Carrier VoIP

Call Agent Basics

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Call Agent Basics

New in this release

Feature changes

See the following sections for information about feature changes.

CS 2000/2100 Compact Hybrid

The CS 2000/2100 Compact Hybrid supports both TDM peripherals and packet gateways. See the section "Geographic survivability" (page 8) for information on geographic survivability for the CS 2100 Compact Hybrid.

Gigabit Ethernet interface for sparing for Compact Call Agent cards

This feature is applicable only to the CS2100 for the enterprise market.

In this release, feature A00012478 introduces the Gigabit Ethernet interface for sparing for MCPN905-based Compact Call Agent (CCA) cards. (MCPN765-based CCA cards continue to use fiber channel sparing.) The introduction of Gigabit Ethernet sparing causes the following changes in the MAP interface:

- "Sparing link" or "SL" appears where "fiber channel" or "FC" formerly appeared.
- Under Compact Call Agent Maintenance (CCAMTC) in the MAP interface, there is a new command to query the sparing link. The command is “16 QuerySL”. You can use the command to find out whether the fiber channel interface or the Gigabit Ethernet interface is selected for sparing.

These changes appear in the illustration titled "Call Agent Manager" (page 26) in the section titled "CS 2000 - Compact software" (page 25).

Other changes

In "CS 2000 - Compact hardware" (page 11), we have removed the tables listing hardware items. The tables contained lists of product engineering codes (PEC). They also identified baseline hardware items and other

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supported hardware items. That information can be found in the hardware baseline document. If you need a copy of the hardware baseline document, contact your next level of support.

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CS 2000 - Compact overview

The Call Agent is the key component in the Communication Server 2000 - Compact (CS 2000 - Compact). This is where the Call Processing engine resides, along with Nortel's vast service and feature set. Two SAM21 shelves house Call Agent cards as well as Gateway Controller cards (GWC). SS7 signaling can be provided by a pair of Universal Signaling Point (USP) - Compact cards in the SAM21 shelves, or a USP deployed in a separate frame.

Use of GWCs provides flexibility when selecting media gateways such as Nortel Media Gateway (MG) 15000 based on the Multiservice Switch 15000 (MSS 15000) for trunking, Nortel Media Gateway 9000 (MG 9000) for line access, or a number of small analog station gateways (Mediatrix 1124, for example) for line access. GWCs use standards compliant H.248, MGCP, NCS, H.323, SIP-T, and TGCP protocols to allow a broad choice of media gateway devices.

Specific gateways and feature set are determined by the Nortel solution purchased and customer needs. The CS 2000 - Compact is available in the following solutions:

- **Universal Access - IP** -- local service access and wireline access
- **Integrated Access Wireline/Integrated Access Cable** -- telephone service through cable modem or derived lines device
- **Packet Trunking - IP** -- local tandem trunking and toll service access

In addition, the CS 2000 - Compact is available in the Enterprise market as the CS 2100 - Compact with the features available in the Enterprise marketplace. The CS 2000 - Compact is used in the Chinese market as a DMS core replacement. The CS 2000 - Compact is available with AC powered components, if NEBS certification of frame configurations is not required for deployment.

Packet network connectivity

The CS 2000 - Compact requires connectivity for call signaling, OAM&P, and in some configurations, bearer path. Two Nortel Ethernet Routing Switch 8600 (ERS 8600) routers provide this Communications Server Local Area Network (CS LAN) connectivity. Each Call Agent card has two Ethernet 10/100 BaseT links, and one link is connected to each CS LAN router. Each card in the SAM21 shelf connects directly to the CS LAN. Cards and equipment with two Ethernet interfaces have two connections, one to each CS LAN router.

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OAMP strategy

The CS2000 Management Tools (CMT)/Integrated Element Management System (IEMS) runs on the Server Platform Foundation Software (SPFS) in the Sun Netra hardware. The CMT and IEMS loads can be either combined on the same SPFS servers or on separate servers.

The user interfaces to the Call Agent provide the following functions:

- CS 2000 SAM21 Manager client

  This graphical user interface provides access to platform OAM&P such as platform software load, platform diagnostics, and platform upgrade. Hardware provisioning is also completed through this interface.

- Call Agent Manager

  This menu driven console application provides access to platform alarms, platform performance monitoring, platform logs, platform connectivity, platform patching, and the primary interface for platform functions such as cold Switch of Activity (SWACT), Routine Exercise Test (RExTst), jamming, and synchronization of the call processing application. Access to this interface is provided by a telnet session to the CS 2000 Core Manager or Core and Billing Manager (CBM) and logging in as user "core0usr" or "core1usr." The CS 2000 Core Manager or CBM forwards valid logins to these accounts to the Call Agent cards.

- MAP

  The MAP is a menu driven console application that provides access to all call processing functions on the Call Agent. Some of the key areas are alarms, logs, and performance monitoring. Once the Call Agent boots and mounts the NFS file system from the STORM units, maintenance and interaction with the file system is completed through this interface. This interface is accessed by telnetting to the CS 2000 Core Manager or CBM and logging in as user "cmusr." The CS 2000 Core Manager or CBM forwards a valid login to the call processing application.

Interfaces

The following list indicates the physical interfaces for the Call Agent. The Call Agent Manager handles all maintenance and fault reporting for these interfaces.

- Fast Ethernet 100 BaseT

  Each Call Agent has two Ethernet interfaces. The physical connection is made on the rear transition module in each of the SAM21 shelves and is labelled NET1 and NET2. These Ethernet connections terminate to the two routers that are part of the Communication Server Local Area Network (CS LAN).

- fiber channel

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The fiber channel interface is used for sparing and data synchronization between Call Agent cards. The Call Agent uses this interface to copy data between the two Call Agents and to maintain synchronization of the call processing application. The fiber channel connection provides a backup link (BLnk) for messaging between the two Call Agent cards. Each Call Agent card has a fiber channel interface on the faceplate of the card. These two interfaces are connected with fiber.

- Gigabit Ethernet

  The Gigabit Ethernet interface is an alternative to the fiber channel interface. The Gigabit Ethernet interface can be used for sparing and data synchronization between pairs of 905-based Call Agent cards. (It cannot be used with 765-based Call Agent cards.) The connector for the Gigabit Ethernet interface is on the transition module used with the 905-based card. The connector is accessible from the rear of the SAM21 shelf. The connector is labeled “PIM11 ENET”. The cable used is a category 5 internet cable.

  Note: The feature supporting the use of the Gigabit Ethernet interface is applicable only to the CS2100 for the enterprise market.

Maintenance and fault monitoring of the Ethernet links and the fiber channel interface is completed through the Call Agent Manager.

File system

For the CS 2000 - Compact, file system storage is provided by two STORage Manager (STORM) units. File system storage is used for the following items:

- billing recording, SBA billing backup
- software load management, AUTODUMP, ITOCCI, PMLOADs
- software patches
- logs, operational measurements, and journal file
- file and volume management tools, DISKUT and DISKADM

The Call Agent cards access files stored on STORM units with the Network File System (NFS) protocol. The Call Agents store files in volumes. Each of these volumes is actually a directory on a STORM unit. Each STORM unit manages the data stored to it with Logical Volume Management (LVM) software so that storage size can be increased while data access remains online. The data stored to a STORM unit is mirrored on the two internal disks in the STORM unit.

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Geographic survivability

Geographic Survivability allows services to continue in the event of a catastrophic loss of a call server site caused by a natural or man-made disaster. The Geographic Survivability for Communications Server 2000 platform distributes the redundancy of the CS2000 - Compact architecture in different physical locations and uses application layer protection. Nodes are connected over a fault-tolerant optical network that spans the distance between two sites. There are mechanisms to select which of the two sites provides services and to allow load sharing and proper routing.

In steady state, each split component of a 1+1 redundant pair maintains communication with its mate in the other site. The pair decide and negotiate activity between the two components using their existing mastership algorithm. An enhanced mastership algorithm is provided for Geographic Survivability for use primarily in disaster scenarios when an entire site or substantial portions of it are lost. The algorithm detects what portions of the system are still active and reconfigures the system in a optimal mode to maintain services with remaining in-service components.

For CS2000 - Compact, Geographic Survivability allows:

- support up to 75 cable miles (120 cable km) between sites
- 99.999% availability be maintained
- failover in around 30 seconds with a 765-based Compact Call Agent (CCA) card, with stable calls and billing maintained. Failover is in less than 20 seconds with the 905 CCA card.
- SN09 hardware baseline

The following components are survivable across the two CS2000 - Compact sites:

- CS LAN switch, such as the ERS8600, or a third-party equivalent
- Services Application Module 21 (SAM21) shelves, each with a pair of Shelf Controllers
- Compact Call Agent (CCA)
- Gateway Controller (GWC) mated pairs
- STORage Management Integrated Array (STORM-IA)
- Centrex IP Client Manager (CICM) gateway
- CICM Manager
- Media Server 2010 (MS2010). The number of units must be distributed evenly between sites. Media servers share the load and a sufficient quantity are deployed at each site to cover the engineered capacity requirements in the event of a full site loss.
- USP - Compact

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- Client PC. One PC is required at each site.
- Contivity. One unit is required at each site.

The CMT and IEMS high availability servers are located in Site A. The CBM high availability server pair is located in Site B. Standby server units are installed in the opposite site and can be recovered manually in the case of an extended site outage.

Session Servers, Policy Controllers, MG 9000 Manager and RTP Media Portal Manager can be provisioned with server pairs located at the same site.

For enterprise, a CS 2100 Compact hybrid can be deployed in a geographically survivability configuration. In such a configuration the TDM equipment is not geographically survivable. The mastership algorithm gives preference to keep the site with the TDM equipment, that is, the site with the Message Controllers, active when there is an optical transport outage.

The configuration supports the same gateways as a non-distributed CS2000 - Compact. Gateways are single units and not geographically survivable. The location of these nodes and how they are connected to the network impacts whether they survive a particular failure. The configuration supports RTP Medial Portals similarly to gateways. The portals can be located on an IP network accessible from both sites of a CS2000 - Compact.

For more information about Geographic Survivability, refer to *Carrier VoIP Disaster Recovery Procedures*, NN10450-900. For offices configured with Message Controllers, refer to *Geographic Survivability Planning Guide*, 555-4031-901. Configurations with MCs are supported only in Enterprise (CS2100) solutions.

For information about alarm and log changes and system behavior during fault scenarios for Geographic Survivability, refer to *Call Agent Fault Management*, NN10087-911.

Restrictions

Customer maintenance infrastructure must be in place to support Geographic Survivability options.

Use of a third-party CS LAN is allowed. However, the inactive Compact Call Agent does not disable the routing protocol in the event of an optical outage to force gateway messaging traffic to the other site. Manual action is required to disable the routing protocol. When an ERS 8600 is used for the CS LAN and the OSPF routing protocol is used, the Call Agent can direct the ERS 8600 to disable OSPF on the inactive site to improve the call completion rate. For more information on failure scenarios, refer to *Call Agent Fault Management*, NN10087-911.

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Both members of the following component pairs must be located at the same site, that is at either one of the two sites where the core components are located:

- CMS/IEMS. The CMT/IEMS is supported in a high-availability (HA) configuration on Site A. A standby is supported on Site B.
- CBM. The CBM is supported in an HA configuration on site B. A standby is supported on site A.
- Session Servers and Policy Controller - SIP Trunking (SS-T) and SIP Lines (SS-L)
- Policy Controller
- Media Gateway 9000 (MG 9000) Manager
- Border Control Point Manager
- TDM components of TDM hybrid configurations will not be geographically split

The Geographic Survivability configuration does not support:

- Storage Management compact PCI (STORM cPCI) card and the DotHill RAID combination
- Universal Audio Server (UAS)
- SuperNode Data Manager (SDM)
- CMT/IEMS on Netra T1400
- Multimedia Communication Server (MCS)
- sites spanning multiple time zones
- in-service conversion from a configuration without Geographic Survivability to a configuration with Geographic Survivability
- USP Grande with a geographic survivable CS2000-Compact

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CS 2000 - Compact hardware

The Call Agent hardware is a Single Board Computer (SBC) based on commercially available Compact PCI (cPCI) technology that resides in a Services Application Module 21 (SAM21) shelf. Two Call Agent cards and two SAM21 shelves are required for redundancy. Each Call Agent card resides in its own SAM21 shelf. Two Call Agent cards are required for redundancy.

The CS 2000 - Compact product hardware is housed in multiple frames.

- The first frame is a Call Control frame (CCF). It contains the CS 2000 - Compact hardware. For a geographic survivability configuration, a CCF is located in each core site, allowing the switch to survive in the event that one of the CCF frames is catastrophically destroyed. For information about the CCF, see "Call Control Frame housing CS 2000 - Compact hardware" (page 13).
- The second frame contains the hardware for element management. This frame is a COAM frame or an OAME frame. For information about the COAM frame, see "COAM frame containing the hardware for element management" (page 18).
- A third frame is optional. If used, the third frame offers added port capacity. This frame is a SAMF frame. For information about the SAMF frame, see "SAMF frame providing additional port capacity" (page 19).

All frames are PTE2000 based and are 7 feet high x 2 feet wide x 2 feet deep with front and rear vented doors and optional side panels.

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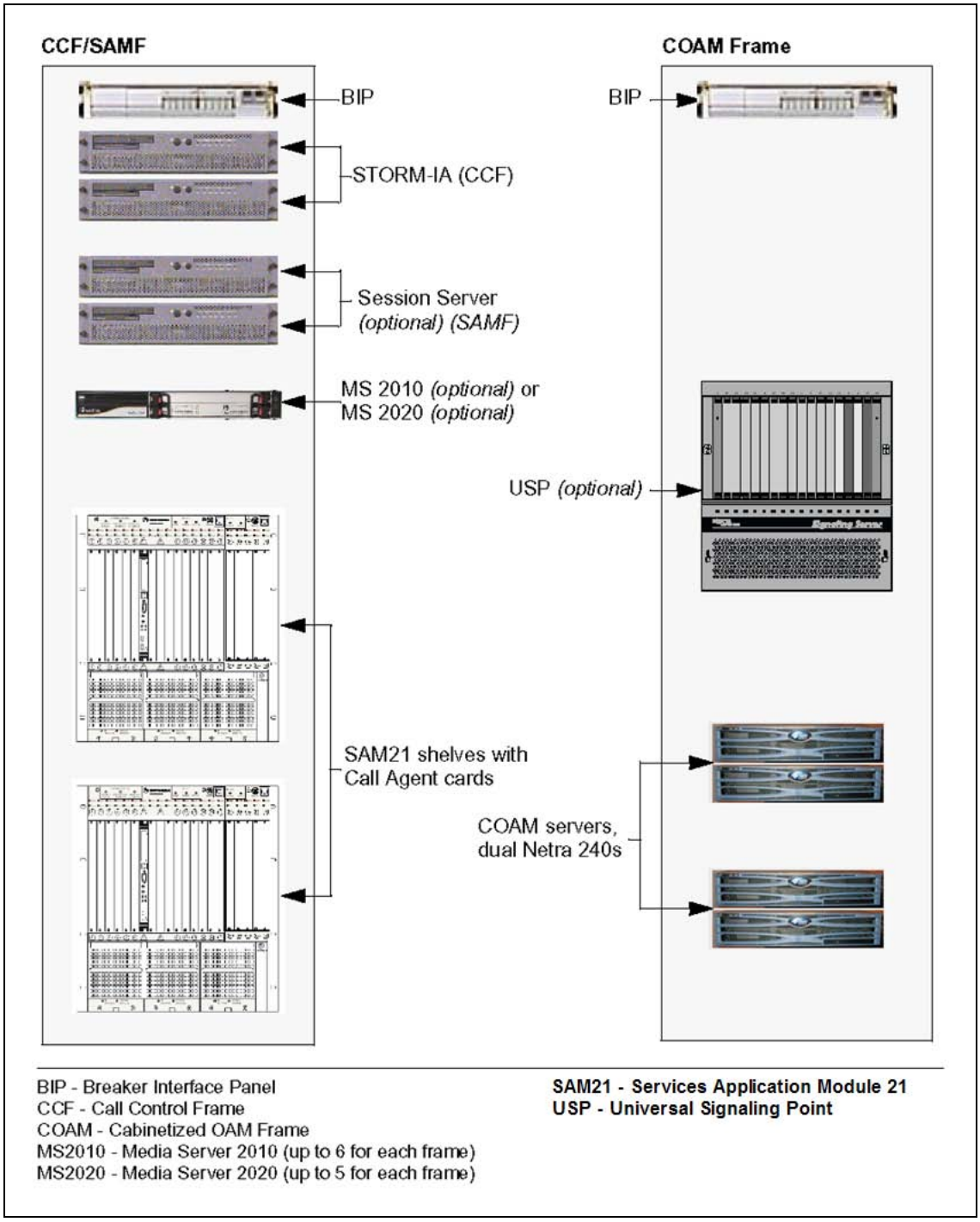
PTE2000 frame layout



Power distribution in the frames

In DC-powered frames, power distribution is provided by a breaker interface panel (BIP) located at the top of each frame. The BIP distributes A and B power feeds from the customer's power plant to the shelves within the frame.

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Power distribution for AC powered systems is a customer responsibility though Nortel recommends each component receive two power inputs from separate circuits to improve reliability.

When deployed in an AC powered configuration, the CS 2000 - Compact components are shipped loose to be installed in existing 19-inch frames at the customer site.

CS 2000 - Compact in the enterprise market

The CS 2000 - Compact is available in the Enterprise market as the CS 2100 - Compact.

Hybrid configuration

When deployed in a hybrid configuration, two Message Controller cards are added to the standard CS 2000 - Compact configuration: one Message Controller card on each CCF SAM21 shelf. The Message Controller cards provide connectivity to the legacy Message Switch. The hybrid configuration also requires the deployment of either the Inter-working Spectrum Peripheral Module (IW-SPM) or loop around trunks to allow inter-working between the TDM side of the system and the packet side. The IW-SPM is housed in a standard SPM frame.

Call Control Frame housing CS 2000 - Compact hardware

The figure "PTE2000 frame layout" (page 12) shows a Call Control frame housing the CS 2000 - Compact hardware.

In the Call Control frame, the hardware includes the following:

- two STORM-IA
- up to two SAM21 shelves, equipped with
  - — Call Agent cards
  - — Gateway Controller (GWC) cards
  - — SAM21 Shelf Controller cards
  - — optionally, USP-Compact (USPc) cards
  - — optionally, Centrex IP Client Manager (CICM) cards

Also residing in the Call Control frame can be any of the following:

- optionally, up to six MS 2010 chassis (if there are no Session Servers in the CCF)
- optionally, up to five MS 2020 chassis (if there are no Session Servers in the CCF)
- optionally, up to three MS 2010 chassis and a pair of Session Servers

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- optionally, up to three MS 2020 chassis and a pair of Session Servers

The following sections contain information on the hardware items in the Call Control frame.

Power distribution shelf, BIP

The power distribution shelf occupies the top position in the CCF frame. The BIP has an alarm module and up to four breaker modules. Locations not occupied by a breaker module require a filler module.

The Alarm Module monitors BIP status and has four inputs to monitor shelf level alarm outputs. Front panel LEDs indicate minor, major, and critical alarms. An array of yellow LEDs provides “Follow Me” visual indicator for operating company personnel. The alarm module also provides connections for gathering lineup alarms

Each Breaker Module has an independent DC input power feed and distributes up to five power feeds to shelves in the frame. Breaker Modules are provided in pairs, one for the “A” power feed and one for the “B” feed.

STORage Manager (STORM)

The STORM-IA application provides persistent data storage. The application runs on a redundant pair of SAM-XTS servers that are installed directly below the BIP. The SAM-XTS is a 2U NEBS-compliant server based on Intel architecture. Each server has a 2+ GHz Pentium 4 Xeon Processor and contains two hot swap SCSI disk drives (72 GB).

Connectivity to the STORM-IA is through dual Gigabit Ethernet Base T copper interfaces. Each server is connected to both CS LAN routers/switches, and the servers are also connected to each other over Gigabit Ethernet.

Session Server, Policy Controller

The SIP Lines and Trunk Session Servers and the Policy Controller use SAM-XTS servers that have a second CPU and more memory than the SAM-XTS servers used by STORM-IA.

The CCF can include up to two servers. The SAMF supports includes up to 4 servers. Each server has a 2+ GHz Pentium 4 Xeon Processor and contains 2 hot swap SCSI disk drives (72 GB). Connectivity to the STORM-IA is through dual Gigabit Ethernet Base-T copper interfaces. Each server is connected to both LAN routers/switches, and they are connected to each other over Gigabit Ethernet.

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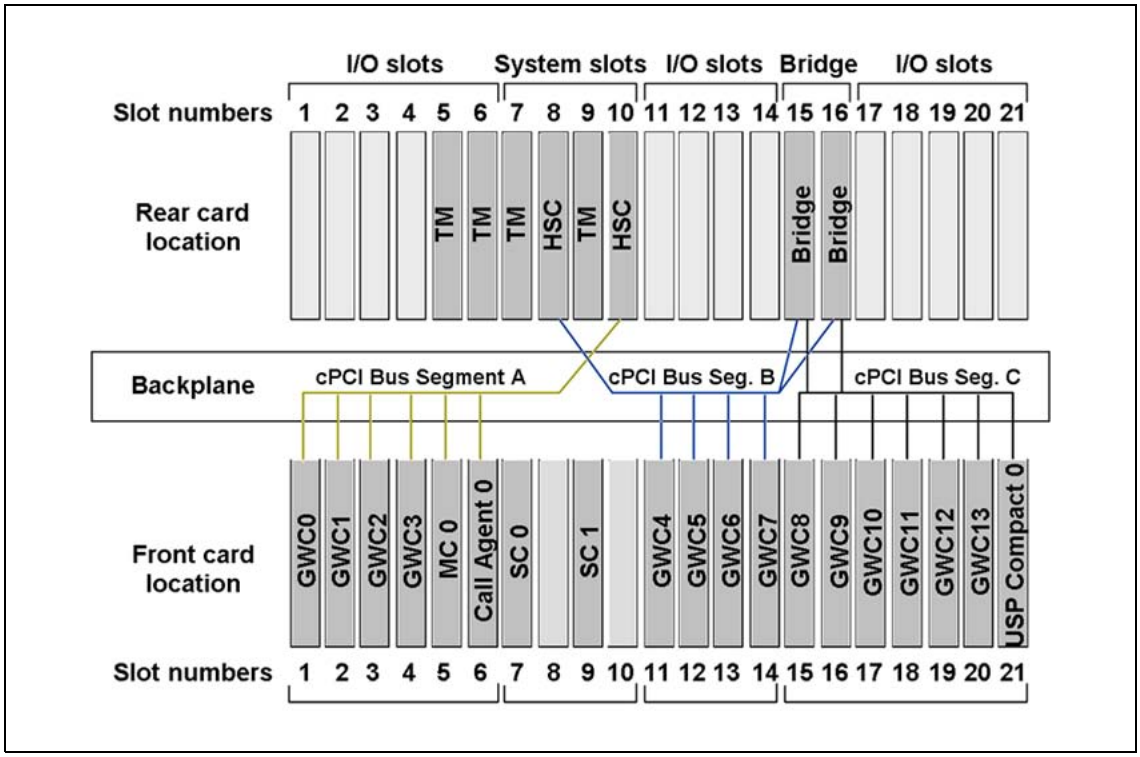
SAM21 shelf

The Nortel SAM21 shelf uses Motorola CPX8221 hardware. An alarm panel is at the top of the shelf, above the card slots. The fan and power supplies are located at the bottom of the shelf, below the card slots.

Packfill depends on the office configuration and customer needs. The following figure shows packfill for front and rear card locations. The Message Controller in slot 5 is available in some markets that need to support services provided by legacy peripheral modules (PM).

SAM21 Shelf slot layout



Several cards have more than one card type. The CS 2000 SAM21 Manager displays the card name and corresponding memory size in the Equip tab of the card view. The following figure shows an example. The CS 2000 SAM21 Manager contains bootp entries for all card types and assigns correct loads to selected cards during provisioning.

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Card view example

SAM21 Shelf Controller SAM21 Shelf Controller cards are provisioned in slots 7 and 9 of each CPX8221 shelf. Each SAM21 Shelf Controller card has one 10/100 BaseT Ethernet port. The hardware is of two types:

- Motorola SMM750HA-1352-F board, model number MCP750HA, with a MPC750 366MHz processor and 128 Mb RAM
- Motorola SMM820HA-1352-F board, model number MCP820HA, with a MPC7410 500 MHz processor and up to 2 Gb RAM

Both card types run the Linux PowerPC operating system. Two transition modules are needed for each SAM21 shelf.

Hot swap controller card Hot swap controller cards are located in slots 8 and 10 in the rear of the shelf.

Extension bridge card Extension bridge cards are located in slots 15 and 16 in the rear of the shelf.

Gateway Controller (GWC) GWC cards are configured in pairs, one active and one standby. Each GWC card has one 10/100 BaseT Ethernet port. The hardware is of two types:

- Motorola MCPN750 board, model number MCPN750A, with a 366 MHz processor, 128 MB RAM
- a Motorola MCPN905 board, model number MCPN905-240, with a 1 GHz processor, 512 Mb RAM

The 750- and 905-based cards can coexist in a CS 2000 - Compact. However, both GWC cards of a mated pair must be of a consistent hardware type. They cannot be mixed, except as part of the upgrade process.

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GWCs are not needed for CS 2000 - Compact offices that use TDM peripherals only.

Call Agent Two Call Agent cards are used for redundancy, but only one is active at any given time. Each Call Agent has two 10/100 BaseT Ethernet ports and a fiber channel interface. The fiber channel link is connected directly to the fiber channel interface on the other Call Agent. If the Call Agent is deployed as part of an Enterprise CS 2100 with Geographic Survivability, the fiber channel interface is connected to the CS LAN.

The Call Agent card is of two types:

- a Motorola MCPN765 board, with MPC7410 500 MHz processor and 1.5GB RAM, running Nortel Carrier Grade Linux (NCGL) operating system. Ethernet ports are on the rear Transition Module. The fiber channel interface is provided by a Systran fiber channel PCI Mezzanine Card (PMC).
- a Motorola MCPN905 board, with MCP7457 1GHz processor and 2.0GB RAM, running LinuxPPC (Nortel distribution). The fiber channel interface is provided by daughter board, a Systran fiber channel PCI Mezzanine Card (fiber channel PMC). A Motorola PrPMC815 is used to provide persistent memory. An NTRX51HS transition module is needed for each Call Agent card. The Ethernet ports are on the rear of the Transition Module. As an alternative to the fiber channel interface, the Gigabit Ethernet interface can be used for sparing and data synchronization. The Gigabit Ethernet interface uses one of the Ethernet ports on the rear of the Transition Module. The connector is labeled “PIM11 ENET”.

Note that the feature supporting the use of the Gigabit Ethernet interface is applicable only to the CS2100 for the enterprise market.

Message Controller Message Controller cards are used in configurations requiring connectivity to legacy peripheral modules (PM). The hardware includes two MC cards (NTRX51GY), and two rear Transition Modules. Each MC is a Motorola MCPN765 board with MPC7410 500 MHz processor, 512 MB RAM, two multi-mode ATM PMCs, and two 10/100 Ethernet ports, running LinuxPPC operating system (Nortel distribution), and using the open source ATM stack. The PMCs are Interphase 4576-500A.

Centrex IP Client Manager CICM provides Centrex IP functionality for the Carrier Voice over IP network by exchanging H.248 protocol messages with GWCs. Hardware is a Motorola 5385 card with a 40GB hard drive and a Transition Module. CICM provides the following functionality:

- parses incoming H.248 messages from GWC
- generates outgoing H.248 messages to GWC
- manages call contexts, including NULL context

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- manages physical, ephemeral, and root terminations, including state
- isolates hardware specific details from the H.248 functionality by providing neutral interfaces
- implements a synchronization mechanism with a peer MG
- provides QoS reporting

Media Server The rackmount chassis that host the Media Server application are 1U 19-inch for MS 2010, and 2U 19-inch for MS 2020. The processing function in the chassis is provided by the Audiocodes IPM-1610 for the MS2010 and TP-6310 for the MS2020.

For more information, see *Media Server 2000 Series Basics*, NN10323-111.

USP - Compact The USP - Compact provides a cost effective Signaling Gateway function in a small footprint. One USP - Compact system consists of two USP - Compact cards (MCPN905-220, 866 MHz, 512 MB). The USP - Compact cards can be located on the same SAM21 shelf in the CS2000 - Compact, or on different shelves.

USP - Compact supports a maximum of 16 links and linksets on the two cards. USP - Compact supports channelized T1/E1 SS7 links (4 or 8 channels per card), and IPS7 connections, but does not support m2pa IP High speed SS7 links, ATM based high speed SS7 links, DS0a SS7 links, or V-35 SS7 links.

COAM frame containing the hardware for element management

The OAM hardware is located within the OAME or COAM frame. This hardware consists of one Sun Microsystems T1400 in the OAME frame, or a clustered pair of Sun Microsystems Netra 240s in the COAM frame. The CS 2000 Management Tools software is deployed on the platform to provide element management and various provisioning functions critical to the CS 2000 - Compact. OAME optional equipment includes a KVM switch, foldaway monitor, and additional Sun Microsystems servers. COAM optional equipment includes additional Sun Microsystems servers and a Universal Signaling Point chassis.

The figure "PTE2000 frame layout" (page 12) shows a COAM frame containing the hardware for element management

The following sections describe the hardware housed in the COAM frame.

CS 2000 Management Tools server (CMT)/IEMS

With the Netra 240 servers, either two units running in high availability cluster mode or simplex mode may be configured.

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The CMT or Integrated Element Management System (IEMS) runs on the Server Platform Foundation software (SPFS) on the Sun Netra hardware. CMT and IEMS loads are usually combined on the same SPFS servers, but can also be on separate servers.

This server runs management application software such as CS 2000 SAM21 Manager, GWC Manager, QoS Collector Application (QCA), Trunk Maintenance Manager (TMM), Line Maintenance Manager (LMM), and OSS configuration gateway (OSSGate). This host can also provide the Audio Provisioning Server (APS).

Billing Manager

In SN07 the Core and Billing Manager (CBM) replaced the SuperNode Data Manager (SDM) as the billing and core management system for the CS 2000 - Compact.

The CBM is setup in a high availability configuration using two Sun Microsystems Netra 240 servers in the COAM frame. The CBM software consists of the CBM application load running on the SPFS platform. Note that CBM is not supported on the t1400 hardware.

KVM switch and foldaway monitor

This hardware is supported, but it is no longer shipped.

The Keyboard Video Mouse (KVM) switch and one foldaway monitor were provided as part of the SAM16 based Universal Audio Server (UAS). The functionality provided by the UAS is now provided by the Media Server 2000 series.

Power inverter

This hardware is supported, but it is no longer shipped.

The inverter was required to provide AC power to the KVM.

SAMF frame providing additional port capacity

If there is an optional frame for additional port capacity, that frame is a SAMF frame.

When used as a frame to provide additional port capacity in a CS 2000 - Compact, the SAMF can support the following configurations:

- up to 2 SAM21s, one pair of NTRX51HX Servers, and up to 5 MS2020 or 6 MS2010 Media Servers
- up to 2 SAM21s, two pairs of NTRX51HX servers, and up to 3 MS2020 Media Servers or MS2020 Media Servers

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In the SAMF, each SAM21 shelf can support up to 17 GWC cards, or a combination of GWC and CICM cards totaling 17.

Environmental specifications

This section identifies the power requirements, environmental tolerances, and regulatory compliance information.

Power requirements

The following table lists power requirements for the CCF and SAMF.

In the table we use product engineering codes (PEC) to identify specific hardware items. The hardware baseline document contains lists of hardware components and their product engineering codes. If you need a copy of the document, contact your next level of support.

Power requirements for CCF and SAMF

Frame	Equipment	Current draw at -48 VDC (nominal)	Current draw at -41.5 VDC (maximum draw)
CCF (NTRX51 TA)	Standard conf iguration: two SAM21 shelves, two STORM-IA, two Call Agent cards, Session Server	18.0 A	21.0 A
	GWC (NTRX51BL)	Add 0.75 A for each GWC pair	Add 0.9 A for each GWC pair
	GWC (NTRX51DL)	Add 1.3 A for each GWC pair	Add 1.5 A per GWC pair
	USP - Compact (NTRX51FJ/FN)	Add 0.9 A for each pair	Add 1.0 A for each pair
	USP - Compact (NTRX51TD)	Add 1.4 A for each pair	Add 1.6 A for each pair
	CICM (NTRX51HJ) and CICM Manager (NTRX51HK)	Add 1.2 A for each CICM or CICM Manager pair	Add 1.4 A for each CICM or CICM Manager pair
	Message Controller (NTRX51GY/FS)	Add 1.6 A for each pair	Add 1.8 A for each pair
	MS 2010 chassis (NTRX51JF/JG/JJ/ JK/JL)	Add 0.9 A for each chassis	Add 1.0 A for each chassis
	MS2020 chassis (NTRX51MA/MB/ MC/MD)	Add 2.0 A for each chassis	Add 3.5 A for each chassis

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Frame	Equipment	Current draw at -48 VDC (nominal)	Current draw at -41.5 VDC (maximum draw)
	Session Server (NTRX51HX)	Add 3.0 A for each chassis	Add 3.5 A for each chassis
SAMF (NTRX51HA)	SAM21 shelf (NTRX51RX)	Add 3.5 A for each SAM21 shelf	Add 4.1 A for each SAM21 shelf
	GWC (NTRX51BL)	Add 0.75 A for each GWC pair	Add 0.9 A for each GWC pair
	GWC (NTRX51DL)	Add 1.0 A for each GWC pair	Add 1.2 A per GWC pair
	CICM (NTRX51HJ) and CICM Manager (NTRX51HK)	Add 1.2 A for each CICM or CICM Manager pair	Add 1.4 A for each CICM or CICM Manager pair
	MS 2010 chassis (NTRX51JF/JG/JJ/JK/JL)	Add 0.9 A for each chassis	Add 1.0 A for each chassis
	MS 2020 chassis (NTRX51MA/MB/MC/MD	Add 2.0 A for each chassis	Add 3.5 A for each chassis
	Session Server (NTRX51HX)	Add 3.0 A for each chassis	Add 3.5 A for each chassis

The following table lists power requirements for COAM frames.

Power requirements for COAM frames

Equipment	Voltage range	Typical current (Amps)	Comment
Frame level	-40 to -57 VDC	14.5 A at -48 VDC (700 watts) for two Netras and Inverter	4 feeds rated at 68.0 A
Sun Microsystems Netra 240	-36 to -72 VDC	6.0 A at -48 VDC (300 watts)	20-amp breaker
KVM switch	120 VAC	0.2 A at 120 VAC	Inverter powered
Foldaway monitor	120 VAC	0.2 A at 120 VAC	Inverter powered
Inverter	-48 VDC	2.5 A at -48 VDC	20-amp breaker
BPS2000	-40 to -57 VDC	2.0 A at -48 VDC	5-amp breaker

For best AC power redundancy, Nortel recommends a minimum of twelve 15-Amp circuit breakers dedicated to the CS 2000 - Compact. Each circuit breaker should provide power to a single duplex receptacle, for a total of

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24 plug in locations. A 15-foot power cable is provided for each power input. Because the cables are 15 feet, receptacles must be within three feet of the frame.

Follow the connection strategy in the following table.

AC power circuit and outlet strategy

Equipment	Circuit breaker	Outlet
SAM21 0-A	0	0-0
SAM21 1-A	1	1-0
STORM 0-A	2	2-0
STORM 0-B	3	3-0
STORM 1-A	2	2-1
STORM 1-B	3	3-1
Session Server or Policy Controller 0-A	4	4-0
Session Server or Policy Controller 0-B	5	5-0
Session Server or Policy Controller 1-A	4	4-1
Session Server or Policy Controller 1-B	5	5-1
Media Server 2010 0-A	6	6-0
Media Server 2010 0-B	7	7-0
Media Server 2010 1-A	6	6-1
Media Server 2010 1-B	7	7-1
CBM 0-A	8	8-0
CBM 0-B	9	9-0
CBM 1-A	8	8-1
CBM 1-B	9	9-1
CMTT 0-A	10	10-0
CMTT 0-B	11	11-0
CMTT 1-A	10	10-1
CMTT 1-B	11	11-1
Miscellaneous	12	As required

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The following table lists power requirements for AC powered equipment.

Power requirements for AC powered equipment

Equipment	Voltage range	Typical current (Amps) @115 VAC	Comment
SAM21 shelf, NTRX51NZ	90-260 V AC, 47-63 Hz	1.8 A	no cards inserted
		2.02 A	two SAM21 Shelf Controllers inserted
		2.39 A	one Message Controller and two SAM21 Shelf Controllers inserted
		0.13 A	add for each NTRX51BL GWC card
		0.22 A	add for each NTRX51DL GWC card
		0.26 A	for each NTRX51FJ/FN USP - Compact card
		0.3 A	add for each NTRX51TD USP - Compact card
Sun Microsystems Netra 240	90-264 VAC, 47-63 Hz	3.0 A	for each chassis
SAM-XTS - STORM-IA	100-127 VAC, 60 Hz, or 200-240 VAC, 50 Hz	1.0 A	for each chassis
SAM-XTS - Session Server	100-127 VAC, 60 Hz, or 200-240 VAC, 50 Hz	1.3 A	for each chassis
Media Server 2010	90-260 VAC, 47-63 Hz	0.75 A	for each chassis

Environmental tolerances

The environmental specifications for each of the PTE 2000 based frames:

- temperature and humidity
  - — during storage and transportation

    temperature: -40 degrees Celsius to +70 degrees Celsius

    humidity: maximum 95% at 40 degrees Celsius
  - — installed and operational

    temperature: +5 degrees Celsius to +40 degrees Celsius

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short term temperature: -5 degrees Celsius to +50 degrees Celsius for less than 96 hours

humidity: 5 to 85%

short term humidity: 5 to 90%, not to exceed 0.024 kg water/kg of dry air

- altitude

  installed and operational: -60 m (-197 ft.) to +1800 m (5905 ft.) above sea level

- earthquake

  Each frame meets Telcordia Earthquake Zone 4 requirements when installed with appropriate frame anchor kits.

- acoustic

  Each frame meets the Verizon NEBS checklist, SIT.NEBS.TE.NPI.2002.010, limit of 75 dB(A). In addition, the COAM frame meets the GR-63 Core requirement of 60 dB(A).

Regulatory compliance

Electromagnetic Compatibility (EMC)

The CS 2000 - Compact is tested and complies with the following EMC requirements described in the *CMAC Electromagnetic Compatibility Test Plan*, R0000698-TP-EMC-NEBS-01-01:

- radiated and conducted emissions
- radiated and conducted immunity
- surge/voltage transients
- electrical fast transient burst
- ESD
- HF and LF voltage dips and sags

The tests cover compliance to Verizon NEBS, AT&T NEDS, and SBC requirements.

Product safety

The CS 2000 - Compact complies with the following product safety requirements:

- UL 60950
- EN 60950
- GR-1809-CORE Electrical Safety
- CSA C22.2 No. 60950

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CS 2000 - Compact software

Call Agent software is divided into three layers:

- platform (non call processing)

  A Linux operating system and maintenance software image is stored on the CS 2000 Core Manager or CBM and loaded by the Call Agent when the Call Agent boots. The software release is available with the **`QryLd`** command at the Call Agent Manager. For more information, see *Call Agent Performance Management*, NN10153-711.

- virtual machine

  Peel is a Nortel-developed application. This application provides a Protel Environment Emulation Layer (PEEL) that acts as a virtual machine for the call processing application. This software is delivered as part of the platform software.

- call processing application

  Call processing is provided by a Nortel-developed core image that operates in the virtual machine. This software is patchable with the Post-Release Software Manager (PRSM) tool available at the Command Interpreter (CI) level of the MAP. The software version is available from the CI with the **`IMAGENAME`** command.

Operations, Administration, and Maintenance (OAM) of the Call Agent is provided through the Call Agent Manager.

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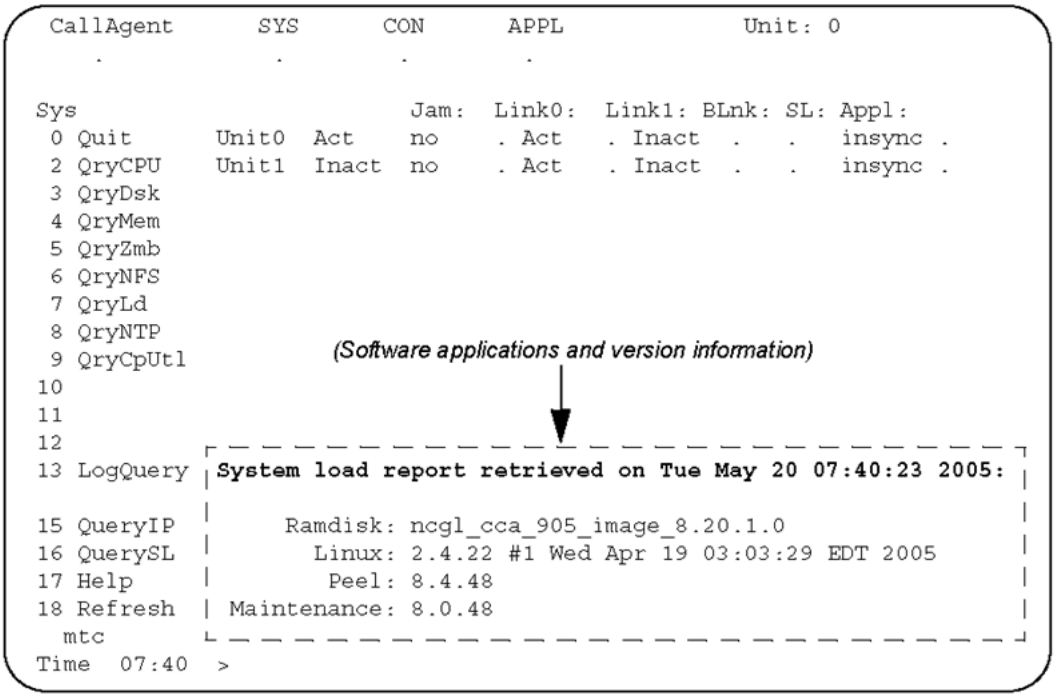
Call Agent Manager



Fault management of the call processing application is available at the MAP.

CI level of the MAP

```
2002/08/07 21:22 OFC_CLLI
>IMAGENAME
PPC_3PC_CORE BCS 55 CE built on 2004-APR-12 at 16:51:00 using
csnn07ce
PRODUCT: SNNCSC.007
LOAD: SNC00.007
LAYER: BAS.21.0.CE
LAYER: TL.20.0.CE
LAYER: SHR.20.0.AA
LAYER: CCM.20.0.CE
LAYER: CNA.20.0.CE
LAYER: UCS.20.0.CE
LAYER: TOPSC.20.0.CE
LAYER: CNATOPS.20.0.CE
LAYER: BCTOPS.20.0.CE
LAYER: MSH.20.0.CE
LAYER: SNNCSH.07.0.CE
```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MAPCI level of the MAP

```
MAPCI
 0 Quit
 2 Mtc
 3 SASelect
 4 NWM
 5 CPSys
 6 IBNMEAS
 7
 8 FPE
 9 TESTTOOL
10
11
12
13
14
15
16
17
18
  USERNAME
Time  18:42  >
```

Upgrade and patch system

The platform software is patchable, with the exception of the Linux kernel. Maintenance release (MR) software is delivered by electronic transfer or CDROM. Platform patches are delivered to the electronic dropbox or CS 2000 Core Manager through regional patch selector (RPS). If the office uses a CBM instead of a CS 2000 Core Manager, the patches are delivered to the CBM.

Platform MRs are reprovisioned from the CS 2000 SAM21 Manager client application. A Lock and Unlock request loads the new software. If a firmware upgrade is delivered with the SAM21 platform software load and the FW flash enable checkbox is checked at the Card View window of the CS 2000 SAM21 Manager client, the upgrade firmware is applied during the unlock request. Platform patches are applied through the Call Agent Manager. For information about platform software patching and the platform software upgrade procedure, see *Upgrading the Carrier Voice over IP Network*, NN10440-450.

The call processing application software is patchable. This software is patchable through the PRSM in the PRSM level of the MAP. The application is upgraded through Product Computing Module Loads (PCL). For information about upgrading the call processing application software,

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see *Upgrading the Carrier Voice over IP Network*, NN10440-450. For information about call processing application patching, see *Post-Release Software Manager Reference Manual*, 297-8991-540.

If a customer prefers having Nortel Software Delivery personnel perform upgrades, contact your account representative and discuss what software services are available in your market.

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Carrier VoIP

Call Agent Basics

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