CHAPTER 1

Overview

Revised: May 14, 2012, OL-24999-02

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

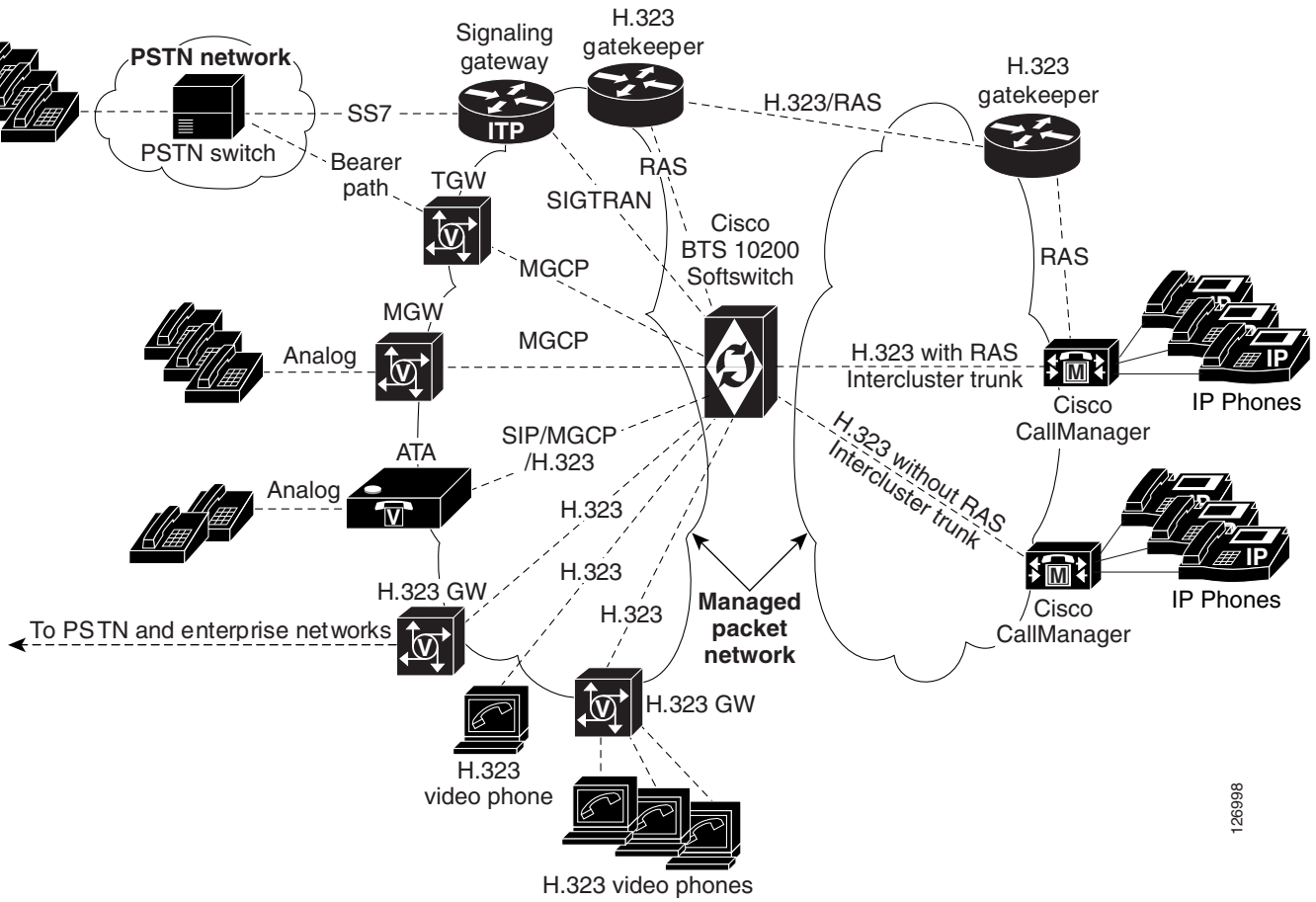
This chapter provides technical information about the implementation of H.323 features. It covers the following topics.

- Cisco BTS 10200 Softswitch in the H.323 Packet Network, page 1-1
- Summary of H.323 Capabilities, page 1-3
- Interoperability with Cisco CallManager and Other Endpoints, page 1-4
- Annex E UDP Functionality, page 1-7
- Message Tunneling and Protocol Transparency for H.323-Based Transit Traffic, page 1-9
- Reattempt, Route Advance, and Hairpinning (Redirection), page 1-11
- T.38 Fax Support over H.323, page 1-12
- Additional H.323-Related Features, page 1-14

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 1-1.

Figure 1-1 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, Release 6.0.4* and the *Cisco BTS 10200 Softswitch Network and Subscriber Feature Descriptions, Release 6.0.4* documents.

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

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 for Release 6.0.4*.

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

Release 6.0.x of Cisco BTS 10200 provides the following H.323 features and services:

- 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 Automatic Number Identification (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 "Interoperability Data for Cisco IOS, Cisco CallManager, and MGCP" section on page 6-1.

The Cisco BTS 10200 Softswitch supports the following signaling capabilities:

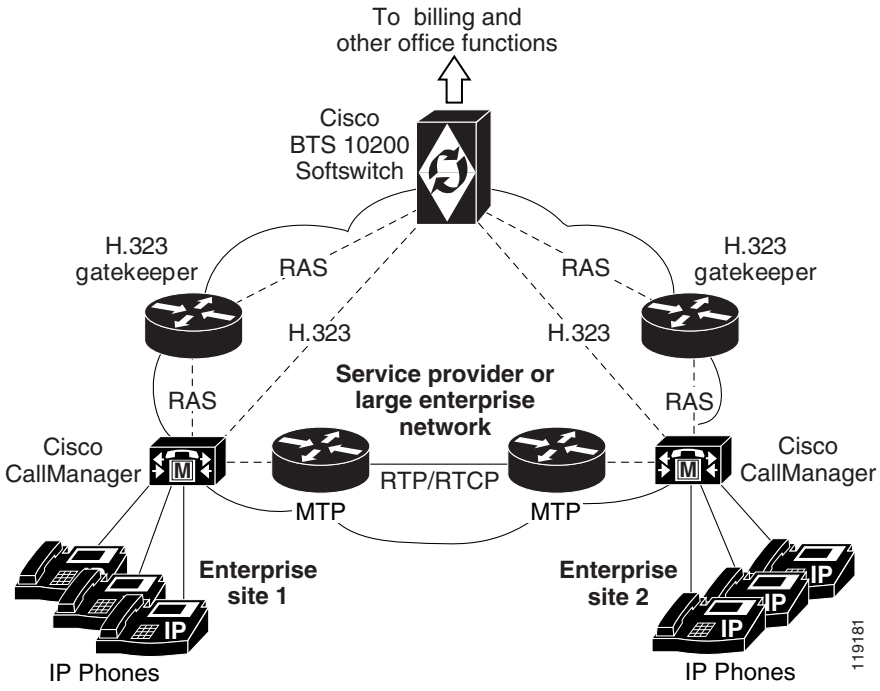
- Information request response (IRR)—When a GK sends an information request (IRQ) message to an H.323 gateway, the gateway responds with an IRR message. IRRs contain per-call information. Cisco BTS 10200 Softswitch GWs can pack multiple call block information messages inside a single IRR message, thereby 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 through 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 Interoperability" section on page 1-5 and the "Link Failure Recovery Process" section on page 4-3.

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

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 for 6.0.4*.

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 procedures are provided in the "Provision for Interoperability with Cisco CallManager" section on page 3-21.
  - (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.

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

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 "Interoperability Data for Cisco IOS, Cisco CallManager, and MGCP" section on page 6-1 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.

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.

- 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 affected in the following way:

- 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 could continue 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.

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 uses 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 1-11.

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 three 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 the 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 an OLC message or from an OLC Ack message.

Provisionable Parameters for T.38 Fax over H.323

For details on provisioning parameters, see the "H.323-Based T.38 Fax Parameters" section on page 3-29.

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.
- Overload Control—Overload control for the H.323 protocol on the Cisco BTS 10200 is just one aspect of the operation of the Overload Control feature on the entire softswitch. The overload control feature detects and controls machine overload due to traffic congestion from H.323 networks.

  The Cisco BTS 10200 performs Overload Control with regard to H.323 networks in the following way:

- The Cisco BTS10200 reports the Machine Congestion Level (MCL) to the H.323 network by sending the Resource Availability Indicator (RAI) message to GK.
- The Cisco BTS 10200 reports CallCapacity data in all Admission Request (ARQ), Disconnect Request (DRQ), and ReleaseComplete messages.
- If alternate endpoints are configured, the Cisco BTS 10200 reports them in the Registration Request (RRQ) message to GK.
- When an overload condition exists, the Cisco BTS 10200 rejects incoming calls from the H.323 network (when required by the MCL level action) by responding to the incoming SETUP with a RELEASE-COMPLETE with cause=42—switching equipment congested.
- When a peer gateway indicates congestion, the Cisco BTS 10200 does not route outgoing calls using the particular trunk group for a period of time.

The tokens SEND-RAI, ALT-ENDPOINT1, ALT-ENDPOINT2, ALT-ENDPOINT3, ALT-ENDPOINT4, and ALT-ENDPOINT5, are added to the H323-GW table to support Overload Control.

A new token, PEER-GW-OVERLOAD-TIMER, is added to the H323-TG-PROFILE table to indicate that a trunk group is congested. When this timer is started, traffic is not routed to the trunk group. When the timer expires, traffic resumes to the trunk group.

The configurable parameters mentioned above are not be entered by a user through CLI provisioning. These parameters are contained in one of the system configuration files.