# Cisco BTS 10200 Softswitch PacketCable Guide, Release 6.0.3

**Revised: August 10, 2011, OL-25002-01**

This document describes how the Cisco BTS 10200 Softswitch implements PacketCable-based interfaces and functions. It also provides provisioning and operating information for PacketCable features and event messages (EMs). It is intended for use by service provider management, system administration, and engineering personnel who are responsible for designing, installing, provisioning, and maintaining networks that use the Cisco BTS 10200 Softswitch system in a PacketCable-based network.

### Document Change History

The following table lists the revision history for the *Cisco BTS 10200 Softswitch PacketCable Guide, Release 6.0.3*.

| Version Number | Issue Date | Status | Reason for Change |
|---|---|---|---|
| OL-25002-01 | August 10, 2011 | Initial | • Initial document for Release 6.0.3. |

## Contents




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# Technical Overview

This section provides technical information about the implementation of PacketCable features. It covers the following topics.



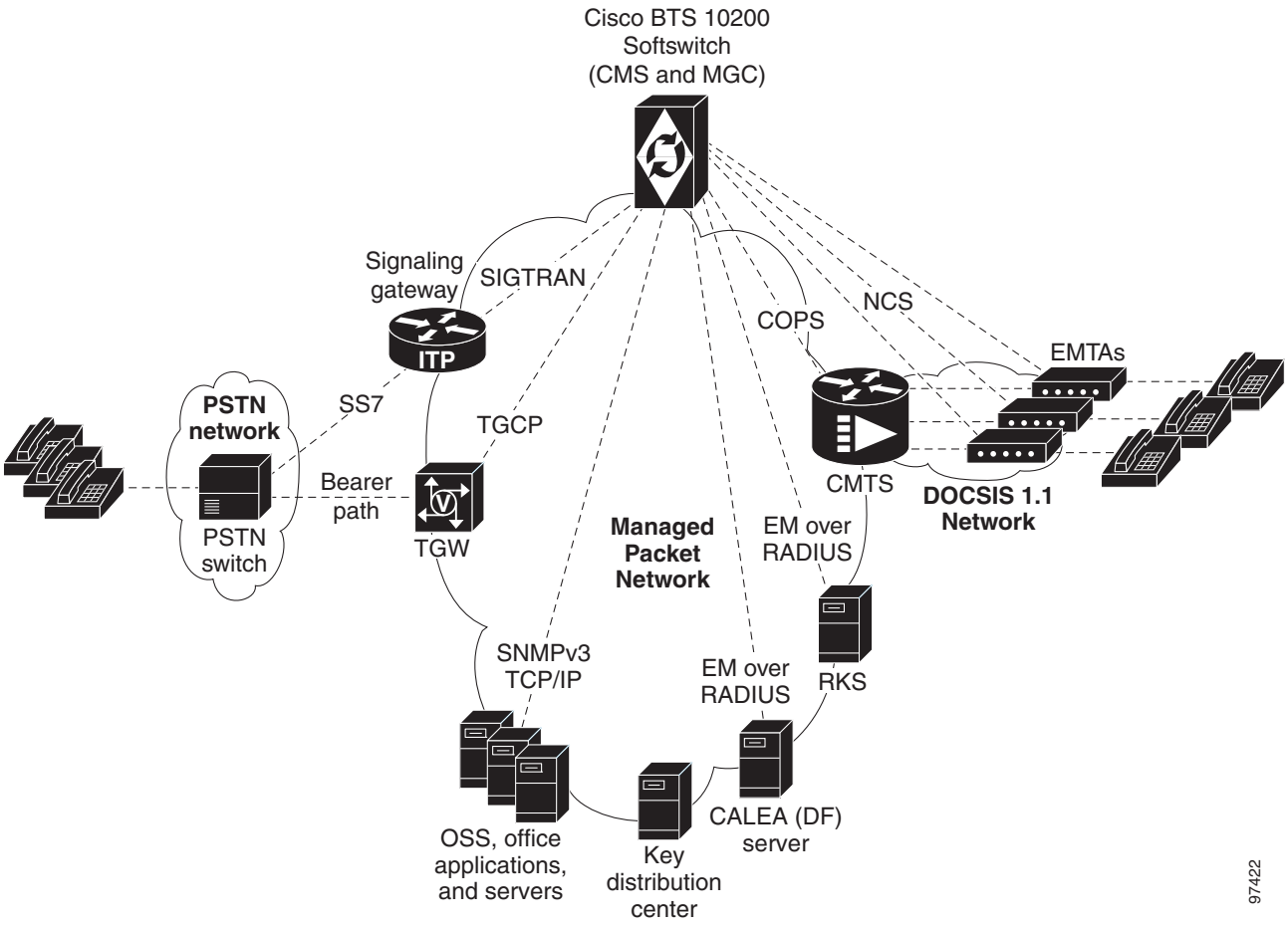
**Note** In this document, the term embedded multimedia terminal adapter (eMTA) refers to eMTAs using PacketCable Network-based Call Signaling (NCS) protocol.

## Cisco BTS 10200 Softswitch in the PacketCable Network

The Cisco BTS 10200 Softswitch is a class-independent network-switching element. In a PacketCable-based network, it functions as both a call management server (CMS) and a media gateway controller (MGC). It provides call control, call routing, and signaling for several types of multimedia terminal adapters (MTAs) and embedded MTAs (eMTAs), cable modem termination systems (CMTSs), and trunking gateways (TGWs) in PacketCable-based networks. It provides interfaces to record keeping servers (RKSs) and key distribution centers (KDCs). The Cisco BTS 10200 Softswitch also communicates with announcement servers, Signaling System 7 (SS7)-based signaling gateways, Media Gateway Control Protocol (MGCP)-based media gateways, and Session Initiation Protocol (SIP) networks.

Figure 1 shows a typical network with PacketCable-based network elements and the applicable external interfaces of the Cisco BTS 10200 Softswitch. In the PacketCable-based network, the Cisco BTS 10200 Softswitch performs the functions of both the CMS and MGC. The Cisco BTS 10200 Softswitch also provides provisionable options for customizing the external interfaces.

*Figure 1 Example of PacketCable-Based Network Architecture*




## PacketCable-Based Interfaces

The Cisco BTS 10200 Softswitch supports signaling on specific PacketCable-based interfaces shown in Figure 1. The following list summarizes the supported protocols for each of the links:

- CMS to MTA (NCS)—CMS-to-MTA interface for subscriber access
- CMS to CMTS (Common Open Policy Service[COPS])—CMS-to-CMTS interface for gate management
- CMS to RKS (EM over Remote Access Dial-In User Service [RADIUS])—CMS-to-Record Keeping Server (RKS) interface for EM-based billing functions
- MGC to RKS (EM over RADIUS)—MGC-to-RKS interface for EM-based billing functions
- CMS to Communications Assistance for Law Enforcement Act (CALEA) (EM over RADIUS)—CMS-to-CALEA server (Delivery Function [DF]) interface
- MGC to TGW (Trunking Gateway Control Protocol [TGCP])—MGC-to-trunking gateway (TGW) interface for TGW management (which allows calls to be connected between the PacketCable network and the public switched telephone network [PSTN])

Additional interfaces are defined for the PacketCable Multimedia (PCMM) quality of service (QoS) features in the "PCMM-Based QoS for Type 1 Clients" section on page 10.

The Simple Object Access Protocol/Extensible Markup Language (SOAP/XML) interface for CMS subscriber provisioning is defined in the "SOAP/XML Interface for CMS Subscriber Provisioning" section on page 11.

For a description of Cisco BTS 10200 Softswitch support for CALEA, see the *Cisco BTS 10200 Softswitch System Description*. For provisioning procedures related to CALEA support, see the *Cisco BTS 10200 Softswitch Provisioning Guide.*

**Note** For information on compliance with specific paragraphs of PacketCable standards and explicit congestion notifications (ECNs), contact your Cisco account team.

## Additional Network Interfaces

The following additional interfaces are not part of the PacketCable feature set, but they provide other important functions useful in the service provider network:

- Cisco BTS 10200 Softswitch/Signaling Gateway (SIGTRAN)—This interface allows calls to be made between the PacketCable network and the PSTN. The Call Agent (CA) of the Cisco BTS 10200 Softswitch interfaces to an Internet transfer point (ITP) signaling gateway (SG), for example, the Cisco 7500 series router. The ITP SG provides an SS7-based interface to the Signal Transfer Point (STP) (PSTN).
- MGCP Interface—The Cisco BTS 10200 Softswitch communicates with MGCP-based TGWs that provide a bearer path to the PSTN.
- SIP Interface—SIP signaling is used for the following two functions:
  - Communications with another CMS
  - Access to voice mail
- Cisco BTS 10200 Softswitch office applications (Simple Network Management Protocol Version 3 [SNMPv3] and Common Object Request Broker Architecture [CORBA] over Transmission Control Protocol/Internet Protocol [TCP/IP])—
  This interface provides communication with Operations Support System (OSS) and office applications servers.

## Gate Coordination Functions

In the PacketCable environment, the Cisco BTS 10200 Softswitch performs the gate coordination functions of a CMS, including the gate controller (GC). GC signaling is based on the COPS stack. Each CMTS informs the CMS when a gate is successfully opened or closed. Two gate coordination messages are used, Gate-Open and Gate-Close. Gate coordination is required to avoid several theft-of-service scenarios, as described in Appendix K of the *PacketCable Dynamic Quality-of-Service Specification*, PKT-SP-DQOS-I07-030815, August 15, 2003.

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs, contact your Cisco account team.

### Gate-Open Process

The normal coordination process for Gate-Open signaling, illustrated in Figure 2, has four main steps:

1. During call setup, the Cisco BTS 10200 Softswitch requests the MTA to commit bearer-path resources.
2. The MTA sends a commit message to the CMTS to request opening of the gate on the bearer path.
3. The CMTS opens the gate and sends a Gate-Open message to the Cisco BTS 10200 Softswitch.
4. The Cisco BTS 10200 Softswitch allows the call.

*Figure 2 Gate Coordination Signaling Example (Gate-Open)*

If the Gate-Open message arrives at the Cisco BTS 10200 Softswitch before it has sent a resource-commit request to the MTA, the Cisco BTS 10200 Softswitch sends a GATE-DELETE message to the CMTS with Unexpected Gate-Open included in the reason code.

### Gate-Close Process

During a call, if the Cisco BTS 10200 Softswitch receives a Gate-Close message from the CMTS, it allows the call to proceed on a best-effort basis, without a guaranteed level of service. (It tears down the call only when one of the parties in the call goes on-hook.)

## Security Interface Features

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs, contact your Cisco account team.

The implementation of PKT-SP-SEC-I09-030728, *PacketCable Security Specification*, July 28, 2003, provides a security scheme for the voice-over-cable network built on a set of security protocols. These protocols, based on the following documents, provide authentication (to help prevent theft of bandwidth, denial-of-service attack, replay, and so forth) and enable message integrity, privacy, and confidentiality.

- IETF documents covering IP security (IPsec) architecture:
  - RFC 2401, *Security Architecture for the Internet Protocol*, IETF (S. Kent, R. Atkinson), Internet Proposed Standard, November 1998

  - RFC 2406, *IP Encapsulating Security Payload (ESP)*, IETF (D. Piper), Internet Proposed Standard, November 1998

- IETF documents covering key management protocols—Internet Key Exchange (IKE) and Kerberos with extensions:
  - RFC 2409, *The Internet Key Exchange (IKE)*, IETF (D. Harkins, D. Carrel), Internet Proposed Standard, November 1998
  - RFC 1510, *The Kerberos Network Authentication Service (V5)*, IETF (J. Kohl, C. Neuman), September 1993, with updates presented in PKT-SP-SEC-I09-030728

The Cisco BTS 10200 Softswitch performs the security functions of a CMS and a MGC in the PacketCable environment. It supports security in accordance with PKT-SP-SEC-I09-030728 for both signaling and media:

- Signaling security—For signaling from CMS to eMTA, CMS to CMTS, and MGC to TGW
- Media (bearer) security—For signaling between originating eMTA and terminating eMTA, which is facilitated by the CMS during call signaling setup

The system supports IPsec features for encryption and authentication on specific PacketCable-based interfaces (see Figure 1 on page 3). There are two aspects to the security features; the security protocol itself (IPsec), and the key management (Kerberos or IKE). The following list summarizes the supported security type for each of the links:

- CMS to MTA (NCS)—IPsec/Kerberos
- CMS to CMTS (COPS)—IPsec/IKE
- CMS to RKS (EM over RADIUS)—IPsec/IKE
- MGC to RKS (EM over RADIUS)—IPsec/IKE
- CMS to CALEA (EM over RADIUS)—IPsec/IKE
- MGC to TGW (TGCP)—IPsec/IKE

As shown in Figure 1 on page 3, there is no interface between the KDC and the Cisco BTS 10200 Softswitch. To ensure secure NCS signaling, a dynamic key exchange is performed. This exchange provides for IPsec security operations between the MTA and the Cisco BTS 10200 Softswitch. (These procedures are described in the CableLabs document *PacketCable Security Specification*, PKT-SP-SEC-I09-030728, under "Kerberized IPsec" and other sections.)

- Manual key provisioning must be used to match data stored in the KDC with data stored in the Cisco BTS 10200 Softswitch (pre-setup).
- The MTA must contact the KDC to obtain the credentials to talk to the server, which in this case, is the Cisco BTS 10200 Softswitch.

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs, contact your Cisco account team.

**Note** See the "Installation" section on page 14 regarding the requirement for setting the IPSEC_ENABLED parameter at the time of Cisco BTS 10200 Softswitch software installation.

# Event Message Feature

This section describes Cisco BTS 10200 Softswitch support for the EM feature.

## Billing Data Options

The Cisco BTS 10200 Softswitch can provision billing support using either of the following billing data generation methods:

- Call detail blocks (CDBs)—This is traditional post-call billing data, which is assembled into call detail records (CDRs) by an external billing mediation system or billing server.
- PacketCable EMs—This is real-time call data flow, which is transferred to an external RKS that assembles CDRs from the EMs.

The Cisco BTS 10200 Softswitch should be provisioned to generate either EMs or CDBs, but not both.

**Caution** We strongly recommend that you provision the Cisco BTS 10200 Softswitch to generate either EMs or CDBs, but not both. Attempting to generate both types of records simultaneously can significantly degrade system performance. See the "Provisioning the System to Generate EMs for Billing" section on page 51 for provisioning details.

The content of the CDBs is outside the scope of this document. See the *Cisco BTS 10200 Softswitch Billing Interface Guide* for information about CDBs.

## Description of the Event Message Feature

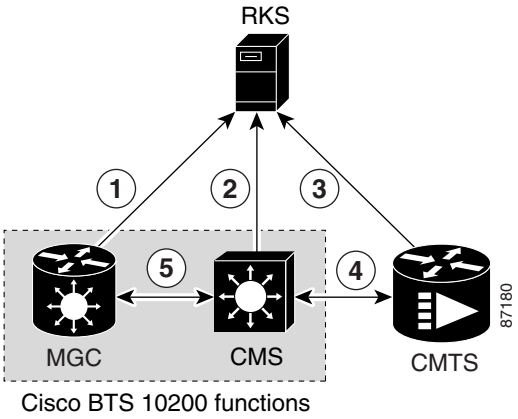
EMs are real-time data records containing information about network usage and activities. (They must not be confused with system event messages that report events and sometimes trigger alarms.) EMs are used in PacketCable networks to collect resource usage data for billing purposes. In the PacketCable architecture, EM generation is based on the half-call model. A single EM can contain complete usage data or it might contain only part of the usage information.

The RKS is a PacketCable network element that receives EMs from network elements, such as the CMS, the MGC, and the CMTS. The physical Cisco BTS 10200 Softswitch contains both CMS and MGC logical network elements. The EMs generated by both the CMS and MGC are sent to the RKS. The RKS correlates the information in multiple EMs and provides the complete record of service for a call, which is referred to as a CDR.

For information about EM-related operations on the Cisco BTS 10200 Softswitch, see the "Operations, Billing, and EM Transfer Procedures" section on page 56.

Figure 3 illustrates the PacketCable network elements that are involved in the EM process.

***Figure 3 Event Message Interfaces***




The EM related interfaces illustrated here are described as follows:

1. MGC to RKS—EMs generated by MGC (Cisco BTS 10200 Softswitch) are sent to RKS.
2. CMS to RKS—EMs generated by CMS (Cisco BTS 10200 Softswitch) are sent to RKS.
3. CMTS to RKS—EMs generated by CMTS are sent to RKS. The Cisco BTS 10200 Softswitch (MGC/CMS) is not involved.
4. CMS to CMTS—CMS (Cisco BTS 10200 Softswitch) sends the billing correlation ID (BCID) to the CMTS using the dynamic quality of service (DQoS) GateSet message.
5. CMS to MGC—An internal exchange of originating/terminating information such as BCID and financial entity ID (FEID).

PacketCable EMs can support billing and settlement activities for single-zone architectures. The originating and terminating CMSs exchange unique BCIDs and (FEIDs) for each half of the call. The originating CMS sends a BCID and an FEID in the INVITE message. The Cisco BTS 10200 Softswitch allocates the BCID for calls it originates or terminates. Along with the FEID, the BCID is used across network elements to reference calls. The FEID is provisioned on a system-wide basis (a single setting for the Cisco BTS 10200 Softswitch) as defined in the "Provisioning the System to Generate EMs for Billing" section on page 51.

## Event Message Generation Details and Content

See the "EM Generation Details and Content" section on page 65 for information on EM data.

## Timestamp Support for Event Messages

The system-generated timestamps for EMs are based on the host operating system (OS) time and time zone. This data is not affected by command line interface (CLI) provisioning. The Solaris OS obtains the time automatically through Network Time Protocol (NTP) services.

**Caution** You should never attempt to modify the system date or time in a Cisco BTS 10200 Softswitch host machine while system components (CA, feature server [FS], Element Management System [EMS], and Bulk Data Management System [BDMS]) are running. The attempt could cause the system to have serious problems. Allow the Solaris OS to obtain the time automatically through NTP services.

## Event Message Transport

Remote Access Dial-In User Service (RADIUS) is a client/server protocol used for Authorization, Authentication, and Accounting (AAA). The RADIUS protocol is an industry standard for remote access AAA defined in a set of Internet Engineering Task Force (IETF) standards: RFC 2865 and RFC 2866.

The RADIUS transport protocol is used between the Cisco BTS 10200 Softswitch (CMS/MGC) and the RKS. The RKS (or mediation device) communicates with the IP port configured in platform.cfg file for event message adapter (EMA) process (responsible for sending RADIUS message to the network) in BTS 10200.

**Note** You should not have both the signaling and management interfaces available to the billing mediation center (the remote end of the RADIUS link). EM packets can originate on any of the BTS 10200 interfaces. Only those EM packets originating in the management network should be allowed. Ensure that the client side can account for the temporary receipt of packets from the two management interfaces of the BTS 10200.

The system sends EMs to an RKS without waiting for acknowledgment of the previous message. The maximum number of pending ACK messages is 256.

EMs are first sent to the primary RKS. If the specified number of retry attempts fail, the EMs are sent to the secondary RKS. If one RKS is found to be unreachable, then the other RKS is considered for subsequent messages. If both the primary and secondary RKSs become unreachable, the EMs are stored in an error file on the hard disk (as described in the "Event Message Storage on the CA" section on page 9) and a timer is started. When the timer expires, newly arriving EMs are sent to the primary RKS.

If EMs are being sent to the primary RKS and the primary RKS goes down, the Cisco BTS 10200 Softswitch sends subsequent EMs to the secondary RKS. When the primary RKS comes back up, the Cisco BTS 10200 Softswitch continues to send EMs to the secondary RKS. (It does not automatically begin sending them to the primary RKS.) Provisioning of timers and retry attempts is described in the "Provisioning Support for EM Transmission and Storage" section on page 48.

## Event Message Storage on the CA

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs listed in this document, contact your Cisco account team.

EMs are stored in the network element (CA) that generates them until they are transferred to the RKS. After receipt of the EMs is acknowledged by the RKS, they are deleted. The number of EMs generated by the Cisco BTS 10200 Softswitch depends on the number of calls processed. Multiple EMs are generated for each call. Depending on provisioning in the call-agent-profile table and the type of call, EMs can be generated by the CMS or MGC (or both) within the CA. The exact storage requirement varies depending on the rate of EM generation and how long the Cisco BTS 10200 Softswitch is required to keep the records before transferring them to an RKS.

The Cisco BTS 10200 Softswitch generates and stores EMs with the following characteristics:

- EMs are generated in real time during a call. EMs contain timestamps with a granularity of 1 millisecond. The time interval between generation and transmission is not specified.
- The Cisco BTS 10200 Softswitch synchronizes with the network clock using NTP at least once per hour. The deviation of the clock in the Cisco BTS 10200 Softswitch remains within ±100 milliseconds between NTP synchronizations.
- EMs that cannot be successfully transferred to the RKS due to loss of communication are stored in the /opt/BTSem directory on the CA. The system uses the file-naming conventions specified in PacketCable ECN EM-N-04.0186-3 for the stored EMs. The maximum EM file size and the time limit on keeping a file open are provisionable, as described in the "Provisioning Support for EM Transmission and Storage" section on page 48. These files are not automatically deleted or transferred out of the CA.

**Caution** Event messages that cannot be successfully transferred to the RKS due to loss of communication are not automatically deleted or transferred out of the CA. *You must transfer these files to the RKS when communication is restored.*

The procedure for doing this is provided in the "Manual Recovery and Transfer of Stored EMs" section on page 58.

- Each time an EM file is placed in local storage, the system checks current disk usage and takes the following actions:
  - The system generates an alarm if the disk space allocated to EMs fills up to a certain level—50 percent (minor alarm), 70 percent (major alarm), or 100 percent (critical alarm).
  - When the critical condition is reached, the system issues a critical alarm, and further EMs are dropped without any additional warning.
  - When the critical condition is reached, the disk usage is monitored periodically (one time every minute) to check if disk space usage has decreased and EMs can be stored again.

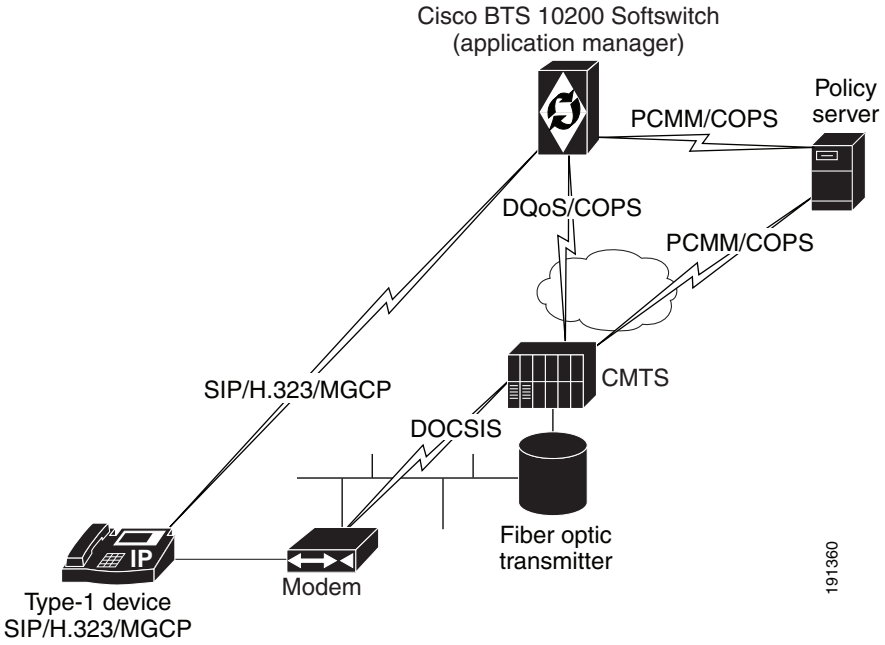
# PCMM-Based QoS for Type 1 Clients

This section describes the implementation of the PacketCable Multimedia (PCMM) feature that provides quality of service (QoS) for type 1 clients managed by the Cisco BTS 10200 Softswitch. This feature is applicable to endpoints using SIP, MGCP, or H.323 as the call signaling protocol.

**Note** The Cisco BTS 10200 Softswitch supports this PCMM-based feature in addition to all of the PacketCable-based features provided in earlier releases. If you would like detailed information on compliance with specific PacketCable specifications, contact your Cisco account team.

Figure 4 provides a sample system context for this feature.

***Figure 4 Network Architecture with Policy Server and PCMM Interfaces***




As shown in Figure 4, the PCMM implementation requires the Cisco BTS 10200 Softswitch to communicate with a policy server (PS), which is a third party device. For calls originating on, or terminating to a type 1 client, the Cisco BTS 10200 Softswitch acts as an application manager (AM) and sends requests to the PS for admission control through PCMM-based signaling. The PS in turn requests the CMTS to allocate bandwidth and other resources as in the request. After resources are allocated, the results are provided to the AM (via the PS) and the Cisco BTS 10200 Softswitch continues with call signaling to set up the call.

For the CLI provisioning procedure related to PCMM-based functions, see the "Provisioning PCMM-Based QoS for Type 1 Clients" section on page 54.

For maintenance commands related to the CMTS and PS, see the "Reset, Control, and Status Commands" section on page 57.

# SOAP/XML Interface for CMS Subscriber Provisioning

This section describes the implementation of PacketCable CMS subscriber provisioning on the Cisco BTS 10200 with a Simple Object Access Protocol/Extensible Markup Language (SOAP/XML) interface.

This initial release supports only the Pkt-p1 interface to the PS/CMS and only the PcspService Object, without extensions. It supports a subset of the call feature objects in the ListOfCallFeatures element.

In the Pkt-p1 interface, the Cisco BTS 10200 Softswitch plays the role of CMS. Any third-party PS using SOAP Version 1.1 can provision the BTS. The requests and responses between the CMS and the PS are encapsulated in SOAP Version 1.1 messages. A secure transport protocol is provided by IPsec.

## SOAP/XML Interface

Currently, a user can connect to a Cisco BTS 10200 CORBA server to access command templates and enter command executions, allowing system-to-system provisioning. The feature described in this document allows the XML commands to be transported by the SOAP transport protocol, rather than CORBA. Users of this feature communicate with a BTS SOAP server, which resides on the Cisco BTS 10200 EMS.

The Cisco BTS 10200 XML schema is a general purpose schema currently used by the XML/CORBA interface. The XML schema does not change with the incorporation of the SOAP transport protocol.

SOAP/XML Adapter and specifications are documented in the *Cisco BTS 10200 Softswitch SOAP Adapter Interface Specification Programmer Guide*.

## System Components

CMS subscriber provisioning involves the interface between the following components:

- Provisioning Server (PS)—Provides the interface between the service provider's back office components and the PacketCable elements. The PS consists of a provisioning application that contains provisioning logic and a provisioning SNMP entity that provides access to active components.
- Call Management Server (CMS)—Provides call control and signaling-related services for the MTA and CMTS in the PacketCable network. The Cisco BTS 10200 is the CMS.

## CMS Subscriber Provisioning

CMS subscriber provisioning includes the operations necessary to provide a specified service to a customer and provides two main functions:

- CMS Basic POTS Provisioning (BPP)—Provides the CMS with the minimum information necessary for routing of plain old telephone service (POTS) in the PacketCable network. Data consists of a telephone number mapped to its associated MTA's fully qualified domain name (FQDN) and NCS endpoint identifier and is used to set up translation tables enabling the CMS to route calls to the appropriate device given a specific telephone number. BPP for a customer is required before the customer can receive any calls.
- CMS Call Feature Provisioning (CFP)—Provides call features to a customer.

## Call Features

The following call features are supported by the PacketCable CMS subscriber provisioning interface. The following list provides the name of each feature in PacketCable terminology, followed by the corresponding Cisco BTS 10200 feature in parentheses:

- Calling Number Delivery (CND)
- Calling Name Delivery (CNAM)
- Calling Identity Delivery on Call Waiting (CIDCW)
- Call Waiting (CW)
- Cancel Call Waiting (CCW)
- Call Forwarding Variable and Usage-Sensitive Call Forwarding (*72/*73) (CFVBBG)
- Automatic Recall (*69) (AR)

- Automatic Callback (*66) (AC)
- Visual Message Waiting Indicator (VMWI)
- Customer Originated Trace (*57) (COT)
- Three Way Calling/Usage-Sensitive Three-Way Calling (*71) (TWC)
- Remote Activation of Call Forwarding (RACF)
- Anonymous Call Rejection (*77/*87) (ACR)
- Call Forwarding Busy Line (*68/*40/*88) (CFB)
- Call Forwarding Don't Answer (*68/*24/*88) (CFNA)
- Call Forwarding Combination (CFU)
- Selective Call Forwarding (*63/*83) (SCF)
- Selective Call Acceptance (*64/*84) (SCA)
- Selective Call Rejection (*60/*80) (SCR)
- Distinctive Ringing/Call Waiting (*61/*81) (DRCW)
- Speed Calling (*74/*75) (SC1D)
- Line Service Restriction (COS)
- Do Not Disturb (DND)

## Prerequisites for CMS Subscriber Provisioning

This section lists requirements that must be met before provisioning the CMS subscriber.

- The web server and SOAP engine are running.
- The CMS and the PS reside in the same secure provisioning domain.

## Limitations on CMS Subscriber Provisioning

This section lists limitations. These are conditions for which the CMS subscriber provisioning is not designed to work.

- The CMS provisioning interface is limited to the exchange of service activation data between the CMS and the provisioning server.
- The CMS provisioning interface supports only the existing CMS subscriber provisioning functionality in the Cisco BTS 10200.
- The scope of the feature is limited to subscriber provisioning in a PacketCable 1.5 network.
- The system supports only the Pkt-p1 interface to the PS/CMS and only the PcspService Object, without extensions. It supports a subset of the call feature objects in the ListOfCallFeatures element.

# Planning

Delivery of the features and functions described in this document requires interoperability with the network elements connected to the Cisco BTS 10200 Softswitch. See the "Component Interoperability" section in the *Cisco BTS 10200 Softswitch Release Notes*, which lists the specific peripheral platforms, functions, and software loads that have been tested by Cisco for interoperability with the Cisco BTS 10200 Softswitch.

**Note** The "Component Interoperability" section in the *Cisco BTS 10200 Softswitch Release Notes* is intended as a guide. Earlier or later releases of platform software might be interoperable, and it might be possible to use other functions on these platforms. The list certifies only that the required interoperation of these platforms, the functions listed, and the protocols listed have been successfully tested with the Cisco BTS 10200 Softswitch.

# Installation

Installation of Cisco BTS 10200 Softswitch software follows a standard process. For details, see the *Application Installation Procedure* in the Cisco BTS 10200 Softswitch documentation set. Of the three main PacketCable feature areas (DQoS, EM, and security), two of them (DQoS and EM) are always installed, and do not require the setting of any special flags during software installation. However, the third area (security) is not installed unless a special flag (IPSEC_ENABLED) is set in the opticall.cfg file during software installation.

**Caution** We strongly recommend that you contact Cisco Technical Assistance Centre (TAC) if you believe that you might need to reinstall Cisco BTS 10200 Softswitch software in order to change the value of IPSEC_ENABLED.

# Provisioning Procedures

This section explains how to perform the following procedures:


- Provisioning Basic PacketCable and DQoS Features, page 15
- Provisioning Security Interfaces, page 39
- Provisioning Event Messages, page 48
- Provisioning PCMM-Based QoS for Type 1 Clients, page 54
- Provisioning AuditConnection Parameters, page 55


These tasks include examples of CLI commands that illustrate how to provision the specific feature. Most of these tables have additional tokens that are not included in the examples. For a complete list of all CLI tables, tokens, descriptions, valid ranges, and default values, see the *Cisco BTS 10200 Softswitch CLI Database*.

**Note** The command sequences shown in this section provide guidance on how to provision a new system. Therefore, in most cases the commands are **add** commands. If you are modifying previously provisioned gateways (GWs), TGs, and so forth, use the **change** commands.

# Provisioning Basic PacketCable and DQoS Features

This section describes how to provision the Cisco BTS 10200 Softswitch interfaces to connect to other PacketCable-based network elements (NEs) and how to select DQoS options. It includes the following tasks:



## Provisioning CMS Parameters

This section describes how to provision DQoS functionality for the CMS logical entity on the Cisco BTS 10200 Softswitch (Call Agent).

### SUMMARY STEPS

1. **add call-agent-profile id=**<id>**; dqos-supp=[y | n]; description=**<description>**;**
2. **add ca-config type=**<timer type>**; datatype=INTEGER; value=**<value>**;**
3. **add ca-config type=LOCAL-RINGBACK; datatype=BOOLEAN; value=**<value>**;**
4. **add ca-config type=COPS-DSCP-TOS; datatype=INTEGER; value=**<value>**;**
5. **add ca-config type=MAX-MGCP-DATAGRAM; datatype=INTEGER; value=**<value>**;**

**Note** The token values shown in this section are examples.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add call-agent-profile id=**<id>**; dqos-supp=[y \| n]; description=**<description>**;**<br><br>**Example:**<br>`add call-agent-profile id=CA146; dqos-supp=y; description=BostonCA33` | Enables DQoS support. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **add ca-config type**=<timer type>**; datatype**=**INTEGER; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=DQOS-T1-TIMER;<br>datatype=INTEGER; value=250;<br><br>add ca-config type=DQOS-DS-SLACK-TERM;<br>datatype=INTEGER; value=30000;<br><br>add ca-config type=DQOS-GATE-TIMER;<br>datatype=INTEGER; value=3; | (Optional) Set CMS timers in the Call Agent Configuration (ca-config) table, if you are using values other than the defaults. The applicable timers are DQOS-T1-TIMER, DQOS-T5-TIMER, DQOS-T7-TIMER, DQOS-T8-TIMER, DQOS-DS-SLACK-TERM, DQOS-US-SLACK-TERM, and DQOS-GATE-TIMER.<br><br>The default values for these timers might be adequate for your specific case. In each case, you can use the **show** command to find out how the parameter is currently set. See the *Cisco BTS 10200 Softswitch CLI Database* for parameter definitions and valid ranges. |
| **Step 3** | **add ca-config type**=**LOCAL-RINGBACK; datatype**=**BOOLEAN; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=LOCAL-RINGBACK;<br>datatype=BOOLEAN; value=N; | (Optional) Set the local ringback flag in the ca-config table.<br><br>The default values for these parameters might be adequate for your specific case. In each case, you can use the **show** command to find out how the parameter is currently set. See the*Cisco BTS 10200 Softswitch CLI Database* for parameter definitions and valid ranges. |
| **Step 4** | **add ca-config type**=**COPS-DSCP-TOS; datatype**=**INTEGER; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=COPS-DSCP-TOS;<br>datatype=INTEGER; value=96; | (Optional) Set the differential service code point (DSCP)/type of service (TOS) parameter in the ca-config table.<br><br>The default values for these parameters might be adequate for your specific case. In each case, you can use the **show** command to find out how the parameter is currently set. See the*Cisco BTS 10200 Softswitch CLI Database* for parameter definitions and valid ranges.<br><br>⚠ **Caution** We do not recommend that you change the DSCP value unless necessary, and recommend that you contact Cisco TAC regarding any plans to change it. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 5** | **add ca-config type=MAX-MGCP-DATAGRAM; datatype=INTEGER; value=**<value>**;**<br><br>**Example:**<br>add ca-config type=MAX-MGCP-DATAGRAM; datatype=INTEGER; value=3900; | (Optional) Set the maximum MGCP datagram sizes in the ca-config table.<br><br>The default values for these parameters might be adequate for your specific case. In each case, you can use the **show** command to find out how the parameter is currently set. See the *Cisco BTS 10200 Softswitch CLI Database* for parameter definitions and valid ranges.<br><br>The MAX-MGCP-DATAGRAM parameter specifies the maximum size of an MGCP message datagram (which can include one or more piggybacked messages) that the Cisco BTS 10200 Softswitch can decode before discarding the rest of the message part. The default value of 4000 bytes is adequate for most applications, and *Cisco does not recommend that you change this value* unless you are deploying MGCP-based media gateways or MTAs that require larger datagram sizes. |

## Provisioning the CMS Interfaces to the CMTS and eMTA

This section describes how to provision the interfaces to the CMTS and eMTA nodes. Specific tables are provisioned for each of these interfaces:

- CMTS—The Aggregation Profile (aggr-profile) and Aggregation (aggr) tables define the parameters for the connected CMTS devices. These parameters are used by the COPS adapter to establish and terminate TCP connections to the CMTS.
- MTA (or eMTA)—The Cisco BTS 10200 Softswitch uses the Media Gateway Profile (mgw-profile), Media Gateway (mgw), and Termination (termination) tables to establish and terminate connections to the eMTAs. The supported MGCP variant is NCS. The following tables are provisioned for this interface:
  - The mgw-profile table provides templates for defining each type of eMTA by hardware vendor. It identifies the specifications and settings necessary for communications between the Cisco BTS 10200 Softswitch (which functions as the CMS) and each type of eMTA. An mgw-profile ID must be created in this table before entries can be added to the mgw table. Several tokens have values that can be overwritten after the Cisco BTS 10200 Softswitch (CMS) queries the eMTA for supported capabilities. If the eMTA returns a value different from the value originally provisioned in the Cisco BTS 10200 Softswitch, the returned value automatically replaces the originally provisioned value.
  - The mgw table holds information about each eMTA managed by the Cisco BTS 10200 Softswitch (CMS). The eMTA can be uniquely addressed by domain name, an IP address, or the TSAP address.
  - The termination table holds information about each endpoint in eMTAs managed by the CMS. Termination events and signals are grouped into packages, which are groupings of events and signals supported by a particular type of endpoint, such as an eMTA endpoint. One or more packages can exist for a given endpoint-type.

## SUMMARY STEPS

1. **add aggr-profile id**=<id>**; dqos-supp**= [**y** | **n**];
2. **add aggr id**=<id>**; tsap-addr**=<tsap-addr>**; aggr-profile-id**=<id>**;**
3. **add mgw-profile id**=<id>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**; mgcp-default-pkg=LINE; mgcp-conn-id-at-gw-supp**= [**y** | **n**];
4. **show mgw-profile;**
5. **change mgw-profile id**=<id>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**;**
6. **add mgw id**=<id>**; tsap-addr**=<tsap-addr>**; call-agent-id**=<id>**; mgw-profile-id**=<id>**; type=rgw; aggr-id**=<id>**; node**=<node>**;**
7. **add termination prefix**=<prefix>**; port-start**=<port>**; port-end**=<port>**; type=LINE; mgw-id**=<id>**;**
8. **control mgw id**=<id>**; target-state=INS; mode=forced;**
9. **status mgw id**=<id>**;**
10. **equip subscriber-termination id**=<id>**;**
11. **control subscriber-termination id**=<id>**; target-state=INS; mode=forced;**
12. **status subscriber-termination id**=<id>**;**

**Note** The token values shown in this section are examples.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add aggr-profile id**=<id>**; dqos-supp**=[**y** \| **n**]**;**<br><br>**Example:**<br>`add aggr-profile id=aggrprofile001; dqos-supp=y;` | Creates the CMTS (aggregation device) and enables DQoS support.<br><br>**Caution** DQoS is disabled (DQOS-SUPP=N) by default. Set this value to Y to enable DQoS. |
| **Step 2** | **add aggr id**=<id>**; tsap-addr**=<tsap-addr>**; aggr-profile-id**=<id>**;**<br><br>**Example:**<br>`add aggr id=cmts777;tsap-addr=ADDRESS123.cisco.com; aggr-profile-id=aggrprofile001` | The TSAP-ADDR can be a DNS or IP address. If you enter a domain name system (DNS) address, it must be a fully qualified domain name (FQDN). |
| **Step 3** | **add mgw-profile id**=<id>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**; mgcp-default-pkg**=**LINE; mgcp-conn-id-at-gw-supp**= [**y** \| **n**]**;**<br><br>**Example:**<br>`add mgw-profile id=mgwprofile777; mgcp-version=MGCP-1-0; mgcp-variant=NCS-1-0; mgcp-default-pkg=LINE; mgcp-conn-id-at-gw-supp=n;` | Creates the mgw-profile for this type of eMTA, and specifies values for the optional parameters.<br><br>The default values for these parameters might be adequate for your specific case. In each case, you can use the **show** command to find out how the parameter is currently set. See the *Cisco BTS 10200 Softswitch CLI Database* for parameter definitions and valid ranges. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **show mgw-profile;**<br><br>**Example:**<br>`show mgw-profile id=mgwprofile777;` | Shows the provisioned values for the parameters in the mgw-profile table.<br><br>Verify that the following values are present:<br>vendor=Cisco [or applicable vendor name]<br>mgcp-version=MGCP-1-0<br>mgcp-variant=NCS-1-0<br>mgcp-default-pkg=LINE<br>codec-neg-supp=y<br>pc-mptime-supp=y<br>mgcp-xdlcx-supp=n<br>domain-name-caching-supp=y<br>mgcp-conn-id-at-gw-supp=y |
| **Step 5** | **change mgw-profile id**=<id>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**;**<br><br>**Example:**<br>`change mgw-profile id=mgwprofile777;`<br>`mgcp-version=MGCP-1-0; mgcp-variant=NCS-1-0;` | (Optional) If any of the mgw-profile token values (from Step 4) need to be changed, use the **change mgw-profile** command. |
| **Step 6** | **add mgw id**=<id>; **tsap-addr**=<tsap-addr>;<br>**call-agent-id**=<id>; **mgw-profile-id**=<id>; **type=rgw**;<br>**aggr-id**=<id>**; node**=<node>**;**<br><br>**Example:**<br>`add mgw id=CiscoGW50; tsap-addr=192.168.26.104;`<br>`call-agent-id=CA146; mgw-profile-id=mgwprofile777;`<br>`type=rgw; aggr-id=cmts777; node=main0044;` | Creates the mgw id for a single eMTA, and specifies values for the other required parameters.<br><br>Be sure to set type=rgw or an eMTA.<br><br>You must enter the value for aggr-id to identify the appropriate CMTS for this eMTA.<br><br>The **node** token allows you to identify a hybrid fiber coax (HFC) node to which the eMTA is assigned. Typically, each eMTA is assigned to a node, and one or more nodes are assigned to a CMTS. |
| **Step 7** | **add termination prefix**=<prefix>**; port-start**=<port>**;**<br>**port-end**=<port>**; type=LINE; mgw-id**=<id>**;**<br><br>**Example:**<br>`add termination prefix=aaln/; port-start=1;`<br>`port-end=2; type=LINE; mgw-id=CiscoGW50;` | Creates the line termination for the eMTA and specifies values for the required parameters.<br><br>For eMTA terminations, always enter type=LINE. |
| **Step 8** | **control mgw id**=<id>**; target-state=INS; mode=forced;**<br><br>**Example:**<br>`control mgw id=CiscoGW50; target-state=INS;`<br>`mode=forced;` | Brings the eMTA in service (INS state). |
| **Step 9** | **status mgw id**=<id>**;**<br><br>**Example:**<br>`status mgw id=CiscoGW50;` | Verifies that the administrative state is INS. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 10** | **equip subscriber-termination** id=<**id**>**;**<br><br>**Example:**<br>equip subscriber-termination id=sub3456; | Equips the termination. |
| **Step 11** | **control subscriber-termination** id=<id>**;**<br>**target-state**=**INS; mode**=**forced;**<br><br>**Example:**<br>control subscriber-termination id=sub3456;<br>target-state=INS; mode=forced; | Places it in service (INS state). |
| **Step 12** | **status subscriber-termination id**=<id>**;**<br><br>**Example:**<br>status subscriber-termination id=sub3456; | Verifies that the administrative state is INS. |

## Provisioning DQoS Parameters for Codec Negotiation Service

The Quality of Service (qos) table is used in providing the codec negotiation service. Codec negotiation is the process the Cisco BTS 10200 Softswitch uses to find a common codec for the compression or decompression of a signal between two gateways. The Subscriber Profile (subscriber-profile) and Subscriber (subscriber) tables point to the qos table.

The following commands allow you to specify the required characteristics for these tables.

### SUMMARY STEPS

1. **add qos id**=<id>**; codec-type**=<type>**; client-type=dqos;**
2. **add subscriber-profile id**=<id>**; dial-plan-id**=<id>**; POP**=<POP**; qos-id**=<id>**;**
3. **add subscriber id**=<id>**; dn1**=<dn1>**; sub-profile-id=**<id>**; qos-id**=<id>**; term-type=**<type>**;**

**Note** The token values shown in this section are examples.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add qos id**=<id>**; codec-type**=<type>**; client-type=dqos;**<br><br>**Example:**<br>`add qos id=Gold1; codec-type=PCMU; client-type=dqos;` | Adds a QoS with the preferred codec type, specifies client type as DQoS, and other parameters as needed.<br><br>You must enter client-type=dqos in this command (and then assign this qos id to the subscriber or subscriber-profile in the next step) to enable DQoS functionality for the subscriber. |
| **Step 2** | **add subscriber-profile id**=<id>**; dial-plan-id**=<id>**; POP**=<POP>**; qos-id**=<id>**;**<br><br>**Example:**<br>`add subscriber-profile id=richardson; dial-plan-id=dp1; POP=BLDG222; qos-id=Gold1;` | Assigns a qos id to each subscriber-profile.<br><br>You must assign the qos id (the ID of the qos table that was provisioned in Step 1) to the subscriber-profile to enable DQoS functionality for the subscriber. |
| **Step 3** | **add subscriber id**=<id>**; dn1**=<dn1>**; sub-profile-id**=<id>**; qos-id**=<id>**; term-type**=<type>**;**<br><br>**Example:**<br>`add subscriber id=Person123; dn1=800-555-0123; sub-profile-id=richardson; qos-id=Gold1; term-type=none;` | Assigns a qos id to each subscriber.<br><br>You must assign the qos id (the ID of the qos table that was provisioned in Step 1) to the subscriber to enable DQoS functionality for the subscriber. |

## Provisioning TGCP Interfaces to TGWs

This section describes how to provision the TGCP interfaces to the TGWs.

The mgw-profile table provides templates for defining each type of TGW by hardware vendor. It identifies the specifications and settings necessary for communications between the Cisco BTS 10200 Softswitch (which functions as the MGC) and each type of TGW. Several tokens in this table have values that can be overwritten after the Cisco BTS 10200 Softswitch (MGC) queries the TGW for supported capabilities. If the TGW returns a value different from the value originally provisioned in the Cisco BTS 10200 Softswitch, the returned value automatically replaces the originally provisioned value.

### SUMMARY STEPS

1. **add mgw-profile id**=<id>**; vendor**=<vendor>**; mgw-type**=<type>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**; mgcp-default-pkg**=<pkg>**; pc-mptime-supp**=[**y** | **n**]**;**
2. **add mgw id**=<id>**; tsap-addr**=<tsap-addr>**; call-agent-id**=<id>**; mgw-profile-id**=<id>**; type**=<type>**;**
3. **add termination prefix**=<prefix>**; mgw-id**=<id>**; port-start**=<port>; **port-end**=<port>**; type**=<type>;
4. **add qos id**=<id>**; lptime**=<time>**; hptime**=<time>**; codec-type**=<type>**; client-type**=<type>**;**
5. **add trunk-grp id**=<id>**; call-agent-id**=<id>**; tg-type**=<id>**; qos-id**=<id>**; mgcp-pkg-type**=<type>**; pop-id**=<id>**;**

**Note** The token values shown in this section are examples.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add mgw-profile id**=<id>**; vendor**=<vendor>**; mgw-type**=<type>**; mgcp-version**=<version>**; mgcp-variant**=<variant>**; mgcp-default-pkg**=<pkg>**; pc-mptime-supp**=[**y** \| **n**]**;**<br><br>**Example:**<br>`add mgw-profile id=tgwprf222; vendor=cisco; mgw-type=MGX8850; mgcp-version=MGCP-1-0; mgcp-variant=TGCP-1-0; mgcp-default-pkg=TRUNK; pc-mptime-supp=y;` | Creates an mgw-profile for this type of TGW and specifies values for required parameters.<br><br>Be sure to set the following values for a TGW:<br>mgcp-version=MGCP-1-0<br>mgcp-variant=TGCP-1-0<br>mgcp-default-pkg=TRUNK<br><br>For most TGWs, set the pc-mptime-supp to Y. However, for a Cisco MGX8850 Voice Interworking Service Module (VISM) gateway, the MP function is not available. Therefore, set the pc-mptime-supp token to N for a Cisco MGX8850 VISM gateway. |
| **Step 2** | **add mgw id**=<id>**; tsap-addr**=<tsap-addr>**; call-agent-id**=<id>**; mgw-profile-id**=<id>**; type**=<type>**;**<br><br>**Example:**<br>`add mgw id=tgw50; tsap-addr=TGW1515.cisco.com; call-agent-id=CA146; mgw-profile-id=tgwprf222; type=tgw;` | Links a specific TGW to the applicable mgw-profile.<br><br>Be sure to set type=tgw. |
| **Step 3** | **add termination prefix**=<prefix>**; mgw-id**=<id>**; port-start**=<**port**>**; port-end**=<port>**; type**=<type>**;**<br><br>**Example:**<br>`add termination prefix=S0/ds1-2/; mgw-id=tgw50; port-start=1; port-end=24; type=TRUNK;` | Creates trunk terminations for the TGW.<br><br>Be sure to set type=TRUNK. |
| **Step 4** | **add qos id**=<id>**; lptime**=<time>**; hptime**=<time>**; codec-type**=<type>**; client-type**=<type>**;**<br><br>**Example:**<br>`add qos id=gold-service; lptime=20; hptime=20; codec-type=PCMU; client-type=dqos;` | Adds a QoS with the preferred codec type, specifies client type as DQoS, and specifies other parameters as needed.<br><br>You must enter client-type=dqos in this command (and then assign this qos id to the trunk-grp in the next step) to enable DQoS functionality for the trunk group.<br><br>⚠ **Caution** Provision the same values for lptime and hptime for both media gateways in the call. See the explanation in the "Quality of Service" section in the *Cisco BTS 10200 Softswitch Command Line Reference Guide*. |

| | Command or Action | Purpose |
|---|---|---|
| Step 5 | **add trunk-grp id**=<id>**; call-agent-id**=<id>**; tg-type**=<id>**; qos-id**=<id>**; mgcp-pkg-type**=<type>**; pop-id**=<id>**;**<br><br>**Example:**<br>`add trunk-grp id=101; call-agent-id=CA146; tg-type=ss7; qos-id=gold-service; mgcp-pkg-type=IT; pop-id=chicago333;` | Assigns a qos id and pop id to each trunk-grp.<br><br>For trunk groups on TGCP-based TGWs (mgcp-variant=TGCP-1-0 in the mgw-profile table), set the mgcp-pkg-type value to IT (ISUP trunk package).<br><br>You must assign the qos id (the ID of the qos table that was provisioned in the previous step) to the trunk-grp to enable DQoS functionality for the trunk group. |

## Provisioning the Keepalive AUEP Ping Option

This section explains how to provision the keepalive audit endpoint (AUEP) ping option. There are two tokens to provision:

- AUEP ping can be globally disabled on the system by use of the mgw-monitoring-enabled token in the Call Agent (call-agent) table.
- If globally enabled in the call-agent table, the AUEP ping can be selectively enabled or disabled for each mgw-profile by use of the keepalive-method token in the mgw-profile table. Each media gateway (eMTA) is linked to an mgw-profile by means of the mgw table.

### SUMMARY STEPS

1. **show call-agent id**=<id>**;**
2. **change call-agent id**=<id>**; tsap-addr**=<tsap-addr>**; mgw-monitoring-enabled**=[**Y** | **N**]**;**
3. **show mgw-profile id**=<id>**;**
4. **change mgw-profile id**=<id>**; keepalive-method**=<value>**;**
5. **change mgw-profile id**=<id>**; mgcp-keepalive-interval**=<interval>**; mgcp-keepalive-retries**=<retries>**; mgcp-max-keepalive-interval**=<interval>**; mgcp-max1-retries**=<retries>**; mgcp-max2-retries**=<retries>**;**
6. **add mgw id**=<id>**; mgw-profile-id**=<id>**;**

**Note** If mgw-monitoring-enabled=Y (the default value) in the call-agent table, the system checks the provisioning of the keepalive-method token in the mgw-profile table for each media gateway.

However, if mgw-monitoring-enabled=N, the AUEP ping is globally disabled, and the keepalive-method token is not checked.

The token values shown in this section are examples. In addition, these tables have many additional optional tokens not shown in these examples. For a complete list of all the tokens for each table, see the *Cisco BTS 10200 Softswitch CLI Database*.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show call-agent id**=<id>**;**<br><br>**Example:**<br>show call-agent id=CA146; | Show the setting for mgw-monitoring-enabled in the call-agent table.<br><br>The system responds with the current settings for the call-agent table. The default value of mgw-monitoring-enabled is Y. |
| **Step 2** | **change call-agent id**=<id>**; tsap-addr**=<tsap-addr>**;**<br>**mgw-monitoring-enabled**=[**Y** \| **N**]**;**<br><br>**Example:**<br>change call-agent id=CA146;<br>tsap-addr=CA146.cisco.com;<br>mgw-monitoring-enabled=Y; | (Optional) If the current value of mgw-monitoring-enabled is N, use this command to change it to Y. (Otherwise, go to Step 3.) |
| **Step 3** | **show mgw-profile id**=<id>**;**<br><br>**Example:**<br>show mgw-profile id=mgwprofile001; | Show the setting for keepalive-method in the mgw-profile table.<br><br>The system responds with the current settings for the mgw-profile table. |
| **Step 4** | **change mgw-profile id**=<id>**;**<br>**keepalive-method**=<value>**;**<br><br>**Example:**<br>change mgw-profile id=mgwprofile001;<br>keepalive-method=auep; | (Optional) If necessary, change the value of keepalive-method in the mgw-profile table.<br><br>The options for keepalive-method are:<br>• **none**—Turns off AUEP ping.<br>• **auep** — (Default) Performs AUEP ping. |
| **Step 5** | **change mgw-profile id**=<id>**;**<br>**mgcp-keepalive-interval**=<interval>**;**<br>**mgcp-keepalive-retries**=<retries>**;**<br>**mgcp-max-keepalive-interval**=<interval>**;**<br>**mgcp-max1-retries**=<retries>**;**<br>**mgcp-max2-retries**=<retries>**;**<br><br>**Example:**<br>change mgw-profile id=mgwprofile001;<br>mgcp-keepalive-interval=120;<br>mgcp-keepalive-retries=4;<br>mgcp-max-keepalive-interval=720;<br>mgcp-max1-retries=3; mgcp-max2-retries=4; | (Optical) If necessary, change the value of other keepalive tokens in the mgw-profile table.<br><br>The mgcp-max1-retries and mgcp-max2-retries tokens can be adjusted, if necessary, to improve response if there are network bandwidth or reliability issues, or if a media gateway is slow in responding to commands from the CA. For a detailed explanation of how these and other parameters affect the keepalive process, see "System Usage of MGW Keepalive Parameters" chapter of the *Cisco BTS 10200 Softswitch Troubleshooting Guide*. |
| **Step 6** | **add mgw id**=<id>**; mgw-profile-id**=<id>**;**<br><br>**Example:**<br>add mgw id=mgw_abc; mgw-profile-id=mgwprofile001; | Links an individual media gateway (eMTA) to an mgw-profile. |

## Provisioning MGCP Command Timeout and QoS Parameters

This section describes the steps required to provision the parameters for MGCP command timeout, silence suppression, and echo cancellation.

- MGCP command message timeout is a system-wide MGCP parameter, provisioned in the Call Agent Configuration (ca-config) table.
- The QoS parameters for silence suppression and echo cancellation are provisioned in the qos table.

### SUMMARY STEPS

1. **show ca-config type=mgcp-t-max;**
2. **show ca-config type=mgcp-t-hist;**
3. **change ca-config type=mgcp-t-max; datatype=integer; value=**<value>**;**
4. **change ca-config type=mgcp-t-hist; datatype=integer; value=**<value>**;**
5. **show mgw-profile id=**<id>**;**
6. **change mgw-profile id=**<id>**; ec-supp=**[**y** | **n**];
7. **show qos id=mta-subscriber;**
8. **change qos id=mta-subscriber; silence-suppression=**[**on** | **off**]**; echo-cancellation=**[**on** | **off**]**;**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show ca-config type=mgcp-t-max;**<br><br>**Example:**<br>`show ca-config type=mgcp-t-max;` | Display the values of mgcp-t-max.<br>• MGCP-T-MAX—The maximum time elapsed between sending of the initial MGCP datagram and all retransmissions cease. The range is 10 to 60 seconds (default 20 seconds). |
| **Step 2** | **show ca-config type=mgcp-t-hist;**<br><br>**Example:**<br>`show ca-config type=mgcp-t-hist;` | Display the values of mgcp-t-hist.<br>• MGCP-T-HIST—The maximum time elapsed between sending of the initial MGCP datagram and the copy of Response is destroyed, even though the media gateway does not send ResponseAck. Any message received from the media gateway with the same transaction ID after MGCP-T-HIST is considered to be a new command (and not retransmission). The range is 3 to 120 seconds (default 30 seconds).<br>**Note** If more than 2*mgcp-t-hist has elapsed, the system considers the endpoint disconnected, and takes appropriate action.<br>**Tip** Keep in mind that the system considers the endpoint disconnected after a period of 2*mgcp-t-hist, that is, twice the value provisioned for mgcp-t-hist. |
| **Step 3** | **change ca-config type=mgcp-t-max; datatype=integer; value=**<value>**;**<br><br>**Example:**<br>`change ca-config type=mgcp-t-max; datatype=integer; value=24;` | (Optional) If necessary, change the values of mgcp-t-max.<br>**Note** Use the **change** command if the show command in Step 1 displayed a value for the parameter; otherwise use the **add** command. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **change ca-config type=mgcp-t-hist; datatype=integer; value=<value>;**<br><br>**Example:**<br>change ca-config type=mgcp-t-hist; datatype=integer; value=36; | (Optional) If necessary, change the values of mgcp-t-hist.<br><br>⚠<br>**Caution** mgcp-t-hist must be greater or equal to mgcp-t-max+10. Otherwise the system reverts to the default values for these parameters. (The 10 seconds are added to allow for the maximum propagation delay.)<br><br>**Note** Use the **change** command if the show command in Step 1 displayed a value for the parameter; otherwise use the **add** command. |
| **Step 5** | **show mgw-profile id=<id>;**<br><br>**Example:**<br>show mgw-profile id=telcomta; | Display the values of EC-SUPP in the mgw-profile table.<br><br>EC-SUPP—Specifies whether the media gateway supports echo cancellation. Values are:<br>• Y—Media gateway supports echo cancellation.<br>• N (default)—Media gateway does not support echo cancellation.<br><br>**Note** The service-provider-provisioned value can be overwritten automatically on the CA upon query from the media gateway. |
| **Step 6** | **change mgw-profile id=<id>; ec-supp=[y \| n];**<br><br>**Example:**<br>change mgw-profile id=telcomta; ec-supp=y; | (Optional) If necessary, change the value of EC-SUPP in the mgw-profile table. |
| **Step 7** | **show qos id=mta-subscriber;**<br><br>**Example:**<br>show qos id=mta-subscriber; | Display the values of SILENCE-SUPPRESSION and ECHO-CANCELLATION in the qos table.<br>• SILENCE-SUPPRESSION—Specifies whether to send the silence suppression parameter to the media gateway, and the value (if sent):<br>– NONE—(default) Do not send silence suppression parameter (do not override the existing settings on the media gateway).<br>– ON—Silence suppression is ON.<br>– OFF— Silence suppression is OFF.<br>• ECHO-CANCELLATION—Specifies whether to send the echo cancellation parameter to the media gateway, and the value (if sent):<br>– NONE—(default) Do not send echo cancellation parameter (do not override the existing settings on the media gateway).<br>– ON—Echo cancellation is ON.<br>– OFF—Echo cancellation is OFF.<br>**Note** The QoS values for silence suppression and echo cancellation provisioned in the Cisco BTS 10200 Softswitch are ignored if the MGCP endpoint reports that it does not support these options during the capabilities audit. |

| | Command or Action | Purpose |
|---|---|---|
| Step 8 | **change qos id**=**mta-subscriber**; **silence-suppression**=[**on** \| **off**]; **echo-cancellation**=[**on** \| **off**];<br><br>**Example:**<br>change qos id=mta-subscriber;<br>silence-suppression=on;<br>echo-cancellation=off; | (Optional) If necessary, change the values of silence-suppression and echo-cancellation in the qos table. |

## Provisioning the Aggregation ID Subnet

Establishing subnets for MTAs enables a service provider to use the Subnet table to statically configure all subnets handled by every CMTS. The Cisco BTS 10200 Softswitch uses the IP address of the eMTA and Subnet table to determine the CMTS handling of a particular eMTA. An eMTA is a residential gateway. A CMTS is an aggregation device for multiple eMTAs.

An effective aggr-id is the aggr-id in effect for a particular eMTA. It identifies the CMTS to which the Cisco BTS 10200 Softswitch sends DQoS requests for that eMTA. A manual aggr-id is an aggr-id that is provisioned by a service provider. If an aggr-id is provisioned in the mgw table or Subnet table, it is a manual aggr-id.

The Cisco BTS 10200 Softswitch uses the following data precedence to decide an MTA's aggr-id:

- An MTA's aggr-id is equivalent to its manual aggr-id as long as the manual aggr-id is provisioned in the mgw table (not null).
- If an MTA's manual aggr-id is not provisioned, the MTA's effective aggr-id is equivalent to its subnet aggr-id as provisioned in the Subnet table. If a manual aggr-id is not provisioned either in the mgw table or the Subnet table, then DQoS is not applied to the eMTA.

This section explains the steps to manually provision subnets for an MTA.

### Provision the Media Gateway

This section explains the steps required to provision the residential (media) gateway (eMTA), if it has not already been provisioned. Provisioning an aggr-id for each eMTA is no longer required.

### SUMMARY STEPS

1. **add mgw-profile id**=<id>**;**
2. **add mgw id**=<id>**; tsap-addr**=<tsap-addr>**;**
3. **add termination id**=<id>**; mgw-id**=<id>**; sub-id**=<id>**;**
4. **add subscriber id**=<id>**; term-id**=<id>**;**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add mgw-profile id**=<id>**;**<br><br>**Example:**<br>add mgw-profile id=sa; | Add the media gateway profile. |
| **Step 2** | **add mgw id**=<id>**; tsap-addr**=<tsap-addr>**;**<br><br>**Example:**<br>add mgw id=sa1; tsap-addr=<whatever.net>; | Add the media gateway. |
| **Step 3** | **add termination id**=<id>**; mgw-id**=<id>**; sub-id**=<id>**;**<br><br>**Example:**<br>add terminati0n id=aaln/1;mgw-id=sa1;sub-id=NULL; | Add the termination id. |
| **Step 4** | **add subscriber id**=<id>**; term-id**=<id>**;**<br><br>**Example:**<br>add subscriber id=sub1;term-id=aaln/1; | Add the subscriber. |

### Provision the Subnet

This section explains the steps required to provision a subnet and associate it to an aggregation id. The aggr-id identifies the CMTS on the subnet level. The Cisco BTS 10200 Softswitch determines which subnet an eMTA belongs to by looking at the eMTAs IP address and the subnet's IP prefix. For example, if the eMTAs IP address is 192.168.0.1, then it is on subnet (prefix=192.168.0.0, prefix-length=24). If eMTA is on a provisioned subnet, the provisioned subnet aggr-id is the effective aggr-id for the eMTA.

## SUMMARY STEPS

1. **add aggr-profile id**=<id>**; dqos-supp**=[**Y** |**N**]**;**
2. **add aggr id**=<id>**; tsap-addr**=<tsap-addr>**; aggr-profile-id**=<id>**;**
3. **add subnet subnet-prefix**=<subnet>**; subnet-prefix-length**=<length>**; aggr-id**=<id>**;**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add aggr-profile id**=<id>**; dqos-supp**=[**Y** \|**N**]**;**<br><br>**Example:**<br>add aggr-profile id=cmts-prof-1; dqos-supp=Y; | Add the aggregation profile. |
| **Step 2** | **add aggr id**=<id>**; tsap-addr**=<tsap-addr>**; aggr-profile-id**=<id>**;**<br><br>**Example:**<br>add aggr id=cmts1; tsap-addr=<cmts-tsap-addr>;<br>aggr-profile-id=cmts-prof-1; | Add the aggregation ID for the CMTS. |
| **Step 3** | **add subnet subnet-prefix**=<subnet>**;**<br>**subnet-prefix-length**=<length>**; aggr-id**=<id>**;**<br><br>**Example:**<br>add subnet subnet-prefix=192.168.0.0;subnet-prefix-length=24;<br>aggr-id=cmts1;<br><br>add subnet subnet-prefix=192.160.0.0;<br>subnet-prefix-length=24;aggr-id=cmts1; | Add the subnet(s). |

### Missing Provisioned Data

A CMTS (AGGR) is provisioned in the Aggregation table, but none of the provisioned Subnets refers to that CMTS (AGGR).

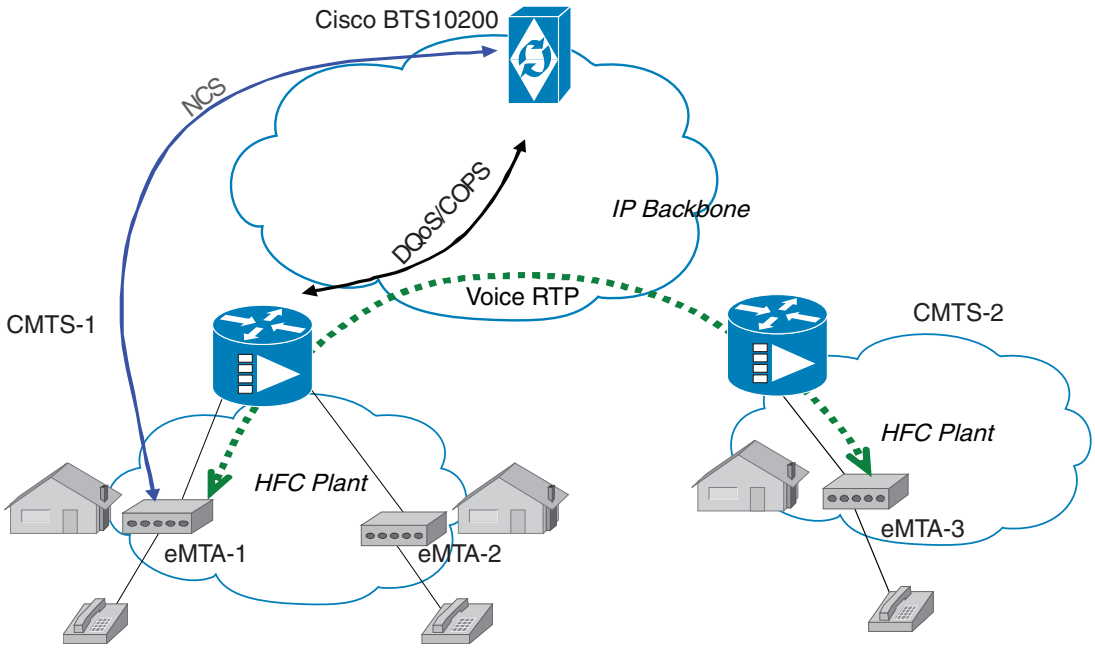
Use the following command to audit condition:

**report aggr subnet=NONE;**

## Provisioning CMTS Discovery Using the Static Subnet Table

To enable CMTS Discovery Using the Static Subnet table, you statically provision the Subnet table in the Cisco BTS 10200 system. Service providers must configure all subnets handled by every CMTS using the Subnet table. The Cisco BTS 10200 uses the IP address of the MTA and the Subnet table information to determine which CMTS (AGGR) is handling the MTA. Figure 5 provides a network diagram of the Cisco BTS 10200 to CMTS network connectivity. Figure 6 provides the CMTS to MTA association preference flow.

***Figure 5 Network Diagram***




- NCS: Call-processing messages between Cisco BTS10200 and eMTA
- DQoS/COPS: DQoS gate-control messages between Cisco BTS10200 and CMTS

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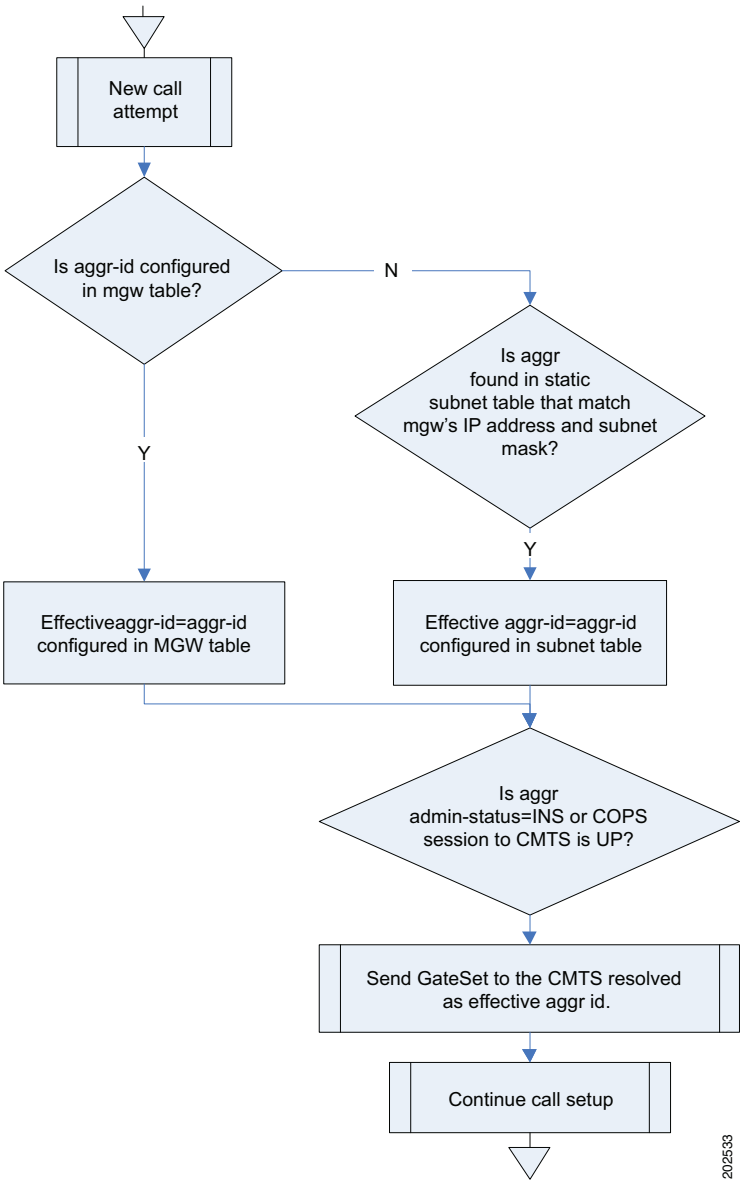
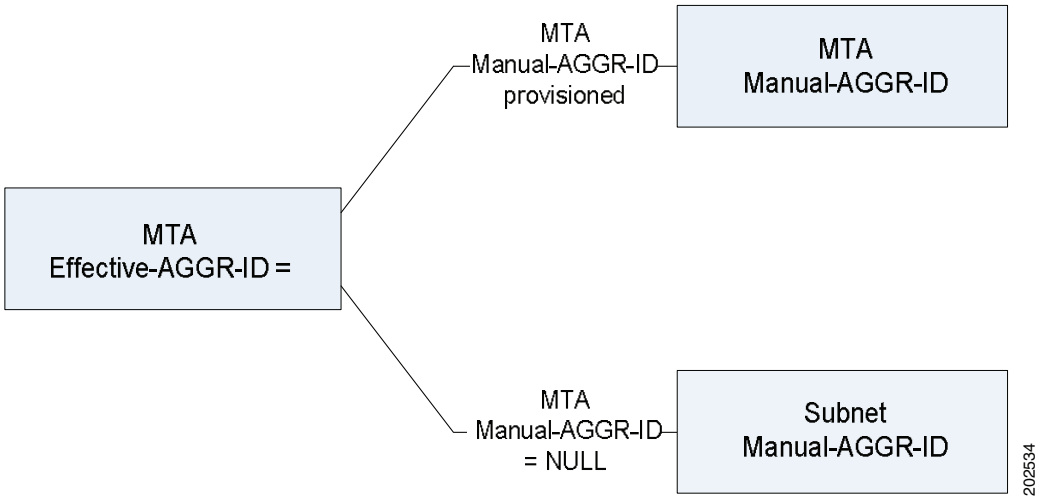
*Figure 6 CMTS to MTA Association Preference*




The Cisco BTS 10200 uses the following data precedence to determine the MTA effective-aggr-id as shown in Figure 7:

- The MTA's effective-aggr-id is equivalent to its manual-aggr-id (AGGR-ID provisioned in the mgw table) as long as the latter is provisioned as NOT NULL.
- If the MTA manual-aggr-id is not provisioned, the MTA effective-aggr-id is equivalent to its subnet's manual-aggr-id (AGGR-ID provisioned in the subnet table).

*Figure 7 MTA Effective-AGGR-ID Data Precedence*




## Provisioning a Subnet

This section explains the steps required to provision a subnet.

## SUMMARY STEPS

1. **add subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**[**aggr-id**=<id>]**;**
2. **change subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**; aggr-id**=<id>**;**
3. **delete subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**
4. **show subnet** [**subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>]**;**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**[**aggr-id**=<id>]**;**<br><br>**Example:**<br>`add subnet-prefix=192.168.0.0;subnet-prefix-length=24;[aggr-id=cmts1];` | • subnet-prefix—The subnet prefix is an ASCII String. It supports upto 15 characters.<br>• subnet-prefix in IPv4 address xxx.xxx.xxx.xxx. The subnet-prefix in number of bits. This is an integer between 1 to 32.<br>• subnet-prefix-len—The length of subnet prefix in number of bits. This is an integer between 1 to 32.<br>• aggr-id— The aggr-id is an ASCII String. This supports upto 1–16 characters. The default value is NULL.<br>• manual-aggr-id is provisioned to this subnet. If the value is not NULL, this field must refer to an existing entry in the provisioned aggr table.<br>**Note** Overlapping subnets are not allowed or supported. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **change subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**; aggr-id**=<id>**;**<br><br>**Example:**<br>change subnet subnet-prefix=192.160.0.0;subnet-prefix-length=24;aggr-id=cmts1; | • subnet-prefix—The subnet prefix is an ASCII String. It supports upto 15 characters.<br>• subnet-prefix in IPv4 address xxx.xxx.xxx.xxx. The subnet-prefix in number of bits. This is an integer between 1 to 32.<br>• subnet-prefix-len—The length of subnet prefix in number of bits. This is an integer between 1 to 32.<br>• aggr-id— The aggr-id is an ASCII String. This supports upto 1–16 characters. The default value is NULL.<br>• manual-aggr-id is provisioned to this subnet. If the value is not NULL, this field must refer to an existing entry in the provisioned aggr table.<br>**Note** Overlapping subnets are not allowed or supported. |
| **Step 3** | **delete subnet subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**<br><br>**Example:**<br>delete subnet-prefix=192.160.0.0;subnet-prefix-length=24; | • subnet-prefix—The subnet prefix is an ASCII String. It supports upto 15 characters.<br>• subnet-prefix in IPv4 address xxx.xxx.xxx.xxx. The subnet-prefix in number of bits. This is an integer between 1 to 32.<br>• subnet-prefix-len—The length of subnet prefix in number of bits. This is an integer between 1 to 32.<br>• aggr-id— The aggr-id is an ASCII String. This supports upto 1–16 characters. The default value is NULL.<br>• manual-aggr-id is provisioned to this subnet. If the value is not NULL, this field must refer to an existing entry in the provisioned aggr table.<br>**Note** Overlapping subnets are not allowed or supported. |
| **Step 4** | **show subnet** [**subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**];**<br><br>**Example:**<br>show subnet [subnet-prefix=192.168.0.0;subnet-prefix-length=24]; | • subnet-prefix—The subnet prefix is an ASCII String. It supports upto 15 characters.<br>• subnet-prefix in IPv4 address xxx.xxx.xxx.xxx. The subnet-prefix in number of bits. This is an integer between 1 to 32.<br>• subnet-prefix-len—The length of subnet prefix in number of bits. This is an integer between 1 to 32.<br>• aggr-id— The aggr-id is an ASCII String. This supports upto 1–16 characters. The default value is NULL.<br>• manual-aggr-id is provisioned to this subnet. If the value is not NULL, this field must refer to an existing entry in the provisioned aggr table.<br>**Note** Overlapping subnets are not allowed or supported. |

### Provisioning an AGGR-ID

This section explains the steps required to provision an AGGR-ID.

### SUMMARY STEPS

1. **change mgw id**=<id>**; aggr-id=NULL;**
2. **change mgw id**=<id>**; aggr-id**=<id>**;**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **change mgw id**=<id>**; aggr-id=NULL;**<br><br>**Example:**<br>`change mgw id=<ABC>; aggr-id=NULL;` | This command voids the aggr-id provisioned to a single MTA.<br><br>At this command, the Cisco BTS 10200 will look up the subnet table. If the MTA's subnet is found, the subnet's provisioned aggr-id will be used as the MTA's effective-aggr-id.<br><br>If the aggr-id field is already NULL for the media gateway, the Cisco BTS 10200 will not take any action at the command. |
| **Step 2** | **change mgw id**=<id>**; aggr-id**=<id>**;**<br><br>**Example:**<br>`change mgw id=<ABC>; aggr-id=<UVW>;` | This command forces the MTA effective-aggr-id to be the one specified in the command. |

### Provisioning the Display of Non DQoS Calls

This section explains the steps required to provision the display of non DQoS calls.

### SUMMARY STEPS

1. **report mgw id**=[percent | <mgw-id>]; **oper-status=qos-best-effort; aggr-id**=[percent | <aggr-id>]; **LIMIT**=<value> **; output-type**=<type>**; output** =<desired file name for the report>**; start_row**=<value>**;**
2. **report subscriber id**=[percent]**; oper-status=qos-best-effort; aggr-id**=[percent | <aggr-id>]**; LIMIT**=<value>**; output-type**=<type>**;output** =<desired file name for the report>**; start_row**=<value>**;**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **report mgw id**=[percent \| <mgw-id>]; **oper-status**=**qos-best-effort; aggr-id**=[percent \| <aggr-id>]; **LIMIT**=<value>; **output-type**=<type>; **output**=<desired file name for the report>; **start_row**=<value>;<br><br>**Example:**<br>report mgw id=[% \| <mgw-id>]; oper-status=qos-best-effort; aggr-id=[% \| <aggr-id>]; LIMIT=100; output-type=<csv>; output =xyz; start_row=900 | This command reports all MTAs with a specific aggr-id that uses "best-effort" (non DQoS) calls in the network.<br>• (Optional) If no output-type is mentioned, the output will be displayed in the CLI. Otherwise, the user will have the option of specifying the output format. The user can select either csv or xml format.<br>• LIMIT is an optional parameter which will be specified if the user has not specified output type. The range is 1 to 35000. The default value of LIMIT is 50.<br>The output will display only those media gateways that use the NCS variant.<br>The file containing the response will be placed at: /opt/ems/report by default. |
| **Step 2** | **report subscriber id**=[percent]; **oper-status**=**qos-best-effort; aggr-id**=[percent \| <aggr-id>]; **LIMIT**=<value>; **output-type**=<type>;**output** =<desired file name for the report>; **start_row**=<value>;<br><br>**Example:**<br>report subscriber id=[%]; oper-status=qos-best-effort; aggr-id=[% \| <aggr-id>]; LIMIT=100; type=<csv>;output =xyz; start_row=1000 | This command reports all subscribers with a specific aggr-id that uses "best-effort" (non DQoS) calls in the network.<br>• (Optional) If no output-type is mentioned, the output is displayed in the CLI. Otherwise, the user will have the option of specifying the output format. The user can select either csv or xml format.<br>• LIMIT is an optional parameter which will be specified if the user has not specified output type. The range is 1 to 35000. The default value of LIMIT is 50.<br>The output will display only NCS subscribers.<br>The file containing the response will be placed at: /opt/ems/report by default. |

### Provisioning the Refreshing of IP Address Cache

This section explains the steps required to provision the refreshing of the IP address cache.

## SUMMARY STEPS

1. **refresh mgw id**=<percent>**; category**=**dns-cache; subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**
2. **refresh mgw id**=<id>**; category**=**dns-cache; subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **refresh mgw id**=<percent>**; category**=**dns-cache; subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**<br><br>**Example:**<br>`refresh mgw id=%; category=dns-cache; subnet-prefix=192.168.0.0;subnet-prefix-length=24;` | This updates the IP address cache for all media gateway that match with the specified subnet if the newly discovered IP address is different. subnet-prefix and subnet-prefix-len are two optional parameters in this command.<br><br>The execution of this command takes a finite amount of time due to asynchronous DNS lookup. The **status mgw** command shows the refreshed IP address after the command is executed. |
| **Step 2** | **refresh mgw id**=<id>**; category**=**dns-cache; subnet-prefix**=<subnet-prefix>**; subnet-prefix-len**=<length>**;**<br><br>**Example:**<br>`refresh mgw id=<mgw-id>; category=dns-cache; subnet-prefix=192.168.0.0;subnet-prefix-length=24;` | This updates the IP address cache of the specified media gateway mentioned in command if the media gateway IP address matches with the specified subnet and it is different than the newly discovered IP address. subnet-prefix and subnet-prefix-len are two optional parameters in this command.<br><br>The execution of this command takes a finite amount of time due to asynchronous DNS lookup. The **status mgw** command shows the refreshed IP address after the command is executed. |

### Termination Connection Test with the DQoS Diagnostic Command

This section explains the steps required to provision a termination connection test with the DQoS diagnostic commands.

## SUMMARY STEPS

1. **diag subscriber_termination id**=<id>**; test**=<value>**;**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **diag subscriber_termination id=**<id>**; test=**<value>**;**<br><br>**Example:**<br>diag subscriber_termination id=<xyz>; test=4<br><br>diag subscriber_termination id=c2421_1;test=?<br><br>Matches found:<br>test; Enter a number from 0 to 4.<br>===<br>(1) Subscriber MGCP Connectivity Test<br>(2) Subscriber Termination Connection Test<br>(3) Subscriber Termination Ring Test<br>(4) Subscriber Termination Connection Test with DQoS<br>(0) All | Provides the method to validate the MTA to CMTS association (either by the statically configured aggr-id field of the mgw table or by the dynamically learned effective-aggr-id by searching through the static subnet table for a given MTA address) by sending a sequence of GATE-SET/GATE-DELETE message to the CMTS.<br><br>**Note** The DQoS connection test is allowed even if DQOS-SUPP=N in the call-agent table, DQOS-SUPP=N in the aggr-profile table, if the endpoint does not support DQoS. For this specific diagnostic test, the Cisco BTS 10200 does not rely upon the dynamic capability of the endpoint (reported in AuditEndpoint response message).<br><br>**Note** Prior to Release 5.0, the test option (4) represented All Tests. Now option (0) replaces option (4). Option (0) represents all the existing tests including option (4). Option (4) represents the Subscriber Termination Connection Test with DQoS. |

## Provisioning Subscriber ID Parameters and DQoS Measurement Counter

PacketCable ECN, DQoS 1.5-N-06.0339-4 was written as part of the PacketCable 1.5 specification to add Subscriber ID to all gate control messages and enhance error codes returned from the CMTS.

In the current DQoS specification, the Gate ID is unique only to individual CMTS systems. With the CMTS proxying all CMS gate control messaging through a central device that manages the CMTS connections on the behalf of the CMS, the CMS only has a single COPS association to the proxy device. Due to the fact that Gate IDs can be duplicated when using multiple CMTS systems, the ECN defines adding a Subscriber ID to each gate control message to disambiguate the Gate IDs between the CMS and proxy device. This particular application is shown in Figure 8 on page 38.

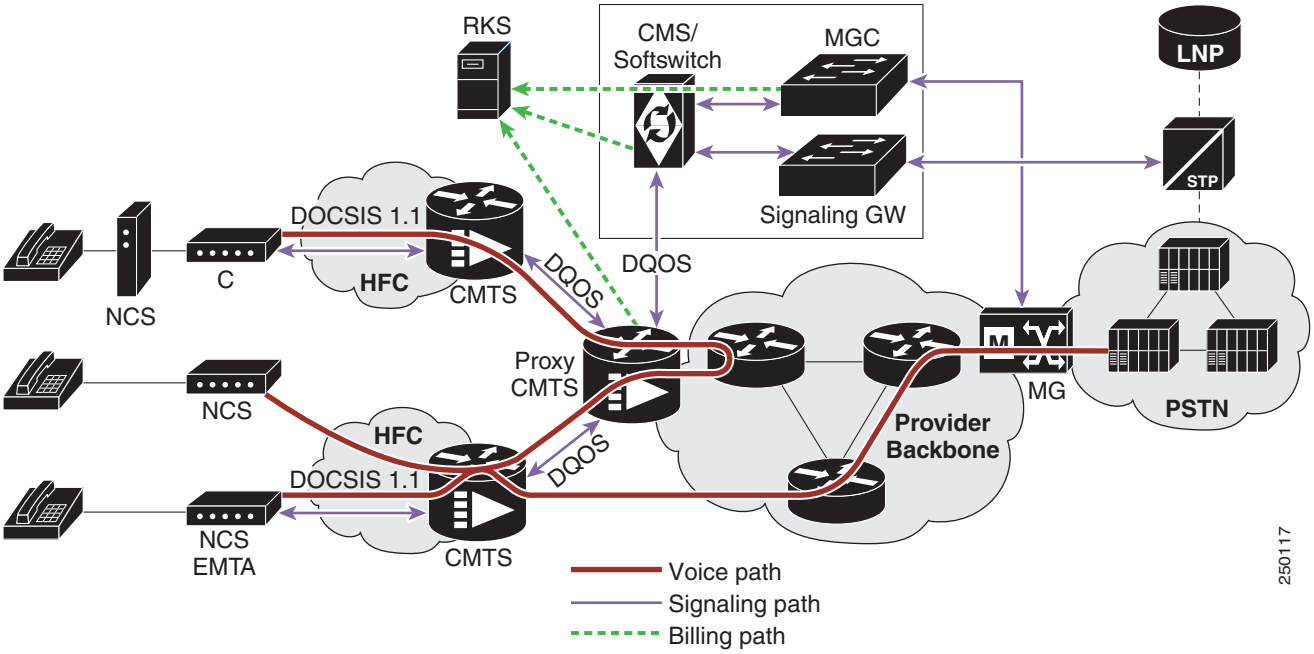
The ECN DQoS 1.5-N-06.0339-4 augments the following COPS messages, where the Subscriber ID parameter is added:

- GATE-INFO
- GATE-DELETE
- GATE-OPEN
- GATE-CLOSE

The Subscriber ID is available at the CMS and is used in the GATE-SET messages.

This ECN also enhances the error codes returned from CMTS or its proxy to allow more precise definition why a particular gate operation may have failed. Additionally, some new measurement counters for COPS are added.

***Figure 8 Network Diagram***




## CLI Provisioning and Schema

CLI supports the following schema change.

For complete CLI information, see the *Cisco BTS 10200 Softswitch CLI Database*.

## AGGR PROFILE TABLE

The AGGR-PROFILE Table is used to define properties of an Aggregation Device, CMTS or PCMM Server.

Table Name: AGGR-PROFILE

Table Containment Area: Call Agent

**Examples**

```
add aggr-profile id=er1; subscriber-id-supp=y;
change aggr-profile id=er1; subscriber-id-supp=n;
```

### POP TABLE

Table Name: POP

Table Containment Area: Call Agent, POTS Feature Server, AIN Feature Server

**Examples**

```
add pop id=dallaspop; state=tx; country=usa; aggr-id=proxycmts;
```

# Provisioning Security Interfaces

This section describes the PacketCable-based security interface feature and explains how to provision security options. The subsections are as follows:



**Note** A global security parameter, IPSEC_ENABLED, must already be set in the initial configuration file (opticall.cfg) during the Cisco BTS 10200 Softswitch software installation process. This parameter enables or disables the IPsec feature on the Cisco BTS 10200 Softswitch. See the detailed requirement in the "Installation" section on page 14.

## Provisioning Parameters for Secured Media

This section describes how to provision the SECURED-MEDIA-ONLY flag, which affects transmission of security parameters from the qos and Ciphersuite tables (ciphersuite) when the system sets up a call. This parameter affects the setup of calls to unsecured media gateways.

### SUMMARY STEPS

1. **show ca-config type=SECURED-MEDIA-ONLY;**
2. **add ca-config type=SECURED-MEDIA-ONLY; datatype=BOOLEAN; value=[Y | N];**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show ca-config type=SECURED-MEDIA-ONLY;**<br><br>**Example:**<br>`show ca-config type=SECURED-MEDIA-ONLY;` | Displays the current setting of the secured-media-only flag:<br>• If set to Y, the Cisco BTS 10200 Softswitch forces the security parameters from the qos and ciphersuite tables to the endpoint when it sets up the connection. This may result in call failure if either side cannot handle these parameters.<br>• If set to N, the Cisco BTS 10200 Softswitch forces the security parameters from the qos and ciphersuite tables when it sets up the connection to the endpoint *only if* both sides can handle the security parameters. |
| **Step 2** | **add ca-config type=SECURED-MEDIA-ONLY; datatype=BOOLEAN; value=[Y \| N];**<br><br>**Example:**<br>`add ca-config type=SECURED-MEDIA-ONLY; datatype=BOOLEAN; value=Y;` | (Optional) If necessary, change the setting of the secured-media-only flag.<br><br>**Caution** Do not change this value unless specified by your network administrator. This command can affect the setup of calls to unsecured MTAs. |

## Provisioning Security Interfaces to the MTA

The MTA is the only device that uses Kerberos key management. This section explains how to provision the MTA IPsec interface, including:

- Provisioning Kerberos
- Provisioning IPsec policy
- Enabling IPsec

**Note** The token values shown in this section are examples. For detailed token descriptions, see the *Cisco BTS 10200 Softswitch CLI Database*.

### SUMMARY STEPS

1. **add ipsec-kerberos krb-fqdn=**<krb-fqdn>**; krb-realm=**<krb-realm>**; krb-srv-key=**<key>**; srv-key-version=**<version>**;**
2. **show ipsec-kerberos-keys** (optional).

3. **add ipsec-policy** - You can use Full-duplex or Half-duplex security policy.
   For Full duplex you can use either fqdn or ip address option

a. **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action**= [**apply | permit | ipsec];**
   or

b. **add ipsec-policy id**=<id>**; src_ipaddr**=<src_ipaddr>**; src_ipmask**=<src_ipmask>**; dest_ipaddr**=<dest_ipaddr>**; action**= [**apply | permit | ipsec];**

   Use the following command for Half-duplex security policy:

c. **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=apply;**

4. **change mgw-profile id**=<id>**; krb-reest-flag**=[**y | n**]**;** i**psec-sa-esp-cs**=<cipher suite for ESP>**; ipsec-sa-lifetime**=<IPsec SA expiration time>**; ipsec-sa-grace-period**=<expiration grace period>**; ipsec-ulp-name**=[**IP | UDP | TCP**]**; ike-group**=[**1 | 2**]**; ike-sa-lifetime**=<IKE SA expiration time>**; ike-cs**=<cipher suite for IKE>**; ike-key**=<IKE pre-shared key>**;**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add ipsec-kerberos krb-fqdn**=<krb-fqdn>**; krb-realm**=<krb-realm>**; krb-srv-key**=<key>**; srv-key-version**=<version>**;**<br><br>**Example:**<br>`add ipsec-kerberos krb-fqdn=cms-ca1.ciscolab.com; krb-realm=cisco-realm.com; krb-srv-key=5468697320697320612061206b6579206f662032342 06368612e; srv-key-version=8;` | Provisions Kerberos parameters.<br><br>**Note** The KRB-FQDN must be the FQDN used on the key distribution center (KDC) for this node.<br><br>KRB-REALM is used to create the CMS principal name.<br><br>If the krb-serv-key is changed, the srv-key-version must also be changed, and if the srv-key-version is changed, the krb-srv-key must also be changed.<br><br>Neither krb-srv-key nor srv-key-version can already exist in the ipsec-kerberos-keys table. The system updates the ipsec-kerberos table before it updates the ipsec-kerberos-keys table.<br><br>After you enter a value for the krb-srv-key parameter, the system encrypts it and stores the encrypted value. A **show ipsec-kerberos** command displays the encrypted value only. There is no way to display the value of the krb-srv-key that you originally entered. |
| **Step 2** | **show ipsec-kerberos-keys;**<br><br>**Example:**<br>`show ipsec-kerberos-keys;` | (Optional) Displays the rolling list of old Kerberos service keys. Use this command when you need to display the list. |

| Command or Action | Purpose |
|---|---|
| **Step 3** **add ipsec-policy -** You can use Full-duplex or Half-duplex security policy.<br><br>For Full duplex you can use either fqdn or ip address option<br><br>(a) Provisioning using FQDNs<br><br>**add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action**=[**apply** \| **permit** \| **ipsec**]**;**<br><br>**Example:**<br>add ipsec-policy id=mta01-out;<br>src-fqdn=cms-ca1.ciscolab.com;<br>dest-fqdn=mta1.ciscolab.com; action=apply;<br><br>add ipsec-policy id=mta01-in;<br>src-fqdn=mta1.ciscolab.com;<br>dest-fqdn=cms-ca1.ciscolab.com; action=permit;<br><br>add ipsec-policy id=mta01;<br>src-fqdn=cms-ca1.ciscolab.com;<br>dest-fqdn=mta1.ciscolab.com; action=ipsec<br>or<br><br>(b) Provisioning using IP addresses:<br><br>**add ipsec-policy id**=<id>**; src_ipaddr**=<src_ipaddr>**; src_ipmask**=<src_ipmask>**; dest_ipaddr**=<dest_ipaddr>**; action**=[**apply** \| **permit** \| **ipsec**]**;**<br><br>**Example:**<br>add ipsec-policy id=mta02-out;<br>src_ipaddr=192.168.45.211;<br>src_ipmask=255.255.255.0;<br>dest_ipaddr=192.168.17.222; action=apply;<br><br>add ipsec-policy id=mta02-in;<br>src_ipaddr=192.168.45.211;<br>src_ipmask=255.255.255.0;<br>dest_ipaddr=192.168.17.222; action=permit;<br><br>add ipsec-policy id=mta02;<br>src_ipaddr=192.168.45.211;<br>src_ipmask=255.255.255.0;<br>dest_ipaddr=192.168.17.222; action=ipsec; | Adds an IPsec policy for all incoming and outgoing traffic on the MTA. Perform one or more of the following steps, as applicable:<br>• Full-duplex security policy<br>– Using FQDN<br>– Using IP addresses<br>• Half-duplex security policy<br><br>Full-duplex security policy—When the MTA vendor applies security policy on all ports, use action=apply for outbound traffic and action=permit for inbound traffic. Alternatively, you can use a single command with action=ipsec for all outbound and inbound traffic.<br><br>**Note** You must specify at least one of the following: src-fqdn, src-ipaddr, or src-port.<br><br>You must also specify at least one of the following: dest-fqdn, dest-ipaddr, or dest-port.<br><br>The value of the ***action*** token defines whether security is applied to outbound or inbound traffic, both, or neither. This is a mandatory token. The allowed values are:<br>• PERMIT—Security on inbound traffic<br>• APPLY—Security on outbound traffic<br>• IPSEC—Security on both inbound and outbound traffic<br>• BYPASS—No security |

| Command or Action | Purpose |
|---|---|
| (c) Half-duplex security policy<br>**add ipsec-policy id**=<id>; **src-fqdn**=<src-fqdn>; **dest-fqdn**=<dest-fqdn>; **action**=**apply;**<br><br>**Example:**<br>add ipsec-policy id=mta01-out;<br>src-fqdn=cms-ca1.ciscolab.com;<br>dest-fqdn=mta1.ciscolab.com; action=apply;<br><br>add ipsec-policy id=mta01-in;<br>src-fqdn=mta1.ciscolab.com;<br>dest-fqdn=cms-ca1.ciscolab.com; action=permit;<br>dest-port=2727; | Half-duplex security policy—When the MTA vendor applies security policy on a specific signaling port only, use action=apply for outbound traffic and action=permit and dest-port=<destination port> for inbound traffic. |
| **Step 4** **change mgw-profile id**=<id>; **krb-reest-flag**=[**y** \| **n**]; **ipsec-sa-esp-cs**=<cipher suite for ESP>; **ipsec-sa-lifetime**=<IPsec SA expiration time>; **ipsec-sa-grace-period**=<expiration grace period>; **ipsec-ulp-name**=[**IP** \| **UDP** \| **TCP**]; **ike-group**=[**1** \| **2**]; **ike-sa-lifetime**=<IKE SA expiration time>; **ike-cs**=<cipher suite for IKE>; **ike-key**=<IKE pre-shared key>;<br><br>**Example:**<br>change mgw-profile id=cvmdqos; krb-reest-flag=y;<br>ipsec-sa-esp-cs=<cipher suite for ESP>;<br>ipsec-sa-lifetime=<IPsec SA expiration time>;<br>ipsec-sa-grace-period=<expiration grace period>;<br>ipsec-ulp-name=IP; ike-group=2;<br>ike-sa-lifetime=<IKE SA expiration time>;<br>ike-cs=<cipher suite for IKE>; ike-key=<IKE pre-shared key>; | (Optional) Enters values for additional security parameters. Use this command only if you need to modify these values in your system.<br><br>The default values of these security parameters are sufficient for some networks. Before making any changes, you can use the **show** command to determine if changes are needed to any of the default values.<br><br>After you enter a value for the **ike-key** parameter, the system encrypts it and stores the encrypted value. A **show mgw-profile** command displays the encrypted value only. There is no way to display the value of the **ike-key** that you originally entered. |

## Provisioning Security Interfaces to the CMTS

This section explains how to provision security interfaces to the CMTS.

### SUMMARY STEPS

1. **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=ipsec;**
2. **change aggr id**=<id>**; tsap-addr**=<DNS | IP-address>**; ike-key**=<IKE preshared security key>**;**
3. **change aggr id**=<id>**; tsap-addr**=<DNS | IP-address>**; ipsec-sa-esp-cs**=<cipher suite for ESP>**; ipsec-sa-lifetime**=<IPsec SA expiration time>**; ipsec-sa-grace-period**=<expiration grace period>**; ipsec-ulp-name**=<IPsec SA upper layer protocol>**; ike-group**=[**1** | **2**]**; ike-sa-lifetime**=<IKE SA expiration time>**; ike-cs**=<cipher suite for IKE>**; ike-key**=<key>**; description**=<description>**;**

**Note** The token values shown in this section are examples.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action**=**ipsec;**<br><br>**Example:**<br>add ipsec-policy id=cmts01;<br>src-fqdn=cms-ca1.ciscolab.com;<br>dest-fqdn=cmts1.ciscolab.com; action=ipsec; | Adds a security policy for the CMTS. |
| **Step 2** | **change aggr id**=<id>**; tsap-addr**=<DNS \| IP-address>**;**<br>**ike-key**=<IKE preshared security key>**;**<br><br>**Example:**<br>change aggr id=cmts1;<br>tsap-addr=ADDRESS123.cisco.com; ike-key=<IKE<br>preshared security key>; | Enables IPsec for the CMTS.<br><br>After you enter a value for the **ike-key** parameter, the system encrypts it and stores the encrypted value. A **show aggr** command displays the encrypted value only. There is no way to display the value of the ike-key that you originally entered. |
| **Step 3** | **change aggr id**=<id>**; tsap-addr**=<DNS \| IP-address>**;**<br>**ipsec-sa-esp-cs**=<cipher suite for ESP>**;**<br>**ipsec-sa-lifetime**=<IPsec SA expiration time>**;**<br>**ipsec-sa-grace-period**=<expiration grace period>**;**<br>**ipsec-ulp-name**=<IPsec SA upper layer protocol>**;**<br>**ike-group**=[**1** \| **2**]**; ike-sa-lifetime**=<IKE SA<br>expiration time>**; ike-cs**=<cipher suite for IKE>**;**<br>**ike-key**=<key>**; description**=<description>**;**<br><br>**Example:**<br>change aggr id=cmts1;<br>tsap-addr=ADDRESS123.cisco.com;<br>ipsec-sa-esp-cs=<cipher suite for ESP>;<br>ipsec-sa-lifetime=<IPsec SA expiration time>;<br>ipsec-sa-grace-period=<expiration grace period>;<br>ipsec-ulp-name=<IPsec SA upper layer protocol>;<br>ike-group=1; ike-sa-lifetime=<IKE SA expiration<br>time>; ike-cs=<cipher suite for IKE>; ike-key=234;<br>description=CMTS_City1; | (Optional) Enters values for additional security parameters for this CMTS. Use this command only if you need to modify these values in your system.<br><br>The default values of these security parameters are sufficient for some networks. Before making any changes, you can use the **show** command to determine if changes are needed to any of the default values.<br><br>**Note** The **aggr id** and **tsap-addr** are both required in this command. |

## Provisioning Security Interfaces to the TGW

This section explains how to provision security interfaces to the TGW.

### SUMMARY STEPS

1. **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=ipsec;**
2. **change mgw-profile id**=<id>; **ike-key**=<IKE preshared security key>**;**
3. **change mgw-profile id**=<id>**; krb-reest-flag**=[**y** | **n**]**; ipsec-sa-esp-cs**=<cipher suite for ESP>**;**
   **ipsec-sa-lifetime**=<IPsec SA expiration time>**; ipsec-sa-grace-period**=<expiration grace period>**;**
   **ipsec-ulp-name**=[**IP** | **UDP** | **TCP**]**; ike-group**=[**1** | **2**]**; ike-sa-lifetime**=<IKE SA expiration time>**;**
   **ike-cs**=<cipher suite for IKE>**; ike-key**=<IKE pre-shared key>**;**

**Note** The token values shown in this section are examples.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=ipsec;**<br><br>**Example:**<br>add ipsec-policy id=tgw01;<br>src-fqdn=cms-ca1.ciscolab.com;<br>dest-fqdn=tgw1.ciscolab.com; action=ipsec; | Adds a security policy for the TGW.<br><br>You must specify at least one source (**src-fqdn**, **src-ipaddr**, or **src-port**), and at least one destination (**dest-fqdn**, **dest-ipaddr**, or **dest-port**).<br><br>**Note** You cannot specify both a **src-fqdn** and a **src-ipaddr** at the same time. You cannot specify both a **dest-fqdn** and a **dest-ipaddr** at the same time. |
| **Step 2** | **change mgw-profile id**=<id>**; ike-key**=<IKE preshared security key>**;**<br><br>**Example:**<br>change mgw-profile id=tgw1; ike-key=<IKE preshared security key>; | Enables IPsec for the TGW—To enable IPsec on the TGW, change the mgw-profile entry associated with this TGW.<br><br>**Note** Changing this entry enables security for all TGWs that use this profile, so you might want to have a security-enabled and security-disabled profile for each vendor class.<br><br>After you enter a value for the **ike-key** parameter, the system encrypts it and stores the encrypted value. A **show mgw-profile** command displays the encrypted value only. There is no way to display the value of the **ike-key** that you originally entered. |
| **Step 3** | **change mgw-profile id**=<id>**; krb-reest-flag**=[**y** \| **n**]**;**<br>**ipsec-sa-esp-cs**=<cipher suite for ESP>**;**<br>**ipsec-sa-lifetime**=<IPsec SA expiration time>**;**<br>**ipsec-sa-grace-period**=<expiration grace period>**;**<br>**ipsec-ulp-name**=[**IP** \| **UDP** \| **TCP**]**; ike-group**=[**1** \| **2**]**;**<br>**ike-sa-lifetime**=<IKE SA expiration time>**;**<br>**ike-cs**=<cipher suite for IKE>**; ike-key**=<IKE pre-shared key>**;**<br><br>**Example:**<br>change mgw-profile id=cvmdqos; krb-reest-flag=y;<br>ipsec-sa-esp-cs=[cipher suite for ESP];<br>ipsec-sa-lifetime=[IPsec SA expiration time];<br>ipsec-sa-grace-period=[expiration grace period];<br>ipsec-ulp-name=TCP; ike-group=1;<br>ike-sa-lifetime=[IKE SA expiration time];<br>ike-cs=[cipher suite for IKE]; ike-key=[IKE pre-shared key]; | (Optional) Enters values for additional security parameters for this mgw-profile. Use this command only if you need to modify these values in your system.<br><br>The default values of these security parameters are sufficient for some networks. Before making any changes, you can use the **show** command to determine if changes are needed to any of the default values. |

## Provisioning Security Interfaces to the RKS

This section explains how to provision security interfaces to the RKS.

### SUMMARY STEPS

1. **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=ipsec;**
2. **change radius-profile id**=<primary RKS id | secondary RKS id>**; tsap-addr**=<ip-address | ip-address:port-number>**; ike-key**=<IKE preshared security key>**;**
3. **change radius-profile id**=<primary RKS id | secondary RKS id>**; tsap-addr**=<ip-address | ip-address:port-number>**; ipsec-sa-esp-cs**=<cipher suite for ESP>**; ipsec-sa-lifetime**=<IPsec SA expiration time>**; ipsec-sa-grace-period**=<expiration grace period>**; ipsec-ulp-name**=<SA upper layer protocol>**; ike-group=[1|2]; ike-sa-lifetime**=<IKE SA expiration time>**; ike-cs**=<cipher suite for IKE>**;**

**Note** The token values shown in this section are examples.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add ipsec-policy id**=<id>**; src-fqdn**=<src-fqdn>**; dest-fqdn**=<dest-fqdn>**; action=ipsec;**<br><br>**Example:**<br>`add ipsec-policy id=rks01; src-fqdn=cms-ca1.ciscolab.com; dest-fqdn=rks1.ciscolab.com; action=ipsec;` | Adds a security policy for the RKS.<br>You must specify at least one source (**src-fqdn**, **src-ipaddr**, or **src-port**), and at least one destination (**dest-fqdn**, **dest-ipaddr**, or dest-port).<br>**Note** You cannot specify both a **src-fqdn** and a **src-ipaddr** at the same time. You cannot specify both a **dest-fqdn** and a **dest-ipaddr** at the same time. |
| **Step 2** | **change radius-profile id**=<primary RKS id \| secondary RKS id>**; tsap-addr**=<ip-address \| ip-address:port-number>**; ike-key**=<IKE preshared security key>**;**<br><br>**Example:**<br>`change radius-profile id=<primary RKS id \| secondary RKS id>; tsap-addr=192.168.26.104; ike-key=<IKE preshared security key>;` | Enables IPsec for the primary and secondary RKS units.<br>After you enter a value for the **ike-key** parameter, the system encrypts it and stores the encrypted value. A **show radius-profile** command displays the encrypted value only. There is no way to display the value of the **ike-key** that you originally entered. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **change radius-profile id**=<primary RKS id \| secondary RKS id>**; tsap-addr**=<ip-address \| ip-address:port-number>**; ipsec-sa-esp-cs**=<cipher suite for ESP>**; ipsec-sa-lifetime**=<IPsec SA expiration time>**; ipsec-sa-grace-period**=<expiration grace period>**; ipsec-ulp-name**=<SA upper layer protocol>**; ike-group**=[**1** \| **2**]**; ike-sa-lifetime**=<IKE SA expiration time>**; ike-cs**=<cipher suite for IKE>**;**<br><br>**Example:**<br>change radius-profile id=<primary RKS id \| secondary RKS id>; tsap-addr=192.168.26.104; ipsec-sa-esp-cs=<cipher suite for ESP>; ipsec-sa-lifetime=<IPsec SA expiration time>; ipsec-sa-grace-period=<expiration grace period>; ipsec-ulp-name=<SA upper layer protocol>; ike-group=1; ike-sa-lifetime=<IKE SA expiration time>; ike-cs=<cipher suite for IKE>]; | (Optional) Enters values for additional security parameters for this radius-profile. Use this command only if you need to modify these values in your system.<br><br>The default values of these security parameters are sufficient for some networks. Before making any changes, you can use the **show** command to determine if changes are needed to any of the default values. |

## Provisioning IPsec Security Associations and Ciphersuite Algorithms

This section explains how to provision the IPsec security associations (SAs) and the ciphersuite encryption and authentication algorithms.

- The IPsec SA (ipsec-sa) table contains the IPsec SAs that are not associated with IKE or Kerberos key management.
- A cipher is an algorithm that transforms data between plain text and encrypted text. A ciphersuite consists of both an encryption algorithm and a message authentication algorithm. The Ciphersuite Profile (ciphersuite-profile) and ciphersuite tables provision the allowed ciphersuites for media security (encryption of bearer-path data) between two MTAs.

### SUMMARY STEPS

1. **add ipsec-sa id**=<id>**; auth-algo**=<auth-algo>; auth-key=<auth-key>**; dest**=<dest-addr>**; encrypt-algo**=<encrypt-algo>**; encrypt-key**=<encrypt-key>**; spi**=<spi>**; src**=<src-addr>**; soft-lifetime**=<soft-lifetime>**; hard-lifetime**=<hard-lifetime>**;**
2. **add ciphersuite-profile id**=<id>**; description**=<description>**;**
3. **add ciphersuite id**=<id>**; proto-type**=[**RTP | RTCP**]**; auth-algo**=<auth-algo>**; encrypt-algo**=<encrypt-algo>**; priority=1;**

**Note** The token values shown in this section are examples. For a complete list of tokens and detailed descriptions, see the *Cisco BTS 10200 Softswitch CLI Database*.

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add ipsec-sa id**=<id>**; auth-algo**=<auth-algo>**; auth-key**=<auth-key>**; dest**=<dest-addr>**; encrypt-algo**=<encrypt-algo>**; encrypt-key**=<encrypt-key>**; spi**=<spi>**; src**=<src-addr>**; soft-lifetime**=<soft-lifetime>**; hard-lifetime**=<hard-lifetime>**;**<br><br>**Example:**<br>add ipsec-sa id=cmts01; auth-algo=HMAC-SHA-1; auth-key=2069732061206b6579206f66203234206368612e; dest=10.10.7.7; encrypt-algo=DES; encrypt-key=4bb586a120532c07; spi=-85723; src=10.10.2.2; soft-lifetime=3600; hard-lifetime=7200; | Adds a security association for a device.<br><br>The range of values is 1 to 8 ASCII characters. The suggested format is <device-type>NN, for example, mta01, cmts01, rks01. This token is mandatory.<br><br>After you enter a value for the **auth-key** and **encrypt-key** parameters, the system encrypts them and stores the encrypted values. A **show ipsec-sa** command displays the encrypted values only. There is no way to display the values that you originally entered for these two parameters. |
| **Step 2** | **add ciphersuite-profile id**=<id>**; description**=<description>**;**<br><br>**Example:**<br>add ciphersuite-profile id=cp1gold; description=This ID is used for QoS gold. | Creates a ciphersuite-profile. |
| **Step 3** | **add ciphersuite id**=<id>**; proto-type**=[**RTP** \| **RTCP**]**; auth-algo**=<auth-algo>**; encrypt-algo**=<encrypt-algo>**; priority**=**1;**<br><br>**Example:**<br>add ciphersuite id=cp1gold; proto-type=RTP; auth-algo=RTP-MMH-4; encrypt-algo=RTP-3DES-CBC; priority=1;<br><br>add ciphersuite id=cp1gold; proto-type=RTCP; auth-algo=RTCP-HMAC-MD5-96; encrypt-algo=RTCP-AES-CBC; priority=1; | Creates the ciphersuite data supporting the ciphersuite-profile. |

# Provisioning Event Messages

This section explains how to provision EM functionality on the Cisco BTS 10200 Softswitch. It includes the following tasks:

- Provisioning Support for EM Transmission and Storage, page 48
- Provisioning the System to Generate EMs for Billing, page 51
- Provisioning Media_Alive Verification for EMs, page 54

## Provisioning Support for EM Transmission and Storage

The commands in the following procedure specify the required IDs for the primary and secondary RKSs and link them with the CA (CMS/MGC). They also control parameters related to the transmission of EMs to the RKS and parameters related to storage of EMs on the CA.

- The RADIUS Profile (radius-profile) table is required in PacketCable networks that use an EM-based billing system and a RADIUS-based Record Keeping Server (RKS). This table includes provisionable parameters such as primary and secondary RKS node IDs, IP address and port address, RADIUS retry intervals and retry counts.
- The call-agent-profile table establishes a link between the CA (CMS) and the primary and secondary RKSs.

## SUMMARY STEPS

1. **add radius-profile id=**<primary rks>**; tsap-addr=**<tsap-addr>**; encryption-key=**<key>**; acc-rsp-timer=**<timer>**; acc-req-retransmit=**<retransmit>**; description=**<description>**;**
2. **add radius-profile id=**<secondary rks>**; tsap-addr=**<tsap-addr>**; encryption-key=**<key>**; acc-rsp-timer=**<timer>**; acc-req-retransmit=**<retransmit>**; description=**<description>**;**
3. **add ca-config type=retry-pri-rks-timer; datatype=integer; value=**<value>**;**
4. **add ca-config type=em-file-open-time; datatype=integer; value=**<value>**;**
5. **add ca-config type=em-file-size; datatype=integer; value=**<value>**;**
6. **add ca-config type=batch-mode-supp; value=**[**Y | N**]**;**
7. **add ca-config type=batch-latency; value=**<value>**;**
8. **add ca-config type=RADIUS-DSCP-TOS;** value=<value>**;**
9. **add ca-config type=EM-PRIVACY-IND-SUPP; datatype=BOOLEAN; value=**[**Y | N**]**;**

## DETAILED STEPS

The token values shown in this section are examples. These tables have many additional optional tokens not shown in these examples. For a complete list of all the tokens for each table, see the *Cisco BTS 10200 Softswitch CLI Database*.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **add radius-profile id=**<primary rks>**;**<br>**tsap-addr=**<tsap-addr>**; encryption-key=**<key>**;**<br>**acc-rsp-timer=**<timer>**;**<br>**acc-req-retransmit=**<retransmit>**;**<br>**description=**<description>**;**<br><br>**Example:**<br>add radius-profile id=prirks;<br>tsap-addr=192.168.100.100;<br>encryption-key=abcdef1234567890; acc-rsp-timer=7;<br>acc-req-retransmit=4;<br>description=primary_billing_server<br>add radius-profile id=secrks;<br>tsap-addr=192.168.100.101;<br>encryption-key=abcdef1234567890; acc-rsp-timer=6;<br>acc-req-retransmit=2;<br>description=secondary_billing_server; | Creates the interfaces to primary RKS units and sets values for various parameters.<br><br>The **acc-rsp-timer** and **acc-req-retransmit** tokens control the retransmission of EMs from the CA to the RKSs when the first attempt does not go through. **acc-rsp-timer** controls how long the system waits before retransmitting, and **acc-req-retransmit** controls how many retransmission attempts are made to the target RKS. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **add radius-profile id**=<secondary rks>**; tsap-addr**=<tsap-addr>**; encryption-key**=<key>**; acc-rsp-timer**=<timer>**; acc-req-retransmit**=<retransmit>**; description**=<description>**;**<br><br>**Example:**<br>add radius-profile id=secrks; tsap-addr=192.168.100.101; encryption-key=abcdef1234567890; acc-rsp-timer=6; acc-req-retransmit=2; description=secondary_billing_server; | Creates the interfaces to secondary RKS units and sets values for various parameters.<br><br>The **acc-rsp-timer** and **acc-req-retransmit** tokens control the retransmission of EMs from the CA to the RKSs when the first attempt does not go through. **acc-rsp-timer** controls how long the system waits before retransmitting, and **acc-req-retransmit** controls how many retransmission attempts are made to the target RKS. |
| **Step 3** | **add ca-config type**=**retry-pri-rks-timer; datatype**=**integer; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=retry-pri-rks-timer; datatype=integer; value=14; | Specifies how the system stores EMs in files on the CA (when loss of communication with the RKSs prevents EMs from being transmitted to the RKSs).<br><br>Use the **change ca-config** command to modify the parameters. |
| **Step 4** | **add ca-config type**=**em-file-open-time; datatype**=**integer; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=em-file-open-time; datatype=integer; value=900; | An open EM file does not close automatically when communication to the RKS is restored. The file closes automatically according to the provisioned value in **em-file-open-time**.<br><br>The file closes according to the provisioned value in **em-file-open-time** or **em-file-size**, whichever occurs first.<br><br>Use the **change ca-config** command to modify the parameters. |
| **Step 5** | **add ca-config type**=**em-file-size; datatype**=**integer; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=em-file-size; datatype=integer; value=50; | An open EM file does not close automatically when communication to the RKS is restored. The file closes automatically according to the provisioned value in **em-file-size**.<br><br>The file closes according to the provisioned value in **em-file-open-time** or **em-file-size**, whichever occurs first.<br><br>Use the **change ca-config** command to modify the parameters. |
| **Step 6** | **add ca-config type**=**batch-mode-supp; value**=[**Y** \| **N**]**;**<br><br>**Example:**<br>add ca-config type=batch-mode-supp; value=Y; | Provisions batch mode handling of EMs.<br><br>Use the **change ca-config** command to modify the parameters. |
| **Step 7** | **add ca-config type**=**batch-latency; value**=<value>**;**<br><br>**Example:**<br>add ca-config type=batch-latency; value=240; | Provisions batch mode handling of EMs.<br><br>Use the **change ca-config** command to modify the parameters. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 8** | **add ca-config type=RADIUS-DSCP-TOS; value=**<value>**;**<br><br>**Example:**<br>add ca-config type=RADIUS-DSCP-TOS; value=96; | Sets the DSCP for signaling packets on RADIUS interfaces between the CMS and RKS.<br><br>The default values for this parameter might be adequate for your specific case. We do not recommend that you change this value unless necessary, and recommend that you contact Cisco TAC regarding any plans to change it.<br><br>Use the **change ca-config** command to modify the parameters. |
| **Step 9** | **add ca-config type=EM-PRIVACY-IND-SUPP; datatype=BOOLEAN; value=[Y \| N];**<br><br>**Example:**<br>add ca-config type=EM-PRIVACY-IND-SUPP; datatype=BOOLEAN; value=Y; | Instructs the system to include the privacy-indicator field in the signaling start EM. For details of this field, see the "EM Generation Details and Content" section on page 65.<br><br>This change takes effect immediately when provisioned. It is not necessary to restart any platforms.<br><br>Use the **change ca-config** command to modify the parameters. |

## Provisioning the System to Generate EMs for Billing

The Cisco BTS 10200 Softswitch can provision billing support using either CDBs, which are assembled into CDRs by an external billing server, or PacketCable EMs, which are transferred to an external RKS that assembles CDRs from the EMs.

The Cisco BTS 10200 Softswitch contains two PacketCable-based logical network elements: the CMS and MGC. The CMS and MGC have provisionable element IDs as described in this section. The applicable element ID is included in each EM sent from the CMS or MGC.

To provision the Cisco BTS 10200 Softswitch to generate EMs for billing, complete the steps shown in the following section.

### SUMMARY STEPS

1. **show call-agent-profile id=**<id>**;**
2. **change call-agent-profile id=**<id>**; cdb-billing-supp=[Y | N]; em-billing-supp=[Y | N]; pri-rks-profile-id=**<id>**; sec-rks-profile-id=**<id>**;**
3. **change call-agent-profile id=**<id>**; cms-id=**<id>**; mgc-id=**<id>**; feid=**<id>**;**
4. **change subscriber id=**<id>**; sub-profile-id=**<profile-id>**; account-id=**<account-id>**; billing-type=**<type>**;**

## DETAILED STEPS

The token values shown in this section are examples. In addition, these tables have many additional optional tokens not shown in these examples. For a complete list of all the tokens for each table, see the *Cisco BTS 10200 Softswitch CLI Database*.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show call-agent-profile id**=<id>**;**<br><br>**Example:**<br>show call-agent-profile id=CA146; | Displays the current parameters for the CA profile. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **change call-agent-profile id**=<id>; **cdb-billing-supp**=[**Y** \| **N**]; **em-billing-supp**=[**Y** \| **N**]; **pri-rks-profile-id**=<id>; **sec-rks-profile-id**=<id>;<br><br>**Example:**<br>change call-agent-profile id=CA146;<br>cdb-billing-supp=N; em-billing-supp=Y;<br>pri-rks-profile-id=prirks;<br>sec-rks-profile-id=secrks;<br><br>add call-agent-profile id=CA146;<br>cdb-billing-supp=N; em-billing-supp=Y;<br>pri-rks-profile-id=prirks88;<br>sec-rks-profile-id=secrks88; | If the system response (in the display from Step 1) contains data, use the **change call-agent-profile** command if you want to change any of the parameter values.<br><br>If the system response (in the display from Step 1) indicates that this table does not exist, then you must create it using the **add call-agent-profile** command. Otherwise, the EM function is not supported and EMs are not generated.<br><br>**Caution** If the call-agent-configuration table is not created, the Cisco BTS 10200 Softswitch generates CDBs but not EMs.<br><br>**EM and CDB Billing Options**<br>In a PacketCable network, the service provider can choose EM-based billing or CDB-based billing.<br><br>**Caution** We strongly recommend that you *do not* set both of these tokens (EM [em-billing-supp] and CDB billing support [cdb-billing-supp]) to **y**. Attempting to generate both types of records simultaneously can significantly degrade system performance.<br><br>**Note** To set both tokens to **y**, you must also include **forced=y** in the command line.<br><br>**Note** Provisioning changes for cdb-billing-supp and em-billing-supp take effect only after a CA switchover or restart.<br><br>**RKS IDs**<br>The value for primary RKS profile ID (pri-rks-profile-id) must be the same as the value for the radius-profile ID for the primary RKS, and the value for secondary RKS profile (IDsec-rks-profile-id) must be the same as the radius-profile ID for the value for the secondary RKS. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **change call-agent-profile id**=<id>**; cms-id**=<id>**; mgc-id**=<id>**; feid**=<id>**;**<br><br>**Example:**<br>`change call-agent-profile id=CA146; cms-id=12345; mgc-id=67890; feid=feid0001;` | Identifies the CMS and MGC logical network elements and the FEID. The system uses these IDs when generating EMs.<br><br>The Cisco BTS 10200 Softswitch contains both the CMS and MGC logical entities. For PacketCable systems, the cms-id must be entered. If your Cisco BTS 10200 Softswitch communicates with a TGW, you must enter the mgc-id. The FEID value is also required for EM billing.<br><br>You must provision the cms-id and mgc-id tokens so that the Cisco BTS 10200 Softswitch can provide support for the CALEA. For provisioning procedures related to CALEA support, see the *Cisco BTS 10200 Softswitch Provisioning Guide.* |
| **Step 4** | **change subscriber id**=<id>**;**<br>**sub-profile-id**=<profile-id>**;**<br>**account-id**=<account-id>**; billing-type**=<type>**;**<br><br>**Example:**<br>`change subscriber id=SUB5551212; sub-profile-id=profile777; account-id=123456789; billing-type=FR2;` | (Optional) Provision a billing type (flat rate or measured rate) and an account ID for individual subscribers. |

## Provisioning Media_Alive Verification for EMs

Use the Activity (activity) table to schedule and configure Media_Alive EMs. These EMs are used during longer-duration calls to verify that the media connection is still alive. For information on these operational commands, see the "Viewing Media_Alive Verification for EMs" section on page 61.

For an additional sample provisioning sequence, see the *Cisco BTS 10200 Softswitch Provisioning Guide.* For additional reference information on CLI tables and parameters, see the *Cisco BTS 10200 Softswitch CLI Database*.

# Provisioning PCMM-Based QoS for Type 1 Clients

The Cisco BTS 10200 uses the aggr table for maintaining a COPS connection with the PS. The policy-server table, which is an alias to the aggr table, is provided to distinguish between the CMTS-type of COPS client and the PS-type of COPS client.

**Tip** In DQoS, the CMTS is assigned at the media gateway level. In PCMM, the PS is assigned at POP level.

### Office Provisioning—Configure PCMM Support, Policy Server, and QoS

**Step 1** Enable PCMM support. The default value of pcmm-supp is N (no), so you must change it to Y to enable PCMM support on the switch.

**change call-agent-profile id=CA146; pcmm-supp=Y;**

**Step 2** (Optional) Add the aggr-profile for the PS. This is necessary only if you need to tune timing or gate-coordination parameters for the PS.

```
add aggr-profile id=ps-profile; <additional parameters as needed>;
```

**Step 3** Add the PS.

```
add policy-server id=ps-dallas; tsap-addr=ps@dallas.cisco.com
```

**Note** If you added an aggr-profile in **Step 2**, this command should also include **aggr-profile-id=ps-profile;**

**Step 4** Change the pop table to reference the policy-server ID.

```
change pop id=pop-dallas; policy-server-id=ps-dallas;
```

**Step 5** Change the client-type field in the qos table to use PCMM.

```
change qos id=qos-pcmm; client-type=mm-cops;
```

### Configuring Subscribers and Trunk Groups to Use PCMM-Based Admission Control

**Step 1** To provide PCMM to the subscriber, change the Subscriber-Profile or Subscriber table to reference the qos-id.

```
change subscriber-profile id=sub-1; qos-id=qos-pcmm;
```

or

```
change subscriber id=sub-1; qos-id=qos-pcmm;
```

**Step 2** To provide PCMM to a trunk group, change the Trunk-Group table to reference the qos-id.

```
change trunk-grp id=99; qos-id=qos-pcmm;
```

For maintenance commands related to the CMTS and PS, see the "Reset, Control, and Status Commands" section on page 57.

# Provisioning AuditConnection Parameters

The system uses the AuditConnection function to audit the status of connections to any MGCP-based endpoint. This allows the system to discover call identifiers corresponding to stray connections, that is, connections that exist on an MGCP endpoint but are not accounted for on the Cisco BTS 10200 Softswitch. An example of a stray connection is a ringing endpoint for which no call is being set up. These stray connections can occur, for example, on endpoints that were engaged in a TWC during a CA failover. The system can send an AuditConnection function to recover the connection state from the MGCP device after a CA failover. A provisionable parameter in the Cisco BTS 10200 Softswitch database allows the service provider to enable or disable the AuditConnection functionality for each mgw-profile. The system uses the MGCP-compliant DeleteConnection function to clear stray connections.

This section describes the steps required to provision the AuditConnection functionality for each mgw-profile.

### SUMMARY STEPS

1. **show mgw-profile id=**<id>;
2. **change mgw-profile id=**<id>**; mgcp-aucx-supp=**[**y** | **n**]**;**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **show mgw-profile id=**<id>**;**<br><br>**Example:**<br>show mgw-profile id=telcomta; | Display the value of mgcp-aucx-supp in the mgw-profile table.<br><br>mgcp-aucx-supp—Specifies whether AuditConnection function is enabled or disabled. Values are:<br>• Y (default)—AuditConnection function is enabled.<br>• N—AuditConnection function is disabled. |
| **Step 2** | **change mgw-profile id=**<id>**;**<br>**mgcp-aucx-supp=**[**y** | **n**]**;**<br><br>**Example:**<br>change mgw-profile id=telcomta<br>mgcp-aucx-supp=y; | If necessary, change the value of mgcp-aucx-supp in the mgw-profile table. |

# Operations, Billing, and EM Transfer Procedures

This section covers the operational features of the Cisco BTS 10200 Softswitch PacketCable implementation, including the following topics:



## PacketCable Billing Data and Formats in Deployments Using CDBs

For deployments that use CDBs for billing (rather than EMs), the following CMTS and eMTA identifying information is included in the CDBs:

- Billing field 82, overall correlation identifier
- Billing field 158, originating endpoint TSAP address
- Billing field 159, terminating endpoint TSAP address
- Billing field 160, originating CMTS ID
- Billing field 161, terminating CMTS ID
- Billing field 162, originating fiber node ID
- Billing field 163, terminating fiber node ID

- Billing field 223, originating call admission control (CAC) type
- Billing field 224, terminating CAC type

See "Call Detail Block File Fields" chapter of the *Cisco BTS 10200 Softswitch Billing Interface Guide* for a complete list of billing fields and field contents, and a description of the options for CDB file-naming conventions.

# Reset, Control, and Status Commands

This section describes the reset, control, and status commands for aggr and policy-server tables.

## Reset

To provide the functionality of resetting the TCP connections to the CMTS and PS, the Cisco BTS 10200 implements a **reset** command for the AGGR (CMTS) or PS. The system closes and reinitiates the TCP connection and COPS session to the CMTS or PS when the operator executes the following CLI command:

```
reset aggr id=<id>;
reset policy-server id=<id>;
```

If an aggr or policy-server table is in any operational state other than INS, for example if the aggr or policy-server table is operationally OOS or transitioning between operational states, the system does not execute the reset. It responds to the **reset** command by displaying a failure message.

### Control

The system implements control command for the aggr table. There are only two possible administrative states for aggr table (CMTS/PS); in-service and out-of-service.

For control out-of-service with mode set to forced/graceful, the Cisco BTS 10200 Softswitch closes the TCP connection (thus COPS session) to CMTS or PS when operator takes the aggr table out-of-service by executing the following CLI command. After you control the aggr or policy-server tables OOS, the Cisco BTS 10200 does not attempt to set up any new calls through this aggr or policy-server tables. Existing calls may or may not be affected depending upon the CMTS implementation.

```
control aggr id=<id>; target-state=OOS; mode=forced;
control policy-server id=<id>; target-state=OOS; mode=forced;
```

The system initiates a setup for TCP as well as a COPS connection to the CMTS or the PS when the operator brings the aggr table into in-service mode by executing the following CLI command:

```
control aggr id=<id>; target-state=INS; mode=forced;
control policy-server id=<id>; target-state=INS; mode=forced;
```

## Status

The system shows the operational state when the operator queries the current status of TCP and COPS connection associated with the CMTS or PS:

```
status aggr id=<id>;
status policy-server id=<id>;

status aggr ID=c7246-777;
ID -> c7246-777
OPER STATE -> AGGR IN Service
RESULT -> ADM configure result in success
REASON -> ADM executed successfully
```

For the **status aggr** command, the available displayed values include INS, OOS, and CONNECTING. CONNECTING state means that the Cisco BTS 10200 Softswitch is reattempting to connect to the CMTS.

For a DQoS/PCMM subscriber, Cisco BTS 10200 first checks whether the aggr/policy_server is provisioned or dynamically resolved. If it is not provisioned (or resolved), Cisco BTS 10200 lets the call to continue on a best-effort basis. However, if the aggr/policy_server is not provisioned for a tapped (CALEA) subscriber making a non-emergency call, the call is blocked.

If the aggr/policy_server is properly provisioned, Cisco BTS 10200 checks the status of aggr/policy_server. For a DQoS/PCMM call, if the aggr/policy-server operational state is not INS, and the BEST_EFFORT_ON_QOS_FAIL flag is set to N, the system drops the call. If the aggr/policy-server operational state is not INS, and the BEST_EFFORT_ON_QOS_FAIL flag is set to Y, the system continues the (DQoS/PCMM) call on a best-effort basis.

# Manual Recovery and Transfer of Stored EMs

This section describes how to manually recover and transfer stored EM files from the CA to the RKS. This procedure must be used if communication to both RKS units goes down. Perform these procedures after communication is restored.

## Recovering the Billing Files

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs, contact your Cisco account team.

Billing data is normally transferred to the RKS on a real-time basis. In the unlikely event that communications with the RKS go down, alarms are raised and billing data files are written to a local drive on the Cisco BTS 10200 Softswitch (see the /opt/BTSem directory on the CA that generated the EMs). If communications are not promptly restored, additional billing alarms of increasing severity are raised at time intervals of 1 hour (minor), 3 hours (major), and 5 hours (critical).

EMs that are not successfully transferred to the RKS are stored on the CA. The system uses the naming conventions specified in PacketCable ECN EM-N-04.0186-3 for the stored EMs. Here is the format for the file name:

**PKT_EM**_<yyyymmddhhmmss>_<priority>_<record type>_<node id>_<sequence>.bin

The parameters are defined as follows:

- **PKT_EM** is fixed and does not change across files.

- yyyymmddhhmmss is a timestamp, where:
  - <yyyy> is the year, such as 2005.
  - <mm> is the month, from 01 through 12.
  - <hh> is the hour, from 00 through 23.
  - <mm> is the minute, from 00 through 59.
  - <ss> is the second, from 00 through 59.
- <priority> is always set to 3.
- <record type> is always set to 0.
- <node id> is the CMS ID or MGC ID. It must be five digits long and padded with leading 0s if necessary. (The system uses the CMS ID or the MGC ID depending on whether the file contains EMs generated by the CMS or the MGC function of the CA.)
- <sequence> is the file sequence number. It must be six digits long, padded with leading 0s if necessary. (The CMS and MGC files are numbered independently.)
- **.bin** is the binary file type designation.

Here is an example of a typical EM file name:

**PKT_EM_20050915103142_3_0_01234_000002.bin**

All billing data generated during the period of the communication outage is stored in the /opt/BTSem directory. If communication with the RKS is lost for an extended period, the available disk space on the local Cisco BTS 10200 Softswitch drives can begin to fill up with EM files. The system monitors the amount of space available on the disks and raises alarms of increasing severity when the disks are 50 percent (minor), 70 percent (major) and 100 percent (critical) full.

**Note** There can be billing data files on both CAs, primary and secondary, depending on whether there have been any switchovers during the loss of communication with the RKS.

We recommend that you monitor the available disk space on a regular basis to prevent the possible loss of billing data. If the disks become full, the data on the disk is preserved and new EMs are discarded.

**Caution** Do not allow the disk to become full. If you do not transfer the billing data files to the RKS, billing data might be lost. If EMs are discarded, they cannot be recovered and revenue could be lost.

## Sending Billing Files to the RKS via FTP

To send billing files from the CA to the RKS, perform the following steps:

**Step 1** On the CA, navigate to the subdirectory to which the billing data is written.

```
cd /opt/BTSem
```

**Step 2** At the prompt, establish an FTP session with the RKS.

```
ftp <RKS name>
```

**Step 3** When prompted, enter your user name and password for the RKS. The FTP prompt should appear.

**Step 4** At the FTP prompt, enter **bin** to enable binary transfer:

```
bin
```

**Step 5** On the RKS, navigate to the subdirectory to which the billing files will be written.

```
cd /.../.../<billing file subdirectory name>
```

**Step 6** Place the applicable billing files in the billing files subdirectory.

```
put <billing-filenames>
```

**Step 7** After the transfer is complete and the FTP prompt reappears, exit the FTP session.

```
bye
```

## Comparing Checksums

To compare the checksums to ensure that the data was transferred correctly, perform the following steps:

**Step 1** Log in to the RKS, using your user name and password for that system.

**Step 2** Navigate to the subdirectory to which the billing data files were written.

```
cd /.../.../<billing file subdirectory name>
```

**Step 3** List the files in the billing directory. The following command lists the files in reverse order by creation date:

```
ls -lrt
```

**Step 4** Run a checksum on the files that were backed up.

```
cksum <billing-filename>
```

**Step 5** Compare these checksum values to the corresponding checksum values on the CA.

**a.** If the checksum values are the same, the file transfer has completed without error.

**b.** If the checksum values are **not** the same, repeat all of the steps in the "Sending Billing Files to the RKS via FTP" section on page 59 and "Comparing Checksums" section on page 60.

If the checksum values are still different, contact Cisco TAC for assistance.

## Content of EMs Sent to the RKS

Following is an example of a typical EM sent by the Cisco BTS 10200 Softswitch to an RKS. The format of the event-time field is yyyymmddhhmmss.mmm, where .mmm refers to milliseconds.

```
EM-Header (1):
    version: 4
    bci: 3378049121- 55555-58 (STD, -06:00:00)
    event-type: Signaling Start (1)
    element-type: CMS (1)
    element-id: 55555
    zone: STD, -06:00:00
    sequence-number: 618
    event-time: 20070117125847.132
    status: 0
    priority: 128
```

```
attribute-count: 6
event-object: 1
Direction-Indicator (37): Originating (1)
```

# Viewing Media_Alive Verification for EMs

Use the activity table to schedule and configure Media_Alive EMs. These EMs are used during longer-duration calls to verify that the media connection is still alive.

**Step 1** Configure Media_Alive generation according to local requirements (example shown here):

**add activity id=MEDIA-ALIVE-EM; freq=6H; start-time=**<HH:MM>**;**

where:

- **id**—The value must be **MEDIA-ALIVE-EM**, which is a fixed system value listed in the Activity Base (activity-base) table.

  **Note** You can view other tokens in the activity-base table by using the command **show activity-base**. However, you cannot change any values in that table.

- **freq**—Frequency. The number of times to schedule the specified EM Media_Alive activity.
- **start-time**—Time of day in the format HH:MM ranging from 00:00 to 23:59 (default is 00:00).

**Note** The activity table has several other tokens that support other EM Media_Alive options. For more detailed information about these options, see the *Cisco BTS 10200 Softswitch CLI Database*.

**Step 2** To view the MEDIA-ALIVE-EM activity, enter the following command:

**show activity id=MEDIA-ALIVE-EM;**

Sample command line output:

```
ID=MEDIA-ALIVE-EM
FREQ=30 MINUTES
DAY_OF_MONTH=NA
DAY_OF_WEEK=NA
START_TIME=00:00
FIXED_TIME_INTERVAL=N
ENABLED=N
SO_ENABLED=N
RESTART_ENABLED=N
LAST_CHANGED=2004-10-20 16:45:30
```

# Measurements

Several traffic measurements pertain to the PacketCable implementation. For detailed descriptions see the "Traffic Measurements" section in the *Cisco BTS 10200 Softswitch Operations and Maintenance Guide*.

## Creating Reports and Displays of Measurements

This section outlines the procedure for creating reports and displays of measurements. It uses the DQoS feature as an example. Additional details about measurement provisioning, reporting, and display commands for all features can be found in the *Cisco BTS 10200 Softswitch Operations Guide* and the *Cisco BTS 10200 Softswitch CLI Database*.

To create a report file of the DQoS counters for all time intervals in the period starting and ending at specific times, enter the following command. The system prepends the file with the string "Tm_" and writes the file to the /opt/ems/report directory on the active EMS.

```
report measurement-dqos-summary; start-time=<start-time>; end-time=<end-time>;
aggr-id=<id>; output=<desired file name for the report>; output-type=[CSV | XML];
```

where:

- **start-time** and **end-time** have the format yyyy-mm-dd hh:mm:ss.
- **aggr-id** = id of the aggregation router (CMTS) for which data should be reported.
- **CSV** = comma-separated value.
- **output** = desired file name for the report.

**Note** Time intervals can be every 5, 15, 30, or 60 minutes. This is provisionable in another command, **change measurement-prov**, as described later in this section.

Use any of the following commands to display DQoS counters on your monitor.

- To display DQoS counters for all time intervals in the past 48 hours for all CMTS IDs, enter the following command:

  ```
  report measurement-dqos-summary; interval=ALL;
  ```

- To display DQoS counters tracked at every interval in the period starting at a specific start-time and for all aggregation IDs, enter the following command:

  ```
  report measurement-dqos-summary; start-time=<start-time>;
  ```

**Note** start-time has a format of yyyy-mm-dd hh:mm:ss, and the end-time defaults to the most recent interval.

- To display DQoS counters for the most recent time interval for all aggregation IDs, enter the following command:

  ```
  report measurement-dqos-summary;
  ```

**Note** start-time and end-time both default to the most recent interval.

In this example, the system displays the most recent time interval for all aggregation IDs:

```
report measurement-dqos-summary
Reply: Request was successful.
TIMESTAMP       20020310184428
DQOS_GATESET_ATTMP       10
DQOS_GATESET_SUCC         9
```

```
DQOS_GATE_COMMIT          9
```

In this example, the display token is used to specify desired counters (separated by commas):

```
report measurement-dqos-summary; display=DQOS_GATESET_ATTMP,DQOS_GATE_COMMIT;

Reply: Request was successful.
TIMESTAMP       20020310184428
DQOS_GATESET_ATTMP       10
DQOS_GATE_COMMIT          9
```

To manage the collection of DQoS measurements, use the following commands:

- To display the current provisioning settings of DQoS measurements (enabled or disabled status), enter the following command:

  ```
  show measurement-prov type=DQOS;
  ```

- To change the current provisioning settings of DQoS measurements (enabled or disabled status) and/or the time interval (5, 15 [default], 30, or 60 minutes), enter the following command:

  ```
  change measurement-prov type=dqos; enable=yes; time-interval=[5 | 15 | 30 | 60]
  ```

## Measurements for the DQoS Feature on COPS Interface

The system supports a number of measurements related to gate coordination over DQoS and PCMM interfaces. See the complete list of measurements in the "Using BTS Measurements" chapter of the *Cisco BTS 10200 Softswitch Operations and Maintenance Guide*.

The Cisco BTS 10200 Softswitch tracks and reports measurements separately for each of the CMTS units (aggregation routers) and PS units it supports.

## Measurements for the EM Feature

The system supports a number of measurements related to EMs. Use the following CLI command to retrieve these measurements:

```
report measurement-em-summary
```

Following is a typical command and system response:

```
report measurement-em-summary

TIMESTAMP          2003-07-10 16:15:00
CALL_AGENT_ID      CA146
CONDITION          Normal
BILLING_EM_ACKED   2
BILLING_EM_LOGGED  3
BILLING_EM_RETRANS 3
```

See the complete list of measurements in the "Using BTS Measurements" chapter of the *Cisco BTS 10200 Softswitch Operations and Maintenance Guide*.

# Events and Alarms

This section lists the events and alarms applicable to the PacketCable implementation, including:



This section lists only the events and alarms that are specific to the PacketCable-based implementation, and includes only the name and description of each alarm. The lists in this section are not exhaustive. Detailed descriptions of all events and alarms, and recommended corrective actions, are presented in the *Cisco BTS 10200 Softswitch Troubleshooting Guide.*

## Events and Alarms Specific to PacketCable-Based Network Elements and PCMM Features

The following events and alarms can be generated in response to processing problems or network connection issues with PacketCable-based network elements:

- CALL PROCESSING Event #15—CMTS ER ID Not found in MGW table (INFO)
- SIGNALING Alarm #103—AGGR Connection Down (MAJOR)
- SIGNALING Event #104—AGGR Unable To Establish Connection (INFO)
- SIGNALING Event #105—AGGR Gate Set Failed (INFO)
- SIGNALING Alarm #155—PCMM Unsolicited Gate Delete (INFO)

## Events and Alarms for the EM Feature

The following events and alarms can be generated by the EM feature:

- BILLING Alarm #38—EM log file access error (MAJOR)
- BILLING Alarm #39—RADIUS accounting receive failure (MINOR)
- BILLING Alarm #40—EM encode failure (MINOR)
- BILLING Alarm #41—Message content error (MINOR)
- BILLING Event #42—Error reading provisioned data—using default (WARNING)
- BILLING Event #44—RKS switch occurred (MAJOR)
- BILLING Event #45—Event Message log file opened (MINOR)
- BILLING Event #46—Event Message log file closed (MINOR)
- BILLING Alarm #47—RKS unreachable for 1 hr (MINOR)
- BILLING Alarm #48—RKS unreachable for 3 hours (MAJOR)
- BILLING Alarm #49—RKS unreachable for 5 hours (CRITICAL)
- BILLING Alarm #53—Event Message disk space 50 percent full (MINOR)
- BILLING Alarm #54—Event Message disk space 70 percent full (MAJOR)
- BILLING Alarm #55—Event Message disk space 100 percent full (CRITICAL)

## Events and Alarms for the Security Interface Feature

The following events and alarms can be generated in response to PacketCable-related security signaling conditions:

- SECURITY Alarm #3—IPsec connection down (MAJOR)
- SECURITY Event #4—IPsec MTA Key Establish Error (WARNING)
- SECURITY Event #5—IPsec outgoing SA not found (WARNING)

# EM Generation Details and Content

This section describes the internal processes for EM generation and the content of the EMs. These processes are based on the *PacketCable Event Message Specification* PKT-SP-EM-I10-040721.

**Note** The system complies with the RKS EM billing interface requirements of PKT-SP-EM-I10-040721. For information on compliance with specific paragraphs of PacketCable standards, contact your Cisco account team.

## EM Generation Details

Table 1 lists the EMs generated by call configuration.

***Table 1 EMs Generated by Call Configuration***

| Cisco BTS 10200 Softswitch Generates EMs for ... | Call Configuration | | |
|---|---|---|---|
| | On-net to On-net | On-net to Off-net | Off-net to On-net |
| Originating CMS | X | X | — |
| Terminating CMS | X | — | X |
| Originating MGC | — | — | X |
| Terminating MGC | — | X | — |

Table 2 lists the EMs that can be generated by the CMS and MGC.

***Table 2 EMs Generated by Logical Entity***

| Event Message | CMS | MGC |
|---|---|---|
| Signaling_Start | X | X |
| Signaling_Stop | X | X |
| Interconnect_Start | — | X |
| Interconnect_Stop | — | X |
| Call_Answer | X | X |
| Call_Disconnect | X | X |
| Database_Query | X | — |
| Service_Instance | X | — |

*Table 2 EMs Generated by Logical Entity (continued)*

| Event Message | CMS | MGC |
|---|---|---|
| Service_Activation | X | — |
| Service_Deactivation | X | — |
| Media_Alive | X | X |
| Time_Change | X | X |

Table 3 lists the EMs for a call and the triggers that generate them (single zone scenario only) in the appropriate logical entities running in the Cisco BTS 10200 Softswitch (CMS and MGC).

*Table 3 EM Triggers Grouped by Logical Entity*

| Event Message | Originating CMS | Terminating CMS | Originating MGC | Terminating MGC |
|---|---|---|---|---|
| Signaling_Start | Timestamp: Receipt of NCS NTFY<br>Send: after translation | Internal system trigger (internal to the Cisco BTS 10200 Softswitch) | 1. Receipt of IAM<br>or<br>2. TGCP NTFY | Receipt of Invite (internal system trigger) |
| Signaling_Stop | If T-CMS releases first: receipt of 250RSP to DLCX<br>If O-CMS releases first: before deallocating call block | If O-CMS releases first: receipt of 250RSP to DLCX<br>If T-CMS releases first: before deallocating call block | If T-MGC releases first: upon last of following events:<br>1. Receipt or transmission of RLC from/to SG<br>2. Receipt or transmission of Ack for TGCP DLCX<br>3. Receipt or transmission of last msg from/to T-CMS (internal system trigger)<br>If O-MGC releases first: before deallocating call block | Receipt of 250 OK to DLCX |
| Interconnect_Start | — | — | Transmission or receipt of ACM | Transmission or receipt of ACM |
| Interconnect_Stop | — | — | Release of PSTN bandwidth | Release of PSTN bandwidth |
| Call_Answer | Receipt of 200 OK to Invite with call answer | Receipt of NCS NTFY for off-hook of T-MTA | 1. Receipt of ANM<br>or<br>2. Answer indication on operator service | 1. Receipt of ANM<br>or<br>2. Answer indication on operator service |
| Call_Disconnect | Transmission of DLCX or delete connection on errors | Transmission of DLCX | 1. Receipt of REL<br>or<br>2. Transmission of BYE for REL | 1. Receipt of REL<br>or<br>2. Disconnect indication on operator service trunk disconnect |

*Table 3 EM Triggers Grouped by Logical Entity (continued)*

| Event Message | Originating CMS | Terminating CMS | Originating MGC | Terminating MGC |
|---|---|---|---|---|
| Database_Query | Receipt of response from DB or intelligent peripheral | Receipt of response from DB or intelligent peripheral | — | — |
| Service_Instance | Operation of service | Operation of service | — | — |
| Service_Activation | Successful activation | Successful activation | — | — |
| Service_Deactivation | Successful deactivation | Successful deactivation | — | — |
| Media_Alive | Periodic, based on provisioned parameters | Periodic, based on provisioned parameters | Periodic, based on provisioned parameters | Periodic, based on provisioned parameters |
| Time_Change | When time is adjusted | When time is adjusted | When time is adjusted | When time is adjusted |

Table 4 lists the PacketCable 1.0 features, the EMs generated for them, and the event that triggers the message. Some of the triggering events include the logical entities—Originating CMS (O-CMS) and Terminating CMS (T-CMS)—running in the Cisco BTS 10200 Softswitch.

*Table 4 PacketCable 1.0 Features and Associated EMs*

| | EMs Sent in Addition to Basic Call EMs | | |
|---|---|---|---|
| **PacketCable 1.0 Feature** | **Event Message** | **Trigger** | **Comments** |
| 911 service—Similar to on-net to off-net call on a unique trunk group ID. | None | — | — |
| Other N11 services—Similar to 911 service. | None | — | — |
| Database Query | — | — | — |
| **a.** Send all database queries to PSTN on special trunk | None | — | — |

*Table 4 PacketCable 1.0 Features and Associated EMs (continued)*

| | EMs Sent in Addition to Basic Call EMs | | |
|---|---|---|---|
| **PacketCable 1.0 Feature** | **Event Message** | **Trigger** | **Comments** |
| **b.** Query database and route accordingly | db_query | O-CMS on receipt of response to database dip. | Query types:<br>1 = Toll-free number lookup<br>2 = Local number portability (LNP) number lookup<br>3 = Calling name delivery lookup<br>If the query is successful—that is, if the query returns the calling party's name—the query type (1, 2, or 3) is included in the EM:<br>• For types 1 and 2, the value in the EM Return_Number field contains the new called party digits.<br>• For type 3, the value in the EM Return_Number field contains a valid string, such as "O" or "P". [1]<br>If the query fails, no EM is sent. |
| Operator Service | | | |
| **a.** 0– service (no digit after 0) | None | Called party number 0 is replaced by Operator Service Provider number. | Only call routing. |
| **b.** 0+ service (digits after 0, not needed in PacketCable 1.0) | — | — | Only call routing. |
| Call block service (with new call to announcement server) | Service instance | O-CMS and T-CMS decide to block call. | If announcement server is connected, event messages are generated for call with same BCID. |

*Table 4 PacketCable 1.0 Features and Associated EMs (continued)*

| | EMs Sent in Addition to Basic Call EMs | | |
|---|---|---|---|
| **PacketCable 1.0 Feature** | **Event Message** | **Trigger** | **Comments** |
| Call waiting | | | |
| **a.** Announcement server on net | Service instance | O-CMS and T-CMS when call waiting is initiated. Second call BCID for service instance. | Only two calls, one active and one on hold, are required. Each half-call generates an EM. A half-call for an on-net announcement server for call waiting tone need not generate an EM. Here is an example of a call scenario:<br>A calls B, C calls A:<br>(A ≫ B, C ≫ A)<br>BCID1 for A(O), other leg BCID2<br>BCID2 for B(T), other leg BCID1<br>BCID3 for C(O), other leg BCID4<br>BCID4 for A(T), other leg BCID3<br>BCID4 for CW service instance, related BCID = BCID1 |
| **b.** Announcement server on PSTN | Not supported | — | — |
| Call forwarding | Service instance | CMS (O/T) when forwarded call leg is initiated. | A calls B, B forwards to C:<br>(A ≫ B ≫ C)<br>BCID1 for A(O), other leg BCID2<br>BCID2 for B(T), other leg BCID1<br>BCID3 for B(O), other leg BCID4<br>BCID4 for C(T), other leg BCID3<br>BCID3 for CFW service instance, related BCID=BCID2 |
| Return call<br>(with caller ID privacy restriction) | — | — | — |
| **a.** Announcement server on net | Service instance | O-CMS on feature initiation. | **Note** CMS-CMS signaling is not supported in this Release 6.0.x |
| **b.** Announcement server on PSTN | Not supported | — | — |
| Repeat call (*66) | — | — | CMS-CMS signaling is not supported in this Release 6.0.x |
| **a.** Announcement server on net | Service instance | Repeat call is initiated. | Separate BCID for service instance. |
| **b.** Announcement server on PSTN | Not supported | — | — |
| Voice mail (voice mail server on off-net) | None | — | — |
| Deposit and retrieval: similar to on-net to off-net call | None | — | — |

*Table 4 PacketCable 1.0 Features and Associated EMs (continued)*

| | EMs Sent in Addition to Basic Call EMs | | |
|---|---|---|---|
| **PacketCable 1.0 Feature** | **Event Message** | **Trigger** | **Comments** |
| Message waiting indicator | None | — | No event messages for message waiting. |
| Privacy indicator | Signaling start | — | Indicates whether the system populates field 12 of the EM with the calling party service (privacy setting) for the calling party.<br>This attribute uses the previously undefined field 12 in PKT-SP-EM-I10-040721.<br>See the "EM Content" section on page 70 for additional requirements. |

1. "O" = Name is out of area, unknown, or not available. "P" = Name presentation is restricted.

## EM Content

The following EMs for a call contain the attributes listed, and are based on the four logical entities running in the Cisco BTS 10200 Softswitch: Originating CMS (O-CMS), Terminating CMS (T-CMS), Originating MGC (O-MGC), and Terminating MGC (T-MGC).

Table 5 lists the signaling start attributes.

*Table 5 Signaling Start*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Direction indicator | X | X | X | X |
| MTA endpoint name | Originating | Terminating | Name of endpoint (EP) in media gateway | Name of endpoint (EP) in media gateway |
| Calling party number | X | X | X | X |
| Calling party service [1] | X | X | X | X |
| Called party number | X | X | X | X |
| Routing number | X | X | X | X |
| Location routing number (LRN) | X | X | X | X |
| Carrier identification code (CIC) | — | — | X | X |
| Trunk group ID | — | — | X | X |
| Jurisdiction information parameter (JIP) | X | X | X | — |
| Ported-in calling number | X | — | — | — |

*Table 5 Signaling Start*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Ported-in called number | — | X | — | — |
| Calling party NP source | X | — | — | — |
| Called party NP source | — | X | — | — |
| Billing type (measured rate or flat rate) | X | — | — | — |

1. The calling party service attribute uses the previously undefined field 12 (see PKT-SP-EM-I10-040721). It is an unsigned integer, 4 bytes in length. If (a) the EM-PRIVACY-IND-SUPP token in the CA-CONFIG table is set to Y, and (b) the calling party number field in the EM is populated, then the system populates the calling party service field as follows: If the presentation status (PS) of the calling party is set to private, the calling party service field is set to 1; if the PS is set to public, the calling party service field is set to 0. If the EM-PRIVACY-IND-SUPP token is set to N (default), or if the calling party number is not present in the Signaling Start EM, or the PS is not present in the incoming message, the system does not populate the calling party service field.

Table 6 lists the signaling stop attributes.

*Table 6 Signaling Stop*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| BCID of T-CMS or T-MGC | X | — | X | — |
| BCID of O-CMS or O-MGC | — | X | — | X |
| FEID of T-CMS or T-MGC | X | — | X | — |
| FEID of O-CMS or O-MGC | — | X | — | X |

Table 7 lists the interconnect start attributes.

*Table 7 Interconnect Start*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Routing number | — | — | X | X |
| CIC | — | — | X | X |
| Trunk group ID | — | — | X | X |

Table 8 lists the interconnect stop attributes.

*Table 8 Interconnect Stop*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| CIC | — | — | X | X |
| Trunk group ID | — | — | X | X |

Table 9 lists the call answer attributes.

*Table 9 Call Answer*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Charge number | X | X | X | X |
| BCID of T-CMS or T-MGC | X | — | X | — |
| FEID of T-CMS or T-MGC | X | — | X | — |
| BCID of O-CMS or O-MGC | — | X | — | X |
| FEID of O-CMS or O-MGC | — | X | — | X |

Table 10 lists the call disconnect attributes.

*Table 10 Call Disconnect*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Call termination cause | X | X | X | X |

Table 11 lists the service instance attributes.

*Table 11 Service Instance*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Service name (plus specified attributes in the Table 12 | X | X | — | — |
| Account code | X | — | — | — |
| Authorization code | X | — | — | — |

**Note** Only a limited number of service names are specified in the PacketCable 1.0 specification. The Cisco BTS 10200 Softswitch supports many other features; however, it does not send EMs for those features to a standard RKS because the feature codes for those features have not yet been defined by PacketCable.

Table 12 lists the service-specific attributes.

***Table 12 Service- Specific Attributes***

| Attribute | Call Forward | Call Waiting | Repeat Call | Return Call | Call Block | Three-Way Call | Privacy Indicator |
|---|---|---|---|---|---|---|---|
| Related BCID | X | X | — | — | — | X | — |
| Charge number | X | X | X | X | — | X | — |
| First call calling party number | — | X | — | — | — | — | — |
| Second call calling party number | — | X | — | — | — | — | — |
| Called party number | — | X | — | — | — | — | — |
| Routing number | — | — | X | X | — | — | — |
| Calling party number | — | — | X | X | — | — | X |
| Calling party service | — | — | X | X | — | — | X |
| Termination cause | — | — | — | — | X | — | — |

Table 13 lists the service activation attributes.

***Table 13 Service Activation***

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Service name (plus specified attributes in the Table 14) | X | X | — | — |

Table 6 lists the service-specific attributes.

***Table 14 Service-Specific Attributes***

| Attribute | Call Forward | Call Waiting | Call Block | Customer Originated Trace |
|---|---|---|---|---|
| Charge number | X | X | X | X |
| Calling party number | X | X | X | X |
| Forwarded number | X | — | — | — |

Table 15 lists the service deactivation attributes.

***Table 15 Service Deactivation***

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Service name (plus specified attributes in the Table 16) | X | X | — | — |

Table 16 lists the service-specific attributes.

*Table 16 Service-Specific Attributes*

| Attribute | Call Forward | Call Waiting | Call Block |
|---|---|---|---|
| Charge number | X | X | X |
| Calling party number | X | X | X |

Table 17 lists the database query attributes.

*Table 17 Database Query*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Database ID | X | X | — | — |
| Query type | X | X | — | — |
| Called party number | X | X | — | — |
| Returned number | X | X | — | — |

Table 18 lists the activity attributes.

*Table 18 Activity*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Media alive | X | X | X | X |

Table 19 lists the time change attributes.

*Table 19 Time Change*

| Attribute | O-CMS | T-CMS | O-MGC (Off-net to On-net Call) | T-MGC (On-net to Off-net Call) |
|---|---|---|---|---|
| Time adjustment | X | X | X | X |

# References to Industry Standards

- IETF RFC 2748: *The COPS (Common Open Policy Service) Protocol, January 2000*
- PKT-SP-CODEC-I04-021018: *PacketCable Audio/Video Codecs Specification*, October 18, 2002
- PKT-SP-DQOS-I07-030815: *PacketCable Dynamic Quality of Service Specification, August 15, 2003*
- PKT-SP-MGCP-I08-030728: *PacketCable Network-Based Call Signaling Protocol Specification, July 28, 2003*
- PKT-SP-TGCP-I05-030728: *PacketCable PSTN Gateway Call Signaling Protocol Specification, July 28, 2003*

- PKT-SP-EM-I10-040721: *PacketCable Event Message Specification, July 21, 2004*

**Note** Compliant with the RKS EM billing interface requirements of PKT-SP-EM-I10-040721.

- EM-N-04.0186-3: *CableLabs Engineering Change (EC) Form*

**Note** Compliant with the file-naming convention in EM-N-04.0186-3.

- PKT-SP-SEC-I09-030728: *PacketCable Security Specification, July 28, 2003*
- PKT-SP-ESP-I01-991229: *PacketCable Electronic Surveillance Specification, December 29, 1999*
- PKT-SP-MM-I02-040930: *PacketCable Multimedia Specification, September 30, 2004*

**Note** For information on compliance with specific paragraphs of PacketCable standards and ECNs, contact your Cisco account team.