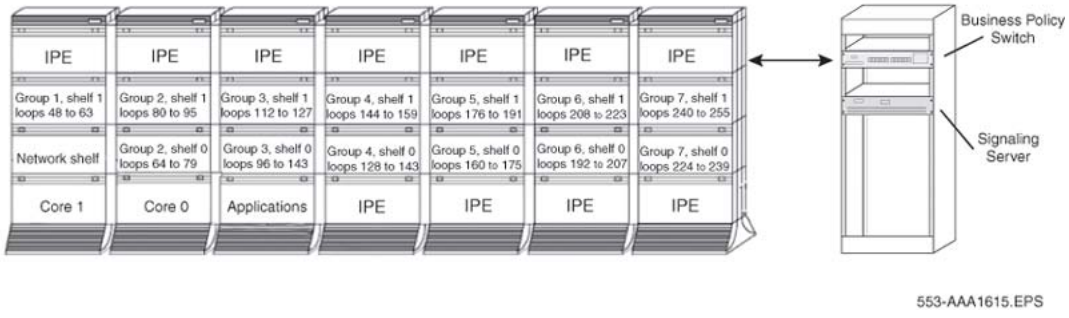

Figure 5: Communication Server 1000M MG

Table 3: Specifications for Communication Server 1000M MG and Meridian 1 Option 81C CP PIV on page 23 lists specifications for the Meridian 1 Option 81C CP PIV.

Table 3: Specifications for Communication Server 1000M MG and Meridian 1 Option 81C CP PIV

System characteristics:	
Maximum number of ports	• 10 000
Input voltage	• 208 V AC or –48 V DC
Number of CPUs	• 2 (redundant)
Number of network loops	• 256
Memory	• 512 MB
Base hardware:	
cCPI Core/Network module (two side-by-side)	Cards in the front of the module: • Call Processor Pentium IV® (CP PIV) card • System Utility (Sys Util) card • Core to Network Interface (cCNI) cards • 3-Port Extender (3PE) card • Peripheral Signaling card (PS) • Fiber Junctor Interface (FIJI) card • Network cards • Superloop Network cards • Conference/TDS card • CE power supply • Hybrid Bus Terminators Cards in the back of the module: • System Utility Transition (Sys Util Trans) card • cCNI Transition (cCNI Trans) cards • Superloop Network card • Clock Controller card • SDI-type card

IPE module	• DDP2 pack • MSDL • IPE power supply • Controller card • IPE cards
Pedestal (one per column)	• System monitor • Power Distribution Unit (PDU) • Blower unit
Top cap (one per column)	• Thermostat harness • Air probe harness

System modules

Each type of module is available in AC-powered and DC-powered versions (except the NT8D36 InterGroup module that does not require power). AC-power modules generally require a module power distribution unit (MPDU) to provide circuit breakers for the power supplies. DC-powered modules do not require an MPDU because a switch on each power supply performs the same function as the MPDU circuit breakers.

Note:

In the UK, DC-powered modules must be used.

The figures in this chapter show a typical configuration for each module. DC power is represented in these examples.

NT4N41 Core/Network module

This module provides common control and network interface functions. With the Communication Server 1000M MG and the Meridian 1 Option 81C CP PIV, two Core/Net modules are installed side-by-side. With the Communication Server 1000M SG and the Meridian 1 Option 61C CP PIV, the modules are stacked or mounted side-by-side.

One section of this module houses the common control complex (CPU, memory, up to four cCNI cards, and mass storage functions). The other section supports a Conference card, one Peripheral Signaling card, one 3-Port Extender card, and optional network cards.

Note:

cCNI card slots 13 and 14 remain empty.

Each Core/Network module houses up to four NT8D04 Superloop Network Cards for a total of 16 network loops. Superloop Network cards are cabled to the backplane of an IPE module. In a typical configuration, one conference/TDS card is configured in the module, leaving 14 voice/data loops available.

Figure 6: NT4N41 cPCI Core/Network module on page 25 illustrates an NT4N41 Core/Network module.

Core side

The Core side of the module contains the circuit cards that process calls, manage network resources, store system memory, maintain the user database, and monitor the system. These circuit cards also provide administration interfaces through a terminal, modem, or enterprise IP network.

The Core side runs in redundant mode: one Core operates the system while the other runs diagnostic checks and remains ready to take over if the active Core fails. Both Cores are connected to each Network group depending on hardware configuration. If one Core fails, the second Core immediately takes over call processing. The Core shelf backplane is a compact PCI data bus.

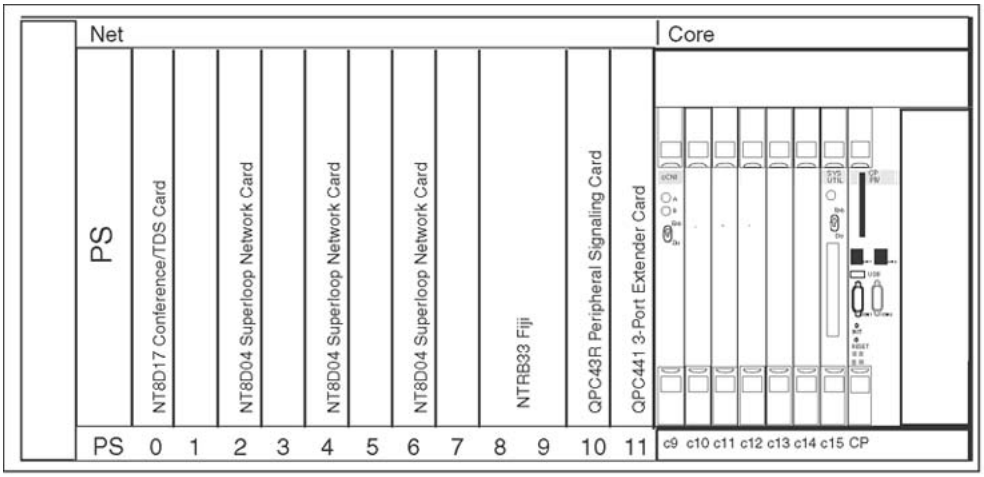

Figure 6: NT4N41 cPCI Core/Network module

Network side

The Network side of this module contains the cards for half of the Network group 0. The other half of Network group 0 resides in the second core network module.

The Communication Server 1000M MG and Meridian 1 PBX 81C CP PIV support a Fiber Network Fabric network system with a FIJI card. The double slot FIJI (NTRB33AF) card is installed in slots 8 and 9 on the Net side of the Core/Net module, while the single slot FIJI (NTRB33BBE5) card is installed in slot 9 on the Net side of the Core/Net module.

The double slot FIJI (NTRB33AF) card is installed in slots 2 and 3 on the Network module, while the single slot FIJI (NTRB33BBE5) card is installed in slot 2 on the Network module.

NT8D35 Network module

This module provides the network switching functions in the Meridian 1 Option 81C CP PIV, and Communication Server 1000M MG.

Two Network modules are required to make a full network group of 32 loops. A maximum of 16 Network modules (eight network groups) can be configured in the Meridian 1 Option 81C, Communication Server 1000M MG, and Meridian 1 Option 81C CP PIV.

The Network module houses up to four NT8D04 Superloop Network Cards, for a total of 16 network loops. Superloop network cards are cabled to the backplane of an IPE module. In a typical configuration, one Conference/TDS card is configured in the module, leaving 14 voice/data loops available. In Communication Server 1000M MG and Meridian 1 Option 81C CP PIV, the Conference/TDS cards are located in the Core/Network module. The Clock Controller must be installed in slot 13.

Figure 7: NT8D35 Network module on page 26 shows the cards housed in the module.

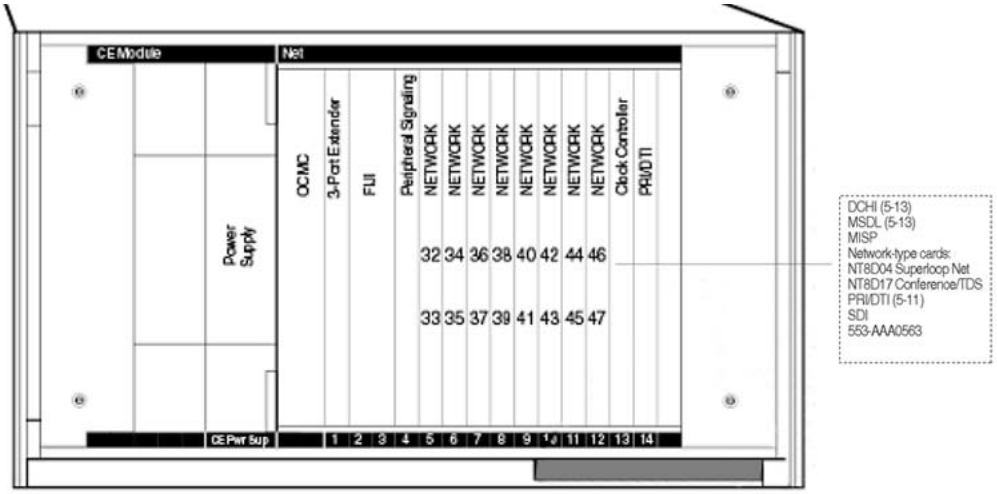

Figure 7: NT8D35 Network module

The Network module can be used as a PRI/DTI expansion module. The number of PRI/DTI expansion modules that can be used is determined by traffic considerations. Figure 8: NT8D35 Network module configured for PRI/DTI expansion on page 27 shows the card slot configuration when the Network module is used for PRI/DTI expansion.

Note:

The bus terminating units (BTUs) that are equipped in the NT8D35AA and NT8D35DC Network module configuration are not required for, and will interfere with, the PRI/DTI expansion configuration. The NT8D35BA and NT8D35EA Network modules do not use or need BTUs for any application.

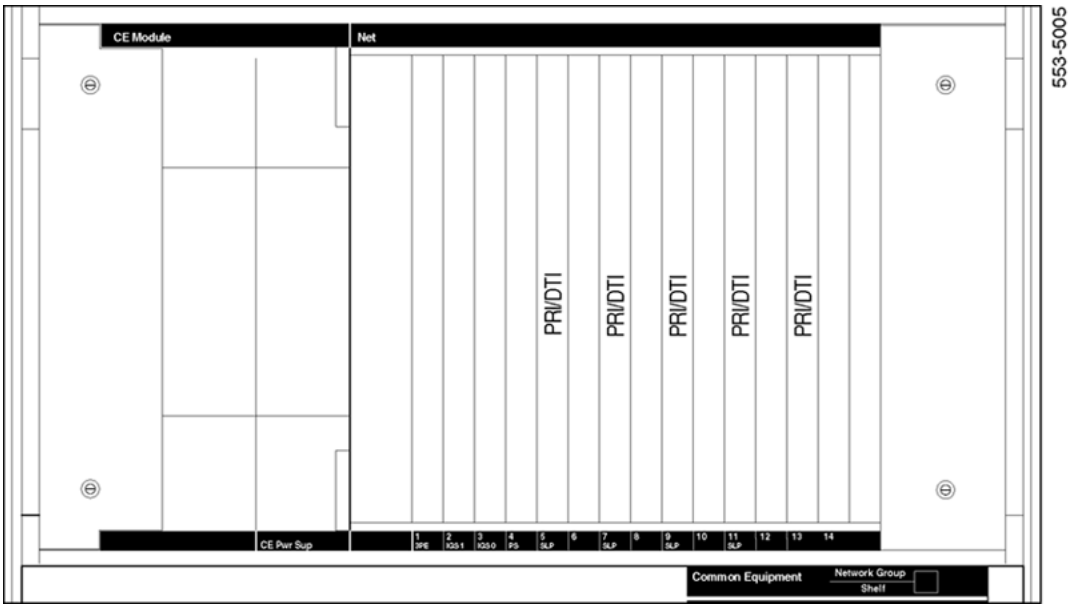

Figure 8: NT8D35 Network module configured for PRI/DTI expansion

Fiber Network Fabric

Fiber Network Fabric extends and enhances the five-group network architecture to 8 non-blocking (inter-group) Network groups, with a resulting expansion in network capacity to 8000 timeslots available for Intergroup traffic. The Meridian 1 Option 61C CP PIV can be upgraded to a Meridian 1 Option 81C CP PIV with Fiber Network Fabric. This upgrade takes a Meridian 1 Option 61C CP PIV to a Meridian 1 Option 81C CP PIV with two groups. Figure 9: Four group Fiber Network Fabric configuration on page 28 illustrates a four group configuration of Fiber Network Fabric.

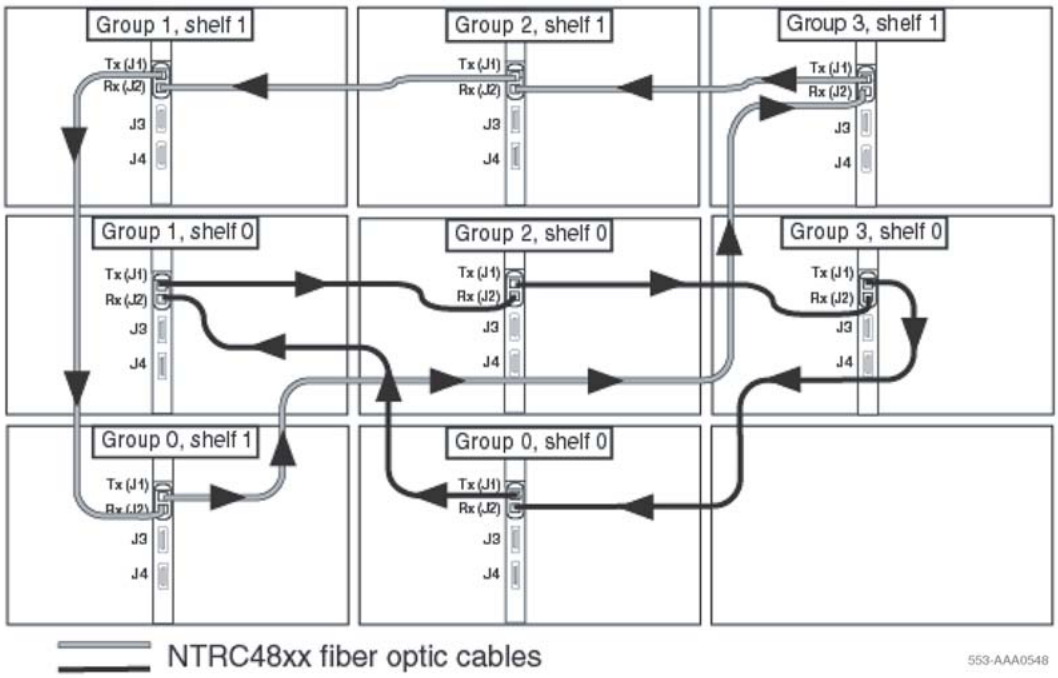

Figure 9: Four group Fiber Network Fabric configuration

NT8D37 Intelligent Peripheral Equipment module

The Intelligent Peripheral Equipment (IPE) module provides the interface between network switching and IPE cards, such as intelligent line and trunk cards, in all Large Systems.

The IPE module houses one NT8D01 Controller Card, which is the peripheral equipment controller, and up to 16 IPE cards, supporting up to 512 terminal numbers (256 voice and 256 data). The controller card is cabled to the NT8D04 Superloop Network Card.

Figure 10: NT8D37 IPE module on page 29 shows the card slot assignments in the module.

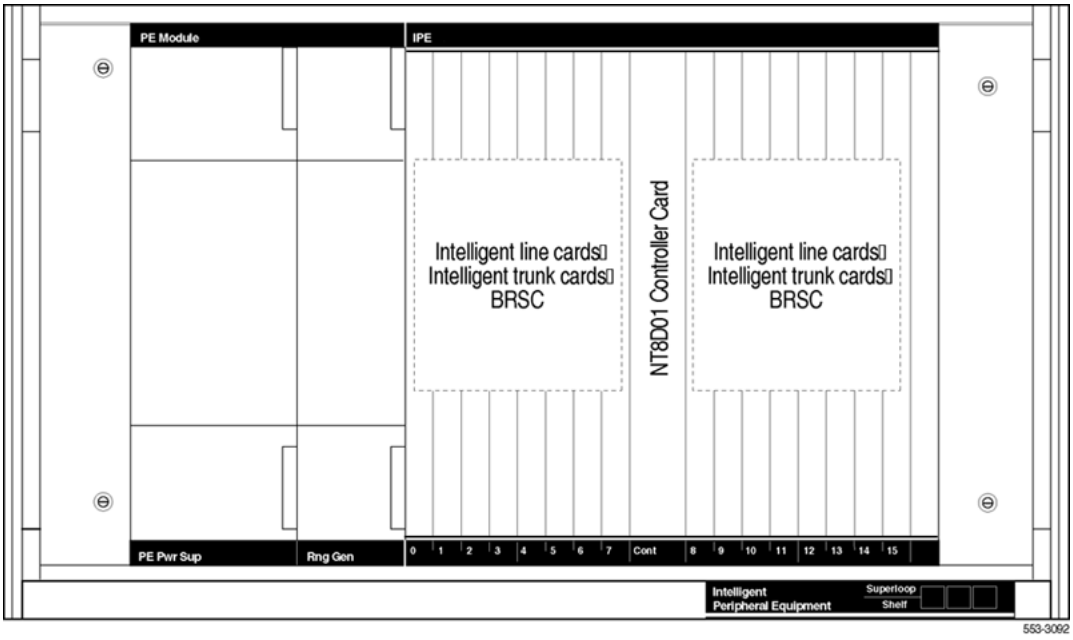

Figure 10: NT8D37 IPE module

Fiber Remote IPE module

This module provides fiber-optic links between the network functions in a Large System and the peripheral controller functions in the Fiber Remote IPE. A floor-standing column or wall-mounted cabinet is installed at the remote site and is connected to the Large System using fiber-optic links.

The Fiber Remote IPE provides Large Systems functionality with the installation of only IPE modules and IPE cards at a distant site. Since the remote IPE system uses the common equipment and network equipment of the associated local Large System, it can deliver the same features and functionality as the local system. See Fiber Remote IPE on page 57 for more information on the Fiber Remote IPE configuration option.

Carrier Remote IPE

The Carrier Remote IPE provides functionality by installing only IPE modules and IPE cards at a distant site. The Remote IPE shares the system common and network equipment to provide the same functions and features to remote subscribers that are available to local system subscribers.

See Carrier Remote IPE on page 59 for more information on the Carrier Remote IPE configuration option.

Chapter 5: System architecture

Contents

This section contains information on the following topics:

Hardware architecture on page 31

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- Network interface on page 36
- Intelligent Peripheral Equipment on page 39
- Terminal equipment on page 41
- Power equipment on page 42
- Signaling Server on page 45

Software architecture on page 53

- Firmware on page 54
- Software on page 54
- Office data on page 54
- Resident programs on page 54
- Nonresident programs on page 55

Configuration options on page 56

- Fiber Remote IPE on page 57
- Carrier Remote IPE on page 59
- Branch Office on page 60
- Geographic Redundancy on page 60

Hardware architecture

Avaya Communication Server 1000M (Avaya CS 1000M) and Meridian 1 systems are circuit-switched digital systems that provide voice and data transmission. The internal hardware is

divided into the following functional areas (see Figure 11: Large System basic architecture on page 32 on Figure 11: Large System basic architecture on page 32):

- Common Control Complex (Common Equipment) circuit cards provide the processor control, software execution, and memory functions of the system.
- Network Interface (Common Equipment) circuit cards perform switching functions between the processor and Intelligent Peripheral Equipment (IPE) cards.

Note:

As shown in Figure 11: Large System basic architecture on page 32, the network interface function is generally considered a subset of the Common Equipment functions.

- IPE circuit cards provide the interface between the network and connected devices, including Terminal Equipment and trunks.
- Terminal Equipment includes telephones and attendant consoles (and may include equipment such as data terminals, printers, and modems).
- Power Equipment provides the electrical voltages required for system operation and cooling, and sensor equipment for system protection.

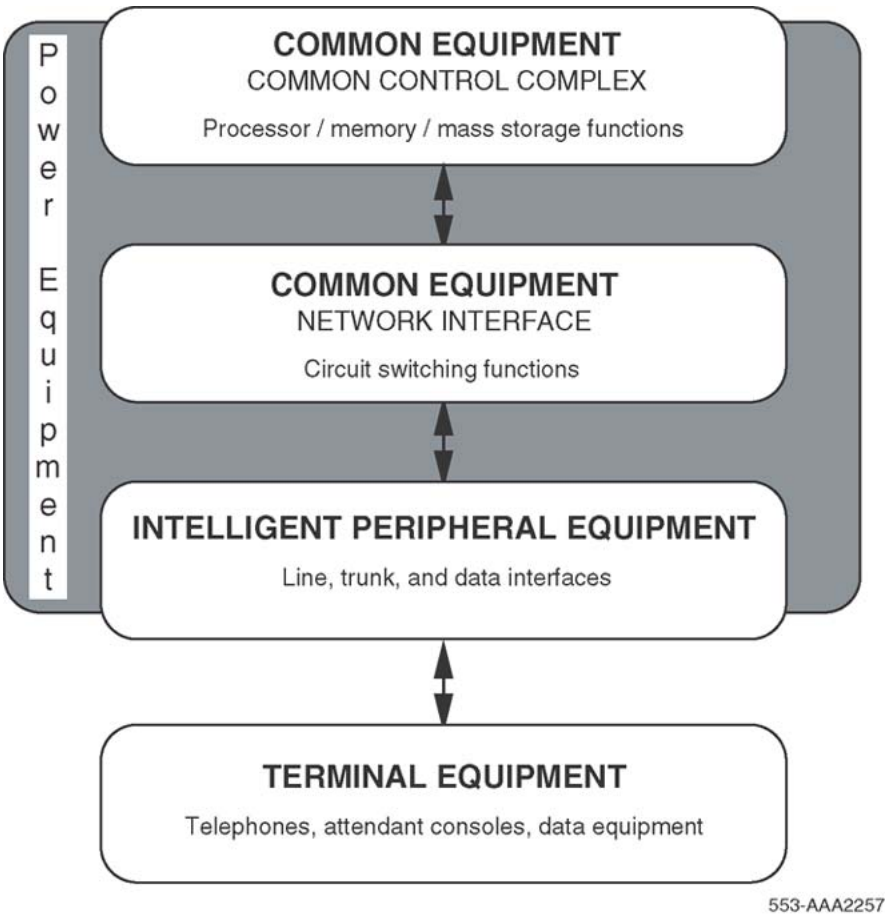

Figure 11: Large System basic architecture

Common control complex

The processor is the common control complex of the system. It provides the sequences to process voice and data connections, monitor call activity, and perform system administration and maintenance.

The processor communicates with the network interface over a common control bus that carries the flow of information.

The common control complex consists of:

- the processor card or cards that provide the computing power for system operation
- system memory that stores all operating software programs and data unique to each system
- the disk drive unit that provides mass storage for operating programs and data
- I/O interfaces that provide an information exchange between the user and the system

Avaya CS 1000M and Meridian 1core processor cards support extensive networking and provide intensive use of software features and applications, including call centers of up to 1000 agents.

The core software architecture incorporates a real-time multitasking operating system, as well as code that delivers features and call processing. This architecture guarantees feature transparency to the user upgrading the core CPU. The core architecture also provides significant operation, administration, and maintenance enhancements for the people who work closely with the system software and hardware.

All core overlays reside in Dynamic Random Access Memory (DRAM) after they are loaded from the hard disk during an initial software load (software is shipped on redundant hard disks). The Resident Overlays featured in core-based systems ensure subsecond speeds in accessing the overlays.

The capacity enhancement in the core architecture is provided by the core control complex. In Large Systems with cPCI Core/Network modules, the core control complex refers to the two Core/Network modules (Core/Network 0 and Core/Network 1). The Core and Core/Network modules are fully redundant, with Core 1 duplicating the contents of Core 0.

The backplane in the Communication Server 1000M MG and Meridian 1 Option 81C CP PIV Core modules is a compact Peripheral Component Interconnect (PCI) data bus. PCI provides a high-speed data path between the CPU and peripheral devices. PCI runs at 33MHz, supports 32- and 64-bit data paths and bus mastering.

The backplane in the system is divided into "core" and "network" sides. The "network" side allows up to eight network cards to be installed for call processing capability.

In the Communication Server 1000M SG and Meridian 1 Option 61C CP PIV Core/Network module, the core side houses the following equipment:

- one Call Processor Pentium IV® (CP PIV) card
- one System Utility (Sys Util) card
- one Core-to-Network Interface (cCNI) cards
- one System Utility Transition (Sys Util Trans) card
- four cCNI Transition (cCNI Trans) cards

Cabling between the CP cards allows memory shadowing and dual-CPU operation.

The CNI and CNI-3 cards provide the interface between the IPB and the network shelf, and between the CP card and three-port extender cards in the network shelf. Each CNI card provides two ports. Each CNI-3 card supports three ports. In a typical configuration, three CNI-3 cards support eight network groups.

Software is now installed with 2 Compact Flash cards: one embedded on the CP PIV pack (FMD), and one hot swappable (RMD).

The system uses a Security Device and an electronic Keycode to perform security authentication. The security device is located on the utility card. The Keycode file contains information about which features the system provides as well as License limits.

Core/Net modules diagnose faults in field-replaceable units for all core hardware, including cables. In case of a failure, a message appears on the system terminal and on the Liquid Crystal Display (LCD) of the CP card. All messages can be stored in a file for future diagnostics.

Figure 12: Communication Server 1000M SG and Meridian 1 Option 61C CP PIV core complex on page 35 provides a block diagram of the Communication Server 1000M SG and Meridian 1 Option 61C CP PIV core architecture.

In the Communication Server 1000M MG and Meridian 1 Option 81C cPCI Core/Network module, the core side houses the following equipment:

- one Call Processor Pentium IV® (CP PIV) card
- one System Utility (Sys Util) card
- up to four Core to Network Interface (cCNI) cards
- one System Utility Transition (Sys Util Trans) card
- four cCNI Transition (cCNI Trans) cards

Core/Net modules diagnose faults in field-replaceable units for all core hardware, including cables. In case of a failure, a message appears on the system terminal and on the LCD of the faceplate of the utility card.

Core to Core Ethernet connection (LAN1 to LAN2) between the CP PIV cards allows memory shadowing and dual-CPU operation.

The cCNI Transition cards connect the Core module cards to the 3PE cards in the Network modules. Each Core module contains between one and four cCNI cards. Since each cCNI

card can connect up to two Network groups, each Core is connected to a minimum of two groups and a maximum of eight groups. The number of cCNI cards in a system depends on the number of Network groups in that system. The first cCNI card that connects to Network group 0 and group 1 is installed in slot c9 of each Core/Net module. Each additional cCNI card is installed in ascending order from slots c10 to c12.

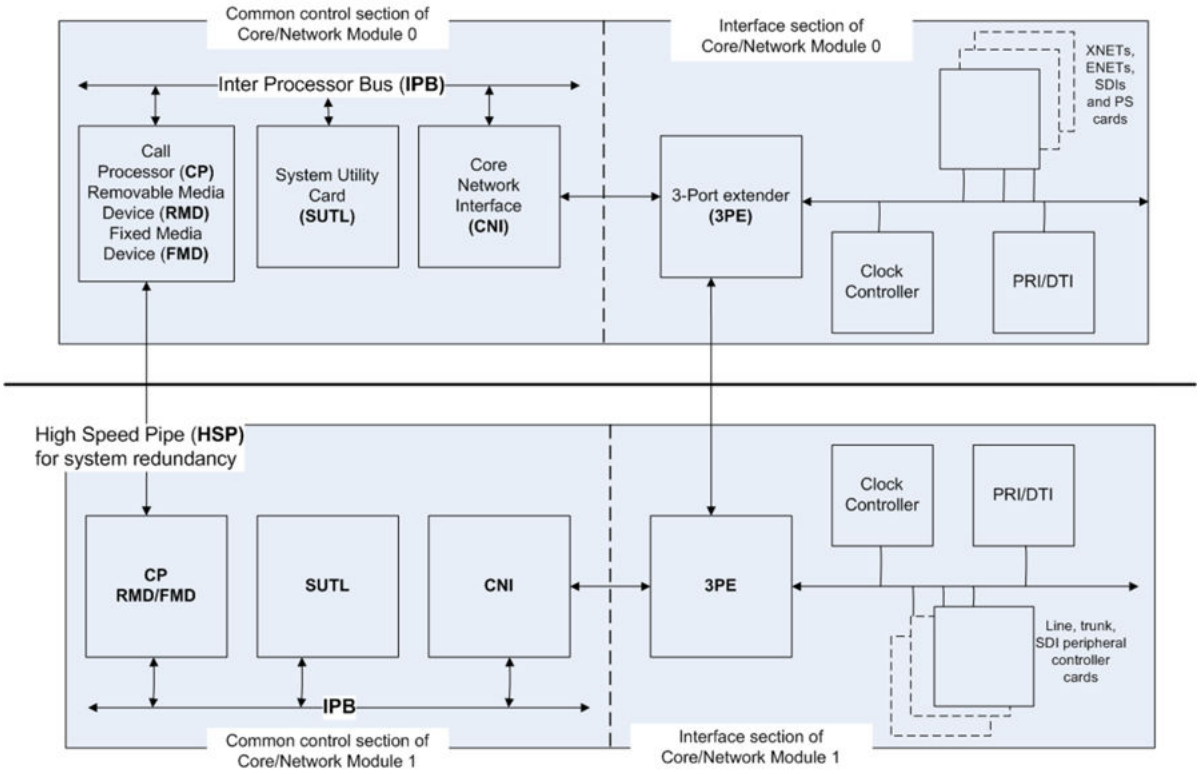

Figure 12: Communication Server 1000M SG and Meridian 1 Option 61C CP PIV core complex

The System Utility card supports Card ID. The card provides an interface between the security device and the computer, and an interface between the XSM and display panel for each Core/Net card cage. This card also includes a switch on the faceplate to enable or disable the Core cards.

The System Utility Transition card provides connections for the security device, the system monitor, and the status panel. This Transition card is mounted on the rear of the backplane (back side) directly behind the System Utility card.

The cCNI Transition cards provide the cable connections to the 3PE Termination Panel at the back of the module. A cCNI Transition card is mounted directly behind each cCNI card (on the back of the Core backplane). Four cCNI Transition cards for Core/Net module are installed in the factory regardless of how many cCNI main cards are configured for the system.

Network interface

Network switching, based on digital multiplexed loops, interconnects peripheral ports. A loop transmits voice, data, and signaling information over a bidirectional path between the network and peripheral ports.

Network cards digitally transmit voice and data signals, using space switching and Time Division Multiplexing (TDM) technology. Network switching also requires service loops (such as conference and TDS loops), which provide call progress tones and outpulsing.

The following cards provide basic network switching control:

- The NT8D04 Superloop Network card provides switching for four loops grouped together in an entity called a superloop.
- The NT5D12 Digital Trunk card provides switching for two DTI/PRI loops and takes one network slot.
- The NT5D97 Digital Trunk card provides switching for two DTI2/PRI2 loops and takes one network slot.

The NT5D12 and NT5D97 Digital Trunk cards replace the functionality of the QPC720 DTI/PRI and QPC414 Network card, which provided switching for two loops.

Network organization

Network loops are organized into groups. A system is generally configured as one of the following:

- a single group system (Communication Server 1000M SG) that provides up to 32 loops
- a multi-group system (Communication Server 1000M MG) that provides up to 256 loops

The Fiber Junctor Interface (FIJI) cards in the Network modules are connected with fiber-optic cables to form a Dual Ring Fiber Network. This network consists of two separate rings: one ring connects all the Network shelf 0s while the second ring connects all the Network shelf 1s. This network communicates on a subset of the Sonet OC12c protocol (622 MB bandwidth on each ring).

The Dual Ring fiber-optic cable configuration provides complete non-blocking communication between the Network groups; this eliminates the incidence of busy signals for calls switched between groups. Each FIJI card can handle 32 PCM links. A system of eight Network groups provides 8000 timeslots for 4000 simultaneous conversations.

This Dual Ring network is fully redundant: each of the fiber-optic cable rings is capable of handling the traffic for an entire eight group network. If a fault in one ring is detected, the other ring automatically takes over call processing. No calls are lost during the switchover.

The Dual Ring Fiber network operated under four states:

- Normal
  - Traffic is shared between the two rings.
  - Each FIJI card drives 480 timeslots.
- Full
  - Traffic is handled by a single ring.
  - Each FIJI card drives 960 timeslots
- Survival
  - FIJI cards in both rings are used to maintain intergroup traffic.
- Disabled
  - The ring is inactive and does not support call processing.

Superloop network configurations

By combining four network loops, the superloop network card makes 120 timeslots available to IPE cards. Compared to regular network loops, the increased bandwidth and a larger pool of timeslots increases network traffic capacity for each 120-timeslot bundle by 25 percent (at a P0.1 grade of service).

The NT8D37 IPE module is divided into segments numbered 0–3 of four card slots each (see Figure 13: Superloop segments in the IPE module on page 38). Segment 0 consists of slots 0–3, segment 1 consists of slots 4–7, segment 2 consists of slots 8–11, and segment 3 consists of slots 12–15.

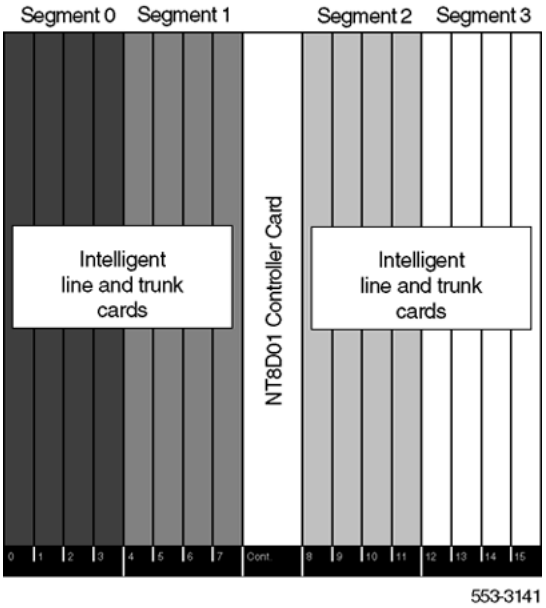

Figure 13: Superloop segments in the IPE module

A superloop is made up of NT8D04 Superloop Network cards, NT8D01AC or NT8D01BC Controller-4 or NT8D01AD Controller-2 cards, and from one to eight IPE segments. The NT8D01BC Controller-4 replaces the NT8D01AC and NT8D01AD Controller cards for replacements and new installations.

A number of superloop-to-segment configurations are possible:

- one segment per superloop requires four superloop network cards and one controller-4 card
- two segments per superloop requires two superloop network cards and one controller-2 card
- four segments per superloop requires one superloop network card and one controller-2 card
- eight segments per superloop requires one superloop network card and two controller-2 cards
- one segment per superloop/three segments on a second superloop requires two superloop network cards and one controller-2 card
- two segments per superloop/six segments on a second superloop requires two superloop network cards and two controller-2 cards

As an example of a superloop configuration, Figure 14: Eight segments per superloop on page 39 shows eight segments per superloop. If a segment in this configuration is equipped with analog line cards and trunk cards, a high concentration environment of 120 timeslots to 128–512 Terminal Numbers (TNs) is provided. If half of the data TNs on digital line cards are enabled, this configuration provides a concentration of 120 timeslots to 768 TNs.

For a detailed description of superloop-to-segment configurations, see *Avaya Communication Server 1000M and Meridian 1 Large System Planning and Engineering, (NN43021-220)*.

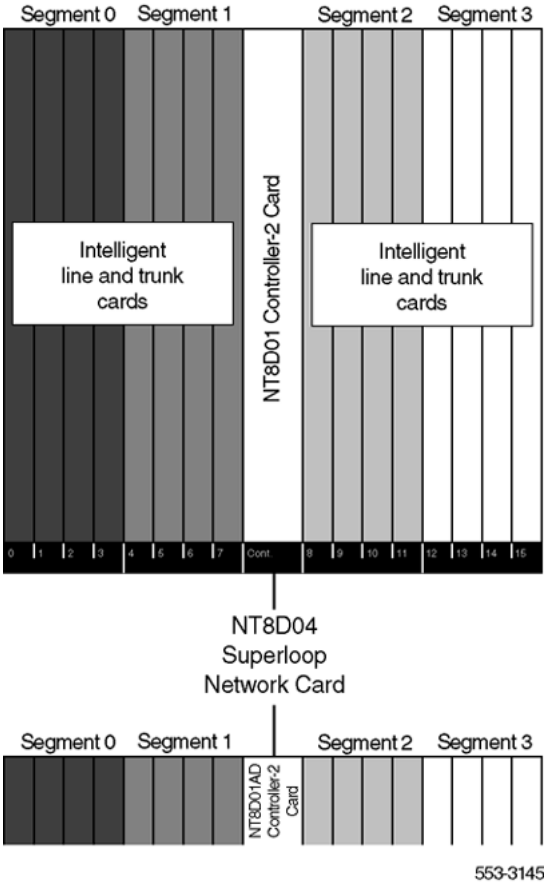

Figure 14: Eight segments per superloop

Intelligent Peripheral Equipment

Using pulse code modulation (PCM), Intelligent Peripheral Equipment (IPE) converts analog signals to digital signals before switching is performed by the network. This conversion method samples the amplitude of the analog signal at a rate of twice the highest signal frequency, then converts the amplitude into a series of coded pulses. For telecommunications, the PCM-sampling frequency standard is 8 kHz.

Compressing-expanding (companding) PCM is a standard technique for using 8-bit words to efficiently represent the range of voice and data signals. Two standards for companding, A-Law and µ-Law, are recognized worldwide. IPE conforms to both standards; the standard required is selected through software.

IPE is associated with network loops. IPE cards are supported by NT8D04 Superloop Network Card loops. The traffic requirements of all IPE cards provisioned on a particular network loop must match the traffic capacity of that loop.

IPE includes:

- controller cards that provide timing and control sequences and monitoring capabilities
- analog and digital line and trunk cards that provide interfaces to equipment outside the modules (such as telephones, data terminals, and trunks)

Table 4: Intelligent Peripheral Equipment cards on page 40 lists the IPE cards and the number of terminations each supports.

Table 4: Intelligent Peripheral Equipment cards

Intelligent Peripheral Equipment cards	Number of terminations
Controller cards:	
NT8D01 Controller Card-4	N/A
NT8D01 Controller Card-2	N/A
Line cards:	
NT1R20 OPS Analog Line card	8
NT5K02 Analog Line card	16
NT5K96 Analog Line card	16
NT8D02 Digital Line card	16 to 32
NT8D09 Analog Message Waiting Line card	16
Trunk cards:	
NT5K07 Universal Trunk card	8
NT5K17 Direct Dial Inward Trunk card	8
NT5K18 Extended CO Trunk card	8
NT5K19 E&M/2280 Hz Trunk card	4
NT5K36 Direct Inward/Direct Outward Dial card	4
NT5K70 Extended CO Trunk card	8
NT5K71 Extended CO Trunk card	4
NT5K72 E&M Trunk card	4
NT5K82 Extended CO Trunk card	8
NT5K83 E&M Trunk card	4
NT5K84 Direct Inward Dial Trunk card	8
NT5K90 Extended CO Trunk card	8
NT5K93 Extended CO Trunk card	8
NT5K99 Extended CO Trunk card	8

Intelligent Peripheral Equipment cards	Number of terminations
NT8D14 Universal Trunk card	8
NT8D15 E&M Trunk card	4
NTAG03 Extended CO Trunk card	8
NTAG04 Extended CO/Direct Inward Dial card	8
NTAG36 Meridian Integrated Recorded Announcement card	8
NTCK16 Generic Extended Flexible CO card	8
Special:	
NT5K20 Extended Tone Detector card	8
NT5K48 Global Extended Tone Detector card	8
NT5K92 Direct Inward Dial Tester card	1

Note:

Terminal number (TN) density per segment is 16 to 128 TNs, with 64 to 512 TNs per IPE module. The maximum TN density assumes all slots are equipped with NT8D02 Digital Line cards with 16 voice and 16 data TNs provisioned. A typical mix of line and trunk cards yields a nominal density of 64 TNs per segment, 256 TNs per IPE module.

Intelligent Peripheral Equipment remote location

In a local operating environment, IPE can be housed up to 15.2 m (50 ft) from the Common Equipment. IPE installed in a remote location extends this range, allowing approximately 112.6 km (70 miles) between local and remote facilities.

This extension is achieved by converting multiplexed loop signals to a form compatible with the commonly used T-1 type digital transmission system. Refer to Table 4: Intelligent Peripheral Equipment cards on page 40 for a list of IPE cards for use at the remote site.

Any medium that conforms to the DS-1 format (1.544 Mbps) can be used to link local and remote sites, including digital microwave radio and fiber-optic transmission systems.

Terminal equipment

Large Systems support a wide range of telephones, including multiple-line and single-line telephones, as well as digital telephones with key and display functions and data transmission capabilities. A range of options for attendant call processing and message center applications is also available. In addition, a number of add-on devices are available to extend and enhance the features of telephones and consoles. Add-on devices include key/lamp modules, lamp field arrays, handsets, and handsfree units.

For more information refer to *Avaya Telephones and Consoles Fundamentals, NN43001-567* and *Avaya IP Phones Fundamentals, NN43001-368*.

Digital telephones

Analog-to-digital conversion takes place in the digital telephone itself, rather than in the associated Peripheral Line card. This eliminates attenuation, distortion, and noise generated over telephone lines. Signaling and control functions are also handled digitally. Time Compression Multiplexing (TCM) is used to integrate the voice, data, and signaling information over a single pair of telephone wires.

For applications where data communication is required, Meridian 1 digital telephones offer an integrated data option that provides simultaneous voice and data communication over single pair wiring to a port on a digital line card.

Communication Server 1000M and Meridian 1 Large System supports telephones as described in:

- *Avaya IP Phones Fundamentals, (NN43001-368)*
- *Avaya Telephones and Consoles Fundamentals, (NN43001-567)*
- *Avaya WLAN Handsets Fundamentals, (NN43001-505)*
- *Avaya DECT Fundamentals, (NN43120-114)*

Attendant consoles

Meridian 1 attendant consoles provide high-volume call processing. Indicators and a 4 x 40 liquid crystal display (LCD) provide information required for processing calls and personalizing call answering. Loop keys and Incoming Call Indicator (ICI) keys allow the attendant to handle calls in sequence or to prioritize answering for specific trunk groups. An optional busy lamp field provides the attendant with user status.

Meridian attendant consoles support attendant message center options. The attendant console can be connected to a PC to provide electronic directory, dial-by-name, and text messaging functions. All call processing features can be accessed using the computer keyboard.

Power equipment

Large Systems provide a modular power distribution architecture.

Each column includes:

- a system monitor that provides:
  - power, cooling, and general system monitoring capabilities
  - error and status reporting down to the specific column and module
- circuit breaker protection

- a cooling system with forced air impellers that automatically adjusts velocity to meet the cooling requirements of the system
- backup capabilities

Each module includes:

- an individual power supply unit with shut-off (switch or breaker) protection
- a universal quick-connect power wiring harness that distributes input voltages and monitor signals to the power supply

All options are available in both AC-power and DC-power versions. The selection of an AC- or DC-powered system is determined primarily by reserve power requirements and existing power equipment at the installation site.

Although AC-powered and DC-powered systems have different internal power components, the internal architecture is virtually identical. AC- and DC-powered systems differ primarily in the external power components.

AC power

AC-powered systems require no external power components and can plug directly into commercial AC (utility) power. AC-powered systems are especially suitable for applications that do not require reserve power. They are also recommended systems that require reserve power with backup times ranging from 15 minutes to 8 hours.

If reserve power is required with an AC-powered system, an Uninterruptible Power Supply (UPS), along with its associated batteries (either internal or external to the unit), is installed in series with the AC power source (see Figure 15: External AC-power architecture with reserve power on page 44). An AC-powered system that does not require long-term backup can benefit from a UPS with short-term backup because the UPS typically provides power conditioning during normal operation, as well as reserve power during short outages or blowouts.

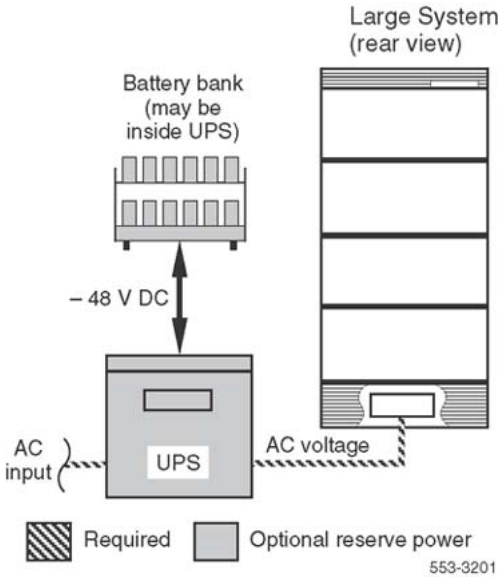

Figure 15: External AC-power architecture with reserve power

DC power

DC-powered systems always require external rectifiers to convert commercial AC power into the standard –48 V DC required within the system (see Figure 16: External DC-power architecture with reserve power on page 45). Batteries are generally used with DC-powered systems, as the traditional telecommunications powering method is for the rectifiers to continuously charge a bank of batteries, while the system power "floats" in parallel on the battery voltage. However, batteries are only required if reserve power is needed.

A variety of rectifiers and distribution equipment can be used to supply external DC power. Existing customer equipment can be used or a system that Avaya either supplies or recommends, such as the Small or Large Candeo, can be used. The Small Candeo is appropriate for Single Group or Multi Group systems that do not require more than 300 A, while the Large Candeo is suitable for larger systems. In all cases, equipment for rectification and distribution is required, while reserve batteries are optional.

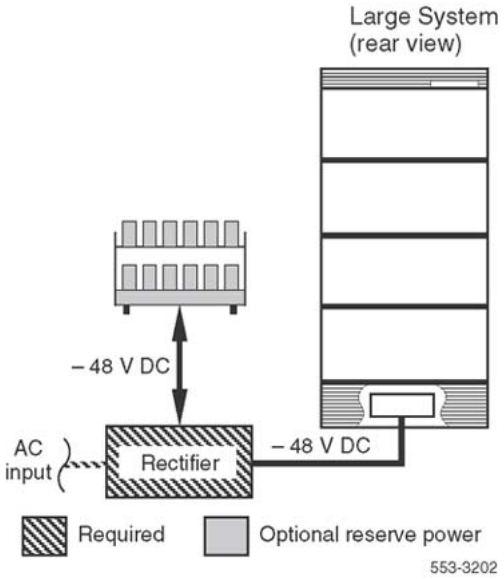

Figure 16: External DC-power architecture with reserve power

Candeo DC power system

The Candeo platform provides a simple, quick-to-deploy, and easy-to-operate power solution. Based upon modular building blocks (rectifiers, System Manager, DC distribution, and battery connection modules), the system is designed to power -48 V DC applications. The Large Candeo power system uses 50 A rectifiers and has a capacity of 1000 A; the Small Candeo (SP48300) uses 30 A rectifiers and has a capacity of 300 A. Both Large and Small Candeo systems provide "plug and walk-away" installation and setup. The platform can be reconfigured or expanded while it remains online.

Signaling Server

Communication Server 1000M systems use a Signaling Server. The Signaling Server is an PC-based server that provides a central processor to drive H.323 and Session Initiation Protocol (SIP) signaling for IP Phones and IP Peer Networking. It provides signaling interfaces to the IP network using software applications that operate on the Linux Platform Base operating system.

The Communication Server 1000 Linux Platform Base includes many operational, performance, and security hardening updates. The User Access Control (UAC) introduces eight Linux groups to define user privileges. Central Authentication provides user authentication across the security domain with single password. The Emergency Account allows you to log on through the Command Line Interface (CLI) if both Primary and Secondary Unified Communications Management (UCM) are offline. Secure File Transfer Protocol (SFTP) is the default file transfer protocol. You must explicitly identify FTP users, all users can use SFTP.

Communication Server 1000 does not support legacy Avaya ISP 1100 Signalling Servers or VxWorks Signaling Server applications. If upgrading, you must replace an ISP 1100 with a supported commercial off-the-shelf (COTS) or Common Processor Pentium Mobile (CP PM) Signaling Server.

Communication Server 1000 supports the following Signaling Server hardware:

- Common Processor Pentium Mobile server on page 46
- International Business Machines X306m server on page 47
- International Business Machines x3350 server on page 48
- Hewlett Packard DL320-G4 server on page 48
- Dell PowerEdge R300 server on page 49

The Signaling Server has both an ELAN and TLAN network interface. The Signaling Server communicates with the Call Server through an ELAN subnet.

The COTS Signaling Server mounts in a 19-inch rack. The CP PM Signaling Server circuit card mounts in an Universal Equipment Module (UEM) chassis. Signaling Servers can be installed in a load-sharing redundant configuration for higher scalability and reliability.

The following software components can operate on a Signaling Server:

- Terminal Proxy Server on page 49 (TPS)
- SIP/H.323 Signaling Gateways on page 50
- Network Routing Service on page 50 (NRS)
- SIP Proxy on page 52
- SIP Line on page 52
- Avaya Unified Communications Management on page 53

Signaling Server software elements can co-reside on one Signaling Server or reside individually on separate Signaling Servers, depending on the traffic and redundancy requirements for each element. For any co-resident Signaling Server software element combination the maximum call rate supported is 10K cph.

For more information about H.323 and SIP Trunking, refer to *Avaya IP Peer Networking Installation and Commissioning , (NN43001-313)*.

For more information about Linux and Linux Signaling Server applications, refer to *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)* and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

Common Processor Pentium Mobile server

The CP PM is a high-performance, circuit card-based server that can be configured as a Call Server, Signaling Server, or can contain a co-resident Call Server and Signaling Server in Communication Server 1000E systems. The CP PM NTDW66 model can only be configured as a Signaling Server in a Communication Server 1000M SG or Communication Server 1000M MG system. The CP PM circuit card installs in a Universal Equipment Module (UEM).

The 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 CP PM Signaling Server contains 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

For more information about installing and configuring the CP PM server as a Signaling Server, see *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)* and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

International Business Machines X306m server

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

The IBM X306m server has the following components:

- Intel Pentium 4 processor (3.6 GHz)
- Two simple swap Serial ATA hard drives (one 80 GB drive configured)
- 2 GB of RAM PC4200 dual-data-rate 2 (DDR2) by means of 4 DIMM slots (8 GB maximum)
- Two Gigabit Ethernet ports
- One DVD-COMBO (DVD/CD-RW) drive
- One serial port
- Four USB ports

For more information about configuring the IBM X306m server as a Signaling Server, see *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)* and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

International Business Machines x3350 server

The IBM x3350 server is a 1U rack-mounted Intel Xeon PC-based industry-standard COTS server.

The IBM x3350 server has the following components:

- Intel Xeon quad-core processor (minimum of 2.4 GHz)
- Two simple swap Serial-attached SCSI (SAS) or SATA hard drives. (minimum of one 75 GB hard drive)
- 4 GB of RAM PC2-5300 DDR II with error correcting code (ECC) by means of 4 DIMM slots (minimum 1 GB, maximum 8 GB RAM)
- Two Gigabit Ethernet ports
- One DVD-COMBO (DVD/CD-RW) drive
- One serial port
- Four USB 2.0 ports
- Hot-swap 450-watt auto-sensing AC power supply (optional second redundant power supply)
- Four hot-swap system fans

For more information about configuring the IBM x3350 server as a Signaling Server, see *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)* and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

Hewlett Packard DL320-G4 server

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

The HP DL320-G4 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 Gigabit Ethernet ports
- One CD-R/DVD ROM drive
- One serial port
- Three USB ports

For more information about configuring the HP DL320-G4 server as a Signaling Server, see *Avaya Linux Platform Base and Applications Installation and Commissioning,*

(NN43001-315) and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

Dell PowerEdge R300 server

The Dell PowerEdge R300 server is a 1U rack mounted Intel Xeon PC-based industry-standard COTS server.

The Dell PowerEdge R300 server has the following components:

- Intel Xeon quad-core processor (minimum of 2.4 GHz)
- Two hot-swap SAS or SATA hard drives. (minimum of one 75 GB hard drive)
- 4 GB of RAM PC2-5300 DDR II with ECC by means of 6 DIMM slots (minimum 1 GB, maximum 24 GB RAM)
- Two Gigabit Ethernet ports
- One DVD-COMBO (DVD/CD-RW) drive
- One serial port
- Three USB 2.0 ports
- Hot-swap 400-watt auto-sensing AC power supply (optional second redundant power supply)
- Six system fans

For more information about configuring the Dell PowerEdge R300 server as a Signaling Server, see *Avaya Linux Platform Base and Applications Installation and Commissioning, (NN43001-315)* and *Avaya Signaling Server IP Line Applications Fundamentals, (NN43001-125)*.

Terminal Proxy Server

The Terminal Proxy Server (TPS) acts as a signaling gateway between the IP Phones and the Call Server 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

Communication Server 1000 provides UNIStim security with Datagram Transport Layer Security (DTLS) enhancements. Each UNIStim service on a Line TPS has a DTLS and non-DTLS version running on adjacent UDP ports. 4100/4101 for CSV, 7300/7301 for TPS, and 5100/5101 for VTM. You must configure your firewall to allow Traffic on these UDP ports for the DTLS signaling to pass through. IP Phones function as DTLS clients and LTPS is the DTLS server. UNIStim-over-DTLS sessions can establish in two modes, depending on the configuration. In Secure Handshake Registration Mode, the phone establishes a DTLS session with the LTPS on port 4101 after initialization. In Switchover Registration Mode, the phone begins a regular registration over unencrypted RUDP on port 4100 and receives instructions

from the LTPS to switch to DTLS encryption. The modes distinguish from the client perspective and not from the server or system-wide perspective. A single Communication Server 1000 system can have some IP phones in Secure Handshake mode and other IP phones in Switchover mode.

The UNIStim security with DTLS feature adds the capability for the LTPS to detect if a telephone is using Secure UNIStim. You can list the telephones based on the encryption type using the isetSecGet command on the LTPS or the STIP DTLS command in overlay 117 on the Call Server.

SIP/H.323 Signaling Gateways

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

The SIP/H.323 Signaling Gateway must register with the Network Routing Service (NRS). Virtual TNs enable you to configure service data without hard-wiring IP Phones to the Communication Server 1000M system. Virtual TNs are configured in LD 97.

To support IP Peer Networking, dual Call Servers in a Communication Server 1000M must be associate with Signaling Servers that run SIP/H.323 Signaling Gateway software. The number of Signaling Servers required depends on the capacity and level of redundancy required.

Network Routing Service

Network Routing Service (NRS) 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 Signaling Server.

The SIP Proxy NRS is hosted in a stand-alone mode on a dedicated CP PM or COTS server running the Linux™ real-time operating system.

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 Connect Server (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. 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 Communication Server 1000M 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.

For more information about NRS, see *Avaya Network Routing Service Fundamentals, (NN43001-130)*.

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 Unified Communications Management framework

For more information about NRS Manager, see *Avaya Unified Communications Management Common Services Fundamentals, (NN43001-116) and Avaya Network Routing Service Fundamentals, (NN43001-130)*

SIP Proxy

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 Communication Server 1000, 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.

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.

SIP Line

The SIP Line feature provides an IP PBX solution to deliver business grade telephony features to IP end points. SIP Line integrates SIP end points in the Communication Server 1000 system and extends business telephony features to SIP clients.

SIP Line comprises three software components: Call Server SIP Line, SIP Line Gateway (SLG), and SIP Line Management Service (SMS). Software changes on the Call Server are bundled within SIPL Package 417. SLG and SMS are Signaling Server applications you can deploy to CP PM and COTS Signaling Servers.

You can configure SIP clients as a regular Universal Extensions or as SIP Lines with LD 11. The Call Server hosts each SIP Line instance, and each UEXT represents one SIP user. SLG serves as the SIP registrar and the SIP Proxy to users, and user AML/ISDN/SSD messages internally communicate with the Call Server.

For more information about SIP Line, see *Avaya SIP Line Fundamentals, (NN43001-508)*.

Avaya Unified Communications Management

Avaya Unified Communications Management (UCM) is a software framework that provides a Web interface to support administration of system components, including the Signaling Server. With Avaya UCM, Web pages provide access to information traditionally spread throughout multiple overlays.

UCM provides tools to configure and maintain the following components:

- Call Servers
- Avaya CS 1000 Media Gateway (MG 1000E, Expander)
- Avaya MG 1000B
- Network Routing Service (NRS)
- Signaling Servers
- Voice Gateway Media Cards

Communication Server 1000 UCM provides an interface to configure and enable Signaling Server application services, such as UNIStim Line TPS, SIP Gateway, H.323 Gateway, and SIP Line. The new interface allows you to configure the SIP Line Gateway along with other Signaling Server applications. You no longer require IP Telephony Node Management for this configuration.

For more information about UCM, see *Avaya Unified Communications Management Common Services Fundamentals, (NN43001-116)*.

Software architecture

The superloop network card and IPE cards contain microprocessors that allow software changes and upgrades from the storage media to be downloaded. These downloads can occur automatically, after a system reload, or manually through software program commands.

Call processing, maintenance, administration, and security are controlled by software programs stored either as firmware programs, as software programs resident in system memory, or as nonresident programs on storage media. The information that describes system configuration and associated IPE is called office data. This data resides in the system memory and on storage media.

Firmware

Firmware provides fundamental programs consisting of hard-wired logic instructions stored in Programmable Read-only Memory (PROM). Firmware programs manipulate data in the central processor and control input/output operations, error diagnostics, and recovery routines.

Software

Software programs consist of instruction sequences that control call processing, IPE, administration, and maintenance functions. Several generic software programs with optional feature packages are available.

Office data

Office data describes the characteristics of the system in terms of configuration and call-dependent information, such as features and services. Office data is arranged in blocks defining IPE, system configuration, and transient data.

Resident programs

Resident programs are always available in memory during system operation. Some resident programs are permanently programmed into the ROM portion of system memory. Other resident programs are automatically loaded into system memory at system power-up.

Resident programs include:

- Error Monitor, which continuously monitors call processing
- Initialize Program, which locates faults, rebuilds data, and releases reserve memory areas
- Overlay Loader, which locates, checks, and loads programs into the overlay area
- Overload Monitor, which monitors the volume of system messages and determines where overloads occur
- Resident Trunk Diagnostic, which monitors all trunk calls
- System Loader, which loads resident programs from the storage media into system memory at power-up
- Traffic Monitor, which examines the system schedule, transfers traffic data from accumulating to holding registers, and produces reports
- Port Blocking, is a VxWorks-based firewall designed to prevent port-based attacks on the CP PIV.

All software programs, including the non-resident programs listed in the following section are resident in, and accessible from, the memory on the cards listed above.

Nonresident programs

Nonresident programs are stored on storage media and loaded into the overlay area of system memory to perform specific tasks. They are removed from the overlay area when no longer required. Nonresident programs can be loaded automatically, under program control, or manually, through software commands.

Nonresident programs are manually loaded into memory through the system terminal (or maintenance telephone). A terminal can be configured as an input-only, output-only, or input and output device.

Software programs provide the system interface for maintenance, service change, and traffic measurement. Each program is independent and has its own specific set of commands and formats. These programs run concurrently with normal call processing without interfering with system traffic.

There are five main categories of nonresident programs:

- service change and print routines
- maintenance diagnostics
- traffic
- equipment data dump
- software audit

Service change and print routines

Service changes do not usually require hardware changes. Instead, the service administration programs are used to create or modify all aspects of the system from individual feature key assignments to complete system configurations. There are also programs and print routines for retrieving data from the system to check the status of office data assignments.

Maintenance diagnostics

These programs are the primary instrument for clearing system faults. Individual programs are used for automatically or manually testing the Common Equipment and IPE. The programs can be loaded into the overlay area at the request of maintenance personnel, or as part of a daily maintenance routine automatically initiated by the system at a specified time. In addition, background and signaling diagnostic routines can occupy the overlay area when it is not in use.

Traffic

All systems are equipped with traffic data accumulation programs. There is also a resident traffic print program that examines the schedules, transfers data from accumulating to holding registers in accordance with schedules, and prints the traffic data. In addition, there is a traffic program used to query and modify schedules, options, and thresholds.

Equipment data dump

After making service changes, the changes must be saved to storage media so that the data are retained in the event of a system reload. When the equipment data dump program is run, all the office data in the read/write memory is written to storage media. The program can be run automatically during the midnight routine or on a conditional basis (for example, a data dump would only occur if a software service change has been made). It can also be run manually through the system terminal or Element Manager.

The data dump program is also used to capture protected data store information (such as speed call lists) that may be changed by a user.

Software audit

This program monitors system operation and gives an indication of the general state of the system operation. The program is concerned mainly with the system software. When a software problem is encountered, the program attempts to clear the problem automatically.

Configuration options

Large Systems offer the following configuration options to support increased system redundancy:

- Fiber Remote IPE on page 57
- Carrier Remote IPE on page 59
- Branch Office on page 60
- Geographic Redundancy on page 60

Fiber Remote IPE

Large Systems can be configured in a distributed system to support remote subscribers, using Remote IPE modules or small cabinets. Fiber-optic links are used to connect the Remote IPE modules and small cabinets to the PBXs.

In a distributed system, subscriber connections are the same at local IPE modules as they are at Remote IPE modules or small cabinets. Furthermore, because Remote IPE equipment uses common and network equipment from the local system, subscriber functions and features are the same at local and remote sites.

Figure 17: Large System to Remote IPE site on page 57 illustrates the fiber-optic connection between a local system and remote system.

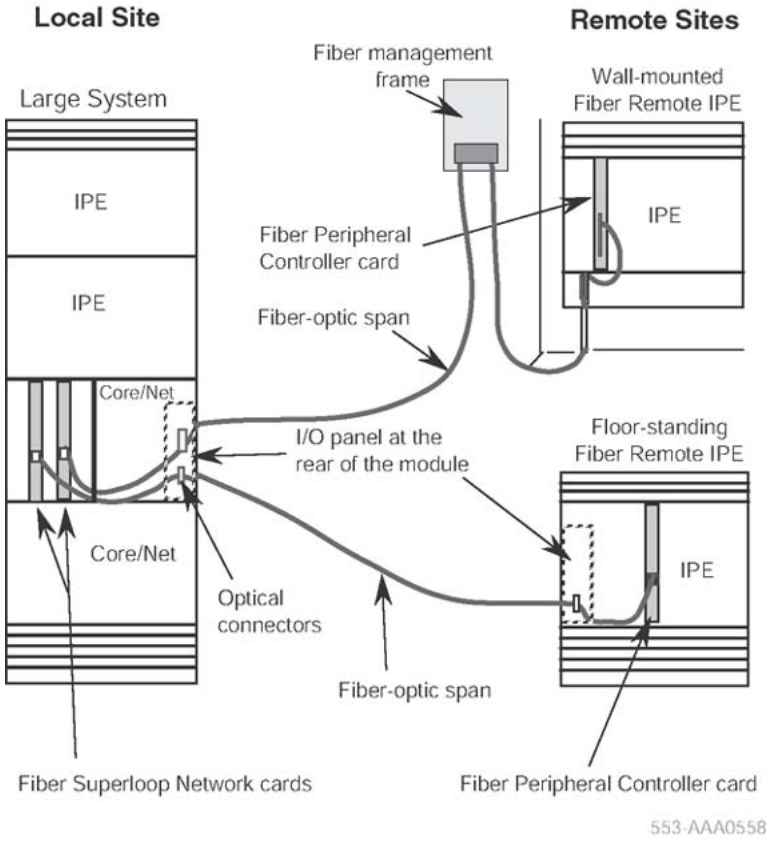

Figure 17: Large System to Remote IPE site

Fiber Remote Multi-IPE Interface

The Fiber Remote Multi-IPE Interface links a Large System with one or more Remote IPE sites to provide Meridian 1 Large System functionality. Since the remote IPE system uses the Common Equipment and Network Equipment of the associated local Large System, it can deliver the same features and functionality as the local system. Figure 18: Meridian 1 Large

System to Remote IPE connection over fiber-optic link on page 58 illustrates the fiber-optic connection between the local system and remote system.

The Fiber Remote Multi-IPE Interface links the local and remote systems using a fiber-optic link over a single-mode optical fiber.

The Fiber Remote Multi-IPE Interface is available in four options which allow the same configuration of the superloop connections at the remote site as the configuration of the IPE modules at the local site:

- Single-mode fiber supporting four superloops
- Single-mode fiber supporting two superloops
- Multi-mode fiber supporting four superloops
- Multi-mode fiber supporting two superloops

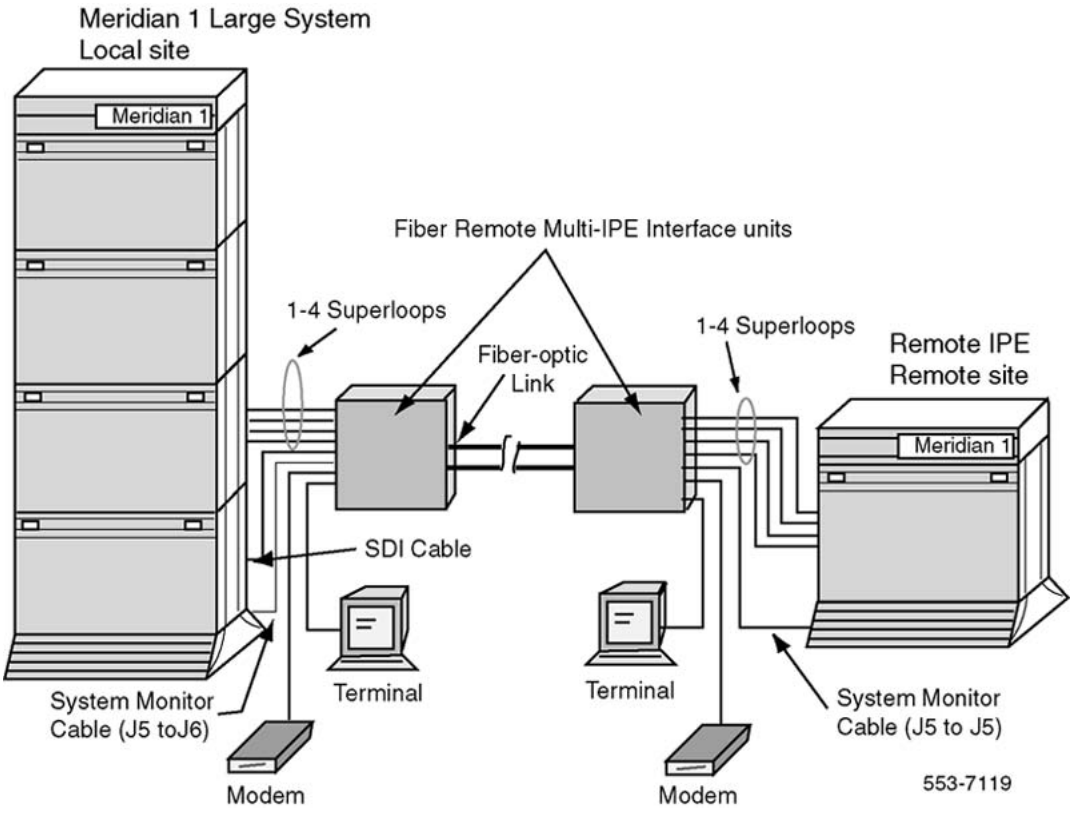

Figure 18: Meridian 1 Large System to Remote IPE connection over fiber-optic link

For more information on Fiber Remote IPE, see *Avaya Fiber Remote IPE Fundamentals, (NN43021-554)*. For more information on the Fiber Remote Multi-IPE Interface, see *Avaya Fiber Remote Multi-IPE Interface Fundamentals , (NN43021-556)*.

Carrier Remote IPE

The Carrier Remote IPE provides functionality by installing only IPE modules and IPE cards at a distant site. The Remote IPE shares the system's Common and Network Equipment to provide the same functions and features to remote subscribers that are available to local system subscribers.

A floor-standing column or a wall-mounted cabinet Carrier Remote IPE is installed at the remote site and is connected to the Meridian 1 Large System using T1 or E1 connection. Figure 19: Meridian 1 Large System to Carrier Remote IPE links on page 59 illustrates the connection between the local system and remote system.

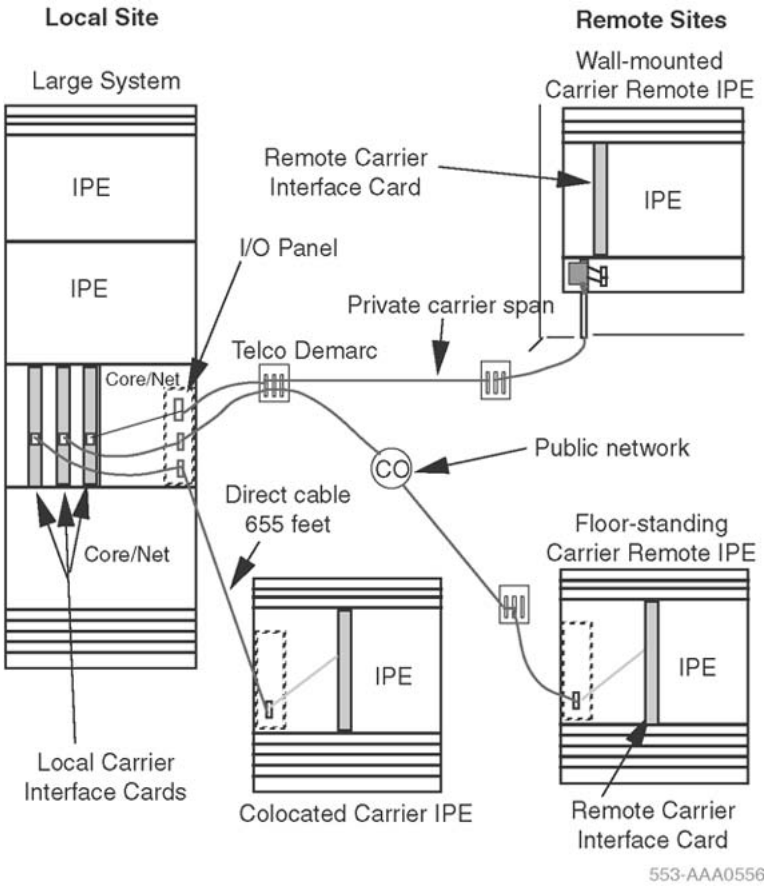

Figure 19: Meridian 1 Large System to Carrier Remote IPE links

For more information on Carrier Remote IPE, see *Avaya Carrier Remote IPE Fundamentals, (NN43021-555)*.

Branch Office

The Branch Office feature extends system features from a main office to one or more Branch Offices.

A Branch Office is an MG 1000B Core connected to an IP PBX at the main office over an enterprise IP network or over a WAN. This configuration enables a secondary location to centralize the call processing of its IP-based communications network. The Call Server at the main office provides the call processing for the IP Phones in both the main office and Branch Offices. The MG 1000B Core provides call processing functionality to local digital telephones and analog devices. The MG 1000B Core also provides digital and analog trunk access to the local Public Switched Telephone Network (PSTN).

The Branch Office connects to the main office over Virtual Trunks on an enterprise IP network or a WAN. The main office transmits and controls IP Phone calls and IP network connections. If the main office fails to function, or if there is a network outage, the MG 1000B Small System Controller (SSC) provides service to the telephones located in the Branch Office. This enables the IP Phones to survive the outage between the Branch Office and the main office.

A Branch Office can be created as a new hardware configuration, or by converting an existing Small System to a Branch Office. The functionality is the same in both configurations.

For more information on the Branch Office feature, see *Avaya Branch Office Installation and Commissioning, (NN43001-314)*.

Geographic Redundancy

Geographic Redundancy enables a customer to duplicate the entire redundant processing core of a Communication Server 1000M SG or Communication Server 1000M MG system at a remote location, at any distance, over the customer WAN. The duplicate core can then take over processing if the primary system fails for any reason. Geographic Redundancy also offers automatic database replication between main and standby systems to promote a smooth transition. When this configuration is implemented, the customer enhances the disaster recovery capability of the network and further secures ultra-high reliability.

Note:

Geographic Redundancy capabilities only apply to IP elements, for example, to IP Phones and Media Gateways. Geographic Redundancy does not apply to TDM elements.

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

Glossary

AC	Alternating Current
analog	A process that models information in the form of a continuously varying parameter such as current, voltage, or phase.
analog signal	A signal that varies in a continuous manner such as voice or music. An analog signal can be contrasted with a digital signal, which represents only discrete states. The signal emitted by a data telephone has both analog and discrete characteristics.
architecture	The interrelationship between the parts of a system; the framework of a system.
backplane	A printed circuit board that extends across the width of the card cage and connects to the circuit card connectors.
battery backup	System power furnished by standby batteries that are charged by a charger. If commercial power fails, the batteries maintain service for a limited period of time, determined by the size of the batteries and the traffic on the system.
capacity	The information-carrying ability of a telecommunications facility, group, network, or system measured in bits per second (bps).
card cage	A frame for holding circuit cards in a module; also called a card chassis.
CBT	Core Bus Terminator
CE	Common Equipment
Central Office (CO)	The site where a telephone company terminates customer lines and houses the switching equipment that interconnects those lines.
central processing unit (CPU)	The main portion of a computer that contains the primary storage, arithmetic and logic units, and the control unit (may also mean a mainframe computer).
circuit cards	Cards which carry the electronics for particular functions (such as memory and switching functions). Most cards are housed in the card cage in a module and connect to the backplane. Some cards must be installed in dedicated slots in a card cage. (Also called circuit packs or boards.)

CNI	Core-to-Network Interface
CO	See Central Office.
Common Equipment (CE)	A hardware subsystem that houses one or more central processing units (CPUs), memory cards, disk drive units, and service cards.
configuration	A group of machines (hardware) that are interconnected and are programmed to operate as a system.
CP	Call Processor
cPCI®	Peripheral Component Interconnect. PCI provides a high-speed data path between the CPU and peripheral devices (video, disk, network, etc.).
cPCI Transition card	Peripheral Component Interconnect Transition Card. Connects the Core module cards to the 3PE cards in the Network modules.
CP PIV®	The successor to the Pentium II from Intel. Pentium IV refers to the Pentium IV CPU chip.
CPU	Central Processing Unit
DC	Direct Current
diagnostic programs	Software routines used to test equipment and identify faulty components
digital signal	A signal made up of discrete, noncontinuous pulses whose information is contained in the duration, periods, and/or amplitude
DTR	Digitone Receiver
electromagnetic interference (EMI)	Unwanted electromagnetic static coupling, such as a ham radio signal being heard on a television, or causing static noise interference.
firmware	A set of instruction sequences stored permanently in hardware (ROM).
input/output (I/O)	Exchange between a machine and end-user equipment.
IODU/C	Input/Output Disk Unit with CD-ROM
IPB	Inter-Processor Bus
IPE	Intelligent Peripheral Equipment
ISDN	Integrated Services Digital Network
line	A communication channel or circuit; an electrical path.

loop	A bidirectional path between network equipment and peripheral equipment.
module power supplies	Individual power units that generate the different DC voltages required by the cards installed in each module.
Network Equipment	A hardware subsystem that provides digital multiplexed switching for voice, data, and signaling paths.
office data	Office data represents system configuration data, peripheral equipment data, and transient data (temporary) used for call processing.
PCM	Pulse Code Modulation.
pedestal	The bottom element in a column. Each pedestal houses a blower unit, an air filter, the PDU (which contains the column circuit breakers), and the system monitor.
power distribution unit (PDU)	Input power for Communication Server 1000M Large Systemand Meridian 1 Large Systemare brought into the pedestal to the PDU. The PDU distributes input power to the column.
Pulse Code Modulation (PCM)	A modulation technique where the signal is converted from an analog to a digital format by sampling the signal at periodic intervals and digitizing the amplitude into a finite number of discrete levels
random-access memory (RAM)	A storage system or computer memory accessible by the user for either storing or retrieving information. RAM is volatile memory.
read-only memory (ROM)	Storage system or computer memory that is "burned into" the microprocessor chip and can be read, but not written to or modified. ROM is nonvolatile memory.
redundancy	The duplication of software, or hardware, or both (such as redundant CPUs) used as a standby in case one fails.
SDI	Serial Data Interface. A family of cards equipped with SDI ports provide the I/O interface for the Communication Server 1000M Large Systemand Meridian 1 Large System.
software	A set of programmed instruction sequences stored either as resident programs in system memory or as nonresident programs stored on disk and loaded into memory when needed.
software generic	A term used to identify the system software. Each software generic has a series of releases, such as Release 25.
system monitor	A microprocessor-based circuit card that controls and monitors the status of cooling equipment and power-related hardware and functions.

system utility card	Provides an interface between the security device and the computer.
TDS	Tone and Digit Switch
Time Compression Multiplexing (TCM)	The combination of two or more information channels into a single transmission channel by assigning each information channel an exclusive periodic transmission time interval.
TN	Terminal Number
top cap	A top cap is mounted on the top module of each column. It provides airflow exits, EMI/RFI shielding, I/O cable entry and exit, and overhead cable-rack mounting. The top cap covers thermal sensor assemblies for the column.
trunk	A single circuit between two points, both of which are switching centers or individual distribution points.
universal equipment module (UEM)	A modular, self-contained hardware cabinet that houses a card cage, power supply, backplane, circuit cards, and other basic equipment. When equipped, the UEM becomes a specific type of module, such as a CPU module or Network module.
UPS	Universal Power Supply
V AC	Voltage Alternating Current
V DC	Voltage Direct Current