NORTEL

Carrier VoIP

SAM21 Shelf Controller Basics

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New in this release

Feature changes

See the following sections for information about feature changes.

Gigabit Ethernet interface for sparing for Compact Call Agent cards

In "Hardware" (page 4), in the table describing the Call Agent, we refer to the use of the Gigabit Ethernet interface for sparing for MCPN905-based Compact Call Agent (CCA) cards.

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

Other changes

In "User interfaces" (page 15), the illustration has been updated.

In "Hardware" (page 4), we have removed the tables listing hardware items. The tables contained lists of product engineering codes (PEC) and identified baseline hardware items and other 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.

Functional description

Services Application Module 21 (SAM21) shelves are mounted in a Nortel Networks PTE2000 frame. PTE2000 frames have two configurations, the Call Control Frame (CCF), and the SAMF frame. The SAMF frame is deployed with CS 2000 XA-Core switches and can also be deployed with CS 2000 - Compact switches when additional Gateway Controllers (GWC) are needed. CS 2000 - Compact configurations require the CCF.

The SAM21 shelf has 21 chassis slots. The hardware platform for the SAM21 shelf is the Motorola CPX8221 cPCI chassis. Two slots are dedicated for the SAM21 Shelf Controller cards (MCP750 or MCP820) and two for the hot swap controllers (HSC).

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Two SAM21 Shelf Controllers are required for each shelf. These cards reside in slots 7 and 9 of the SAM21 shelf. The SAM21 Shelf Controllers:

*   manage the hardware states of the other cards in the SAM21 shelf

*   communicate with the CS 2000 SAM21 Manager to enable administration of cards in the shelf

*   forward alarms to the CS 2000 SAM21 Manager related to environmental alarms

*   forward alarms to the CS 2000 SAM21 Manager related to the hardware states of the cards in the shelf

*   in some Asynchronous Transfer Mode (ATM) networks the SAM21 Shelf Controllers are equipped with an ATM interface to enable Classical IP over ATM (CIPOA) communication between the Gateway Controllers in the SAM21 shelf and media gateways on the ATM network

The active SAM21 Shelf Controller automatically recovers cards in the shelf that experience a software error. The SAM21 Shelf Controller polls the cards in the shelf with a boot audit process to determine if the cards are in-service. If a card is not in-service, firmware on the card attempts a Network Autoboot to restore service. If the Network Autoboot fails, the active SAM21 Shelf Controller initiates an autoboot of the card to restore service. For more information, see *SAM21 Shelf Controller Fault Management*, NN10089-911.

Each card in the shelf stores its own firmware in flash memory. During the software upgrade of each card, the SAM21 Shelf Controller can check if a newer firmware version is available and apply the new firmware on the card. This option is enabled by checking the "FW Flash Enable" checkbox on the Provisioning panel of the CS 2000 SAM21 Manager for each card. For more information, refer to the Upgrades document for the card type. The *SAM21 Platform Base Release Notes* indicate if a firmware upgrade is available for the release.

> *Note:* This document does not discuss the HSC. In the event of a HSC failure or need for replacement, contact Nortel Networks support personnel.

Hardware

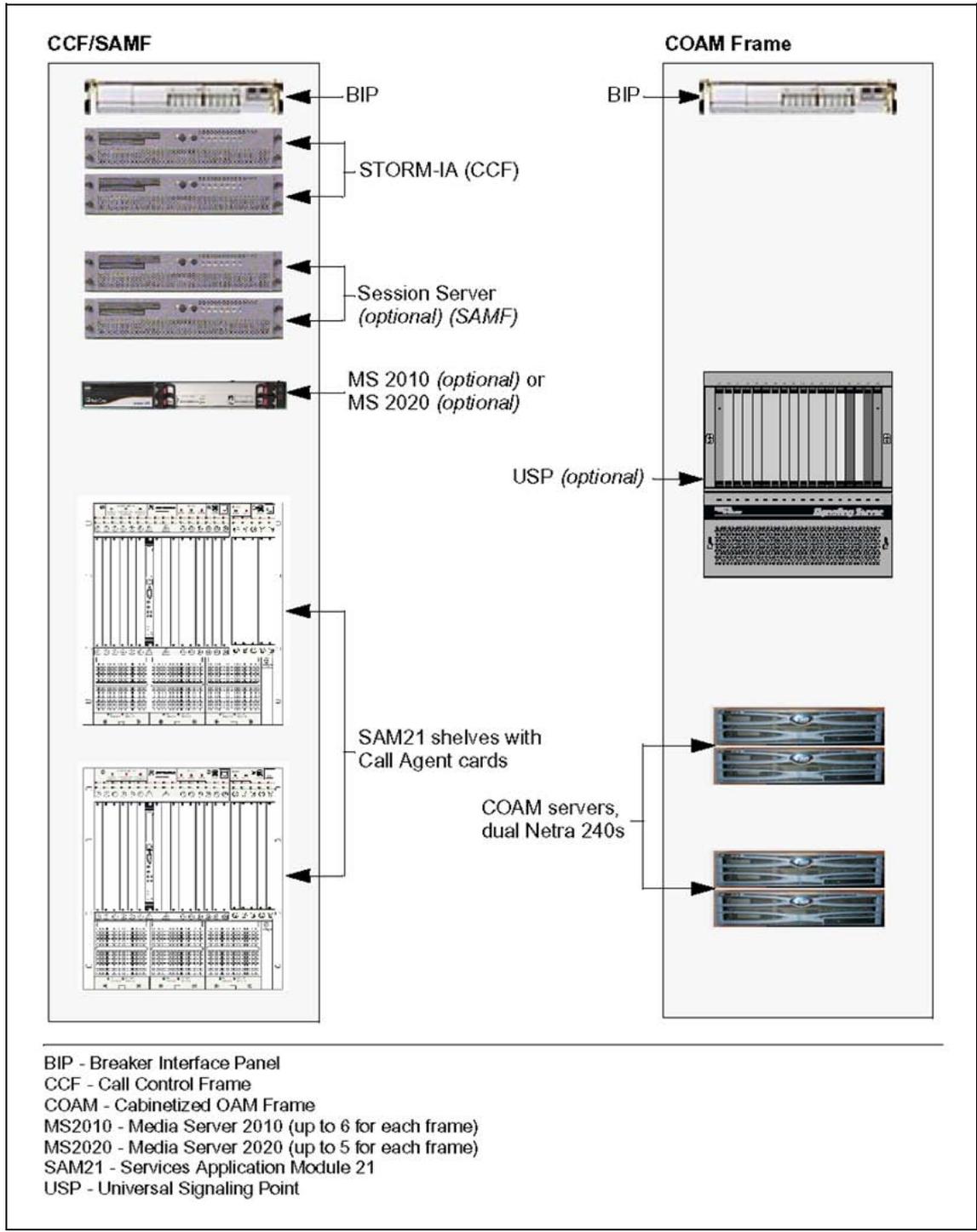The CS 2000 - Compact product hardware is housed in multiple frames.

*   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 7).

- 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 12).

- 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 13).

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.

Figure "PTE2000 frame layout" (page 6) shows a block diagram of a Call Control Frame used in the CS 2000 - Compact product, and a COAM frame used with either a CS 2000 or CS 2000 - Compact.

PTE2000 frame layout

BIP - Breaker Interface Panel
CCF - Call Control Frame
COAM - Cabinetized OAM Frame
MS2010 - Media Server 2010 (up to 6 for each frame)
MS2020 - Media Server 2020 (up to 5 for each frame)
SAM21 - Services Application Module 21
USP - Universal Signaling Point

Call Control Frame housing CS 2000 - Compact hardware

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

- 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.

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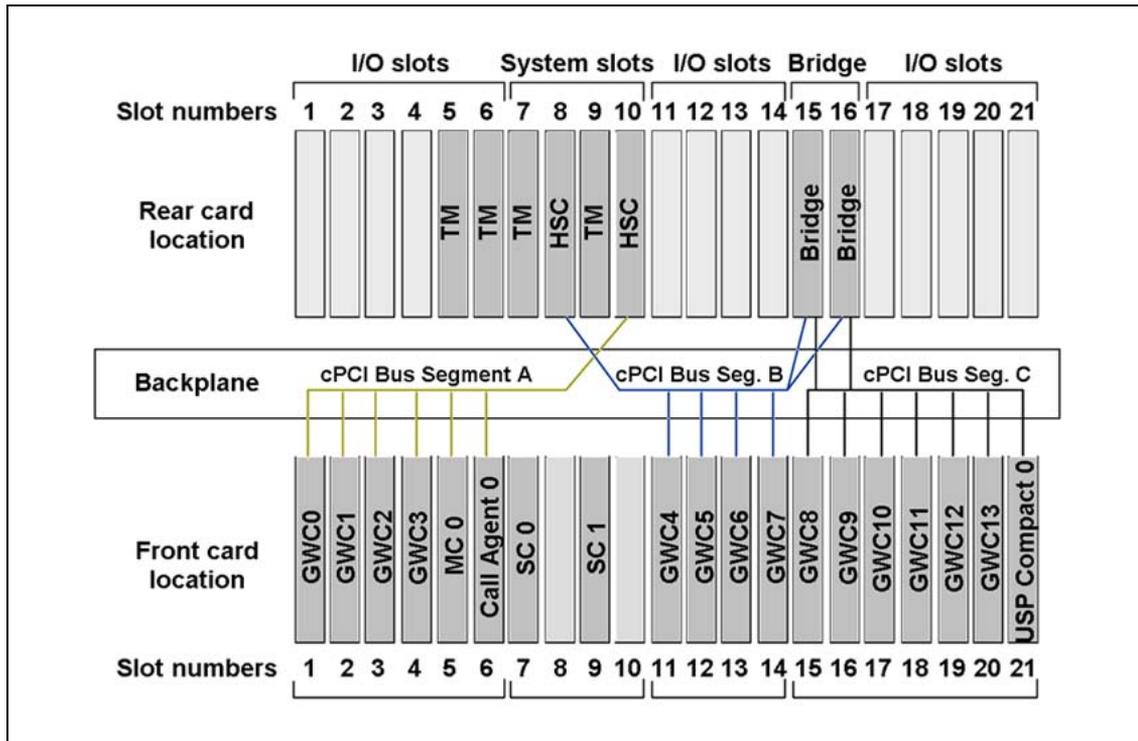
Several cards have more than one card type. The CS 2000 SAM21 Manager displays the card name and corresponding memory size in the Equip tab of the card view. The following figure shows an example. The CS 2000 SAM21 Manager contains bootp entries for all card types and assigns correct loads to selected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

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.

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

- 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 shows a COAM frame housing 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.

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 a CS 2000 - Compact includes 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

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

Tools and utilities

All tools and utilities for the SAM21 Shelf Controllers are provided by the CS 2000 SAM21 Manager. The CS 2000 SAM21 Manager client is a Graphical User Interface (GUI) applet that is started from a Java enabled web browser. The workstation with the web browser is customer supplied. The server application runs on the machine that hosts the CS 2000 Management Tools.

Software

Software loads

The software loadname for the SAM21 Shelf Controller is named 12.x.y.z

where

12   is the version number for the SN09 release
x   is an integer value for the major version
y   is an integer value for the minor version
zzzzzzzzz   is an integer value for the maintenance version

Once installed on the CS 2000 Core Manager, the software is labelled as `SAM21 Platform v12.`

Delivery and ordering processes

Software for the SAM21 Shelf Controllers is available by electronic transfer (ESD) or CDROM. The SAM21 Shelf Controller software is delivered as an RPM file to be installed with the platform_load_install.sh command on the CS 2000 Management Tools server. The SAM21 Shelf Controller software is then installed on the CS 2000 Core Manager or Core and Billing Manager (CBM). In some markets, the software is installed on the server that provides the CS 2000 Management Tools.

The ordering code for the NCL is SAM20009. The ordering code for MNCL releases is SAM2M009.

Upgrade and patch system

Software upgrade of the SAM21 Shelf Controller is completed through the CS 2000 SAM21 Manager. The SAM21 Shelf Controller software is not patchable.

OAMP strategy

Operations, administration, maintenance and provisioning for the SAM21 Shelf Controllers is available through the CS 2000 SAM21 Manager client.

Interfaces

Network interfaces and protocols

The network interface to the SAM21 Shelf Controller is a 10/100 Base T interface on the faceplate of the SAM21 Shelf Controller. This interface uses TCP/IP to communicate with other components in the Carrier Voice over IP network and to communicate with the CS 2000 SAM21 Manager. BOOTP and TFTP protocols are used on this interface to boot the SAM21 Shelf Controller. SNMP is used to coordinate messages between the SAM21 Shelf Controllers and the CS 2000 SAM21 Manager server.

If the SAM21 Shelf Controllers are configured with ATM interfaces, SNMP is used to report OMs to the SNMP Poller application on the CS 2000 Management Tools server and to the IEMS application, if those applications are available.

User interfaces

The CS 2000 SAM21 Manager provides the user interface to the SAM21 Shelf Controllers.

Many windows for the CS 2000 SAM21 Manager client have a help button. When the help button is clicked, the client application checks the entries in the various fields and provides help text for entries that are incorrect. For example, the following figure is the help text when an attempt is made to reprovision a MAC address for a shelf controller with less than 12 characters.

Help text example
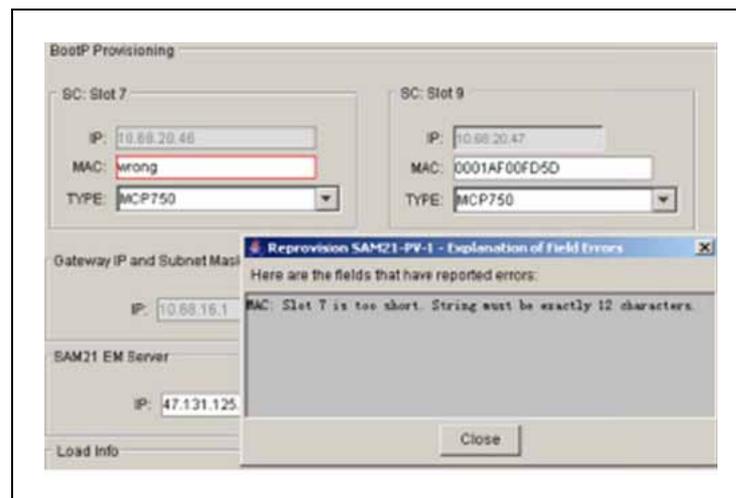
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