H.323 Provisioning, Operating, and Troubleshooting Guide for the Cisco BTS 10200 Softswitch, Release 4.5.1

Revised: October 25, 2006, OL-8300-03

This document describes how the Cisco BTS 10200 Softswitch implements H.323 interfaces and functions in Release 4.5.1. It also provides H.323 provisioning, operating, and troubleshooting procedures.

Note H.323 applications are supported in Release 4.5.1, but not in Release 4.5.0.

CISCO SYSTEMS

Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Feature History

Release	Modification
Release 4.5.1	Document OL-8300-03:
	• Corrections were made to the description of call-setup behaviors in the "Limitations on Annex E Support" section.
	Document OL-8300-02:
	• Improvements were made to the wording for readability; no technical changes were made.
	Document OL-8300-01:
	• Information about the reattempt, route advance, and hairpinning (redirect) functions was updated and enhanced. A new token (SEND-FS-CALLP) was added in the H.323 Trunk Group Profile (h323-tg-profile) and H.323 Terminal Profile (h323-term-profile) tables to control sending of the Fast Start parameter. Previously (in Release 4.4.1 and earlier), this functionality used the MISC-UNSUPP token.
	• T.38 fax functionality was enhanced:
	– Descriptions of the enhancements were added.
	– Tokens for T.38 fax functionality (in the h323-tg-profile and h323-term-profile tables) were changed. The FAX_T38_GWMODE_SUPP and FAX_T38_CAMODE_SUPP tokens were deleted, and the REMOTE-FAX-PORT-RETRIEVAL-MSG token was added.
	– In the QoS table, the FAX-PREF-MODE token was deleted and the FAX-T38-ENABLED token was added.
	– New information was added on fax procedures, limitations, and prerequisites.
	• The sample provisioning script was updated.

Release 4.4.1	Document OL-7280-05: • A note was added to the "Call-Proceeding Message Transparency" section on page 50 to clarify the applicability of this parameter to certain call scenarios. Document OL-7280-04: • Information was added about the dual IP addresses for H.323 signaling, including a section in the "Planning" section explaining how to set up dual links, and a section in the "Operating" section explaining the link-failure recovery process. • Throughout the document (a correction from Release 4.2)—Corrected the provisioning for call-connect-mode and h245-tunneling. Call-start-mode (in h323-gw table) was moved to the h323-tg-profile and h323-term-profile tables and changed to call-connect-mode. H245-tunneling was also moved from the h323-gw table to the h323-tg-profile and h323-term-profile tables. The requirement for placing the H.323 GW OOS and INS is deleted. Document OL-7280-03: Applicability to Release 4.4.1 was clarified. The document title and introduction were modified for clarity. Document OL-7280-02: References were included to the *Cisco BTS 10200 Softswitch Provisioning Guide* and *Cisco BTS 10200 Softswitch Command Line Interface Guide*. Document OL-7280-01: • All H.323 descriptions and procedures were reorganized into one document. • Information was added on the relationship between H245-TUNNELING and FACILITY-SUPP tokens. • Details were added to the route-advance description.
Release 4.2	The following enhancements were provided in this release: • Support for video capability on H.323-based subscriber phones • Support for video on H.323-based trunk groups • H.323 routing enhancements for inbound and outbound call legs • Route advance, reattempt, and redirection • ANI-based screening and routing enhancements • Additional H.323 and video-related billing records • Enhanced interoperability with other endpoints, including Cisco CallManager, using H.323 protocol interface • Improved message tunneling and protocol transparency for H.323-based transit traffic • Additional H.323-related feature enhancements
Release 4.1	Annex E UDP capability was introduced.
Release 3.2	H.323 signaling was introduced on the Cisco BTS 10200 Softswitch.

Contents

This document contains the following sections:

- Planning
- Installing
- Configuring
- Operating
- Troubleshooting
- References

Overview

This section provides technical information about the implementation of H.323 features. It covers the following topics.

Cisco BTS 10200 Softswitch in the H.323 Packet Network

The Cisco BTS 10200 Softswitch provides native H.323 signaling, which allows it to communicate directly with H.323 gatekeepers (GKs) and gateways (GWs). The Cisco BTS 10200 Softswitch can be configured as up to four logical H.323 GWs. The Cisco BTS 10200 Softswitch H.323 subsystem includes H.225 and registration, administration, and status (RAS) signaling control, and H.245 connection control. The Cisco BTS 10200 Softswitch also provides signaling for other trunks and lines over Media Gateway Control Protocol (MGCP) and Session Initiation Protocol (SIP). In addition, the Cisco BTS 10200 Softswitch provides access to the public switched telephone network (PSTN). It communicates with IP transfer points (ITPs) that act as signaling gateways (SGs) for SS7-based networks, and with the trunking gateways (TGWs) that provide the bearer path. The details of these signaling links are shown in Figure 1.

Figure 1   *Signaling Links with the Cisco BTS 10200 Softswitch and Cisco CallManager*
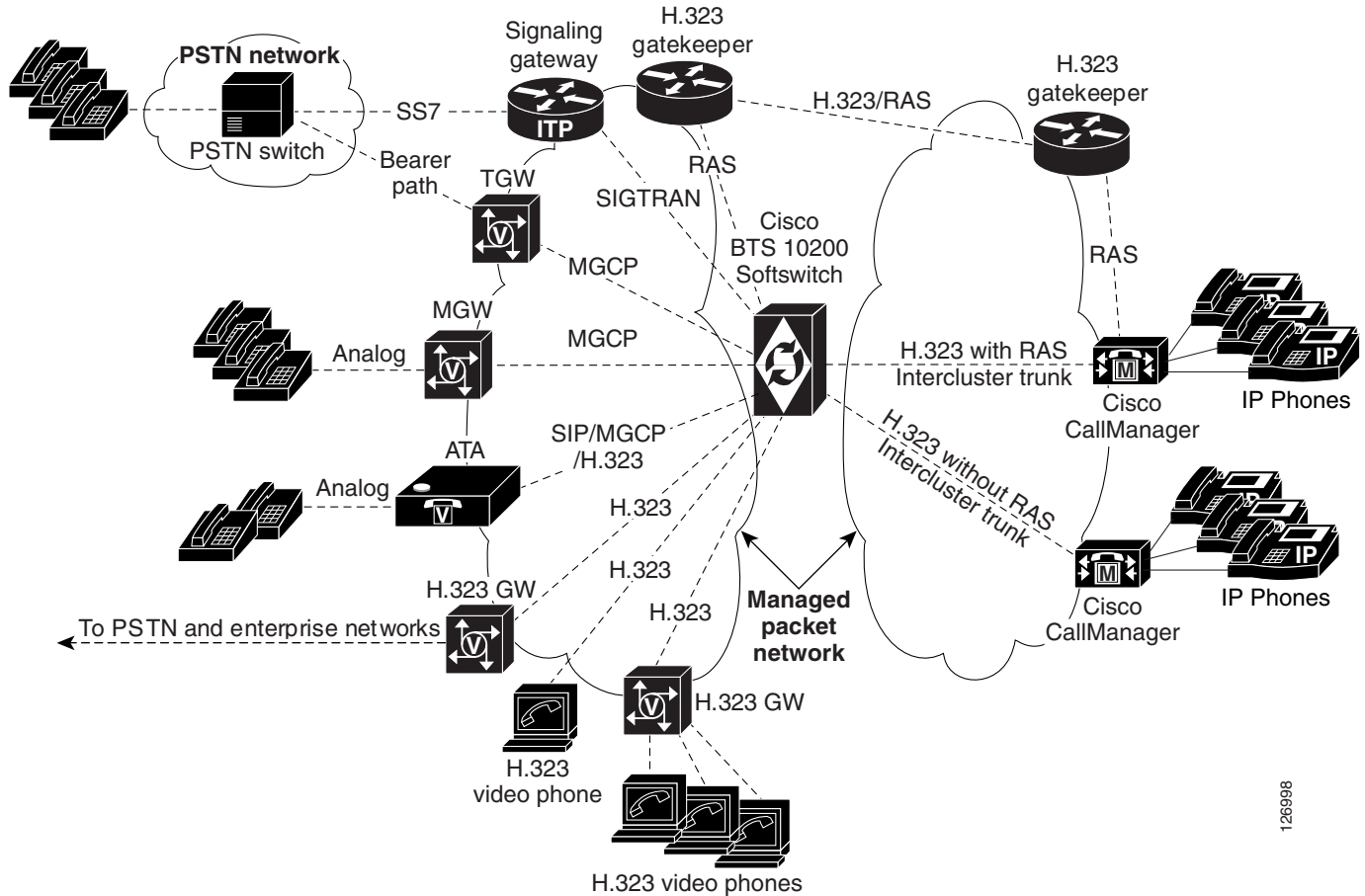
Note   For a more complete description of all Cisco BTS 10200 Softswitch features, refer to the *Cisco BTS 10200 Softswitch System Description* and the *Network and Subscriber Feature Descriptions* document.

The Cisco BTS 10200 Softswitch H.323-based functions can be used on managed H.323 networks that contain the Cisco BTS 10200 Softswitch and the following network element types:

- H.323-based IP PBX systems, including Cisco CallManager
- Analog phones connected to customer premises equipment (CPE) such as integrated access devices (IADs)
- H.323 primary rate interface (PRI) GWs
- H.323 IP-to-IP GWs
- H.323-based GKs
- H.323-based video phones
- H.323-based audio phones

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Note   The above list is intended as a general summary. For interoperability with specific types and models of external devices, see the *Cisco BTS 10200 Softswitch Release Notes*.

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Note   The following terminology is used throughout this document for reference to connection methods described in ITU-T Recommendation H.323, *Packet-based multimedia communications systems*, Draft v4 (11/2000):

  - Fast-start refers to fast-connect procedures.
  - Slow-start refers to non-fast-connect mode.

Summary of H.323 Capabilities

The following H.323 features and services are provided:

- Support for video capability on H.323-based subscriber phones, including video-related billing records.

- Support for video on H.323-based trunk groups.

- Provisionable routing options for inbound and outbound H.323-based call legs.

- Provisionable ANI-based screening and routing options.

- Interoperability with other endpoints, including Cisco CallManager, using H.323 protocol interface.

- Message tunneling and protocol transparency for H.323-based transit traffic.

- Additional H.323-related feature enhancements, such as asymmetric codec resolution, media cut-through, and empty capability set handling.

- Support for reattempt and route advance. If a call does not complete, the Cisco BTS 10200 Softswitch can reattempt the call based on the release cause code. The call can be reattempted to the same trunk group (reattempt) or to another trunk group (route advance).

- Support for hairpinning (call redirection). On an incoming PSTN call, if the GK cannot route the incoming call, or if the GK determines that the call termination is on PSTN, the Cisco BTS 10200 Softswitch can send the call back out to the PSTN (hairpinning) or to another H.323 call leg (redirection).

- Support for modem/fax passthrough. The Cisco BTS 10200 Softswitch allows MGCP GWs and H.323 GWs to transmit and receive faxes using in-band signaling mode. In this mode, the CA treats this call as it would any voice call, and does not perform any T.38 signaling.

- Support for T.38 CA-controlled mode. In this mode, the Call Agent (CA) instructs the gateway to switch to T.38 fax mode in real time. The CA receives a signal (Request mode) when fax signaling starts and stops. To enable interworking between networks, the Cisco BTS 10200 Softswitch maps the fax messages according to the protocol (MGCP or H.323) used for the originating and terminating messages. Billing records are generated in the CA based on fax start and stop signals. For additional information on interoperability for various subscriber features, see the "Cisco IOS - Cisco CallManager - MGCP Interoperability Data" section on page 71.
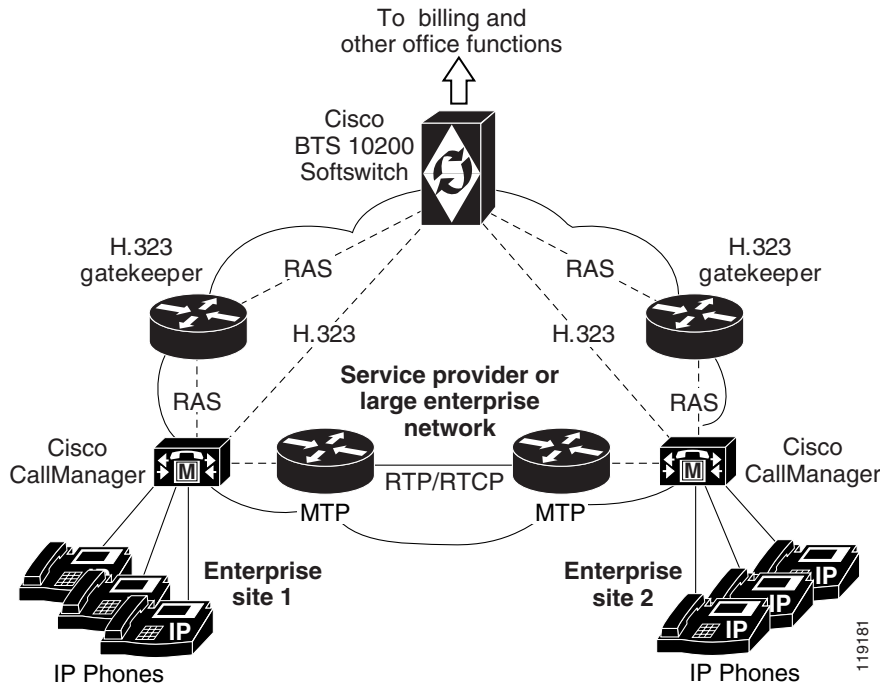
The Cisco BTS 10200 Softswitch supports the following signaling capabilities:

- Information request response (IRR)—When a GK sends an information request (IRQ) message to an H.323 gateway, the gateway responds with an IRR message. IRRs contain per-call information. Cisco BTS 10200 Softswitch GWs can pack multiple call block information messages inside a single IRR message, thereby reducing network traffic. The service provider can provision the CA-CONFIG table for the number of call blocks to pack into a single IRR message.

- Resource availability indicator (RAI)—The RAI is sent by a GW to a GK to indicate a change in resource availability. The service provider can provision three fields in the H323-GW table to control the RAI behavior of the Cisco BTS 10200 Softswitch:

    - MAX-VOIP-CALLS—The total number of calls a Cisco BTS 10200 Softswitch H.323 gateway will support.

    - HIGH-WATER-MARK—A percentage of the MAX-VOIP-CALLS. Once this level is reached, the Cisco BTS 10200 Softswitch sends an RAI with outOfResources=TRUE.

    - LOW-WATER-MARK—A percentage of the MAX-VOIP-CALLS. Once this level is reached, the Cisco BTS 10200 Softswitch sends an RAI with outOfResources=FALSE.

- Calling number information delivery (Octet 3A)—The Cisco BTS 10200 Softswitch delivers calling number information (such as calling number, presentation restrictions, and so forth) to the terminating H.323 GW via a Cisco proprietary octet 3A field in the H.323/H.225 setup message.

- Alternate GK capability—If the preferred GK becomes unavailable, the Cisco BTS 10200 Softswitch can contact alternate GKs on a provisionable list. But if the preferred GK is found using multicast and there are other multicast capable GKs on the network, then alternate GKs are not used.

- Use of dual (redundant) signaling links on the CA—There are two signaling links on each CA. During normal operation, one of these links on the active CA is active, and used for transporting H.323 (and other VoIP) signaling. The other link is standby. If the active signaling link goes down, the H.323 process restarts, and reestablishes communications over a good link (either of the signaling links on the CA). Typically, the link that comes up active is not the same link that originally went down. For additional details on setting up and using this capability, see the "Prerequisites for H.323 Networks" section on page 20 and the "Link Failure Recovery Process" section on page 61.

Interoperability with Cisco CallManager and Other Endpoints

The interoperability between the Cisco BTS 10200 Softswitch, Cisco CallManager, and Cisco IOS H.323 GWs enhances the delivery of call control features between enterprise networks and service provider networks.

The Cisco BTS 10200 Softswitch can be used to connect calls between two phones that reside on different Cisco CallManager systems (see Figure 2). Signaling of certain information, for example connected name and number information, is transparently passed from the terminating Cisco CallManager via the Cisco BTS 10200 Softswitch back to the originating Cisco CallManager.

Figure 2   *Connection of Calls between Phones on Separate Cisco CallManager Systems*

The following details are covered in this section:

- Prerequisites for Interoperability
- Limitations on Interoperability

Prerequisites for Interoperability

To ensure that the Cisco BTS 10200 Softswitch, the Cisco CallManager, and IOS-based H.323 GWs interoperate properly, ensure that your system meets the following conditions:

- Verify that you are using the software releases that have been tested for interoperability with the features described in this document:

  - Cisco BTS 10200 Softswitch—Release 4.5.x
  - Cisco CallManager—4.0(3)
  - Cisco H.323 GWs, such as Cisco 2600 and Cisco 5400—IOS Release 12.3(7)T6

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  Note For a complete list of hardware and software items that have been tested for interoperability with the Cisco BTS 10200 Softswitch, see the *Cisco BTS 10200 Softswitch Release Notes*.

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  Note Contact your Cisco account team regarding any possible updates to these releases or patches that could occur after publication of this document.

- On Cisco CallManager, configure the route to the Cisco BTS 10200 Softswitch as "intercluster trunk" with media termination point (MTP) selected on this trunk.

> **Note** Some subscriber features can be provided by both the Cisco BTS 10200 Softswitch and Cisco CallManager. You must select MTP on Cisco CallManager so that Cisco CallManager can provide these subscriber features.

- To ensure signaling compatibility between the Cisco BTS 10200 Softswitch and Cisco CallManager, perform the following provisioning operations on the Cisco BTS 10200 Softswitch. These procedure are provided in the "Provision for Interoperability with Cisco CallManager" section on page 44.

    - (Optional) Assign a main subscriber ID to the H.323 trunk group (TG) that connects the Cisco BTS 10200 Softswitch with Cisco CallManager. (This is similar to provisioning a TG to a PBX.)

    > **Note** Assign a main subscriber ID only if Cisco CallManager is used as a PBX. The system uses the subscriber ID to perform screening and routing.
    >
    > If Cisco CallManager is not used as a PBX, do not assign a main subscriber ID, and the system uses the TG properties to perform screening and routing.

    - Enable quality of service (QoS) codecs, pulse code modulation mu law (PCMU) and pulse code modulation A law (PCMA), on any TG that is used for connection to Cisco CallManager. In addition, disable codec negotiation for the applicable H.323 TG profile. (Do not perform dynamic codec negotiation for these calls.)

    - Disable generic transparency descriptor (GTD) signaling on the Cisco BTS 10200 Softswitch for any trunk group TG used for connection to Cisco CallManager.

    - Verify that the value of the CODEC-MOD-DURING-CALL token in the CA-CONFIG table is set to its default value of Y.

> ⚠ **Caution** CODEC-MOD-DURING-CALL must be set to Y. If you set it to N, some features might not work.

Limitations on Interoperability

This section describes limitations on interoperability between the Cisco BTS 10200 Softswitch and Cisco CallManager.

Signaling and Processing Limitations

Signaling and processing limitations are as follows:

- DTMF signaling limitation—Only the out-of-band DTMF mode is used over H.323 for signaling between Cisco CallManager and the Cisco BTS 10200 Softswitch.

- Limitation on H.323-based calls on failover:

    The Cisco BTS 10200 Softswitch uses Annex E redundancy capabilities to preserve stable calls during a restart or failover. However, all stable calls between the Cisco BTS 10200 Softswitch and Cisco CallManager are dropped during a restart or failover in the Cisco BTS 10200 Softswitch. Normal processing of new calls between the Cisco BTS 10200 Softswitch and Cisco CallManager resumes after the H.323 call processing function is running.

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> **Note**   Annex E refers to ITU-T Recommendation H.323 - Annex E (05/99).

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> **Note**   Failover refers to the following process—If an H.323-based call processing function in the Cisco BTS 10200 Softswitch experiences a fault, it can restart automatically and begin processing new calls. If it is unable to restart automatically, the standby process in the companion host machine becomes active and takes over the H.323 functions. This event (standby process taking over for a previously active process on a companion host) is called failover.

- T.38 Fax calls cannot be connected between the Cisco BTS 10200 Softswitch and Cisco CallManager.

Limitations on Subscriber Features

The Cisco BTS 10200 Softswitch provides connectivity with H.323 IOS-based GWs, Cisco CallManager, and MGCP-based GWs. These systems interoperate to provide subscriber features such as call forwarding, call waiting, call transfer, and three-way calling. See the "Cisco IOS - Cisco CallManager - MGCP Interoperability Data" section on page 71 for additional data regarding interoperability of the Cisco BTS 10200 Softswitch with H.323 IOS-based gateways, Cisco CallManager, and MGCP-based gateways.

Annex E UDP Functionality

This section describes how the Cisco BTS 10200 Softswitch supports the User Datagram Protocol (UDP)-based Annex E feature of ITU-T Recommendation H.323 v4.

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> **Note**   Annex E as used in this document refers to material that was previously in Annex E of Recommendation H.323, but is incorporated into the main body of Recommendation H.323 as of v4.

Throughout this document, Annex E refers to UDP-based Annex E functionality. (The Cisco BTS 10200 Softswitch does not implement TCP-based Annex E.) In this document, TCP refers to TCP-based signaling without Annex E functionality.

Restart and Failover Scenarios

Annex E implementation allows H.323 signaling to be transported between the Cisco BTS 10200 Softswitch and the far-end H.323 endpoint using UDP (connectionless) signaling instead of TCP (connection-oriented) signaling. The choice of UDP or TCP signaling is important in a Cisco BTS 10200 Softswitch H.323 process restart or CA failover scenario.

Note H.323 process restart means the H.323 GW instance in the Cisco BTS 10200 Softswitch restarts automatically.

CA failover means an automatic CA switchover, in which the standby CA side becomes active and takes over for the previously active CA side. To support the stability of active calls, the CA preserves call processing data, and replicates this data from the active CA side to the standby CA side on a regular basis.

If an H.323 restart or CA failover occurs, a remote H.323 endpoint using TCP signaling cannot reestablish the connection with the previously active process or CA. Therefore, the stable H.323 call(s) on that connection are cleared. However, a remote H.323 endpoint using UDP to communicate with the Cisco BTS 10200 Softswitch in a connectionless session can continue to communicate with the newly active process or CA side using the same connectionless session. This allows the remote endpoint to preserve and support the active call. The Annex E feature must be enabled on the Cisco BTS 10200 Softswitch, the H.323 GK, and the remote H.323 endpoint.

Note An H.323 call is considered to be stable, or in stable state, after the Connect message has been sent (or received) to (or from) the remote H.323 endpoint, and the media channels in both directions have been established. This definition differs somewhat from the typical telephony definition of a stable call.

Use of the Annex E feature is optional and configurable in the Cisco BTS 10200 Softswitch. Each H.323 trunk group (TG) in the Cisco BTS 10200 Softswitch can be independently provisioned to support either Annex E UDP-based signaling or non-Annex-E TCP-based signaling. Each logical H.323 GW instance in the Cisco BTS 10200 Softswitch can have multiple outgoing TGs, with each TG independently configured for Annex E UDP signaling or non-Annex-E TCP signaling.

Limitations on Annex E Support

Annex E must be supported and enabled on both the originating and terminating sides of a call leg for the Annex E redundancy to be supported. If the far-end H.323 device does not support Annex E UDP (or if Annex E is disabled), the following limitations apply:

- For a RAS-based call (RAS parameter set to Y in the H323-TG-PROFILE or H323-TERM-PROFILE table), the Cisco BTS 10200 Softswitch automatically uses TCP mode (to match the far-end device), even if Annex E UDP mode is provisioned on the Cisco BTS 10200 Softswitch.

  Note RAS (Registration, Admission, and Status) protocol is defined in ITU-T Recommendation H.225. It is used to communicate between H.323 GWs, endpoints, and GKs.

- For a non-RAS call (RAS parameter set to N in the H323-TG-PROFILE or H323-TERM-PROFILE table), and with the ANNEXE-SUPP parameter set to Y in both the H323-GW table and the H323-TG-PROFILE or H323-TERM-PROFILE table, the Cisco BTS 10200 Softswitch uses Annex E UDP for outgoing calls. However, if the far end does not support Annex E, these calls fail.

Following are additional limitations on Annex E support:

- All TCP-based calls are automatically cleared if the Cisco BTS 10200 Softswitch H.323 process restarts or if the CA fails over.

- For Annex E functionality to occur, the CALL-CONNECT-MODE parameter in the H323-TG-PROFILE (or H323-TERM-PROFILE) table must be set to fast-start (enables use of fast-connect procedure).

- If a call is established with Annex E, but reverts back to slow-start to match a far-end H.323 endpoint, the call is dropped if there is an H.323 process restart or CA failover.

- If Annex E is enabled but H.245 tunnelling is disabled, stable calls are dropped.

If the H.323-GW process in the Cisco BTS 10200 Softswitch restarts, or if the CA fails over to the other side, Annex E UDP-based transient calls (calls that are in the process of being set up) can be impacted as follows:

- Typically, the system cannot complete the call setup, and the call is torn down.

- Even with the call torn down, the called party might continue to receive ringing, and the ringing continues even if the calling party goes on-hook. Any of the following actions terminates the ringing on the handset of the called party:

  - The called party goes off-hook and then on-hook.

  - The Cisco BTS 10200 Softswitch signals the remote endpoint (the called party) that it should abandon the call after a specified amount of time has elapsed without successful call setup, and that time elapses.

  - The specific endpoint has a timer for incoming call setup, and that time elapses with no call setup.

  After the ringing has terminated, the called party can receive a new incoming call or can go off-hook to receive dial tone.

- Even with the call torn down, the calling party might continue to receive ringback tone, and the ringback tone continues until the calling party goes on-hook. Any of the following actions terminates the ringback tone on the handset of the calling party:

  - The calling party goes on-hook.

  - The calling party endpoint or phone is configured to abandon the call after a specified time without successful call setup, and that time elapses.

  After the ringback tone has terminated, the calling party can receive a new incoming call or can go off-hook to receive dial tone.

Message Tunneling and Protocol Transparency for H.323-Based Transit Traffic

The Cisco BTS 10200 Softswitch supports the interconnection of multiple H.323-based devices by transparently passing certain H.323 messages in calls that transit the Cisco BTS 10200 Softswitch. It also provides signaling functions that enable interoperability with a variety of H.323 and non-H.323 endpoints. These functions are collectively referred to as H.323 protocol transparency functions in this document, and are described below:

- Tunneling of QSIG messages inside H.225 per H.323v4 Annex M1—The Cisco BTS 10200 Softswitch can receive QSIG messages tunneled inside the H.225 call signaling messages on incoming H.323-based calls, and forward the QSIG messages on the outgoing H.323 call leg. The Cisco BTS 10200 Softswitch does not open or process this tunneled data, it simply forwards it to the next H.323 endpoint. No service provider provisioning steps are required for this function.

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Note QSIG messages include, for example, Setup, Alerting, Connect, and Release Complete. Some QSIG messages, such as Call Proceeding, Facility, Information, Notify, and so forth, are mapped to the H.225 Facility message, as described in Annex M1.

- Call-connect mode transparency—This feature refers to the two procedures for H.323 call connection, fast-start and slow-start. Each TG profile (or terminal profile) can be provisioned to operate in slow-start mode, fast-start mode, or auto mode. Each call leg will use the connection mode provisioned for the applicable TG profile or terminal profile. In addition, the system takes the following action based on this provisioning:

  - If the incoming call leg is provisioned for fast-start and the outgoing leg is provisioned for slow-start, the call can go through.

  - If the incoming leg is provisioned for slow-start and the outgoing leg is provisioned for fast-start, the call does not go through.

  - In auto mode, the system automatically uses the same call-connection mode on both legs of an H.323 transit call.

  - There are additional limitations on the system actions for fast-start and slow-start legs. Contact Cisco TAC if you need additional information on these limitations.

- Call-proceeding message transparency—The system can send a call-proceeding message from the terminating endpoint to the originating endpoint as soon as it receives enough called-party digits to route the call. The system provides provisionable options that control the sending of the call-proceeding messages for H.323-based calls.

- Preferential codec order transparency—On an incoming call leg using the fast-start connection method, the fast-start elements are contained in the SETUP message. For a leg using slow-start, the codec preferences come in the terminal capability set (TCS). The system transparently forwards this information to the remote endpoint on the outbound leg. This supports codec negotiation by the two endpoints. No service provider provisioning steps are required for this function.

- Transparency of H.245 tunneling mode—The system receives H.245 messages that are tunneled inside H.225 messages on the incoming leg, and forwards the H.245 messages tunneled inside H.225 messages on the outgoing leg. This supports call processing functions between the originating and terminating endpoints, including scenarios in which one endpoint is H.323-based and the other is MGCP-based. The system provides provisionable options for H.245 tunneling. For H.323 transit calls, a provisionable option allows the system to consider what the peer leg is using as its tunneling mode.

- H.245 message transparency—For H.323-to-H.323 calls, the system can pass H.245 messages, including, for example, EndSession and OpenLogicalChannelAck messages, from the incoming call leg to the outgoing call leg. It can also pass any nonstandard information elements received in the H.245 messages. No service provider provisioning steps are required for this function.

- Transparency of Flash button (hook switch) functionality—When a call is in process and a user presses the Flash button or the hook switch on the handset, a hook-flash signal is sent to the Cisco BTS 10200 Softswitch in an H.245 message. The Cisco BTS 10200 Softswitch reacts by sending a hook-flash signal over H.245 to the other endpoint in the call. No service provider provisioning steps are required for this function.

- DTMF relay method transparency—For H.323 transit calls, the Cisco BTS 10200 Softswitch transparently forwards the types of DTMF parameters listed below. (For this transparent passing functionality, no service provider provisioning steps are necessary.)

  - In-band

- RTP payload (per IETF RFC 2833, *RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*)
- Out-of-band (alphanumeric and signal)

Reattempt, Route Advance, and Hairpinning (Redirection)

The Cisco BTS 10200 Softswitch supports reattempt, route advance, and hairpinning (redirection). In H.323-based networks, the system supports these functions only for calls that use fast-start procedures on the H.323-based call leg(s). It does not support these features for calls that use slow-start procedures.

> **Note** By default, the system attempts to send the FastStart element in the CALLPROCEEDING message. This could cause reattempt, route advance, or hairpinning to fail for H.323-to-H.323 (transit) calls. To control the sending of FastStart in CALLPROCEEDING, see the "Reattempt, Route Advance, and Hairpinning (Redirection)" section on page 54.

Reattempt and Route Advance on H.323-Based Calls

If a call does not complete, the Cisco BTS 10200 Softswitch can reattempt the call based on the release cause code. The action for each received cause code is provisionable in the Cause Code Map (cause-code-map) table. The call can be reattempted to the same TG or to another TG. The selection of the next TG depends on the cause code mapping analysis and on carrier-dependent routing rules.

Table 1 shows an example of mapping cause codes to actions for H.323 TGs.

Table 1   Example of Cause Code Mapping for H.323 TGs

Received Cause Code	Standard Cause Code	Action	Cause Code Description	Action Description
001	001	REATTEMPT	Unassigned number	Reattempt the call by requerying the GK.
003	003	REATTEMPT	No route to the destination	Reattempt the call by requerying the GK.
021	021	REATTEMPT	Call rejected	Reattempt the call by requerying the GK.
031	031	REATTEMPT	Normal, unspecified	Reattempt the call by requerying the GK.
034	034	REATTEMPT	No circuit available	Reattempt the call by requerying the GK.
038	038	REATTEMPT	Network is out of order	Reattempt the call by requerying the GK.
041	041	REATTEMPT	Temporary failure	Reattempt the call by requerying the GK.
042	042	REATTEMPT	Switch is congested	Reattempt the call by requerying the GK.
047	034	ROUTE-ADVANCE	Resource unavailable, unspecified	If additional routes are available in the route table, route advance to the next TG within the route.
049	049	REATTEMPT	QoS is not available	Reattempt the call by requerying the GK.
063	063	REATTEMPT	Service or option not available	Reattempt the call by requerying the GK.

The specific action for route advance is based on provisioning of the route table in the Cisco BTS 10200 Softswitch database. The service provider uses the route table to provision a list of up to 10 trunk groups (TG1 to TG10), and a parameter for selecting the priority of the TGs for routing (TG-SELECTION). The individual TGs can be H.323-based, or can be based on any of the other supported protocols. The system attempts to route the call on the highest priority TG. If the call cannot be completed on the highest priority TG, the system attempts to use the next (lower priority) TG, a process known as route advance. The system attempts route advance to lower priority TGs up to five times. (Any TG in the list that is administratively out of service is not counted as an attempt.) If all five attempts fail, the call is released, and the system provides a release announcement.

Hairpinning (Call Redirection) on H.323-Based Calls

On an incoming PSTN call, if the GK cannot route the incoming call, or if the GK determines that the call termination is on PSTN, the Cisco BTS 10200 Softswitch can send the call back out to the PSTN (hairpinning) or to another H.323 call leg (redirection).

T.38 Fax Support Over H.323

This section describes T.38 fax support over H.323.

Supported Interfaces and Interworking

The Cisco BTS 10200 Softswitch supports ITU-T T.38 procedures on the following H.323 interfaces:

- H.323 trunk using fast connect procedure (fast start)
- H.323 trunk using non-fast connect procedure (slow start)
- H.323 trunk using GK (H.225 RAS messaging)
- H.323 trunk not using GK (direct trunks)
- H.323 trunk with and without H.245 tunneling enabled

Note The system does not support T.38 procedures for H.323 subscribers.

The Cisco BTS 10200 Softswitch supports interworking of T.38 procedures between H.323 trunks and the following interfaces:

- NCS MTA subscribers
- MGCP subscribers
- MGCP (or TGCP) trunking gateways (SS7, ISDN)
- SIP trunks

T.38 Fax Call Features

The following call features apply to T.38 fax calls:

- For the H.323 interface, the system uses H.323 Annex D v2 to handle the fax over T.38.
- For H.323 calls, if the non-H.323 endpoint fails to switch to T.38 fax while the H.323 side is already switched to T.38 fax, the H.323 side reapplies H.245 procedure to return to audio codec.

- After a fax is done, the call falls back to a voice call.

> **Note** T.38 fax calls cannot be connected between the Cisco BTS 10200 Softswitch and Cisco CallManager.

T.38 Glare Handling

The Cisco BTS 10200 applies a call agent controlled switch to T.38 Fax media when initiated by either the originating or terminating endpoint. This includes when both endpoints initiate the switch, causing a glare condition at the Cisco BTS 10200.

For details about glare handling, contact your Cisco support representative.

End-to-End SDP Exchange for T.38 Media and the H.323 Interface

> **Note** This section does not apply to T.38 fax transmissions across H.323-to-H.323 calls on the Cisco BTS 10200 Softswitch. In this case, the H.245 messages are exchanged directly through the Cisco BTS 10200 Softswitch.

The H.323 protocol must negotiate T.38 fax connection attributes (example: bit rate, maximum buffer size) during the voice call establishment using Terminal Capability Set (TCS) messages. However, for SIP and MGCP, the endpoint does not report T.38 fax connection attributes until the fax actually starts. When this occurs between an interworking H.323 endpoints to SIP/MGCP endpoints, and the H.323 endpoint is ready to send TCS message during voice call establishment phase, the T.38 fax attributes are not available from MGCP/SIP endpoints.

To overcome this interworking limitation, all Cisco IOS gateways assume the defaults for these attributes while exchanging TCS messages. Cisco BTS 10200 follows the same philosophy for H.323 to/from MGCP/NCS and H.323 to/from SIP calls. Cisco BTS 10200 assumes following defaults:

- Maximum Bit Rate = 14.4 kbps (This field can be configured in T38_MAX_BIT_RATE field in the CA_CONFIG table)

- Fill Bit Removal = false

- MMR Transcoding = false

- JBIG Transcoding = false

- Data Rate Management Method = transferredTCF

- Maximum Buffer Size = 200 (This field can be configured in T38_MAX_BUFFER_SIZE field in CA_CONFIG table)

- Maximum Datagram Size = 72 (This field can be configured in T38_MAX_DATAGRAM_SIZE field in the CA_CONFIG table)

- Error Correction = t38UDPRedundancy

To overcome other interworking limitations with SIP, IOS H.323 gateways send the fax UDP port in H.245 Open Logical Channel (OLC) messages. A provisioning field (REMOTE_FAX_PORT_ RETRIEVAL_MSG) is added in h323-tg-profile and h323-term-profile, enabling the H.323 interface to read the remote endpoint fax UDP port either from OLC message or from OLC Ack message.

Provisionable Parameters for T.38 Fax Over H.323

For details on provisioning parameters, see the .

Additional H.323-Related Features

The Cisco BTS 10200 Softswitch provides the following additional provisionable H.323-based features:

- DTMF relay support on MGCP-to-H.323 calls—For MGCP-to-H.323 (fast-connect) calls, RFC-2833 capabilities are advertised for the H.323 call leg based on static information configured for the H.323 TG. This is because the far-end H.323 endpoint capabilities (such as DTMF, Fax, and so forth) are not available when the MGCP leg has to complete the two-ended connection. Therefore, all far-end H.323 capabilities must be configured in either the outgoing (for outgoing H.323 calls) or incoming (for inbound H.323 calls) H323-TG-PROFILE (or H323-TERM-PROFILE) table.

- Asymmetric codec resolution—Asymmetric codec refers to the use of different codecs for forward and reverse logical channels created for a slow-start call. In most network scenarios, asymmetric codec is avoided by means of codec negotiation, and, if necessary, some additional resolution techniques when the call is set up. The Cisco BTS 10200 Softswitch resolves asymmetric codec based on a master/slave determination and a codec back-off algorithm.

- Facility message—The FACILITY message is used primarily for passing tunneling and other special information. The service provider provisions a flag in the Cisco BTS 10200 Softswitch to indicate whether the far-end device supports receiving of the FACILITY message. If the far-end device flag indicates that it does not support the FACILITY message, the Cisco BTS 10200 Softswitch can open a separate H.245 TCP connection and use the PROGRESS message to send fast-start information elements backward in the direction of the call.

- Media cut-through—The cut-through parameter can be used to trigger the originating far-end device to perform media cut-through. This is provisionable in the Cisco BTS 10200 Softswitch. In most cases the system handles media cut-through automatically (default behavior).

- Empty capability set (ECS) message handling—When an endpoint in a call receives an ECS message, it reacts by closing its forward logical channel. The sending endpoint might also close its forward logical channel. When the Cisco BTS 10200 Softswitch is the sending endpoint it closes the channel (or not) based on the values provisioned for the ECS method. If provisioned for automatic ECS mode (default), the system acts as follows:

    - For call legs connecting to Cisco CallManager, the Cisco BTS 10200 Softswitch closes its own forward logical channel.

    - For all other types of H.323 devices, the Cisco BTS 10200 Softswitch does not close its own forward logical channel.

- Configurable status enquiry timer—If a Call Agent failover occurs, the Cisco BTS 10200 Softswitch uses Annex E UDP transport to send a STATUS ENQ message to all calls that were previously stable or transient, and starts the STATUS ENQ timer per call. This timer is stopped gracefully when a STATUS message is received from the far end. After timeout, the Cisco BTS 10200 Softswitch releases the corresponding call.

Planning

This section provides guidelines and procedures for planning your H.323-based systems. It includes the following sections:

- Planning for Redundant Operation of H.323 Links
- Prerequisites for H.323 Networks
- Restrictions and Limitations

Tip Prerequisites are tasks or conditions (outside the immediate scope of this document) that are required before these new Cisco BTS 10200 Softswitch features can work as specified.

Restrictions and limitations are special conditions or scenarios for which these features might not work, or might behave in an unexpected manner.

Planning for Redundant Operation of H.323 Links

Figure 3 shows an H.323 network with the Cisco BTS 10200 Softswitch, H.323 GW (with Cisco IOS), and a gatekeeper (GK). Refer to this figure as needed during the planning procedures described in this section. During startup, the Cisco BTS 10200 Softswitch registers its active IP address (the address used for H.323 signaling) with the GK. The peer H.323 GW dynamically obtains the IP address by sending a query to the GK. When the GW signals the Cisco BTS 10200 Softswitch, it transmits to this IP address.

Figure 3 *H.323 Network with Gatekeeper Present*
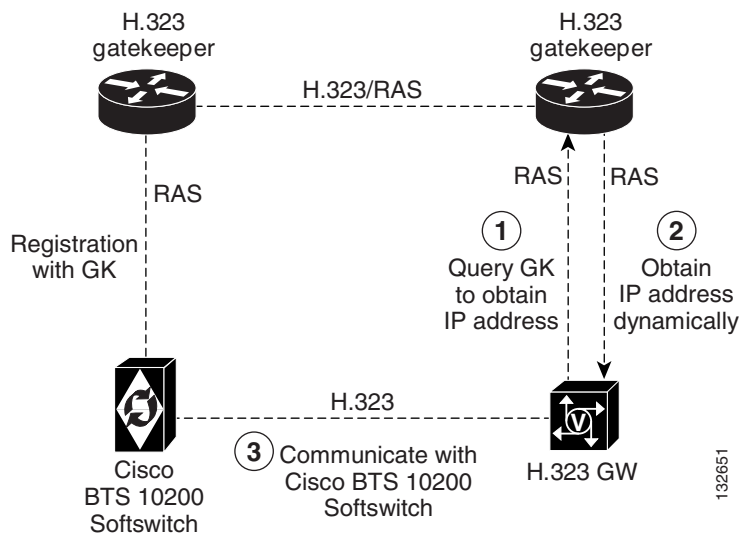
The internal interfaces of the Cisco BTS 10200 Softswitch are shown in Figure 4. There are two signaling links on each CA (shown in the drawing as IF1 and IF2 on each CA unit).

- One link connects IF1 on the CA to a port on Catalyst Switch A, and is in VLAN-2A.
- The other link connects IF2 on the CA to a port on Catalyst Switch B and is in VLAN-2B.

Figure 4   ***Cisco BTS 10200 Softswitch Network Configuration***
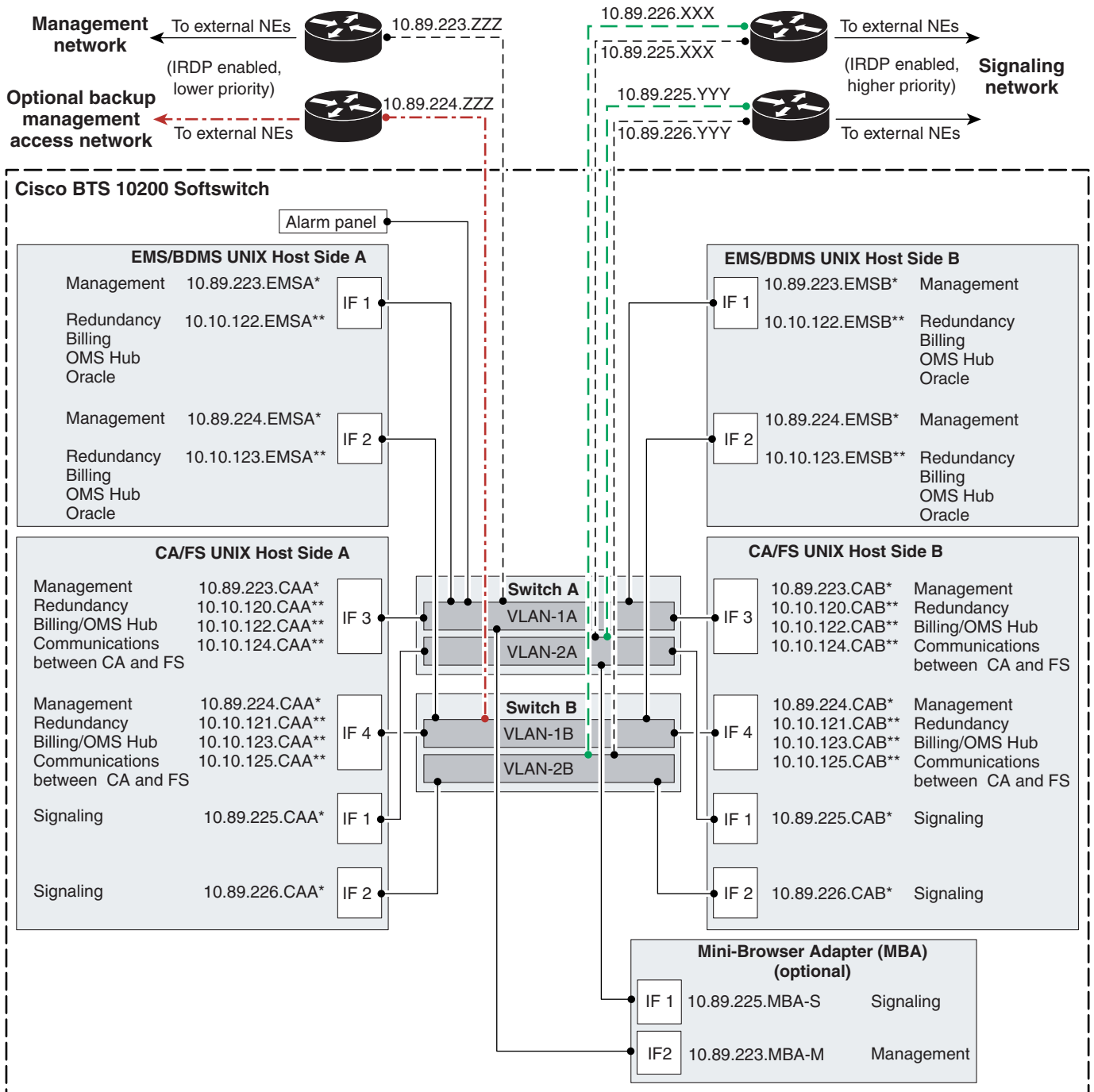
✎
Note The same IP address is used for IF1 on both the active and standby sides of the CA, and likewise the same IP address is used for IF2 on both the active and standby sides.

Prerequisites for H.323 Networks

This section lists prerequisites for video phones, and for networks with and without GKs.

Video Phones

It might not be necessary to configure the GK address in the individual H.323 video phones. The Cisco BTS 10200 Softswitch can receive incoming calls from an H.323 phone with or without using the GK, provided that the H.323 phone supports direct routing. The H.323-based video phones must have the following capabilities:

- The video phones must be able to communicate with the GK, if a GK is present in the network.

- The video phones must be capable of using slow-start connection procedures.

Networks with GKs

If the Cisco BTS 10200 Softswitch is connected to one or more GKs in the H.323 network, the GKs must be configured to support video calls:

- The GKs can be configured to reroute an originating call from a video terminal to the Cisco BTS 10200 Softswitch first (before completing the call to the terminating video terminal). The Cisco BTS 10200 Softswitch participates in the video call as an H.323 proxy (IP-to-IP MGW).

- The GKs can be configured to provide validation and registration of the video phone functions performed by the Cisco BTS 10200 Softswitch. The Cisco BTS 10200 Softswitch does not provide GK functions such as registration and authentication of endpoints.

Networks Without GKs (Direct Routing)

Setting Up Direct Routing on the Cisco BTS 10200 Softswitch

For direct routing scenarios (not using RAS signaling to a GK) the transport service access point (TSAP) addresses of the far-end H.323 endpoints must be identified, so that they can be provisioned in the Cisco BTS 10200 Softswitch database. The TSAP addresses are provisioned for each applicable TG or terminal.

Setting Up Direct Routing on the Peer H.323 GW

If a GK is not used, direct routing must be set up on each of the peer H.323 GWs that communicates with the Cisco BTS 10200 Softswitch. Use this procedure to set up direct routing. While performing this procedure, refer to Figure 4 for a description of signaling interfaces and parameters.

Obtain information from the Cisco BTS 10200 Softswitch and provision the H.323 GW in the following way:

Step 1 On the UNIX level on the active CA, enter the following command (example shown) to determine the IP addresses of the signaling interfaces (IF1 and IF2).

```
host# nslookup h3a-SYS37CA146.ipclab.cisco.com

Typical system response:
Server: lion.ipclab.cisco.com
Address: 10.89.224.1
Name: h3a-SYS37CA146.ipclab.cisco.com
Addresses: 10.89.226.17, 10.89.225.17
```

Tip The domain name for this H.323 link always includes h3a-SYS. The full domain name is shown in the Network Information Data Sheet (NIDS) that was supplied with your system. Alternatively, you can search in the DNS server for domain names containing h3a-SYS.

Step 2 On the Cisco BTS 10200 Softswitch, enter the following CLI command (example shown) to determine which signaling interface (IF1 or IF2) is active on the active CA. The active signaling interface carries the H.323 signaling (and other protocol signaling, if present). The system response contains an IP address for the currently active signaling link.

```
status h323-gw id=GW37_Central_4;
```

A typical system response is shown below.

Note The IP ADDRESS displayed in this system response is the active IP address.

```
status h323-gw id=TB37_Central_4;

ADMIN STATE -> ADMIN_INS
H3A PROCESS NUMBER -> 40
H3A PROCESS NAME -> H3A4
ENDPOINT ID -> 6333EC4400000005
ACTIVE CALLS -> 0
RAS STATE -> CCH323_RAS_STATE_IDLE
RAS PORT -> 57781
IP ADDRESS -> 10.89.225.17
REGISTERED GATEKEEPER ID -> H5-GK
PRIMARY GATEKEEPER ID -> H5-GK
PRIMARY GATEKEEPER PORT -> 1719
PRIMARY GATEKEEPER IP -> 10.89.227.80
H323 VERSION -> 4
TIME TO LIVE -> 60
NUM ALT GATEKEEPERS -> 0
ALT GATEKEEPER PERMANENT -> TRUE
THRESHOLD ENABLED -> FALSE
OUT OF RESOURCES -> FALSE
ALT GATEKEEPER LIST ->
```

Step 3 On the peer H.323 GW, set up two IP addresses. Set the IP address that is currently active on the CA as primary, and set one alternate IP address (to be used if the primary IP address becomes unreachable).

> **Tip** The active IP address is the address returned in the status query (Step 2), and the standby IP address is the other IP address listed in the response to the nslookup query (Step 1).

    a. If the peer H.323 GW is IOS-based, configure this using two dial-peer entries with preferences. Set the preference to 1 on the dial-peer that has the session-target IP address for the active signaling link of the CA. Set preference to 2 on the dial-peer that has the session-target IP address for the standby signaling link of the CA.

    b. If the peer H.323 GW is a Cisco CallManager H.323 intercluster trunk, configure this in the Remote Cisco CallManager Information dialog box as Server IP Address 1 and Server IP Address 2.

Step 4 On the peer H.323 GW, set the H.225 TCP timeout delay to 3 seconds. The purpose of reducing this to 3 seconds is to allow the GW to switch promptly to a secondary IP address if the primary (top preference) IP address goes down.

> **Note** It is important to set the timeout delay in the peer H.323 GW, because the default timeout delay can be much greater than three seconds, which can cause unacceptable call setup delays if one signaling link on the CA goes down.

Step 5 Verify that the active connection is functioning properly by completing several test calls.

Restrictions and Limitations

This section describes restrictions and limitations applicable to the H.323 implementation.

Interoperability with Other H.323 Endpoints

The features described in this document are based on ITU-T Recommendation H.323, *Packet-based multimedia communications systems*, Draft v4 (11/2000). H.323-based endpoints that do not comply fully with this draft of the ITU-T recommendation might not support all of these same features. When you are selecting H.323-based devices, we recommend that you discuss your specific requirements with your Cisco account team.

The Cisco BTS 10200 Softswitch *Release Notes* document identifies the specific peripheral platforms and software loads that have been tested by Cisco for H.323 interoperability with the Cisco BTS 10200 Softswitch software. If you would like to use additional features and devices, ask your Cisco account team for assistance.

> **Note** The interoperability list in the *Cisco BTS 10200 Softswitch Release Notes* includes H.323-based video phones, analog telephone adapters (ATAs), H.323-based PRI gateways, H.323 IP-to-IP GWs, H.323 GKs, and Cisco CallManager.

Functionality Related to Video Phones

The Cisco BTS 10200 Softswitch supports basic call functions for video phones, along with the following subscriber features:

- Call forwarding unconditional (CFU) and call forwarding busy (CFB)
- Calling identity features including presentation and blocking

The following restrictions and limitations apply to video phone calls connected through the Cisco BTS 10200 Softswitch:

- Video calls must be originated using slow-start procedures. H.323 fast-connect signaling does not work for video calls.
- If a video phone uses an H.245 tunneling feature, H.245 tunneling must be disabled in the Cisco BTS 10200 Softswitch H323-TERM-PROFILE table associated with that phone.
- In some cases, video phones do not support codec negotiation. When codec negotiation is not supported by the phones, the originating and terminating video phones must use the same codec.
- Video calls cannot be originated or terminated using multiline hunt group (MLHG) line access.
- In general, the Cisco BTS 10200 Softswitch preserves stable calls during an internal transient such as a process restart or platform switchover. However, H.323-based calls can be preserved only if the connection uses both H.323 Annex E and fast-start functionalities. If the video endpoints in a call do not support fast-start, these calls are dropped when there is a platform switchover or a process restart that affects H.323 call processing.

Functionality Related to ATA Clients

The Cisco BTS 10200 Softswitch supports basic call functions for ATA clients using H.323 protocol, along with the following subscriber features:

- CFU, CFB, and call forwarding no answer (CFNA)
- Call waiting (CW) and calling ID delivery on call waiting (CIDCW)
- Calling identity features including presentation and blocking
- Call transfer (CT) and three-way calling (TWC)

Interoperability Data for Cisco IOS GWs, Cisco CallManager, and MGCP GWs

The Cisco BTS 10200 Softswitch provides connectivity with H.323 IOS-based gateways, Cisco CallManager, and MGCP-based gateways. These systems interoperate to provide subscriber features such as call forwarding, call waiting, call transfer, and three-way calling. See the "Cisco IOS - Cisco CallManager - MGCP Interoperability Data" section on page 71 for additional interoperability data.

Installing

There are no H.323-specific requirements for installation procedures for the Cisco BTS 10200 Softswitch as a result of the features covered in this document. (Installation procedures include hardware installation, cabling, jumpstart, application installation, software upgrade, and hardware upgrade.)

Configuring

This section explains how to perform the following tasks:

- Provision H.323-Based TGs, Logical GWs, and GKs
- Provision H.323-Based Video Phone Terminals and Subscribers
- Provision H.323-Based Outbound Routing Data
- Provision H.323-Based Inbound Routing
- Provision ANI Screening and Routing
- Provision for Interoperability with Cisco CallManager
- Provision Annex E Functionality
- Provision Additional H.323 Options

To see a complete set of commands, see the "Example of Provisioning Script" section on page 56.

> **Note** The tasks described in this section include examples of CLI commands that illustrate how to provision specific features. Most of the database tables in the Cisco BTS 10200 Softswitch have additional tokens that are not used in these examples. For a complete list of all CLI tables and tokens, refer to the *Cisco BTS 10200 Softswitch Command Line Interface Reference Guide*.

> **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 GWs, TGs, and so forth, use the "change" commands.

Provision H.323-Based TGs, Logical GWs, and GKs

The commands in this section provision the following entities on the Cisco BTS 10200 Softswitch:

- H.323-based TGs.
- H.323-based logical GWs internal to the Cisco BTS 10200 Softswitch (the Cisco BTS 10200 Softswitch provides a maximum of four H.323-based GWs).
- Connections to an H.323 GK, if GKs are present in the network.

H.323-Based Logical GWs Internal to the Cisco BTS 10200 Softswitch

Each of the H.323-based internal GWs supports trunks, lines, routing options, and communications with external H.323 endpoints. Each GW can communicate with a GK, if one is present in the network. The parameters described in this section support these functions.

Prerequisites

The Cisco BTS 10200 Softswitch database should already be populated with basic provisioning options as described in the *Cisco BTS 10200 Softswitch Provisioning Guide*.

SUMMARY STEPS

1. **ADD H323-TG-PROFILE**

2. **ADD TRUNK-GRP**

3. **ADD QOS**

4. **ADD H323-GW**

5. **ADD H323-GW2GK**

6. **CHANGE TRUNK-GRP**

Note We recommend that you assign a specific type of inbound routing to each of the four H.323 GWs according to your network requirements. For example, assign tsap-addr routing on one GW, gw-id routing on one GW, "none" on one GW, and choose the routing type for the fourth GW according to your network design. Selecting "none" results in the most efficient processing, but it reduces flexibility.

DETAILED STEPS

	Command or Action	Purpose

Step 1	`ADD H323-TG-PROFILE`
	
	Example:
	`ADD H323-TG-PROFILE ID=TRUNK-PROFILE-1;`
	`H245-SESSION-MODE=AUTO;`
	`VIDEO-SUPP=Y;`
	`CODEC-NEG-SUPP=N;`
		Sets the connection parameters to support certain types of calls.
		
		Note To enable H.323 video capability, set the parameters as follows:
		
		• Set H245-SESSION-MODE to either AUTO or H245-FLOWAROUND
		
		• Set VIDEO-SUPP to Y
		
		• If the far-end video device does not support dynamic codec negotiation, set CODEC-NEG-SUPP to N
		
		⚠ **Caution** The default value for CODEC-NEG-SUPP is Y. Make sure that you change this value to N for video capability.
		
		Note For TG profiles applicable to TGs that connect to Cisco CallManager, set the parameters as follows:
		
		• Set H245-SESSION-MODE to AUTO
		
		• Set VIDEO-SUPP to N
		
		• Set CODEC-NEG-SUPP to N
		
		⚠ **Caution** The default value for CODEC-NEG-SUPP is Y. Make sure that you change this value to N for TGs that connect to Cisco CallManager.

	Command or Action	Purpose

Step 2	`ADD TRUNK-GRP`
	
	Example:
	This trunk group can be used as a match for incoming H.323 calls matched on the IP:port:
	
	`ADD TRUNK-GRP ID=318; CALL-AGENT-ID=CA146; TG-TYPE=H323;`
	`TG-PROFILE-ID=TRUNK-PROFILE-1; DIAL-PLAN-ID=cdp1;`
	`ANI-BASED-ROUTING=N; SOFTSW-TSAP-ADDR=10.89.227.114:1720;`
	`QOS-ID=Codec_1;`
	
	Example:
	This trunk group would be used to match incoming H.323 call from CARRIER-A that is associated with H.323 GW 10.89.227.115, and apply ANI based routing. It can also be used for an outbound H.323 call with sourceCircuitInfo=CARRIER_A:
	
	`ADD TRUNK-GRP ID=418;CALL-AGENT-ID=CA146; TG-TYPE=H323;`
	`TG-PROFILE-ID=TRUNK-PROFILE-1; DIAL-PLAN-ID=cdp1;`
	`ANI-BASED-ROUTING=Y; SOFTSW-TSAP-ADDR=10.89.227.115:1720;`
	`TRUNK-SUB-GROUP=CARRIER_A; QOS-ID=Codec_1;`
		Matches incoming H.323 calls on a specific IP:port to a specific TG and enables or disables ANI-based routing.
		
		QOS-ID specifies which QOS table to use for selection of codec type on outgoing calls to non-H.323 endpoints, for example an H.323 videophone attempting to establish an audio call with a non-H.323 endpoint. Codec negotiation is not supported for video calls; therefore, the codec of the remote H.323 endpoint must be able to use the specified codec.

Step 3	`ADD QOS`
	
	Note This step is required only if CODEC-NEG-SUPP=N in the H323-TERM-PROFILE table, as used with slow-start.
	
	Example:
	`ADD QOS ID=Codec_1;`
	`CODEC-TYPE=PCMA;`
		CODEC-TYPE identifies the codec to use; typically, video calls use PCMU (the default value) or PCMA.

Step 4	`ADD H323-GW`
	
	Example:
	`ADD H323-GW ID=H323_GW1;`
	`GW-H225-PORT=1720;`
	`TGN-ID=318;`
	`SOURCE-BASED-ROUTING=SRC-TSAP-ADDR;`
		Provisions properties of the logical H.323 GW instance on the Cisco BTS 10200 Softswitch. The system can support up to four H323-GW IDs.
		
		Note The Cisco BTS 10200 Softswitch can be configured as up to four logical H.323 GWs.
		
		Note The system uses the SOURCE-BASED-ROUTING parameter to choose the incoming TRUNK-GRP.

Step 5	`ADD H323-GW2GK`
	
	Example:
	`ADD H323_GW2GK H323-GW-ID=H323_GW1; GK-ID=cisco-gk;`
	`GK-IP-ADDR=10.0.10.128; GK-RAS-PORT=1719; MULTICAST=N;`
		Provisions connections to the H.323 GK.

	Command or Action	Purpose

Step 6	`CHANGE TRUNK-GRP`
	
	Example:
	`CHANGE TRUNK-GRP; ID=318; CALL-AGENT-ID=CA146;`
	`DIAL-PLAN-ID=dp001; H323-GW-ID=H323_GW1;`
		Link the TG to the logical H.323 GW.

Provision H.323-Based Video Phone Terminals and Subscribers

The Cisco BTS 10200 Softswitch can be configured as up to four internal H.323-based logical GWs. Each of these GWs can support direct communications with external H.323 endpoints. Each GW can communicate with a GK, if one is present in the network. The commands in this section provision the subscriber lines for H.323-based video phone terminals and subscribers.

Prerequisites

The Cisco BTS 10200 Softswitch database should already be populated with basic provisioning options as described in the *Cisco BTS 10200 Softswitch Provisioning Guide*.

SUMMARY STEPS

1. **ADD H323-TERM-PROFILE**
2. **ADD H323-TERM**
3. **ADD SUBSCRIBER-PROFILE**
4. **ADD SUBSCRIBER**
5. **ADD QOS**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`ADD H323-TERM-PROFILE`
	
	Example:
	`ADD H323-TERM-PROFILE ID=TERM-PROFILE-1;`
	`H245-SESSION-MODE=AUTO;`
	`VIDEO-SUPP=Y;`
	`CODEC-NEG-SUPP=N;`
	`MAX-CALLS=<1, 2, ... 6>;`
		Creates a profile for an H.323 video-phone termination.
		
		Note To enable H.323 video capability, set the parameters as follows:
		
		• Set H245-SESSION-MODE to either AUTO or H245-FLOWAROUND.
		
		• Set VIDEO-SUPP to Y.
		
		• If the far-end video device does not support dynamic codec negotiation, set CODEC-NEG-SUPP to N.
		
		⚠
		Caution The default value for CODEC-NEG-SUPP is Y. Make sure that you change this value to N for video capability.
		
		Note MAX-CALLS is the maximum number of calls allowed on the H.323 terminal. When the current number of calls exceed this number, any call termination to this terminal results in a busy condition (and can trigger the CFB or CW feature if one configured for the subscriber). The range is 1 to 6 and the default is 2.

Step 2	`ADD H323-TERM`
	
	Example:
	`ADD H323-TERM-ID=TERM1-h323;`
	`TSAP-ADDR=10.89.227.114:1720;`
	`H323-TERM-PROFILE-ID=TERM_PROFILE_1;`
	`H323-GW-ID=H323_GW1;`
		Links the H.323 termination to an H.323 termination profile and H.323 GW, and specifies the TSAP address (IP address and port).
		
		Note If H323-GW-ID is set to NULL, the Cisco BTS 10200 Softswitch selects which GW to use, based on a load-distribution algorithm.

Step 3	`ADD SUBSCRIBER-PROFILE`
	
	Example:
	`ADD SUBSCRIBER-PROFILE ID=SP1;`
	`DIAL-PLAN-ID=CDP1;`
	`POP-ID=27;`
		Creates a profile for a subscriber and links the profile to a specific dial plan and POP.

	Command or Action	Purpose

Step 4	**ADD SUBSCRIBER**
	
	Example:
	`ADD SUBSCRIBER ID=JSMITH;`
	`BILLING-DN=212-555-1212;`
	`DN1=212-555-1212;`
	`SUB-PROFILE-ID=SP1;`
	`TERM-TYPE=H323;`
	`H323-TERM-ID=TERM1-h323;`
	`QOS-ID=Codec_1;`
		Adds a subscriber and links the subscriber to a specific subscriber profile, H.323 termination, and billing directory number (DN).
		
		QOS-ID specifies which QOS table to use for selection of codec type on outgoing calls. Codec negotiation is not supported for video calls; therefore, the codec of the remote H.323 endpoint must be able to use the same codec that is provisioned in the specified QOS table. Otherwise, the video call cannot be completed.

Step 5	**Note** This step is required only if CODEC-NEG-SUPP=N in the H323-TERM-PROFILE table, as used with slow-start.
	
	ADD QOS
	
	Example:
	`ADD QOS ID=Codec_1;`
	`CODEC-TYPE=PCMA;`
		CODEC-TYPE identifies the codec to use; typically, video calls use PCMU (the default value) or PCMA.

Provision H.323-Based Outbound Routing Data

This section explains how to provision H.323-based routing data for outbound calls on the Cisco BTS 10200 Softswitch. The Cisco BTS 10200 Softswitch supports sending of either the H.323/H.225 sourceCircuitID or destinationCircuitID parameter (or both) for the outbound call leg.

This section covers the following topics:

- Understanding the Outbound Routing Process
- Outbound Routing Option Summary
- Outbound H.323 Calls
- H.323 Tandem Calls with Circuit Info Sent
- SS7-originated Calls Retransmitted As Outbound H.323 Calls With Circuit Info

Understanding the Outbound Routing Process

Outbound routing is managed through a four-step process that starts when an H.323-based call is originated or received on the Cisco BTS 10200 Softswitch:

1. The system examines the originating/incoming H.225 call data (H.323 ARQ/SETUP message).

2. The system examines the provisioned values of certain parameters in the internal database and prepares routing data that can be sent for the outbound call leg.

3. The system examines the provisioned values of certain parameters in the internal database to determine whether to transmit a sourceCircuitID, a destinationCircuitID, neither, or both, in the H.225 call data (ARQ/SETUP message) for the outbound leg.

4. If provisioned to send, the system transmits the applicable source and/or destination carrier IDs in the outbound ARQ/SETUP message.

Tip The settings in item 3. (above) take precedence over the first two steps: If the parameters in 3. are set to N (no), the system does not transmit this circuit information, regardless of the data or settings described in items 1. and 2.

Table 2 describes several routing terms used in this section, and indicates the relationship of network terminology, H.225-message terminology, and the tokens used to control this data in the Cisco BTS 10200 Softswitch.

Table 2   H.323 Routing Terminology and Applicable Tokens

Network Terminology	H.225 Message Terminology	Applicable Cisco BTS 10200 Softswitch Database Tokens
Source carrier ID	sourceCircuitID	The Cisco BTS 10200 Softswitch database maps this value to the TRUNK-SUB-GROUP token in the TRUNK-GRP table. TRUNK-SUB-GROUP identifies a specific TG when multiple TGs exist between the Cisco BTS 10200 Softswitch and another softswitch. **Note** The SEND-SRC-CIRCUIT-ID token in the H323-TG-PROFILE table specifies whether to send the sourceCircuitID in an outgoing H.323 ARQ/SETUP message. *If this token is set to N (no), the sourceCircuitID is not sent, even if its value is available in the TRUNK-GRP table.*
Destination carrier ID	destinationCircuitID	The Cisco BTS 10200 Softswitch database maps this value to the SP-ID token in the TRUNK-GRP table. SP-ID specifies a unique ID for a particular service provider, and is used when there are multiple carriers providing service through a single logical Call Agent (CA). **Note** The SEND-DEST-CIRCUIT-ID token in the H323-TG-PROFILE table specifies whether to send the destinationCircuitID in an outgoing H.323 ARQ/SETUP message. *If this token is set to N (no), the destinationCircuitID will not be sent, even if its value is available in the TRUNK-GRP table.*

Outbound Routing Option Summary

Table 3 summarizes the outbound routing data options. It shows how the provisioned values affect the outbound routing data sent by the system.

Note If no value is shown (—), the provisioning of the specified table has no effect in this scenario.

Table 3   *Summary of H.323 Outbound Routing Data Options*

Outbound H.323-Based Call Type	Outbound Routing Data Sent	Values to Provision in Terminating or Outbound TRUNK-GRP Table	Values to Provision in H323-TG-PROFILE Table	Values to Provision in SERVICE-PROVIDER Table
Outbound H.323 Calls (Figure 5)	No circuit info sent in ARQ/SETUP messages	—	Set both SEND-SRC-CIRCUIT-ID and SEND-DEST-CIRCUIT-ID to N (no).	—
	sourceCircuitID based on TRUNK-SUB-GROUP in the terminating TRUNK-GRP table	Provision a value for TRUNK-SUB-GROUP in the terminating TG table.	Set SEND-SRC-CIRCUIT-ID to Y (yes) in the H323-TG-PROFILE table.	—
H.323 Tandem Calls with Circuit Info Sent (Figure 6)	destinationCircuitID based on incoming SETUP message	*Do not* provision a value for SP-ID in the outbound TRUNK-GRP table.	Set SEND-DEST-CIRCUIT-ID to Y (yes).	Set SP-BASED-ROUTING to N (no).
	destinationCircuitID based on SP-ID in outbound TRUNK-GRP table	Provision a value for SP-ID in the outbound TRUNK-GRP table.	Set SEND-DEST-CIRCUIT-ID to Y (yes).	Set SP-BASED-ROUTING to N (no).
	sourceCircuitID and destination CircuitID based on incoming SETUP message	—	Set SEND-SRC-CIRCUIT-ID to Y (yes).	Set SP-BASED-ROUTING to Y (yes).
SS7-originated Calls Retransmitted As Outbound H.323 Calls With Circuit Info (Figure 7)	sourceCircuitID based on TNS/CIP data received on the incoming SS7 circuit	—	Set SEND-SRC-CIRCUIT-ID to Y (yes).	—
	sourceCircuitID overwritten by value of TRUNK-SUB-GROUP in the terminating TRUNK-GRP table	Provision a value for TRUNK-SUB-GROUP in the terminating TG table.	Set SEND-SRC-CIRCUIT-ID to Y (yes).	—

Outbound H.323 Calls

The following routing data options can be provisioned for outbound H.323 calls.

No circuit info sent in ARQ/SETUP messages

Take the following action to ensure that no circuit info is sent in the outbound ARQ/SETUP messages: Set both SEND-SRC-CIRCUIT-ID and SEND-DEST-CIRCUIT-ID to N in the H323-TG-PROFILE table. See Figure 5, Part A.

Note When you set these parameters to N, the system does not transmit this circuit information, regardless of the data received on the originating or incoming call and the settings in other tables.

sourceCircuitID based on TRUNK-SUB-GROUP in the terminating TRUNK-GRP table

Take the following action to send sourceCircuitID in the ARQ/SETUP message based on the provisioned TRUNK-SUB-GROUP in the terminating TG table:

- Provision a value for TRUNK-SUB-GROUP in the terminating TG table.
- Set SEND-SRC-CIRCUIT-ID to Y (yes) in the H323-TG-PROFILE table.

See Figure 5, Part B.

Figure 5   Circuit-Info Options For Outbound H.323 Calls
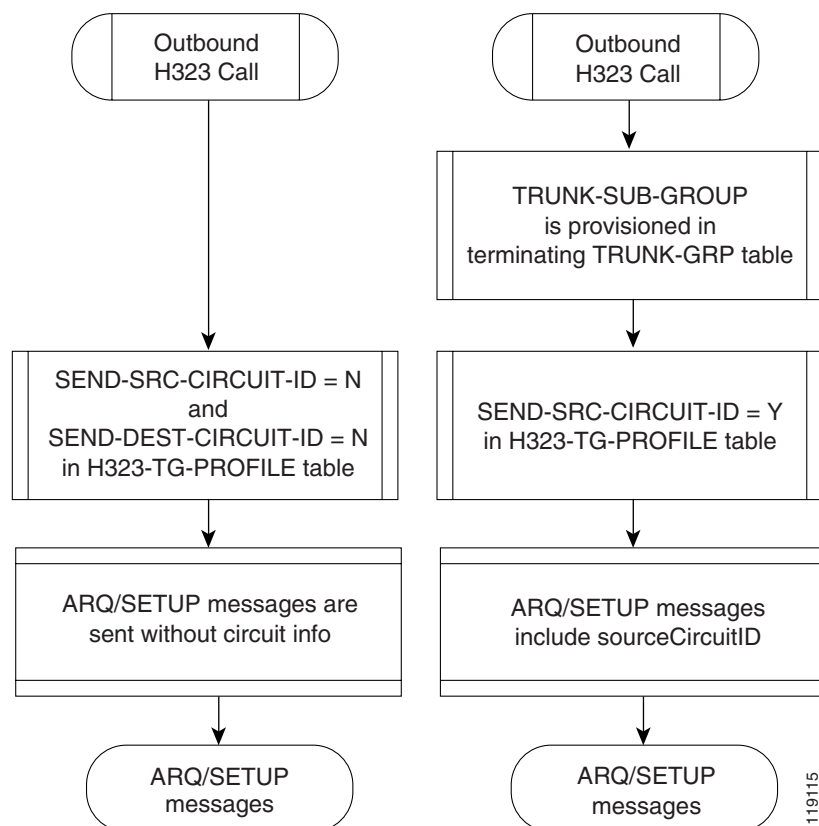
H.323 Tandem Calls with Circuit Info Sent

The following routing data options can be provisioned for outbound H.323 Tandem calls.

destinationCircuitID based on incoming SETUP message

Take the following action to send destinationCircuitID in the ARQ/SETUP message based on the destinationCircuitID contained in the incoming SETUP message:

- Set SP-BASED-ROUTING to N in the SERVICE-PROVIDER table
- *Do not* provision a value for SP-ID in the outbound TRUNK-GRP table
- Set SEND-DEST-CIRCUIT-ID to Y in the H323-TG-PROFILE table

See Figure 6, Part A.

destinationCircuitID based on SP-ID in outbound TRUNK-GRP table

Take the following action to send destinationCircuitID in the ARQ/SETUP message based on the value provisioned for the SP-ID in the outbound TRUNK-GRP table:

- Set SP-BASED-ROUTING to N in the SERVICE-PROVIDER table
- Provision a value for SP-ID in the outbound TRUNK-GRP table
- Set SEND-DEST-CIRCUIT-ID to Y in the H323-TG-PROFILE table

See Figure 6, Part B.

sourceCircuitID and destination CircuitID based on incoming SETUP message

Take the following action to send sourceCircuitID in the ARQ/SETUP message based on the destinationCircuitID contained in the incoming SETUP message:

- Set SP-BASED-ROUTING to Y in the SERVICE-PROVIDER table
- set SEND-SRC-CIRCUIT-ID to Y in the H323-TG-PROFILE table

See Figure 6, Part C.

Figure 6   *H.323 Tandem Calls with Circuit Info Sent*

SS7-originated Calls Retransmitted As Outbound H.323 Calls With Circuit Info

The following routing data options can be provisioned for SS7-originated calls that are retransmitted as outbound H.323 calls.

sourceCircuitID based on TNS/CIP data received on the incoming SS7 circuit

Take the following action to send sourceCircuitID in the ARQ/SETUP message based on the TNS/CIP data received on the incoming SS7 circuit: Set SEND-SRC-CIRCUIT-ID to Y in the H323-TG-PROFILE table.

See Figure 7, Part A.

sourceCircuitID overwritten by value of TRUNK-SUB-GROUP in the terminating TRUNK-GRP table

Take the following action to send sourceCircuitID in the ARQ/SETUP message based on the provisioned TRUNK-SUB-GROUP in the terminating TG table. (The received TNS/CIP data is overwritten by the value provisioned for TRUNK-SUB-GROUP.)

- Provision a value for TRUNK-SUB-GROUP in the terminating TG table.
- Set SEND-SRC-CIRCUIT-ID to Y in the H323-TG-PROFILE table.

See Figure 7, Part B.

Figure 7   SS7-originated Calls Retransmitted as Outbound H.323 Calls with Circuit Info
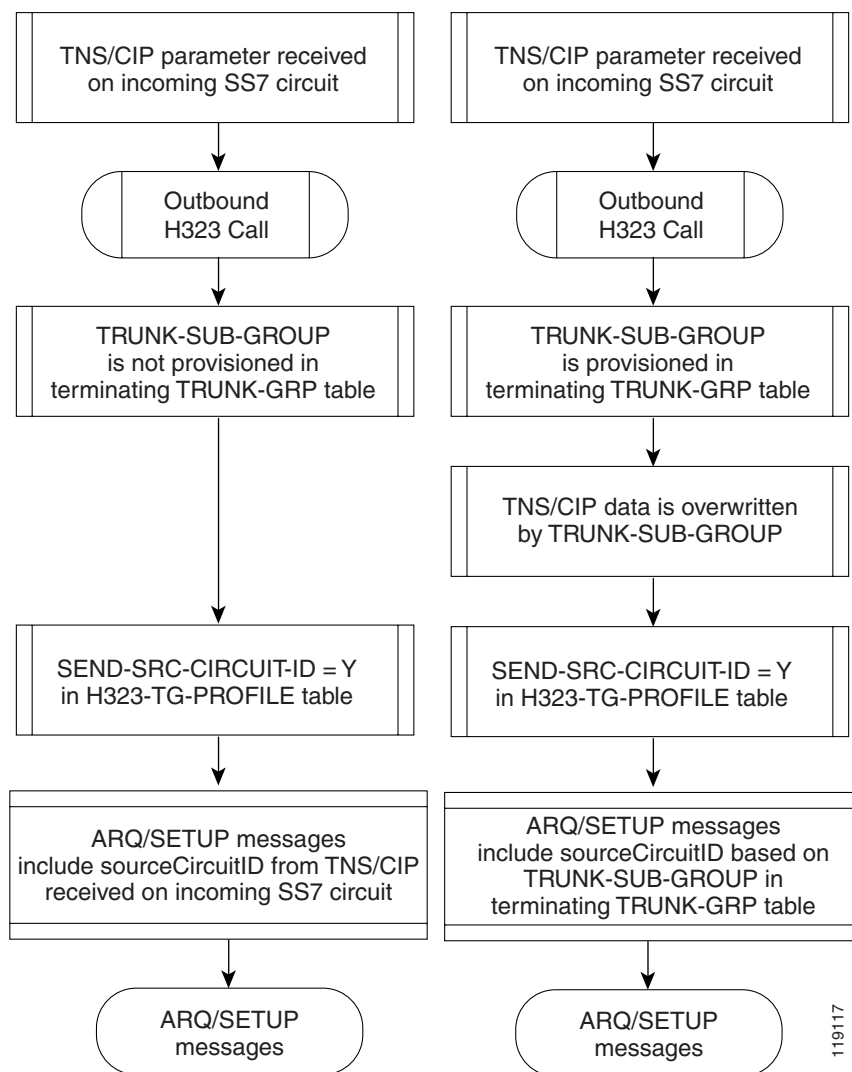
SUMMARY STEPS

1. **ADD H323-TG-PROFILE**
2. **ADD TRUNK-GRP**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`ADD H323-TG-PROFILE`
	`ID=<TG-PROFILE ID>;`
	`SEND-DEST-CIRCUIT-ID=<Y|N>`
	`SEND-SRC-CIRCUIT-ID=<Y|N>`
	
	Example:
	`CLI> ADD H323-TG-PROFILE`
	`ID=TRUNK_PROFILE_1;`
	`SEND-DEST-CIRCUIT-ID=Y;`
	`SEND-SRC-CIRCUIT-ID=N;`
		The SEND-DEST-CIRCUIT and SEND-SRC-CIRCUIT flags can be set to Y to send the circuit info parameters in the outgoing ARQ/SETUP messages.
		
		Tip To understand the impact of SEND-DEST-CIRCUIT-ID and SEND-SRC-CIRCUIT-ID tokens on outbound routing, see Table 3.

Step 2	`ADD TRUNK-GRP ID=<TG ID>;`
	`CALL-AGENT-ID=<CA ID>;`
	`TG-TYPE=H323;`
	`TG-PROFILE-ID=<TG PROFILE ID>;`
	`H323-GW-ID=<H.323 GW ID>;`
	`DIAL-PLAN-ID=<DIAL PLAN ID>;`
	`ANI-BASED-ROUTING=N;`
	`SOFTSW-TSAP-ADDR=<DOMAIN NAME OR IP:PORT>;`
	`QOS-ID=<QOS ID>;`
	`SP-ID=<SERVICE PROVIDER ID>;`
	`TRUNK-SUB-GRP=<TRUNK SUBGROUP ID>;`
	
	Example:
	`ADD TRUNK-GRP ID=318; CALL-AGENT-ID=CA146; TG-TYPE=H323;`
	`TG-PROFILE-ID=TG_PROFILE_1; H323-GW-ID=H323_GW1;`
	`DIAL-PLAN-ID=DP001; ANI-BASED-ROUTING=N;`
	`SOFTSW-TSAP-ADDR=10.89.227.114:1720; QOS-ID=Codec_1;`
	`SP-ID=SP_7777; TRUNK-SUB-GRP=SUBGRP_300;`
		Matches incoming H.323 calls on a specific IP:port to a specific TG. It also disables automatic number identification (ANI)-based routing.
		
		SP-ID identifies a specific service provider when multiple service providers are provisioned on a single logical CA.
		
		TRUNK-SUB-GRP identifies a specific trunk group when multiple trunk groups exist between a Cisco BTS 10200 Softswitch and another softswitch.
		
		Tip To understand the impact of the SP-ID and TRUNK-SUB-GRP tokens on outbound routing, see Table 3.

Provision H.323-Based Inbound Routing

This section explains how to provision H.323-based inbound routing options on the Cisco BTS 10200 Softswitch. All incoming calls from the H.323 network are terminated by one of the four H.323 GW instances on the Cisco BTS 10200 Softswitch. Incoming calls can be routed to the Cisco BTS 10200 Softswitch with or without the use of a GK:

- When no RAS signaling to the GK is used, calls are routed directly from the far-end H.323 device.
- When there is RAS signaling to a GK, calls are routed by the GK toward the Cisco BTS 10200 Softswitch.

Figure 8 provides an overview of the H.323 inbound routing process.

Figure 8   *Overview of H.323 Inbound Routing Process*

Incoming call message

H.323 protocol processing

Provisionable source-based routing options

Source-based routing turned on

Source-based routing turned off

TG match

Examine data in SETUP message of incoming call to determine TG to use

Does SETUP data match a specific TG?

Yes

No

H.323 TERM check

Examine properties of the far-end originating terminal (H323-TERM) to determine SUBSCRIBER identity

Is SUBSCRIBER determined?

No

Yes

Use dial plan for SUBSCRIBER to find destination for called number

Use the matched TG to look up profile information that is used to define call characteristics

Use the default TG for the H.323 GW to look up profile information that is used to define call characteristics

to ANI screening and ANI routing

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The tables that follow provide details on how to provision inbound call routing, including the processes listed below. Use these diagrams to determine how you need to provision the various parameters that affect inbound routing.

- Figure 9—TG match with source-based routing disabled (SRC-BASED-ROUTING set to NONE in the H323-GW table)
- Figure 10—TG match with source-based routing enabled (SRC-BASED-ROUTING set to a value other than NONE in the H323-GW table)
- Figure 11—H.323 TERM check
- Figure 12—ANI screening and ANI routing

Figure 9   ***TG Match with Source-Based Routing Disabled***

New call message

H.323 protocol processing

H323_GW.SOURCE_BASED_ROUTING

SRC-BASED_ROUTING field is in H323_GW table and can be one of the following:
    NONE
    SRC_TERMINAL_AUTO
    SRC_TERMINAL_TRANSPORT
    SRC_TERMINAL_URL
    SRC_TERMINAL_H323_ID
    SRC_TERMINAL_EMAIL
    SRC_TSAP_ADDR

If NONE is specified, this path will be taken

NONE

Use default Trunk Group H323_GW.TG_ID, get profile info from H323_TG_PROFILE. Profile information is used to define the characteristics of the call (ex: video_supp=y).

ANI screening

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Figure 10   *TG Match with Source-Based Routing Enabled*
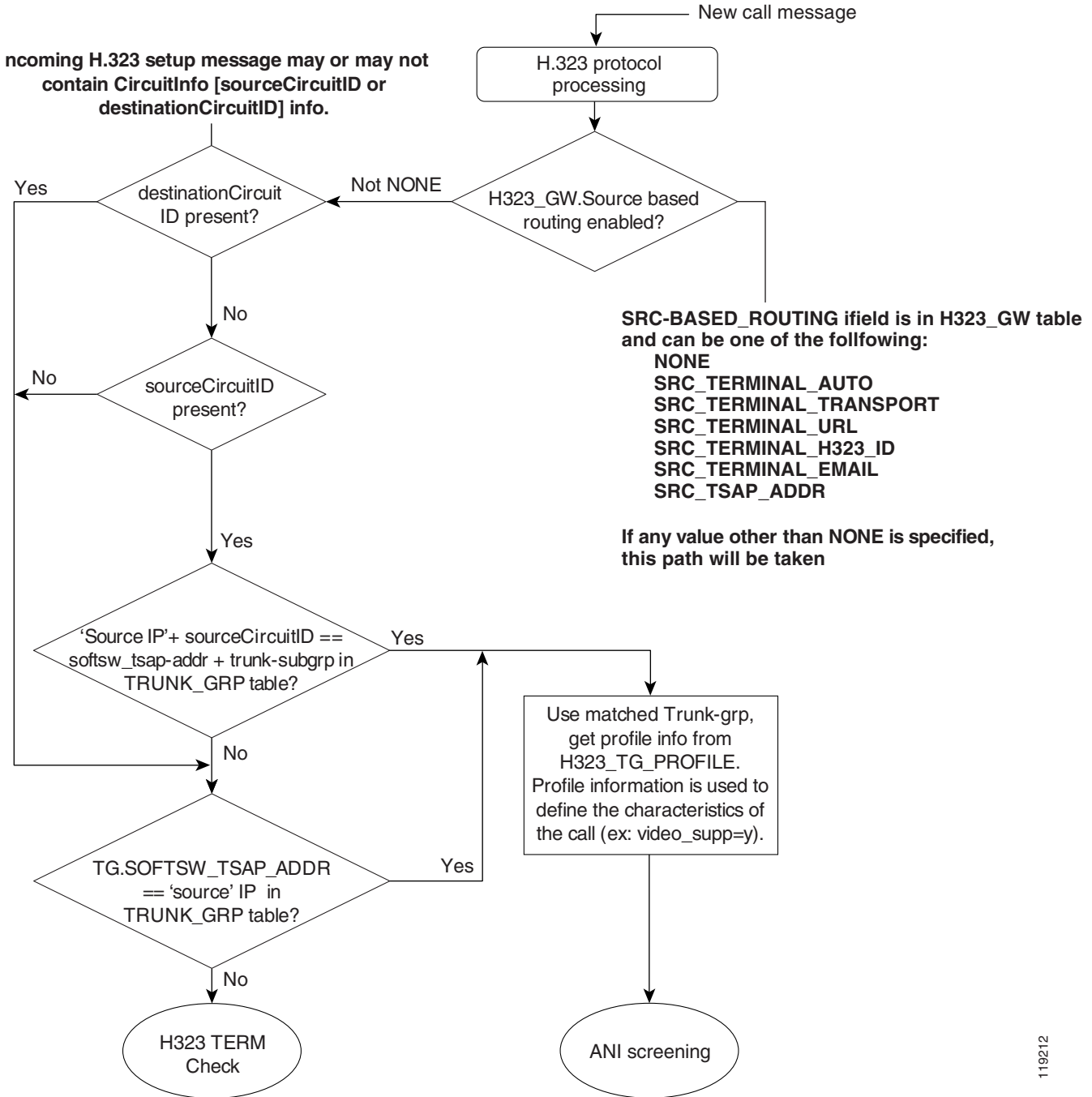
Note: The symbol == means a data match.

Figure 11   *H.323 TERM Check*

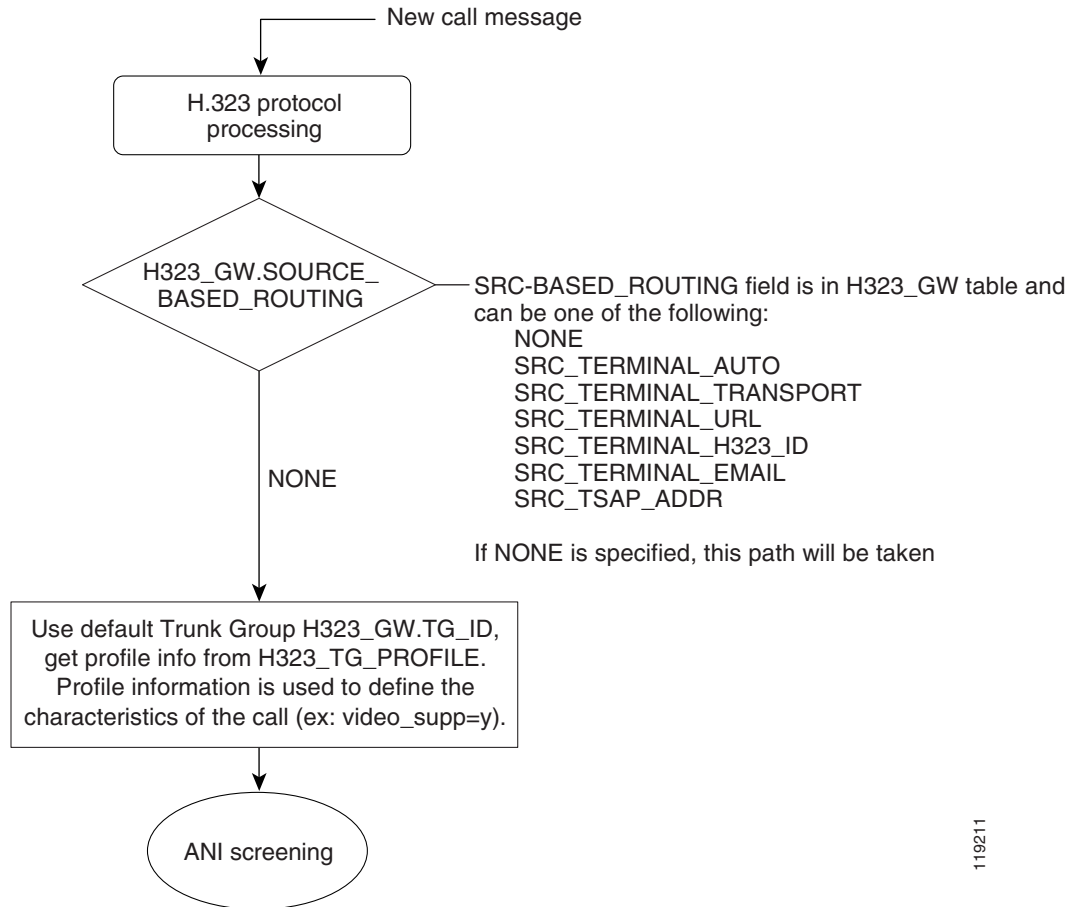*Figure 12*　　　*ANI Screening and ANI Routing*

Provision ANI Screening and Routing

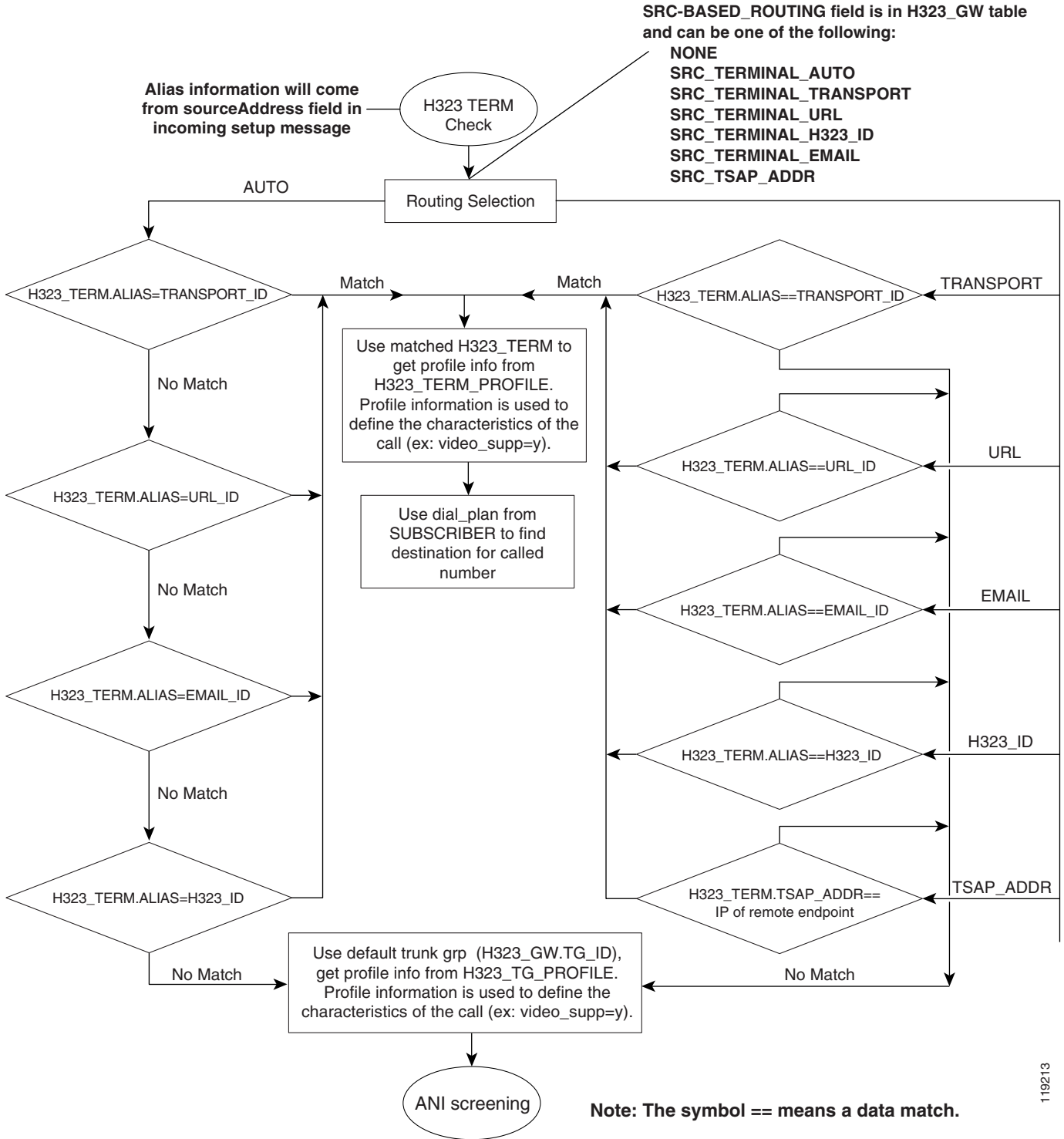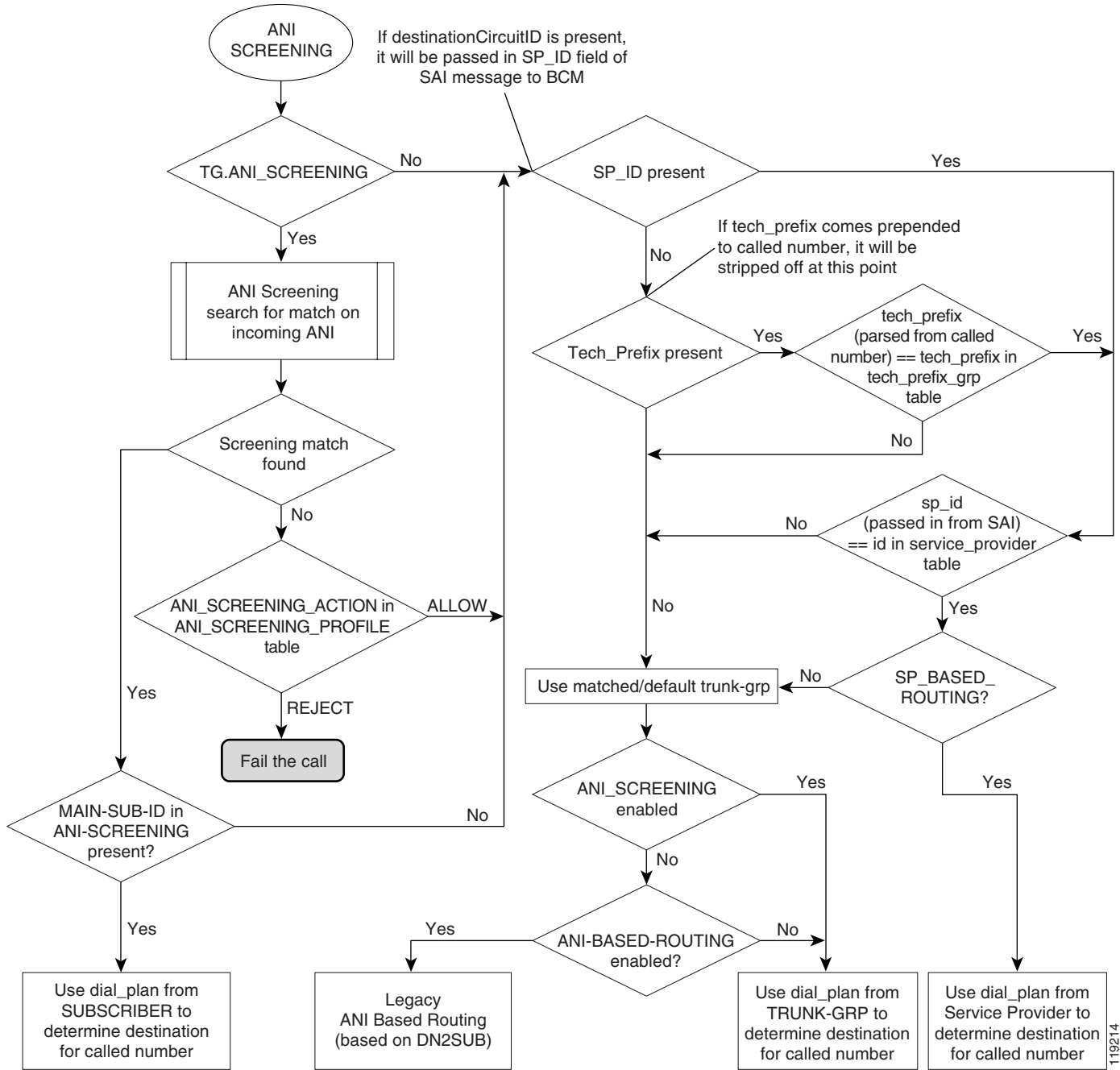This section provides information on provisioning H.323-based ANI screening and routing options on the Cisco BTS 10200 Softswitch.

ANI Screening vs. ANI-Based Routing

The Cisco BTS 10200 Softswitch provides the option to provision ANI-based screening and ANI-based routing on each TG. For ANI screening, the system compares the ANI received in the incoming SETUP message against the provisioned DN ranges. For ANI routing, the system uses the provisioned dial plan for the subscriber (or main subscriber for a PBX). If the subscriber or PBX is associated with a video-enabled endpoint, the billing record is labeled as video.

The system first checks the TRUNK-GRP table for the TG on which the call was received:

- If the ANI-SCREENING and ANI-BASED-ROUTING tokens in the applicable TRUNK-GRP table are both set to N (no), the system uses the dial plan from the TRUNK-GRP table or the SERVICE-PROVIDER table to determine the destination for the called number. The choice between TRUNK-GRP and SERVICE-PROVIDER tables is based on the additional provisioning options that are described in Figure 12.

- If ANI-SCREENING is set to N and ANI-BASED-ROUTING is set to Y, the system performs legacy ANI-based routing according to the provisioning in the DN2SUB table.

- If ANI-SCREENING is set to Y and ANI-BASED-ROUTING is set to N, the system performs ANI screening. Based on the provisionable options that influence this screening, the system can use the dial plan from the SUBSCRIBER table, the TRUNK-GRP table, or the SERVICE-PROVIDER table to route the call (see Figure 12).

- If ANI-SCREENING and ANI-BASED-ROUTING are both set to Y, ANI screening takes precedence.

Identification of H.323 Terminal Property Based on ANI

The Cisco BTS 10200 Softswitch uses the provisioned ANI data to assist in identifying the terminal property of a phone or PBX, specifically, whether the phone or PBX is video-capable. The system can identify the terminal property of an H.323-based video phone or PBX to which it is directly connected. If an H.323-based video phone is connected directly to the Cisco BTS 10200 Softswitch, the Cisco BTS 10200 Softswitch recognizes that it is a video call. However, if the call from a video phone goes first to an intermediate H.323 GW or endpoint which is connected to the Cisco BTS 10200 Softswitch, the Cisco BTS 10200 Softswitch must identify the terminal property (for example, video phone) based on information in the H323-TG-PROFILE for the applicable TG for that GW or endpoint. For example, the properties for a PBX-based TG are different than those for a tie TG. It is important to keep this in mind when provisioning H.323 endpoints and TGs.

ANI Screening

If the ANI-SCREENING token in the applicable inbound TRUNK-GRP table is set to Y, the system compares the ANI received in the incoming SETUP message against the DN ranges provisioned in the ANI-SCREENING table:

- If a match is found, the system accepts and routes the call with the appropriate screening-field value in the outgoing message. If the DN is associated with a video-enabled endpoint, the billing record (CDB) is labeled as video.

- If a match is not found, the system checks the ACTION token value in the ANI-SCREENING-PROFILE table and takes further action.

> **Note** A billing record (CDR) is generated for the call, even if the call is rejected based on ANI screening.

ANI-Based Routing

If ANI screening is performed successfully on a MAIN-SUB-ID that is associated with a particular TG (for example, if the TG is connected to a PBX), the system performs ANI-based routing using the dial plan for the MAIN-SUB-ID. If the MAIN-SUB-ID is associated with a video-enabled endpoint, the billing record (CDB) is labeled as video.

Provision for Interoperability with Cisco CallManager

Provision the Cisco BTS 10200 Softswitch interface to Cisco CallManager as you would any H.323 GW. Refer to the section on H.323 GW provisioning in the *Cisco BTS 10200 Softswitch Provisioning Guide* for this procedure. In addition, perform the following provisioning tasks to support interoperability between the two switches:

- Assign a Main Subscriber ID when Cisco CallManager Is Used as a PBX
- Provision QoS Codec
- Disable GTD

Assign a Main Subscriber ID when Cisco CallManager Is Used as a PBX

The Cisco BTS 10200 Softswitch connects to Cisco CallManager via an H.323 TG. Assign a main subscriber ID only if Cisco CallManager is used as a PBX. The system uses the subscriber ID to perform screening and routing.

> **Note** If Cisco CallManager is not used as a PBX, do not assign a main subscriber ID, and the system uses the TG properties to perform screening and routing.

To provision a main subscriber ID on the TGs connecting the Cisco BTS 10200 Softswitch to Cisco CallManager, use this procedure.

Step 1 Log in to a CLI session on the Cisco BTS 10200 Softswitch.

Step 2 To find out if a main subscriber ID is already assigned to the TG towards Cisco CallManager, enter the following command:

show trunk-grp id=<ID of the TG towards Cisco CallManager>;

Example:

show trunk-grp id=TG001;

Step 3 View the system response and note the displayed value of the main subscriber ID parameter (MAIN-SUB-ID).

Step 4 If no value has been provisioned for MAIN-SUB-ID (or if you need to change the current value), enter the appropriate value using the following command:

> **change trunk-grp id=<ID of the TG towards Cisco CallManager>; main-sub-id=<Main Subscriber ID for this Cisco CallManager>;**

> **Example:**

> **change trunk-grp id=TG001; main-sub-id=CallManager001;**

Provision QoS Codec

To provision the QoS codec on the TGs that connect to Cisco CallManager, use this procedure.

Step 1 Log in to a CLI session on the Cisco BTS 10200 Softswitch.

Step 2 To find the QOS ID applicable to the TG towards Cisco CallManager, enter the following command:

> **show trunk-grp id=<ID of the TG towards Cisco CallManager>;**

> **Example:**

> **show trunk-grp id=TG001;**

Step 3 View the system response and note the displayed value of the QoS ID parameter. If the QoS ID is present, go to Step 5.

Step 4 If the trunk group QOS-ID parameter is not present, a default value is used. To set the trunk group QOS-ID to the value specified in the QOS table, enter the following command:

> **change trunk-grp id=TG001; qos_id=gold3;**

Step 5 Enter the following command to display the codec associated with this QOS ID:

> **show qos id=<QOS ID>;**

> **Example:**

> **show qos id=gold3;**

Step 6 View the system response and determine the value of the CODEC-TYPE parameter.

> **a.** If the value is different from the CODEC-TYPE required by your local work order, change the value by entering the following command:

> **change qos id=<QOS ID>; codec-type=<desired codec type>;**

> **Example:**

> **change qos id=gold3; codec-type=PCMU;**

> **b.** If the value is the same as the CODEC-TYPE required by your local work order, no further action is required on this QOS ID.

Step 7 Repeat Step 2 to verify that CODEC-TYPE is set to the desired value.

Step 8 Repeat Step 2 through Step 7 for any additional TGs that connect to Cisco CallManager.

Disable GTD

We recommend that GTD be disabled on the TGs toward Cisco CallManager. This can be done either by disabling the GTD at Call Agent (CA) level or at the TG level.

⚠️
Caution If you disable GTD at the CA level, this disables GTD completely for the Cisco BTS 10200 Softswitch. If you disable GTD only on the TGs toward Cisco CallManager, the Cisco BTS 10200 Softswitch can still use GTD toward other H.323 GWs that are GTD compatible.

Option to Disable GTD at CA Level

If specified in your local work order, you can disable GTD at the CA level. However, if your local work order requires GTD to be disabled only for certain trunks, skip these steps and go to the "Option to Disable GTD at TG Level" section.

⚠️
Caution After disabling GTD at the CA level, you cannot enable GTD on any TGs.

Step 1 Log in to a CLI session on the Cisco BTS 10200 Softswitch.

Step 2 To display the GTD support status in the CALL-AGENT-PROFILE table, enter the following command:

show call-agent-profile id=<ID of the CA to which the Cisco CallManager is connected>;

(Example) show call-agent-profile id=CA146;

Step 3 View the system response and determine the value of GTD-SUPP.

a. If the value is Y, change it to N by entering the following command:

change call-agent-profile id=<ID of the CA to which the Cisco CallManager is connected>; gtd-supp=N;

(Example) change call-agent-profile id=CA146; gtd-supp=N;

b. If the value is already set to N, GTD is already disabled, and no change is required on GTD.

Step 4 Repeat Step 2 to verify that GTD-SUPP is set to N.

Option to Disable GTD at TG Level

If specified in your local work order, you can disable GTD at the individual TG level.

Step 1 Log in to a CLI session on the Cisco BTS 10200 Softswitch.

Step 2 To display the GTD support status in the H323-TG-PROFILE table, enter the following command:

show h323-tg-profile id=<ID of the TG-profile applicable to the Cisco CallManager>;

(**Example**) **show h323-tg-profile id=TG501;**

Step 3 View the system response and determine the value of GTD-SUPP.

   a. If the value is Y, change it to N by entering the following command:

change h323-tg-profile id=<ID of the TG-profile applicable to the Cisco CallManager>; gtd-supp=N;

Example:

change h323-tg-profile id=TG501; gtd-supp=N;

   b. If the value is N, GTD is already disabled for this H323-TG-PROFILE. No further action is required on this H323-TG-PROFILE.

Step 4 Repeat Step 2 to verify that GTD-SUPP is set to N in the H323-TG-PROFILE table.

Step 5 Repeat Step 2 through Step 4 for any additional Cisco BTS 10200 Softswitch H.323 TGs connected to other Cisco CallManagers.

Provision Annex E Functionality

This section highlights the special parameters that must be provisioned to support Annex E functionality.

Note For basic H.323 provisioning, refer to the section on H.323-GW provisioning in the *Cisco BTS 10200 Softswitch Provisioning Guide*.

Step 1 Log in to a CLI session on the Cisco BTS 10200 Softswitch.

Step 2 To provision Annex E support for the H.323 GW instance on the Cisco BTS 10200 Softswitch, enter the following command:

change h323-gw id=city1gw; annexe-supp=Y; annexe-udp-port=2517; annexe-retransmit-timer=500; annexe-retransmit-multiplier=2; annexe-retransmit-attempts=8;

where:

- *h323-gw id*—Name used to identify the H.323 GW instance. This value must be a string of 1 to 16 ASCII characters, assigned by the service provider.

- *annexe-supp*—This flag indicates whether this H.323 GW instance supports Annex E. The default value is Y. This value must be kept as Y to support Annex E. If the remote H.323 endpoint does not support Annex E UDP signaling, the Cisco BTS 10200 Softswitch automatically adjusts and uses TCP signaling toward that endpoint.

Explanation
   – If the Cisco BTS 10200 Softswitch H323-GW instance is configured as Annex E enabled (*annexe-supp*=Y), the Cisco BTS 10200 Softswitch indicates its Annex E capabilities while registering with the H.323 GK.

- For RAS-routed calls, the GK negotiates all Annex E capabilities between the Cisco BTS 10200 Softswitch and the far-end H.323 endpoint, and notifies the originating endpoint to use Annex E.

- If the Cisco BTS 10200 Softswitch H323-GW instance is Annex E enabled (*annexe-supp*=Y), but the far-end H.323 endpoint is not, the Cisco BTS 10200 Softswitch can still complete calls using regular TCP mode.

- If the Cisco BTS 10200 Softswitch H323-GW instance is configured as Annex E disabled (*annexe-supp*=N), it cannot receive inbound Annex E UDP calls. It can receive inbound calls using TCP signaling only.

- *annexe-udp-port*—This number specifies the port to be used to receive incoming Annex E messages. The default value is 2517, but a unique value must be assigned to each H.323 GW instance on the Cisco BTS 10200 Softswitch.

- *annexe-retransmit-timer*—This is the initial value of the retransmit timer which determines when to resend AnnexE packets if an ACK message has not been received. All subsequent retransmissions are based on exponential back-off algorithm using *annexe-retransmit-multiplier*. The valid range is a number from 1 to 30,000 (in milliseconds), and the default value is 500.

- *annexe-retransmit-multiplier*—The multiplication factor of the previous retransmit interval that is used for subsequent Annex E packet retransmissions. The valid range is 1 to 10, and the default value is 2.

- *annexe-retransmit-attempts*—Specifies how many attempts to resend a message to the remote entity should be made before the message is dropped. The valid range is 1 to 10, and the default value is 8.

Step 3 Use this step to control the H323-GW instance INS (if necessary):

a. To display the service status of the H323-GW instance, enter the following command:

status h323-gw id=city1gw;

b. View the display to see the status of the H323-GW instance.

c. If the displayed status is OOS, continue with Substep d. If the displayed status is INS, go to Step 4.

d. Enter the following commands to place the H323-GW instance INS:

control h323-gw id=city1gw; target-state=INS;

e. Enter the following command and verify that the status of the H323-GW instance is displayed as OOS:

status h323-gw id=city1gw;

Step 4 To provision Annex E support on the outgoing H.323 TGs, enter the following command:

CLI> change h323-tg-profile id=h323tg01; ras=Y; annexe-supp=Y; call-connect-mode=FAST-START; transport-pref-mode=UDP-MODE;

where:

- *h323-tg-profile id*—This is the unique ID for this H323-TG-PROFILE. The format is 1 to 16 ASCII characters, assigned by the service provider.

- *ras*—Specifies whether RAS signaling to H.323 GK is supported. The allowed values are Y and N. Default value is Y. Set this value to Y to enable communications with the GK.

- *annexe-supp*—This flag indicates whether this H323-TG-PROFILE supports Annex E. The default value is Y. This value must be kept as Y to support Annex E. If the remote H.323 endpoint does not support Annex E UDP signaling, the *Cisco BTS 10200 Softswitch* automatically adjusts and uses TCP signaling to communicate with that endpoint.

- *call-connect-mode*—Specifies the preferred call start mode for outgoing H.323 calls. Possible values are FAST-START (default value) and SLOW-START. *You must set this parameter to FAST-START if you want to use Annex E functionality.* If the remote H.323 endpoint does not support fast-start parameters, the Cisco BTS 10200 Softswitch automatically adjusts and uses slow-start mode toward that endpoint. The fast-start parameter is based on the fast-connect procedures described in ITU-T Standard H.323.

- *transport-pref-mode*—Specifies what transport layer protocol to use to transmit H.323 signaling messages. Valid values are as follows:

    - TCP-MODE—Use TCP to transport messages.

    - UDP-MODE (default value)—Use Annex E UDP-based message transport facility. If the remote H.323 endpoint does not support UDP, the Cisco BTS adjusts automatically to use TCP mode. This token must be set to UDP-MODE before *annexe-supp* can be set to Y.

Step 5 If you have not already done so, enable Annex E support on the far-end H.323 endpoint.

Note To enable Annex E support for a particular H.323 TG, you must enable Annex E for the H.323 GW instance on the Cisco BTS 10200 Softswitch and enable Annex E support for the far-end H.323 endpoint.

Provision Additional H.323 Options

This section describes a number of advanced H.323 provisioning options that affect protocol transparency and special H.323 messaging features supported by the Cisco BTS 10200 Softswitch. In the most common network configurations it is generally not necessary to provision these parameters—the default values are sufficient. However, these advanced options can be provisioned to nondefault values if desired. The information is contained in the following two sections:

- H.323 Protocol Transparency Functions
- Additional Advanced H.323 Features

H.323 Protocol Transparency Functions

The Cisco BTS 10200 Softswitch supports the interconnection of multiple H.323-based devices by transparently passing certain H.323 messages in calls that transit the Cisco BTS 10200 Softswitch. There are three transparency functions that include optional service provider provisioning:

- Call-Connect-Mode Transparency
- Call-Proceeding Message Transparency
- Transparency of H.245 Tunneling Mode

Call-Connect-Mode Transparency

The CALL-CONNECT-MODE token in the H323-TG-PROFILE and H323-TERM-PROFILE tables specifies the call setup method used for outbound and inbound H.323-based calls.

> **Note** If this token is configured as FAST-START and the far-end H.323 endpoint does not support FAST-START, the Cisco BTS 10200 Softswitch falls back to the SLOW-START method.

> **Note** If the incoming call is using slow-start procedures, and this token is configured as FAST-START, this call leg functions as slow-start only.

Permitted values for this token are as follows:

- AUTO (default)—Use fast-connect method for calls originated from non-H.323 endpoints and for outbound H.323 calls. For H.323 transit calls, use the same method for outbound H.323 calls as you use for inbound H.323 calls.

  > **Note** For most applications, the default value (AUTO) is sufficient.

- FAST-START—Always use the fast-start procedures for outbound H.323 calls (except where an incoming call uses slow-start procedures), regardless of the originating (inbound) call protocol type.
- SLOW-START—Always use the slow-start procedures during call setup, regardless of the originating (inbound) call protocol type.

Call-Proceeding Message Transparency

The SEND-CALL-PROCEEDING token in the H323-TG-PROFILE and H323-TERM-PROFILE tables specifies the conditions for sending a Call Proceeding message from the terminating endpoint to the originating endpoint.

The permitted values for this token are as follows:

- AUTO (default)—Generate and send a Call Proceeding message on the originating H.323 leg when the terminating leg is non-H.323. Pass the Call Proceeding message end-to-end for H.323-to-H.323 calls.

  > **Note** For most applications, the default value (AUTO) is sufficient.

- LOCAL—Always generate and send a Call Proceeding message on the originating H.323 leg, regardless of the protocol type used on the terminating leg.
- DISABLE—Never send a Call Proceeding message.

  > **Note** This flag is not applicable for incoming calls from the H.323 network to a local subscriber controlled by the Cisco BTS 10200 Softswitch and being forwarded or transferred to the H.323 network.

Transparency of H.245 Tunneling Mode

The H245-TUNNELING token in the H323-TG-PROFILE and H323-TERM-PROFILE tables specifies whether to enable or disable H.245 tunneling mode on each of the call legs. When H.245 tunneling is enabled, all H.245 messages are tunneled inside a FACILITY message instead of through a separate H.245 TCP channel.

The permitted values for this token are as follows:

- AUTO (default)—The system automatically determines whether to enable or disable H.245 tunneling:

  - Use H.245 tunneling on the H.323-based call leg for calls between H.323 and non-H.323 endpoints.

  - For H.323 transit calls, the system automatically considers what the peer leg is using as its tunneling mode to help determine whether to enable or disable H.245 tunneling.

> **Note** For most applications, the default value (AUTO) is sufficient.

> **Note** If H245-TUNNELING in the H323-TG-PROFILE (or H323-TERM-PROFILE) tables for either one of the endpoints in the call is *not* set to AUTO, the system enables or disables H.245 tunneling for each leg of the call individually.

- ENABLE—Always use H.245 tunneling for outgoing calls, without considering the type of incoming call-leg protocol.

- DISABLE—Always disable H.245 tunneling for outgoing call legs and use a separate H.245 TCP channel.

> **Note** If H245-TUNNELING is set to AUTO or ENABLE, the FACILITY-SUPP token should be set to Y.

H.323-Based T.38 Fax Parameters

This section provides tips on provisioning H.323-based parameters for T.38 fax.

Provisioning fax-t38-enabled in the QoS Table

This parameter is a binary flag (Y/N) with default = 'Y'. SIP-to-SIP and H.323-to-H.323 calls ignore this flag. QOS is optional for endpoints and trunks. The settings work as follows:

- If no QOS is provisioned, or if this flag is set all 'Y' (default), then this flag does not change T.38 fax feature behavior.

- MGCP/TGCP/NCS/H.323 endpoints—If either endpoint in the call (including SIP) has a QOS entry and this flag set to 'N', then the Cisco BTS 10200 Softswitch will indicate to each MGCP/H.323 endpoint to *not* use T.38 procedures regardless of the T.38 loose flag setting in the mgw-profile table.

Table 4 illustrates under what conditions the Cisco BTS 10200 uses T.38 fax protocol when fax is detected. This depends on the value of the QOS FAX_T38_ENABLED field for each endpoint involved in the call, and the protocol type of each endpoint. The symbols are described as follows:

- T.38: The Cisco BTS 10200 uses T.38 protocol for fax transmission.

- X: The Cisco BTS 10200 does not use T.38 protocol for fax transmission.

- T.38*: Since one of the field values in this combination is set to 'N,' the MGCP endpoint involved in this call does not receive the local connection option (L:fxr:fx/t38) in the initial CRCX request from Cisco BTS 10200. However, if the endpoint receives T.38 SDP from the remote end detecting fax, then it is assumed here to support the switch to T.38 media connection.

Table 4 Use of T.38 Fax Based on Value of QOS FAX_T38_ENABLED Flag

Interface/Protocol (value)	SIP (Y)	SIP (N)	H.323 (Y)	H.323 (N)	MGCP NCS TGCP (Y)	MGCP NCS TGCP (N)
SIP (Y)	T.38	T.38	T.38	X	T.38	T.38*
SIP (N)	T.38	T.38	X	X	T.38*	T.38*
H.323 (Y)	T.38	X	T.38	T.38	T.38	X
H.323 (N)	X	X	T.38	T.38	X	X
MGCP NCS TGCP (Y)	T.38	T.38*	T.38	X	T.38	X
MGCP NCS TGCP (N)	T.38*	T.38*	X	X	X	X

Provisioning remote-fax-port-retrieval-msg in the H323 TG Profile and H323 Term Profile Tables

The H.323 GW can report the UDP port for T.38 fax transmission in either H.245 OLC (default) or OLC ACK. To provision the H.323 interface, use the REMOTE-FAX-PORT- RETRIEVAL-MSG field in the h323-tg-profile and h323-term-profile tables. This parameter indicates the field in which the system should look for this value.

> **Note** Cisco IOS H323 GWs report the UDP port in OLC.

Provisioning H.323 Parameters in the CA-CONFIG Table

The H.323 interface uses the following global parameters when negotiating the T.38 fax connection during voice call establishment when interworking with a non-H323 endpoint.

- T38_MAX _BIT_RATE, Default 14.4—This is default bit rate for T38 fax.

- T38_MAX _BUFFER_SIZE, Default 200—This is default maximum buffer size for T38 fax.

- T38_MAX _DATAGRAM_SIZE, Default 72—This is default maximum datagram size for T38 fax.

Additional Advanced H.323 Features

Additional H.323 advanced features include:

- DTMF Relay Support on MGCP-to-H.323 Calls

- Asymmetric Codec Resolution

- Facility Message
- Media Cut-Through
- Empty Capability Set
- Configurable Status Enquiry Timer
- Reattempt, Route Advance, and Hairpinning (Redirection)

DTMF Relay Support on MGCP-to-H.323 Calls

For MGCP-to-H.323 (fast-connect) calls, RFC2833 capabilities are advertised for the H.323 call leg based on static information provisioned for the H.323 TG or terminal. Ensure that all far-end H.323 capabilities are provisioned in the appropriate table:

- For incoming H.323 calls, provision the far-end H.323 capabilities in the incoming H323-TG-PROFILE table (or H323-TERM-PROFILE table)
- For outgoing H.323 calls, provision the far-end H.323 capabilities in the outgoing H323-TG-PROFILE table (or H323-TERM-PROFILE table)

Asymmetric Codec Resolution

To enable the asymmetric codec resolution feature, set the CODEC-NEG-SUPP field in H323-TG-PROFILE (for H323 trunk-grp) or H323-TERM-PROFILE (for H323 subscriber) to Y, which is the default value. The configurable fields CODEC-NEG-TIMER and CODEC-NEG-ATTEMPTS in the H323-GW table control the codec resolution procedure. If the CODEC-NEG-SUPP field is configured as Y, it is not necessary for a codec to be configured in the QOS table of the incoming/outgoing trunk-grp.

If the CODEC-NEG-SUPP field (in H323-TG-PROFILE or H323-TERM-PROFILE) is configured as N (no), the Cisco BTS 10200 Softswitch expects the far-end H.323 device (particularly one not using the fast-connect procedure) to use the codec configured in the QOS table entry of both the incoming and outgoing trunk-grp tables (or subscriber table). If the codecs of the two end devices do not match, the call will fail.

Note For all IOS gateways, set this token to Y. For connection to Cisco CallManager, set this token to N. Contact the Cisco TAC if you need additional details on this setting.

Facility Message

The FACILITY message is used primarily for passing tunneling and other special information. The service provider provisions the FACILITY-SUPP flag in the H323-TG-PROFILE (or H323-TERM-PROFILE) table to indicate whether the far-end device supports receiving of the FACILITY message. The default value is Y. If H245-TUNNELING is set to AUTO or ENABLE, then the FACILITY-SUPP token should be set to Y.

Note For connection to Cisco CallManager, set FACILITY-SUPP to N.

Media Cut-Through

The CUT-THRU-PARAM token can be used to trigger the far-end device to perform media cut-through. The service provider provisions the CUT-THRU-PARAM token in the incoming H323-TG-PROFILE (or H323-TERM-PROFILE) table to indicate whether to trigger cut-through on the far-end device. The default value is AUTO.

Note For connection to Cisco CallManager and for most other applications, the default value (AUTO) is sufficient.

Empty Capability Set

Use the ECS-METHOD token in the H323-TG-PROFILE (or H323-TERM-PROFILE) table to set special handling of the ECS message.

Note For connection to Cisco CallManager and for most other applications, the default value (AUTO) is sufficient.

- AUTO (Default)—For connection to Cisco CallManager, the Cisco BTS 10200 Softswitch uses the ALL-PAUSE method. For all other types of H.323 devices, it uses the LOCAL-PAUSE method.
- LOCAL-PAUSE—The far-end H.323 device receiving the ECS message closes the forward logical channel.
- ALL-PAUSE—The far-end H.323 device receiving the ECS message closes the forward logical channel. The local side (Cisco BTS 10200 Softswitch) also closes its forward logical channel.

Configurable Status Enquiry Timer

If a CA failover occurs, the Cisco BTS 10200 Softswitch sends a STATUS ENQ message and starts the STATUS ENQ timer for each call. Provision the STATUS-ENQ-TIMER in the H323-GW table. The range of values is 1 to 30 (seconds) and the default is 4.

Reattempt, Route Advance, and Hairpinning (Redirection)

By default, the system attempts to send the FastStart element in the CALLPROCEEDING message if it is available; otherwise, the element is sent in the ALERTING or PROGRESS message, whichever is sent first. For H.323-to-H.323 (transit) calls, sending the FastStart element in the CALLPROCEEDING message could cause reattempt, route advance, or hairpinning to fail. To support these features for transit calls, you must set the SEND-FS-CALLP token (in the h323-tg-profile or h323-term-profile table) to N (No) to *suppress* sending the FastStart element in the CALLPROCEEDING message. The default value of this token is Y.

Tip The SEND-FS-CALLP token is new in Release 4.5.1. The MISC-UNSUPP token is not used in this release.

Table 5 lists the appropriate settings for the SEND-FS-CALLP token.

Table 5 *Appropriate Settings for the SEND-FS-CALLP Token*

Type of Call	Do You Want the Call to Use Any of the Following Functions: Reattempt, Route Advance, or Hairpinning?	Required Setting for SEND-FS-CALLP (Default = Y)
H.323 to off net	Y	Y
	N	Y
H.323 transit	Y	N
	N	Y

Example of Provisioning Script

```
##########################################################################
# Add Call Agent
##########################################################################
ADD CALL_AGENT ID=CA146; TSAP_ADDR_SIDEA=172.28.255.252;
EMS_PRIMARY_TSAP=172.28.255.251; EMS_SECONDARY_TSAP=172.28.255.251;
MGW_MONITORING_ENABLED=Y;


##########################################################################
# Add Current Concerned NPA#
##########################################################################
ADD NDC DIGIT_STRING=972;
ADD EXCHANGE_CODE NDC=972; EC=813;
ADD OFFICE_CODE CALL_AGENT_ID=CA146; NDC=972; EC=813; DN_GROUP=xxxx;


##########################################################################
# Add POP
##########################################################################
ADD POP ID=27;


##########################################################################
# Add Service Providers
##########################################################################
# This service provider can be used to match incoming h323 call that has used a
# destinationCircuitInfoID set to this service provider
ADD SERVICE_PROVIDER ID=SP1; SP_BASED_ROUTING=N; USE_DIAL_PLAN=Y;
ANI_WB_LIST=NONE;


##########################################################################
# Add H323 TRUNKS
##########################################################################
ADD H323_TG_PROFILE ID=TRUNK_PROFILE_1; RAS=Y; H323_TCP_TIMER=10;
DTMF_CISCO_RTP_SUPP=N; DTMF_H245_ALPHA_SUPP=Y; DTMF_H245_SIGNAL_SUPP=N;
DTMF_RFC2833=N; DTMF_PREF_MODE=DTMF_H245_ALPHA;
H245_SESSION_MODE=AUTO; CALL_CONNECT_MODE=AUTO; H245_TUNNELING=AUTO;
SEND_CALL_PROCEEDING=AUTO; REMOTE_FAX_PORT_RETRIEVAL_MSG=H245_OLC;
SEND_FS_CALLP=Y


# Add QOS ID to enable T38 Fax
```

ADD QOS ID=PCMU; CODEC_TYPE=PCMU; FAX_T38_ENABLED=Y;

\# This trunk can be used as a match for incoming h323 calls matched on IP:port

ADD TRUNK_GRP ID=318; CALL_AGENT_ID=CA146; TG_TYPE=H323; TG_PROFILE_ID=TRUNK_PROFILE_1; DIAL_PLAN_ID=cdp1; ANI_BASED_ROUTING=N; SOFTSW_TSAP_ADDR=10.89.227.114:1720; QOS_ID=PCMU;

\# This trunk group would be used to match incoming h323 call from CARRIER_A that is

\# associated with H323 GW 10.89.227.115, also apply ANI based routing

\# or for outbound h323 call with sourceCircuitInfo=CARRIER_A;

ADD TRUNK_GRP ID=418; CALL_AGENT_ID=CA146; TG_TYPE=H323; TG_PROFILE_ID=TRUNK_PROFILE_1;

DIAL_PLAN_ID=cdp1; ANI_BASED_ROUTING=Y; SOFTSW_TSAP_ADDR=10.89.227.115:1720;

TRUNK_SUB_GROUP=CARRIER_A;

###############################
\# ANI SCREENING AND ROUTING
###############################

ADD SUBSCRIBER_PROFILE ID=sp0; DIAL_PLAN_ID=cdp1; POP_ID=27;

ADD TRUNK_GRP ID=469; CALL_AGENT_ID=CA146; TG_TYPE=H323; TG_PROFILE_ID=TRUNK_PROFILE_1; DIAL_PLAN_ID=cdp1; ANI_SCREENING=Y; ANI-SCREENING-ACTION=ALLOW;

ADD H323_TG_PROFILE ID=video_ani_tg; RAS=Y; H245_SESSION_MODE=H245-FLOWAROUND; CALL_CONNECT_MODE=AUTO; H245_TUNNELING=AUTO; SEND_CALL_PROCEEDING=AUTO;

ADD TRUNK-GRP ID=478; CALL-AGENT-ID=CA146; TG-TYPE=H323; TG-PROFILE-ID=VIDEO_ANI_BLOCK;

ADD SUBSCRIBER ID=ANI_972671_SUB; CATEGORY=PBX; GRP=Y; PRIVACY=USER; SEND-BDN-AS-CPN=N; SEND-BDN-EMG=N; SUB-PROFILE-ID=SP0; TERM-TYPE=TG; TGN-ID=NULL;

ADD ANI-SCREENING TGN-ID=469; ID=SCREEN-972671; FROM-DN=972-671-1000; TO-DN=972=671-2000;

MAIN-SUB-ID=ANI_972671_SUB

###
\# Add H323 SUBCRIBER DESTINATIONS
###

add destination dest_id=h323_video; call_type=LOCAL; route_type=SUB;

###
\# Add H323 TRUNK DESTINATIONS

```
############################################################################
add destination dest_id=h323_318; call_type=LOCAL; route_type=RID; ROUTE_ID=h323_318;
add destination dest_id=h323_469; call_type=LOCAL; route_type=RID; ROUTE_ID=h323_469;


############################################################################
# Add H323 DIAL_PLANS
############################################################################
add dial-plan-profile id=cdp1;
add dial_plan id=cdp1; digit_string=972; dest_id=h323_video; min-digits=7; max-digits=10;
NOA=NATIONAL;


############################################################################
# Add H323 TRUNK DIAL_PLANS
############################################################################
add dial_plan id=cdp1; digit_string=318; dest_id=h323_318; min-digits=7; max-digits=10;
NOA=NATIONAL;
add dial_plan id=cdp1; digit_string=469; dest_id=h323_469; min-digits=7; max-digits=10;
NOA=NATIONAL;


############################################################################
# Add H323 Gateways/Gatekeepers
############################################################################
ADD H323_GW ID=H323_GW1; GW_H225_PORT=1720; TGN_ID=318; SECURITY=N;
PASSWORD=cisco; SECURITY_LEVEL=ENDPOINT; TCP_MAX_LIMIT=5; TCP_MAX_AGE=30;
MAX_VOIP_CALLS=65535; HIGH_WATER_MARK=0; LOW_WATER_MARK=0;
IRR_BANDWIDTH_SUPP=N; IPTOS_SIG_LOWDELAY=Y; IPTOS_SIG_THROUGHPUT=N;
IPTOS_SIG_RELIABILITY=N; IPTOS_SIG_PRECEDENCE=FLASH;
SOURCE-BASED-ROUTING=SRC-TSAP-ADDR


ADD H323_GW ID=H323_GW2; GW_H225_PORT=1820; TGN_ID=469; SECURITY=N;
PASSWORD=cisco; SECURITY_LEVEL=ENDPOINT; TCP_MAX_LIMIT=5; TCP_MAX_AGE=30;
MAX_VOIP_CALLS=65535; HIGH_WATER_MARK=0; LOW_WATER_MARK=0;
IRR_BANDWIDTH_SUPP=N; IPTOS_SIG_LOWDELAY=Y; IPTOS_SIG_THROUGHPUT=N;
IPTOS_SIG_RELIABILITY=N; IPTOS_SIG_PRECEDENCE=FLASH;


ADD H323_GW2GK H323_GW_ID=H323_GW1; GK_ID=cisco-gk; PRIORITY=1;
GK_IP_ADDR=10.0.10.129; GK_RAS_PORT=1719; MULTICAST=N;
ADD H323_GW2GK H323_GW_ID=H323_GW2; GK_ID=cisco-gk; PRIORITY=1;
GK_IP_ADDR=10.0.10.129; GK_RAS_PORT=1719; MULTICAST=N;


############################################################################
```

Add H323 VIDEO Subscribers

##

ADD H323_TERM_PROFILE ID=TERM_PROFILE_1; RAS=Y; H323_TCP_TIMER=10;
DTMF_CISCO_RTP_SUPP=N; DTMF_H245_ALPHA_SUPP=Y; DTMF_H245_SIGNAL_SUPP=N;
DTMF_RFC2833=N; DTMF_PREF_MODE=DTMF_H245_ALPHA;   SRC_CIRCUIT_ID_SUPP=Y;
DST_CIRCUIT_ID_SUPP=Y; VIDEO_SUPP=Y; H245_SESSION_MODE=H245-FLOWAROUND;
CALL_CONNECT_MODE=AUTO; H245_TUNNELING=AUTO;
SEND_CALL_PROCEEDING=AUTO; USE_SUB_DN=Y;
REMOTE_FAX_PORT_RETRIEVAL_MSG=H245_OLC; SEND_FS_CALLP=Y

ADD H323_TERM ID=TERM1-h323; TSAP_ADDR=10.89.227.114:1720;
H323_TERM_PROFILE_ID=TERM_PROFILE_1; H323_GW_ID=H323_GW1; ADD H323_TERM
ID=TERM2-h323; TSAP_ADDR=10.89.227.115:1720;
H323_TERM_PROFILE_ID=TERM_PROFILE_1; H323_GW_ID=H323_GW1;

ADD SUBSCRIBER_PROFILE ID=sp1; DIAL_PLAN_ID=cdp1; POP_ID=27;

add subscriber id=video_1; category=INDIVIDUAL; name=Jane Doe; status=ACTIVE;
address1=9651 n glenville; address2=Richardson tx 75081; ss-number=111-11-1111;
sip-url=//gateway21.home.com; billing-dn=972-813-5100; dn1=972-813-5100; sub-profile-id=sp1;
TERM_TYPE=H323; H323_TERM_ID=TERM1-h323;

add subscriber id=video_2; category=INDIVIDUAL; name=John Smith; status=ACTIVE;
address1=8651 n glenville suite 200; address2=Richardson tx 75081; ss-number=222-22-2222;
sip-url=//gateway21.home.com; billing-dn=972-813-5111; dn1=972-813-5111; sub-profile-id=sp1;
TERM_TYPE=H323; H323_TERM_ID=TERM2-h323;

##

CHANGE H323 TRUNKS

##

CHANGE TRUNK_GRP ID=318; CALL_AGENT_ID=CA146; DIAL_PLAN_ID=cdp1;
H323_GW_ID=H323_GW1;

CHANGE TRUNK_GRP ID=469; CALL_AGENT_ID=CA146; DIAL_PLAN_ID=cdp1;
H323_GW_ID=H323_GW2;

add qos id=silver_svc;

Note 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 Command Line Interface Guide*.

Operating

This section covers the operational features of the Cisco BTS 10200 Softswitch H.323 implementation, including billing, measurements, events and alarms, and announcements.

Billing

This section describes several billing features applicable to H.323, including:

- Identifying Call Legs As Video-Enabled
- Billing Data Generation for Video Calls
- Billing Records for Calls to/from Cisco CallManager
- Updated Billing Field Descriptions
- Link Failure Recovery Process

> **Note** For detailed information regarding billing fields, see the *Cisco BTS 10200 Softswitch Billing Guide*.

Identifying Call Legs As Video-Enabled

The VIDEO-SUPP flag in the H323-TG-PROFILE and H323-TERM-PROFILE tables allows the service provider to identify individual call legs as video-enabled in the billing data record.

> **Note** This flag affects only CDB fields. It does not affect the fields in the PacketCable-based event messages.

Billing Data Generation for Video Calls

The Cisco BTS 10200 Softswitch uses H.245 flow-around mode to transmit video calls. In this mode, the system does not perform dynamic identification of video calls for billing purposes. Instead, the system identifies video-capable call legs by looking up the static provisioning in the H323-TG-PROFILE and H323-TERM-PROFILE tables for both the originating and terminating endpoints.

The Cisco BTS 10200 Softswitch examines the Bearer Capability field of incoming SETUP messages and takes the following actions:

- For an outgoing H.323 call, if either of the endpoints is configured as not video-capable (in H323-TG-PROFILE and H323- TERM-PROFILE tables), the system identifies the outgoing call leg as "speech" in the CDR.
- If the call is coming from (or going to) an H.323 TG that is video-capable (VIDEO-SUPP=Y), all call legs on this TG to (or from) H.323 video phones connected to the Cisco BTS 10200 Softswitch are identified as video-capable in the CDRs.

The following calling conditions do not have any effect on the billing record generated by the Cisco BTS 10200 Softswitch:

- Use of the privacy button on either of the phones in the call
- A midcall change from video mode to speech mode

Billing Records for Calls to/from Cisco CallManager

For calls involving a connection between the Cisco BTS 10200 Softswitch and Cisco CallManager, the Cisco BTS 10200 Softswitch creates the completed call billing record before the voice path is fully established. (For calls not involving Cisco CallManager, the Cisco BTS 10200 Softswitch creates call billing records after the voice path is fully established.)

Updated Billing Field Descriptions

Descriptions of the following fields were updated in the *Cisco BTS 10200 Softswitch Billing Guide*. See the updated descriptions for these (and all other billing fields) in that document.

- Source Carrier Id
- Destination Carrier Id
- Source Service Provider Id
- Source Service Provider Id
- Originating H.323 Network Provider Id
- Destination H.323 Network Provider Id

Measurements

There are a number of traffic measurements applicable to H.323. For detailed information regarding billing fields, see the "Traffic Measurements" section in the *Cisco BTS 10200 Softswitch Operations and Maintenance Guide*.

Events and Alarms

There are a number of events and alarms applicable to H.323. For a detailed list and description of these data fields, see the *Cisco BTS 10200 Softswitch Troubleshooting Guide*.

Announcements

The Cisco BTS 10200 Softswitch supports a full range of announcements; however, there are no announcements specific to the H.323 protocol implementation.

Note See the "Cause Code to Announcement ID Mappings" section in the *Cisco BTS 10200 Softswitch Provisioning Guide* for details on the announcement files and announcement provisioning.

Link Failure Recovery Process

This section explains what to do if the active signaling link on the Cisco BTS 10200 Softswitch goes down. The procedures in this section are based on the configuration tasks described in the "Prerequisites for H.323 Networks" section on page 20.

Dual Links for H.323 Signaling Transport

There are two signaling links on each CA. During normal operation, one of these links on the active CA is active and used for transporting H.323 (and other VoIP) signaling. The other link is standby. If the active signaling link goes down, the H.323 process restarts, and reestablishes communications over a good link (either of the signaling links on the CA). Typically, the link that comes up active is not the same link that originally went down. For example, if the system was originally transmitting H.323 traffic through IF1 (IP address 10.89.225.17), after the restart it might transmit through IF2 (IP address 10.89.226.17).

Automatic Recovery Process When GWs are Registered to a GK

When the Cisco BTS 10200 Softswitch H.323 GWs are registered to a GK, typically, no operator intervention is required. The link failure and recovery process occurs as follows.

1. If there is a failure on the interface or active link used for H.323 signaling, the H.323 process restarts automatically, and might begin transmitting through the other signaling interface (with an IP address different from the one that was used before the restart).

2. When communication is restored, the Cisco BTS 10200 Softswitch automatically reregisters with the GK and includes its current (new) IP address for H.323 signaling.

3. The next time the peer H.323 GW checks the GK for the IP address of the Cisco BTS 10200 Softswitch, it obtains the latest information.

Automatic Recovery Process When No GK Is Used (Direct Routing)

If a GK is not used, direct routing has been set up on each peer H.323 GW that communicates with the Cisco BTS 10200 Softswitch. This should have been done when the network was set up, as described in the "Setting Up Direct Routing on the Peer H.323 GW" section on page 20.

Link Failure and Recovery Scenario

The link failure and recovery scenario is as follows:

1. If there is a failure on the interface or active link used for H.323 signaling, the H.323 process restarts automatically, and might begin transmitting through the other signaling interface (with an IP address different from the one that was used before the restart). However, the H.323 GW is not aware of the current (new) IP address for H.323 signaling.

2. The next time the H.323 GW attempts to signal the Cisco BTS 10200 Softswitch to set up a call, it uses the incorrect IP address (the address of the interface that went down).

3. For 3 seconds, the H.323 GW continues trying to reach the original IP address of the Cisco BTS 10200 Softswitch (provisioned as preference 1 in the GW) for the call setup. Only after these attempts time out does the GW look up the second dial-peer (provisioned as preference 2) and find the IP address for the other (now active) interface. At that time, the call can be completed.

Manual Intervention for Process Recovery (Optional)

When not connected to a GK, the H.323 GW, cannot automatically update its IP address data; therefore, the 3-second call setup delays will continue. If you want to restore normal call setup times (optional) perform the following steps:

Step 1 On the UNIX level on the active CA, enter the following command (example shown) to determine the IP addresses of the signaling interfaces (IF1 and IF2).

```
prica37# nslookup h3a-SYS37CA146.ipclab.cisco.com

Typical system response:
Server: lion.ipclab.cisco.com
Address: 10.89.224.1
Name: h3a-SYS37CA146.ipclab.cisco.com
Addresses: 10.89.226.17, 10.89.225.17
```

Tip The domain name for this H.323 link always includes h3a-SYS. The full domain name is shown in the Network Information Data Sheet (NIDS) that was supplied with your system. Alternatively, you can search in the DNS server for domain names containing h3a-SYS.

Step 2 On the Cisco BTS 10200 Softswitch, enter the following CLI command (example shown) to determine which signaling interface (IF1 or IF2) is active on the active CA. The active signaling interface carries the H.323 signaling (and other protocol signaling, if present). The system response contains an IP address for the currently active signaling link.

```
status h323-gw id=GW37_Central_4
```

A typical system response is shown below.

Note The IP ADDRESS displayed in this system response in the active IP address.

```
status h323-gw id=TB37_Central_4

ADMIN STATE -> ADMIN_INS
H3A PROCESS NUMBER -> 40
H3A PROCESS NAME -> H3A4
ENDPOINT ID -> 6333EC4400000005
ACTIVE CALLS -> 0
RAS STATE -> CCH323_RAS_STATE_IDLE
RAS PORT -> 57781
IP ADDRESS -> 10.89.225.17
REGISTERED GATEKEEPER ID -> H5-GK
PRIMARY GATEKEEPER ID -> H5-GK
PRIMARY GATEKEEPER PORT -> 1719
PRIMARY GATEKEEPER IP -> 10.89.227.80
H323 VERSION -> 4
TIME TO LIVE -> 60
NUM ALT GATEKEEPERS -> 0
ALT GATEKEEPER PERMANENT -> TRUE
THRESHOLD ENABLED -> FALSE
OUT OF RESOURCES -> FALSE
ALT GATEKEEPER LIST ->
```

Step 3 On the peer H.323 GW, display the dial-peers applicable to the H.323 signaling, and determine which dial-peer has the top preference.

Step 4 If the dial-peer with the top preference *is not* set to the IP address of the currently active signaling interface on the Cisco BTS 10200 Softswitch, change the preference levels on the dial-peers on the H.323 GW. The dial-peer with the top preference should contain the IP address of the currently active link.

Step 5 Verify that the active connection is functioning properly by completing several test calls.

Step 6 Check for any alarms on the system that might indicate difficulties with H.323 call processing.

Troubleshooting

This section provides examples of possible problems you may encounter while working with H.323, and recommended solutions:

- Outgoing Trunk Group is Out of Service
- Outgoing H.323 Gateway is Out of Service
- H.323 Gateway Fails to Register With GK (Invalid Alias)
- Outgoing H.323 Gateway Unregistered With GK and Needs to Use RAS
- Stable Calls Are Dropped When CA Switches Over
- No Matching Dial Plan Found on Incoming H.323 Trunk Group
- Configuration at Softswitch or Gatekeeper Has Placed Routing Into a Loop
- Outgoing H.323 Calls Routed to Incorrect Endpoint When Using RAS
- Outgoing H.323 Calls Routed to Incorrect Endpoint When Using Direct Signaling
- RAS Still Used When Outgoing H.323 Call is Provisioned to Use Direct Signaling

Outgoing Trunk Group is Out of Service

```
[I4 10:40:00.299 BCM  01-1 BCM_Main]  "bcm_sel_term_tg_id(): get_tg_from_route() fail"
[bcm_bcsm_util.c:2614]
[***ERROR*** 10:40:00.299 BCM  01-1 BCM_Main  ]  "Route Selection Failure"
[bcm_obcsm_sa_proc.c:3961]
```

This is an indication that the outgoing H.323 trunk group is out of service.

Verify the status of outgoing trunk group as follows:

```
CLI>status trunk_grp id=8991;
Reply : Success:

TGN ID -> 8991
ADMIN STATE -> ADMIN_OOS
OPER STATE -> Trunk group in-service
REASON -> ADM executed successful
RESULT -> ADM configure result in success
```

Solution

Use CLI to place the trunk_grp in-service as follows:

CLI> **control trunk_grp id=8991; target-state=ins; mode=forced;**

Outgoing H.323 Gateway is Out of Service

```
[***WARN**** 10:47:44.793 H3A3 01-1 Main ] "Call failure H3A--->BCM sent for csaid=41
callid=0 reason=H323 gateway/gk seem to be OOS" [h3a_sig_sai.c:1525]
```

This is an indication that the outgoing H.323 gateway is "out of service".

Verify the status of outgoing H.323 gateway:

```
CLI>status h323_gw id=CHINA_3;
Reply : Success:

ADMIN STATE -> ADMIN_OOS
H3A PROCESS NUMBER -> 32
H3A PROCESS NAME -> H3A3
ENDPOINT ID ->
ACTIVE CALLS -> 0
RAS STATE -> CCH323_RAS_STATE_NONE
RAS PORT -> 0
IP ADDRESS ->
REGISTERED GATEKEEPER ID -> NOT REGISTERED
PRIMARY GATEKEEPER ID ->
PRIMARY GATEKEEPER PORT -> 0
PRIMARY GATEKEEPER IP ->
H323 VERSION -> 4
TIME TO LIVE -> 0
NUM ALT GATEKEEPERS -> 0
ALT GATEKEEPER PERMANENT -> FALSE
THRESHOLD ENABLED -> FALSE
OUT OF RESOURCES -> FALSE
ALT GATEKEEPER LIST ->
```

Solution

Use CLI to place the h323_gw in-service as follows:

```
CLI>control h323_gw id=CHINA_3; target-state=ins;
Reply : Success: CLI change successful

H323GW ID -> CHINA_3
INITIAL STATE -> ADMIN_OOS
REQUEST STATE -> ADMIN_INS
RESULT STATE -> ADMIN_INS
FAIL REASON -> ADM found no failure
REASON -> ADM executed successful
RESULT -> ADM configure result in success
```

H.323 Gateway Fails to Register With GK (Invalid Alias)

When the H.323 gateway registers with a GK, sometimes an alias list is provided to the GK in the RRQ message from gateway. Currently, this configuration is supported on IOS gateways (not in use on Cisco BTS 10200 Softswitch) when FXS ports are involved. If an RRJ message is received by gateway with reject reason of "invalidAlias", this is symptomatic of an alias list being provided to the GK but the GK not configured to be responsible for the prefix associated with each of the aliases.

```
[+ .          H3A3 .    .          ] "value RasMessage ::= gatekeeperReject : "
[+ .          H3A3 .    .          ] "    {"
[+ .          H3A3 .    .          ] "      requestSeqNum 11"
[+ .          H3A3 .    .          ] "      protocolIdentifier { 0 0 8 2250 0 3 }"
[+ .          H3A3 .    .          ] "      rejectReason invalidAlias : NULL"
[+ .          H3A3 .    .          ] "    }"
```

- Example:

    Local gatekeeper that gateway is trying to register with configured as follows:

    - zone prefix China-GK 30*
    - zone prefix China-GK 281*
    - zone prefix China-GK 29*

    Gateway has the following aliases that it wishes to register with:

    c2620.50#show gateway

    Gateway China-GW1 is not registered to any gatekeeper

    Alias list (CLI configured)

    - E164-ID 20751101
    - E164-ID 20751102
    - E164-ID 20751103
    - E164-ID 20751104

    In this case, China-GK does not have a prefix to match any of the E164 numbers.

Solution

Add a zone prefix entry to China-GK that would cause a match on the alias numbers that are trying to be registered as follows:

- zone prefix China-GK 20*

Outgoing H.323 Gateway Unregistered With GK and Needs to Use RAS

```
[I4 10:52:44.824 H3A3 01-1 Lib_DBM] "H3A: h3a_use_ras Checking for RAS" [h3a_dbm.c:543]
[I4 10:52:44.824 H3A3 01-1 Lib_DBM] "h3a_get_dest_ip_addr: Need to use RAS ......"
[h3a_dbm.c:484]
[4? 10:52:44.824 H3A3 01-1 H_EVT] ": for callID 5 <cch323_call_setup_normal in
gw/src/cch323_gw_api.c:4247>"
 [bts/os/src/bts_debug.c:200]
[4? 10:52:44.824 H3A3 01-1 H_225_EVT] "H.225 SM: process event H225_EVENT_RAS_RESOLVE,
for callID 5 <cch323_send
_event_to_h225 in gw/src/cch323_h225.c:337>" [bts/os/src/bts_debug.c:200]
[4? 10:52:44.824 H3A3 01-1 H_225_EVT] "cch323_run_h225_sm: received event
H225_EVENT_RAS_RESOLVE while at state
H225_IDLE <cch323_run_h225_sm in gw/src/cch323_h225.c:10085>" [bts/os/src/bts_debug.c:200]
[4? 10:52:44.824 H3A3 01-1 H_EVT] ": state = 0 <cch323_traverse_enum_contact_list in
gw/src/cch323_gw_api.c:
4652>" [bts/os/src/bts_debug.c:200]
```

```
[I3 10:52:44.824 H3A3 01-1 Main]  "Rel message from STACK--->H3A for callid=5, cause
code=16" [h3a_sig_sai.c:1549]
```

This is an indication that the outgoing H.323 gateway needs to use RAS to complete the call, but because the gateway is not registered with a GK, the call is released.

Verify the status of the H.323 gateway with CLI command as follows:

```
CLI>status h323_gw id=CHINA_3;
Reply : Success:

ADMIN STATE -> ADMIN_INS
H3A PROCESS NUMBER -> 32
H3A PROCESS NAME -> H3A3
ENDPOINT ID ->
ACTIVE CALLS -> 0
RAS STATE -> CCH323_RAS_STATE_GRQ
RAS PORT -> 59723
IP ADDRESS -> 10.89.225.165
REGISTERED GATEKEEPER ID -> NOT REGISTERED
PRIMARY GATEKEEPER ID -> China-GK
PRIMARY GATEKEEPER PORT -> 1719
PRIMARY GATEKEEPER IP -> 10.89.227.198
H323 VERSION -> 4
TIME TO LIVE -> 0
NUM ALT GATEKEEPERS -> 0
ALT GATEKEEPER PERMANENT -> TRUE
THRESHOLD ENABLED -> FALSE
OUT OF RESOURCES -> FALSE
ALT GATEKEEPER LIST -> CLI>status h323_gw id=CHINA_3;
```

This shows that the H.323 gateway is in service, but it is not registered with a GK. The following are possible reasons for this: Incorrect provisioning for H323_GW2GK (incorrect gk name, incorrect gk ip address, security violation) ---- this can be verified by trace logs as a GRJ would be sent back by GK as follows:

```
[+ .        H3A3 .   .          ]  "value RasMessage ::= gatekeeperReject : "
[+ .        H3A3 .   .          ]  "    {"
[+ .        H3A3 .   .          ]  "      requestSeqNum 11"
[+ .        H3A3 .   .          ]  "      protocolIdentifier { 0 0 8 2250 0 3 }"
[+ .        H3A3 .   .          ]  "      rejectReason terminalExcluded : NULL"
[+ .        H3A3 .   .          ]  "    }"
```

GK is down (no alternate GK, or alternate is also down) --- this can be verified by trace logs as a timeout would occur (waiting for GCF or GRJ) after the H.323 GRQ has been sent.

Stable Calls Are Dropped When CA Switches Over

If Annex E functionality is provisioned on the Cisco BTS 10200 Softswitch, but stable calls are being dropped when the H.323 process restarts or CA switches over, check to see whether configuration is correctly registered with the GK:

Step 1   Log on to GK.

Step 2   # show gatekeeper endpoints.

Step 3   Examine the display of the GK, which should look similar to the example below:

CallSignalAddr	Port	RASSignalAddr	Port	Zone Name	Type	Flags
aaa.bbb.ccc.ddd	1234	eee.fff.ggg.hhh	12345	City GK	VOIP-GW	E
iii.jjj.kkk.lll	5678	ppp.qqq.rrr.sss	56789	City GK	VOIP-GW	E

Step 4   Verify that both the CA and H323-GW are registered with the GK with Flags=E as shown in the above example.

No Matching Dial Plan Found on Incoming H.323 Trunk Group

```
[I2 14:45:24.288 BCM  01-1 Lib_RTM]  "dial_plan(pcld=45145211, dp_idx=0): no match"
[rtm_dial_plan.c:492]
[***ERROR*** 14:45:24.288 BCM  01-1 BCM_Main]  "No Dial Plan Entry for digits in dial plan
0" [bcm_obcsm_sa_proc.c:8916]
```

After the SETUP message has been received at incoming H.323 gateway, BCM uses the dial_plan_id in the incoming trunk group and the called number to find out how to route the call. If no match is found, then this error will be issued.

Solution

Add an entry to dial_plan for called number and assign the id to incoming trunk_grp.

```
CLI> add dial_plan id=cdp1; digit_string=451452; dest_id=ipdest; min_digits=7;
max_digits=10;
CLI> change trunk_grp id=8991; dial_plan_id=cdp1;
```

Configuration at Softswitch or Gatekeeper Has Placed Routing Into a Loop

```
[I5 10:16:20.921 BCM  01-1 BCM_Main]  "BCM:TPM:Incr Counter( 3 ):4199302144"
[bcm_tpm_proc.c:106]
[***ERROR*** 10:16:20.921 H3A3 01-1 Main]  "alarm=99 reason=<Loop detected!!> call cleared
for callid=1
39 " [h3a_alarms.c:281]
```

Solution

The routing problem could be in either the GK or the Cisco BTS 10200 Softswitch. Check the GK against the dialedDigits pattern in the ARQ, example:

```
destinationInfo "
[+ .          H3A3 .   .          ] "       {"
[+ .          H3A3 .   .          ] "         dialedDigits : "9991231234""
[+ .          H3A3 .   .          ] "       }"
```

There are multiple ways that a GK could determine the destCallSignalAddress to send back in a ACF:

- A registered E.164 address (in this case, highly unlikely)

- A static route configured (has been observed)

- Default routing (highest frequency of problem)

Outgoing H.323 Calls Routed to Incorrect Endpoint When Using RAS

```
[I3 14:25:17.215 H3A3 01-1 Main]  "Rel message from STACK--->H3A for callid=8, cause
code=3" [h3a_sig_sai.c:1549]
```

After the SETUP message has been sent out, a RELEASE COMPLETE is received from the remote endpoint. In this case, the remote endpoint does not service the destination address (cause code=3).

Solution

Login to the GK that the outgoing H.323 gateway is registered with and determine the routing for called number. Gatekeeper could be configured to route based on several configurations:

- Called number is matched against static routing

- No routing defined for called number, uses default routing

- Routing is based on tech prefix (will be prepended to called number in ARQ)

Outgoing H.323 Calls Routed to Incorrect Endpoint When Using Direct Signaling

```
[I3 14:25:17.215 H3A3 01-1 Main]  "Rel message from STACK--->H3A for callid=8, cause
code=3" [h3a_sig_sai.c:1549]
```

After the SETUP message has been sent out, a RELEASE COMPLETE is received from the remote endpoint. In this case, the remote endpoint does not service the destination address (cause code=3).

Verify the value assigned to the SOFTSW_TSAP_ADDR for the outgoing H.323 trunk group

```
CLI>show trunk_grp id=8991;
Reply : Success: Entry 1 of 1 returned.

ID=8991
CALL_AGENT_ID=CA146
TG_TYPE=H323
SOFTSW_TSAP_ADDR=10.89.227.119;
TG_PROFILE_ID=CHINA
STATUS=INS
DIRECTION=BOTH
SEL_POLICY=ASC
GLARE=SLAVE
ALT_ROUTE_ON_CONG=N
SIGNAL_PORTED_NUMBER=N
DIAL_PLAN_ID=cdp1
DEL_DIGITS=0
```

```
OPER_STATUS=NF
```

Solution

If the value for the SOFTSW_TSAP_ADDR is incorrect, use CLI to make the change as follows:

```
CLI> change trunk_grp id=8991; softsw_tsap_addr=10.89.227.219;
```

RAS Still Used When Outgoing H.323 Call is Provisioned to Use Direct Signaling

[I4 14:29:21.163 H3A3 01-1 Lib_DBM   ] "H3A: h3a_use_ras Checking for RAS" [h3a_dbm.c:543]

[I4 14:29:21.163 H3A3 01-1 Lib_DBM   ] "H3A: we need to use the destIP from trunk_grp table " [h3a_dbm.c:489]

[***ERROR*** 14:29:21.163 H3A3 01-1 Lib_DBM   ] "h3a_get_dest_ip_addr: softsw_tsap_addr not set..." [h3a_dbm.c:494]

Although the configuration has specified to no use RAS, if no valid remote endpoint is provided, the fallback mechanism is to try RAS to determine the remote endpoint.

Verify the configuration for the outgoing trunk group with CLI:

```
CLI>show trunk_grp id=8991;
Reply : Success: Entry 1 of 1 returned.

ID=8991
CALL_AGENT_ID=CA146
TG_TYPE=H323
TG_PROFILE_ID=CHINA
STATUS=INS
DIRECTION=BOTH
SEL_POLICY=ASC
GLARE=SLAVE
ALT_ROUTE_ON_CONG=N
SIGNAL_PORTED_NUMBER=N
DIAL_PLAN_ID=cdp1
DEL_DIGITS=0
OPER_STATUS=NF
QOS_ID=china_qos1
TRAFFIC_TYPE=LOCAL
H323_GW_ID=CHINA_3
CAUSE_CODE_MAP_ID=H323_CHINA
ANI_BASED_ROUTING=N
NO_ANSWER_TMR=185
```

Since the SOFTSW_TSAP_ADDR column is not displayed, it contains a null value.

Solution

Use CLI to change the outgoing trunk group as follows:

```
CLI> change trunk_grp id=8991; softsw_tsap_addr=10.89.227.219;
```

References

This section provides reference material applicable to the H.323 implementation.

Cisco IOS - Cisco CallManager - MGCP Interoperability Data

Table 6 through Table 12 provide information on interoperability of the Cisco BTS 10200 Softswitch with H.323 IOS-based gateways, Cisco CallManager, and MGCP-based gateways.

The call configurations are described using designations A, B, and C as follows:

A=Input (incoming signaling from a remote endpoint)

B=MGCP-based subscriber line controlled by the Cisco BTS 10200 Softswitch, with the specific feature subscribed and activated

C=Output (outgoing signaling to a remote endpoint)

Table 6 lists interoperability support for the call forwarding unconditional (CFU) feature:

A->B(CFU)->C — *A calls B (B has CFU activated), call is forwarded to C*

A<->C — *A connected to C*

Table 6   CFU Interoperability via H.323

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Supported
Cisco CallManager	H.323 IOS	Supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Table 7 lists interoperability support for the call forwarding busy (CFB) feature:

A->B(CFB)->C — *A calls B (B has CFB activated), call is forwarded to C*

A<->C — *A connected to C*

Table 7   CFB Interoperability via H.323

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported

Table 7 **CFB Interoperability via H.323 (continued)**

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	Cisco CallManager	Supported
Cisco CallManager	H.323 IOS	Supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Table 8 lists interoperability support for the call forwarding no answer (CFNA) feature:

A->B(CFNA)->C — *A calls B (B has CFNA activated), call is forwarded to C*

A<->C — *A connected to C*

Table 8 **CFNA Interoperability via H.323**

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Not supported
Cisco CallManager	H.323 IOS	Not supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Not supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Table 9 lists interoperability support for the three-way call (TWC) feature:

A->B — *A connected to B*

B->C — *B calls C to establish TWC*

A,B,C TWC — *A, B, and C connected on TWC*

Table 9 **TWC Interoperability via H.323**

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Supported

—

Table 9   TWC Interoperability via H.323 (continued)

A (Incoming)	C (Outgoing)	Supported or Not Supported
Cisco CallManager	H.323 IOS	Supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

lists interoperability support for the call waiting (CW) and call waiting deluxe (CWD) features. These scenarios are applicable with or without codec up-speed:

A<->B — *A connected to B*

C->B — *C calls B*

A on hold C<->B — *B puts A on hold, and C is connected to B*

Table 10   CW and CWD Interoperability via H.323

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Supported
Cisco CallManager	H.323 IOS	Supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Table 11 lists interoperability support for the consultative call transfer (consultative CT) feature *without* codec speedup:

Note   Consultative CT means that the transferring party (caller B) is connected to the transferred-to party (caller C) before completing the connection of the transferred party (caller A) to caller C. Codec speedup refers to modification of the codec type to a higher compression rate, PCMU or MCMA, during the call.

A<->B — *A connected to B*

A on hold B->C — *B puts A on hold, and calls C*

B<->C — *B connected to C*

B on hook A<->C — *B goes on hook, and A is connected to C*

Table 11   Consultative CT without Codec Speedup—Interoperability via H.323

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Supported
Cisco CallManager	H.323 IOS	Not supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Not supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Table 12 lists interoperability support for the consultative call transfer (consultative CT) feature *with* codec speedup:

A<->B — *A connected to B*

A on hold B->C — *B puts A on hold, and calls C*

B<->C — *B connected to C*

B on hook A<->C — *B goes on hook, and A is connected to C*

Table 12   Consultative CT with Codec Speedup—Interoperability via H.323

A (Incoming)	C (Outgoing)	Supported or Not Supported
H.323 IOS	H.323 IOS	Not supported
H.323 IOS	MGCP	Supported
H.323 IOS	Cisco CallManager	Not supported
Cisco CallManager	H.323 IOS	Not supported
Cisco CallManager	MGCP	Supported
Cisco CallManager	Cisco CallManager	Not supported
MGCP	H.323 IOS	Supported
MGCP	MGCP	Supported
MGCP	Cisco CallManager	Supported

Related Documents

Related Topic	Document Title
Hardware and Software Interoperability with the Cisco BTS 10200 Softswitch	*Cisco BTS 10200 Softswitch Release Notes*
General flow of provisioning steps	*Cisco BTS 10200 Softswitch Provisioning Guide*
Reference information on all tables and tokens in the database	*Cisco BTS 10200 Softswitch Command Line Interface Guide*
General troubleshooting information	*Cisco BTS 10200 Softswitch Troubleshooting Guide*
General routing and dial plan procedures	*Cisco BTS 10200 Softswitch Dial Plan Guide*

Industry Standards

Standards	Title
ITU-T Recommendation H.323	*Packet-based multimedia communications systems, Draft v4 (11/2000)*

H.323 Provisioning, Operating, and Troubleshooting Guide for the Cisco BTS 10200 Softswitch, Release 4.5.1