



H.323 Version 2 Support

Feature History

Release	Modification
12.1(1)T	This feature was introduced.
12.1(5)XM2	Support was added for the Cisco AS5350 and Cisco AS5400 universal gateways.
12.2(2)XA	The call rscmon update-timer command was added.

This feature module describes Cisco H.323 Version 2 Support. Included here is an overview of the feature including the benefits, the prerequisites, the supported platforms, the configuration tasks, and a command reference of new and changed commands.

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Feature Overview

Cisco H.323 Version 2 Support upgrades Cisco IOS software to comply with the mandatory requirements and several of the optional features of the version 2 specification. This upgrade enhances the existing Voice Over IP Gateway, the Multimedia Conference Manager (Gatekeeper and Proxy). Future releases will add additional H.323 Version 2 features to the Cisco IOS software.

H.323 Version 2 Compliance

Cisco H.323 Version 2 support enables gatekeepers, gateways, and proxies to send and receive all the required fields in H.323 v2 messages.

Lightweight Registration

Prior to H.323 Version 2, Cisco gateways reregistered with the gatekeeper every 30 seconds. Each registration renewal used the same process as the initial registration, even though the gateway was already registered with the gatekeeper. This generated considerable overhead at the gatekeeper.

H.323 version 2 defines a lightweight registration procedure that still requires the full registration process for initial registration, but uses an abbreviated renewal procedure to update the gatekeeper and minimize overhead.

Lightweight registration requires each endpoint to specify a TimeToLive (TTL) value in its Registration Request (RRQ) message. When a gatekeeper receives a RRQ message with a TTL value, it returns an updated TTL timer value in a Registration Confirmation (RCF) message to the endpoint. Shortly before the TTL timer expires, the endpoint sends an RRQ message with KeepAlive field set to TRUE, which refreshes the existing registration.

An H.323 v2 endpoint is not required to indicate a time-to-live in its registration request. If the endpoint does not indicate a time-to-live, the gatekeeper assigns one and sends it to the gateway in the RCF message. No configuration changes are permitted during a lightweight registration, so all fields other than the endpointIdentifier, gatekeeperIdentifier, tokens, and time-to-live are ignored. In the case of H.323v1 endpoints that cannot process the time-to-live field in the RCF, the gatekeeper probes the endpoint with IRQs for a predetermined grace period to see if the endpoint is still alive.

Improved Gateway Selection Process

Prior to H.323 version 2, the gatekeeper selected a destination gateway by choosing gateways defined with **zone prefix** commands. This command assigns a dialing prefix to a zone and allows the use of wildcards in the dialing prefix. In version 1, the gatekeeper simply matched the destination number with the longest match in the defined dialing prefixes, and randomly selected a gateway registered in that zone.

The H.323 version 2 software improves the gateway selection process as follows:

- When more than one gateway is registered in a zone, the updated **zone prefix** command allows you to assign selection priorities to these gateways based on the dialed prefix.
- Gateway resource reporting allows the gateway to notify the gatekeeper when H.323 resources are getting low. The gatekeeper uses this information to determine which gateway it will use to complete a call.

The gatekeeper maintains a separate gateway list, ordered by priority, for each of its zone-prefixes. If a gateway does not have an assigned priority for a zone-prefix, it defaults to priority 5, which is the median. To explicitly bar the use of a gateway for a zone prefix, define it as having a priority 0 for that zone prefix.

When selecting gateways, the gatekeeper identifies a target pool of gateways by performing a longest zone-prefix match; then it selects from the target pool according to priorities and resource availability. If all high-priority gateways are busy, a low-priority gateway might be selected.

Gateway Resource Availability Reporting

To allow gatekeepers to make intelligent call routing decisions, the gateway reports the status of its resource availability to its gatekeeper. Resources that are monitored are DSO channels and DSP channels. In release 12.0(5)T, this feature is available only on the AS5300 platform.

The gateway reports its resource status to the gatekeeper using the RAS Resource Availability Indication (RAI). When a monitored resource falls below a configurable threshold, the gateway sends an RAI to the gatekeeper indicating that the gateway is almost out of resources. When the available resources then cross above another configurable threshold, the gateway sends an RAI indicating that the resource depletion condition no longer exists.

Resource reporting thresholds are configured by using the “resource threshold” command. The upper and lower thresholds are separately configurable to prevent the gateway from operating sporadically due to the availability or lack of resources.

Support for Single Proxy Configurations

In previous releases, the gatekeeper supported two-proxy and no-proxy call scenarios. The destination gatekeeper decided whether a call would be proxied or direct based on its zone configuration. The source gatekeeper would pick a proxy for its outbound calls only when the destination gatekeeper returned its inbound proxy in the location confirm message. This version of the gatekeeper software adds support for single-proxy calls and the option to independently configure proxies for inbound and outbound call scenarios.

Registration of E.164 Addresses for Gateway-Attached Devices

The H.323 version 2 gateway now supports the registration of fully-qualified E.164 numbers with the gatekeeper for phones connected directly to the gateway. To register these E.164 numbers, use the **register** command when configuring the gateway.

Tunneling of Redirecting Number Information Element

An incoming PRI SETUP message may contain either a Redirecting Number (RDN) Information Element (IE) or an Original Called Number (OCN) IE. These IEs indicate that the call has been redirected (forwarded), and that each message contains the following:

- The destination number (DN) that was originally called,
- The reason for the call being redirected,
- Other related information.

OCN IE is a Nortel variant of the RDN IE.

The H.323 Version 2 gateway now propagates the entire RDN or OCN IE from an incoming PRI message into the H.225 SETUP message. The IE is encapsulated in the nonStandardData field within the UIIE of the H.225 SETUP message. The nonStandardData field can contain the encapsulated RDN or OCN IE and a tunneled QSIG message, or it can contain only the OCN or RDN. Cisco and other third-party H.323 endpoints can access the redirected information by decoding the nonStandardData field. In accordance with the H.225 specification, the nonStandardData is ignored by third-party endpoints and causes no interoperability problems.

For redirected PRI calls that are routed to a Cisco gateway, sent using H.323 to another Cisco Gateway, and exit the gateway using PRI, the RDN/OCN IE is tunneled from the source gateway to the destination gateway. The incoming PRI SETUP message is tunneled through H.323/H.225, and is encoded into the outgoing PRI SETUP message by the destination gateway.

Tunneling the RDN or OCN IE is important for applications such as Unified Messaging servers that need to know the telephone number that was originally dialed so as to access the correct account information.

DTMF-Relay

Dual-Tone Multifrequency (DTMF) is the tone generated on a touch-tone phone when you press keypad digits. During a call you might enter DTMF to access Interactive Voice Response (IVR) systems such as voicemail, automated banking services and so on.

In previous releases of IOS, DTMF is transported in the same way as voice. This approach can result in problems accessing IVR systems. While DTMF is usually transported accurately when using high-bitrate voice CODECs such as G.711, low-bitrate CODECs such as G.729 and G.723.1 are highly optimized for voice patterns, and tend to distort DTMF tones. As a result, IVR systems may not correctly recognize the tones.

DTMF relay solves the problem of DTMF distortion by transporting DTMF tones “out of band”, or separate from the encoded voice stream. Cisco H.323 Version 2 support introduces three options for sending DTMF tones out of band. These are:

- A Cisco proprietary RTP-based method (“dtmf-relay cisco-rtp”).
- H.245 signal (“dtmf-relay h245-signal”).
- H.245 alphanumeric (“dtmf-relay h245-alphanumeric”).

If none of these options is selected, DTMF tones are transported inband, and encoded in the same way as voice traffic.

The “cisco-rtp” option sends DTMF tones in the same RTP channel as voice. However, the DTMF tones are encoded differently from the voice samples and are identified by a different RTP payload type code. Use of this method accurately transports DTMF tones, but since it is proprietary it requires the use of Cisco gateways at both the originating and terminating endpoints of the H.323 call.

The “h245-signal” and “h245-alphanumeric” options are modes of DTMF transport defined by the ITU H.245 standard. These methods separate DTMF digits from the voice stream and send them through the H.245 signalling channel instead of the RTP channel. The tones are transported in H.245 User Input Indication messages. The H.245 signalling channel is a reliable channel, so the packets transporting the DTMF tones are guaranteed to be delivered. However, because of the overhead of using a reliable protocol, and depending on network congestion conditions, the DTMF tones may be slightly delayed. This delay is not known to cause problems with existing applications.

The “h245-signal” option relays a more accurate representation of a DTMF digit than the “h245-alphanumeric” option, in that tone duration information is included along with the digit value. This information is important for applications that require you to press a key for a particular length of time. For example, one popular calling card feature allows you to break out of an existing call by pressing the (#) key for more than two seconds and then make a second call without having to hang up in between. This feature is beneficial because it allows you to avoid having to dial your access number and PIN code again, and it allows you to avoid access charges if you are charged for accessing an outside line as is common at hotels.

The “h245-alphanumeric” option simply relays DTMF tones as ASCII characters. For instance, the DTMF digit 1 is transported as the ASCII character “1”. There is no duration information associated with tones in this mode. When the Cisco H.323 gateway receives a DTMF tone using this method, it will generate the tone on the PSTN interface of the call using a fixed duration of 500 ms. All H.323 version 2 compliant systems are required to support the “h245-alphanumeric” method, while support of the “h245-signal” method is optional.

The ability of a gateway to receive DTMF digits in a particular format and the ability to send digits in that format are independent functions. To receive DTMF digits from another H.323 endpoint using any of the methods described above, no configuration is necessary. The Cisco H.323 version 2 gateway is capable of receiving DTMF tones transported by any of these methods at all times.

However, to send digits out of band using one of these methods, two conditions must be met:

1. You must enable the chosen method of DTMF relay under “dial-peer” configuration using the “dtmf-relay” command.
2. The peer (the other endpoint of the call) must indicate during call establishment that it is capable of receiving DTMF in that format.

You may enable more than one DTMF relay option for a particular dial peer. If you enable more than one option, and if the peer indicates that it is capable of receiving DTMF in more than one of these formats then the gateway will send DTMF using the method among the supported formats that it considers to be the most preferred. The preferences are defined as follows:

1. cisco-rtsp (highest preference)
2. h245-signal
3. h245-alphanumeric

If the peer is not capable of receiving DTMF in any of the modes that you have enabled, DTMF tones will be sent inband.

When the Cisco H.323 version 2 gateway is involved in a call to a Cisco gateway running a version of IOS prior to 12.0(5)T, DTMF tones will be sent inband since those systems do not support DTMF relay.

Hookflash Relay

A “hookflash” indication is a brief on-hook condition that occurs during a call. It is not long enough in duration to be interpreted as a signal to disconnect the call. You can create a hookflash indication by quickly depressing and then releasing the hook on your telephone.

PBXs and telephone switches are frequently programmed to intercept hookflash indications and use them as a way to allow a user to invoke supplemental services. For example, your local service provider may allow you to enter a hookflash as a means of switching between calls if you subscribe to a call waiting service.

In the traditional telephone network a hookflash results in a voltage change on the telephone line. Since there is no equivalent of this voltage change in an IP network, the ITU H.245 standard defines a message representing a hookflash. To send a hookflash indication using this message, an H.323 endpoint sends an H.245 User Input Indication message containing a “signal” structure with a value of “!”. This value represents a hookflash indication.

Cisco H.323 Version 2 support includes limited support for relaying hookflash indications via H.245. H.245 User Input Indication messages containing hookflash indications that are received on the IP call leg are forwarded to the POTS call leg if the POTS interface is FXO. If the interface is not FXO, any

H.245 hookflash indication that is received is ignored. This support allows IP telephony applications to send hookflash indications to a PBX through the Cisco gateway, and thereby invoke the PBX's supplementary services if the PBX supports access to those features via hookflash.

The gateway does not originate H.245 hookflash indications in this release. For example it does not forward hookflash indications from FXS interfaces to the IP network over H.245.

The acceptable duration of a hookflash indication varies by equipment vendor and by country. While one PBX may consider a 250 ms on-hook condition to be a hookflash, another PBX may consider this condition to be a disconnect. Therefore this release of IOS adds the “timing hookflash-out” command to allow the administrator to define the duration of a hookflash signal generated on an FXO interface.

CODEC Negotiation

CODEC negotiation allows the Gateway to offer several CODECs during the H.245 capability exchange phase and ultimately settle upon a single common CODEC during the call-establishment phase. This increases the probability of establishing a connection since there will be a greater chance of over-lapping audio capabilities between endpoints. Normally, only one CODEC can be specified when configuring a Dial-Peer, but CODEC negotiation allows you to specify a prioritized list of CODECs associated with a Dial-Peer. During the call-establishment phase the router will use the highest priority CODEC from the list which it has in common with the remote endpoint. It will also adjust to the CODEC selected by the remote endpoint so that a common CODEC is established for both the receive and transmit audio directions.

When a call is originated, all of the CODECs associated with the Dial-Peer are sent to the terminating endpoint in the H.245 Terminal Capability Set message. At the terminating endpoint, the gateway will advertise all of the CODECs that are available in firmware in its Terminal Capability Set. If there is a need to limit the CODECs advertised to a subset of the available CODECs, a terminating Dial-Peer must be matched which includes this subset. The “incoming called-number” command under the Dial-Peer can be used to force this match.

Benefits

Cisco H.323 Version 2 adds the following benefits to Cisco H.323 gatekeepers, gateways, and proxies:

- H.323 version 2 compliance.
- Lightweight registration. Gatekeepers, gateways, and proxies use a registration renewal process that requires fewer network and device resources than the reregistration process used for H.323 version 1.
- Generation and processing of Request In Progress messages to dynamically extend Registration, Admission, and Status (RAS) timers when additional time is needed for address resolution.
- Gateway resource availability reporting.
- Gatekeeper selects gateways by using gateway resource availability data and priority levels defined at the gatekeeper.
- Support for single proxy configurations, dual-proxy, and no-proxy configurations previously supported.
- Gateway support for DTMF digit relay to allow access to IVR systems.
- Gateway registration of E.164 addresses for devices, such as handsets that are directly connected to FXS interfaces.

- Gateway support for tunneling of Q.SIG supplementary services using the H.225 User-to-User Information Element (UUIE).
- Gateway support for hookflash relay from H.323 endpoints through FX0 ports so as to allow access to PBX supplementary services.
- Tunneling of Redirecting Number Information Element in H.225 messages (PRI Only).

Restrictions

H.323 Version 2 features will not interoperate with H.323 Version 1 features in Cisco IOS versions prior to 11.3(9)NA or 12.0(3)T. Earlier Cisco IOS versions contain H.323 Version 1 software that does not support protocol messages with an H.323 Version 2 protocol identifier. All systems must be running either Cisco IOS version 11.3(9)NA and later or Cisco IOS version 12.0(3)T and later to interoperate with H.323 Version 2.

If you are planning to use a Cisco AS5300 universal access server, your software requires VCWare version 4.04.

Related Features and Technologies

Cisco H.323 Version 2 technologies are typically configured using a number of available compression/decompression (CODECs) and the following High Density DSP/Voice modules.

CODECs

The supported compression/decompression (CODECs) are available for use with Cisco H.323 Version 2. The following table lists each CODEC with a default packet size (in bytes) and a ranges.

CODECs	Range	Default	Bit Rate	Comments
G.711ulaw	40 - 240	160	64 Kbps	A separate CODEC for G.729 Annex B is included, which adds Annex B functionality to G.729. A separate CODEC G.723.1 Annex A adds Annex A functionality to G.723.1. The Annex B functionality added to G.729 and the Annex A functionality added to G.723.1 are the in-built CODEC specific VAD/CNG functions.
G.711alaw	40 - 240	160	64 Kbps	
G.723r63	24 - 240	24	6.3 Kbps	
G.723r53	20 - 240	20	5.3 Kbps	
G.723ar63	24 - 240	24	6.3 Kbps	
G.723ar53	20 - 240	20	5.3 Kbps	
G.726r32	20 - 240	40	32 Kbps	
G.726r24	15 - 240	30	24 Kbps	
G.726r16	10 - 240	20	16 Kbps	
G.728	10 - 240	10	16 Kbps	
G.729br8	10 - 240	20	8 Kbps	
G.729r8 pre-ietf	10 - 240	20	8 Kbps	
G.729r8	10 - 240	20	8 Kbps	

High Density DSPs

The following platforms support Cisco H.323 with the following DSP/Voice modules:

Cisco 2600 Series

The Cisco 2600 series DSP/voice modules support the following sessions:

- NM-1V— has 2 DSPs. Each DSP handles 1 voice or 1 fax call.
- NM-2V— has 4 DSPs. Each DSP handles 1 voice or 1 fax call.

Cisco 3600 Series

The Cisco 3600 series DSP/voice modules support the following sessions:

- NM-1V— has 2 DSPs. Each DSP handles 1 voice or 1 fax call.
- NM-2V— has 4 DSPs. Each DSP handles 1 voice or 1 fax call.

Cisco 7200 Series

This Cisco 7200 series DSP/voice modules support the following sessions:

- PA-VXA-1TE1-24+—24 voice or fax calls.
- PA-VXA-1TE1-30+—30 voice or fax calls.
- PA-VXB-2TE1+—48 voice or fax calls.
- PA-VXC-2TE1+—60 voice or fax calls (120 when used in conjunction with the PA-MCX).

Cisco AS5300 Universal Access Server

The Cisco AS5300 universal access server DSP/voice modules support the following sessions:

- 542 DSP/voice module (AS53-6VOX) supports 6 voice/fax sessions.
- 549 DSP/voice module (AS53-VOXD) supports 12 voice/fax sessions.



Caution

A Cisco AS5300 universal access server can support up to 10 modules of either AS53-6VOX or AS53-VOXD, but it cannot support both.

Related Documents

The following documents describe how to configure Voice over IP:

- For documents about Voice, Video, and Home Applications Configuration Guide, see:
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgr/voice_c/index.htm
- For documents about Voice, Video, and Home Applications Command Reference, see:
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgr/voice_r/index.htm
- For documents about Voice over IP for the Cisco 3600 Series, see:
 - http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113t/113t_1/voip/index.htm

- For the Voice over IP Quick Start Guides, see:
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3600/voice/4936vqsg.htm
- For documents about configuring the Cisco AS5300 for Voice Service Provider Features, see:
 - http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/sprvvoip.htm

The following table lists the documentation available for configuring and using Cisco IOS H.323 gatekeepers, gateways, and proxies:

Document/ Location	Release	2500 Series	2600 Series	3600 Series	AS5300
<i>Multimedia Conference Manager (Configuration)</i> http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113na/1137na/mcm_cfg.htm	11.3NA	x		x	
<i>Multimedia Conference Manager (Command Reference)</i> http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113na/1137na/mcm_cmd.htm	11.3NA	x		x	
<i>Configuring H.323 VoIP Gateway for Cisco Access Platforms</i> http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/0044gw.htm	11.3(7)NA	x		x	x
<i>Configuring H.323 VoIP Gatekeeper for Cisco Access Platforms</i> http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/0042gk.htm	11.3(7)NA	x		x	
<i>Configuring T1 CAS for VoIP on Cisco Access Platform</i> http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/0048t1ca.htm	11.3(7)NA				x
<i>Using Cisco 3600 and Cisco 2600 Series Routers as H.323 VoIP Gateways</i> http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xd/120xd2/3600gw.htm	12.0(2)XD		x	x	x
<i>Configuring the Cisco AS5300 for Voice Service Provider Features</i> http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/5300/cfios/sprvvoip.htm					x

Supported Platforms

The gatekeeper and proxy features apply to the following platforms:

- Cisco 2500 Series
- Cisco 3600 Series
- Cisco 7200 Series
- Cisco MC3810 Multiservice Concentrator

The gateway features apply to these platforms.

- Cisco 2600 Series
- Cisco 3600 Series
- Cisco 7200 Series

- Cisco AS5300
- Cisco AS5350
- Cisco AS5400

Supported Standard MIBs and RFCs

Standards

This feature adds support for the following ITU-T standards: H.323 Annex E and H.323 Annex G.

MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of MIBs supported by platform and Cisco IOS release and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

The Cisco AS5350 and Cisco AS5400 do not support the Mica Modem Card, Microcom Modem Card, or VoIP Feature Card. Voice and modem functions are provided by the Universal Port Dial Feature card running SPE firmware. See the *Cisco AS5350 Universal Gateway Card Installation Guide* and the *Cisco AS5400 Universal Gateway Card Installation Guide* for more information. All references to the Cisco AS5300 in this document apply to the Cisco AS5350 and Cisco AS5400 platforms with the following exceptions:

- Use the Universal Port Dial Feature Card instead of the Mica or Microcom modem cards.
- Use SPE firmware instead of portware version 6.7.7.
- Run Cisco IOS Release 12.1(5)XM2 software for VoIP functionality.

Other Prerequisites

Before you can use the H.323 Version 2 features, you must do the following:

- Establish a working IP network. For more information about configuring IP, refer to the “IP Overview,” “Configuring IP Addressing,” and “Configuring IP Services” chapters in the Cisco IOS Release 12.0 *Network Protocols Configuration Guide, Part 1*.
- Install the appropriate voice network module and voice interface card for your Cisco router. For more information about the physical characteristics of the voice network module, or how to install it, refer to the installation documentation, *Voice Network Module and Voice Interface Card Configuration Note*, that came with your voice network module.
- Configure Voice over IP. For more information about configuring Voice over IP, refer to the documents listed in the “Related Documents” section.
- Configure H.323 gatekeepers, gateways, and proxies as needed. For more information about configuring these H.323 components, refer to the documents listed in the “Related Documents” section.

Configuration Tasks

The H.323 Version 2 configuration options allow you to configure the following H.323 components:

- CODECs
- Gatekeeper
- Gateway
- Proxy

**Note**

When configuring a voice port, use the following configuration designations:

For the Cisco AS5300 access server, port designation is *port*.

For the Cisco AS5350 and Cisco AS5400 universal gateways, port designation is *slot/port*.

For the Cisco AS5800 access server, port designation is *shelf/slot/port*.

CODEC Configuration Tasks

To configure multiple CODECs for a dial-peer, use these steps:

Step 1 Create a prioritized list of CODECs.

The “voice class codec” command is used to create a CODEC preference list which is independent of a Dial-Peer and can be applied to several Dial-Peers.

Step 2 Enter voice class mode, by typing:

```
Router(config)#[no] voice class codec <tag>
Router(config-class)#
```

Step 3 Setup codec list, by typing:

```
Router(config-class)# [no] codec preference <value> <codec_type> [<cr> | bytes]<size>
<cr>
```

Step 4 Apply the list to a Dial-Peer using the "voice-class codec" under the Dial-Peer.

```
Router(config-dial-peer)# voice-class codec <tag>
```

Step 5 Example:

Here is a sample configuration:

```

Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config)#voice class codec 99
(config-class)# codec preference 1 g711alaw
(config-class)# codec preference 2 g711ulaw bytes 80
(config-class)# codec preference 3 g723ar53
(config-class)# codec preference 4 g723ar63 bytes 144
(config-class)# codec preference 5 g723r53
(config-class)# codec preference 6 g723r63 bytes 120
(config-class)# codec preference 7 g726r16
(config-class)# codec preference 8 g726r24
(config-class)# codec preference 9 g726r32 bytes 80
(config-class)# codec preference 10 g728
(config-class)# codec preference 11 g729br8
(config-class)# codec preference 12 g729r8 bytes 50
(config-class)#end
#
Router(config)# dial-peer voice 1919 voip
(config-dial-peer)#voice-class codec 99
(config-dial-peer)#end

Router# show running-config
dial-peer voice 1919 voip
  voice-class codec 99
!
voice class codec 99
  codec preference 1 g711alaw
  codec preference 2 g711ulaw bytes 80
  codec preference 3 g723ar53
  codec preference 4 g723ar63 bytes 144
  codec preference 5 g723r53
  codec preference 6 g723r63 bytes 120
  codec preference 7 g726r16
  codec preference 8 g726r24
  codec preference 9 g726r32 bytes 80
  codec preference 10 g728
  codec preference 11 g729br8
  codec preference 12 g729r8 bytes 50

```

Gatekeeper Configuration Tasks

With this version of the gatekeeper software, you can configure the gatekeeper to do the following:

- Use a proxy for inbound or outbound calls.
- Assign a default proxy selection.
- Assign a dialing prefix to one or more gateways.
- Set a priority value for selecting between multiple gateways.

Detailed instructions for proxy configuration are provided in the “use-proxy” command description. To learn how to configure dialing prefixes, see the “zone prefix” command description.

Gateway Configuration Tasks

This release of the gateway software allows you to configure an H.323 gateway as follows:

- Set the gateway to register or deregister E.164 addresses with a gatekeeper.
- Change the default settings used to report the availability of H.323 gateway resources.
- Enable sending DTMF tones out of band to a particular dial peer by using the “dtmf-relay” command.
- Change the default duration of a hookflash indication generated on an FXO interface by using the “timing hookflash-out” command.

For information on the “dtmf-relay” command, see the “dtmf-relay” command description. For information on the “timing hookflash-out” command, see the “timing hookflash-out” command description.

Configuration Examples

See the examples provided for each command in the “Gatekeeper Command Reference” section.

Gatekeeper Command Reference

This section documents new or modified commands for the gatekeeper. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **clear h323 gatekeeper call**
- **show gatekeeper calls**
- **show gatekeeper endpoints**
- **show gatekeeper gw-type-prefix**
- **show gatekeeper zone status**
- **use-proxy**
- **zone prefix**

clear h323 gatekeeper call

To force a specific call or all calls currently active on the gatekeeper to disconnect, use the **clear h323 gatekeeper call EXEC** command.

```
clear h323 gatekeeper call {all | local-callID local-CallID}
```

Syntax Description	
all	Applies to all active calls currently on this gatekeeper.
local-callID	Applies to a single active call with a specified local CallID that identifies the call.
local-CallID	A local CallID used to identify the call to be disconnected. The local CallID can be derived by using the show gatekeeper calls command under the LocalCallID column.

Command Modes	
	EXEC

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Defaults	
	None

Usage Guidelines	
	Force all calls on the gatekeeper to disconnect by using this command.

Examples Use the following form of the clear h323 gatekeeper call command to force an active call with the local call ID of "12-3339" to disconnect:

```
clear h323 gatekeeper call local-callID 12-3339
```

You can get information about specific active calls by using the **show gatekeeper calls** command.

The following example forces all active calls on this gatekeeper to be disconnected:

```
clear h323 gatekeeper call all
```

Related Commands	Command	Description
	show gatekeeper calls	Display current gatekeeper status for each ongoing call.

show gatekeeper calls

To show the status of each ongoing call that a gatekeeper is aware of, use the **show gatekeeper calls EXEC** command.

show gatekeeper calls

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	11.3(2) NA	This command was introduced.
	12.0(5) T	The display format was modified for H.323 V2.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines Use this command to show the status of all outgoing calls that the gatekeeper handles.

Examples

```
router# show gatekeeper calls
Total number of active calls = 1.
      GATEKEEPER CALL INFO
      =====
LocalCallID          Age(secs)   BW
12-3339              94          768 (Kbps)
  Endpt(s):Alias      E.164Addr   CallSignalAddr  Port  RASignalAddr  Port
  src EP:epA          90.0.0.11   1720  90.0.0.11     1700
  dst EP:epB@zoneB.com
  src PX:pxA          90.0.0.01   1720  90.0.0.01     24999
  dst PX:pxB          172.21.139.90  1720  172.21.139.90  24999
```

Related Commands	Command	Description
	show gatekeeper endpoints	Display status of registered endpoints for a gatekeeper.
	show gatekeeper gw-type-prefix	Display the gateway technology prefix table.

show gatekeeper endpoints

To display the status of all registered endpoints for a gatekeeper, use the **show gatekeeper endpoints EXEC** command.

show gatekeeper endpoints

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	11.3(2) NA	This command was introduced.
	12.0(5) T	The display format was modified for H.323 V2.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines Use this command to display the status of all registered endpoints for a gatekeeper.

Examples

```
Router#show gatekeeper endpoints
CallsignalAddr  Port  RASSignalAddr  Port  Zone Name  Type  F
-----
172.21.127.8    1720  172.21.127.8   24999  sj-gk      MCU
                H323-ID:joe@cisco.com
172.21.13.88   1720  172.21.13.88   1719   sj-gk      VOIP-GW  O  H323-ID:la-gw
```

Field	Description
CallsignalAddr	The endpoint's call-signaling IP address. If the endpoint also registered with alias(s), a list of all aliases registered for that endpoint should also be listed on the line below.
Port	The endpoint's call-signaling port number.
RASSignalAddr	The endpoint's RAS IP address.
Port	The endpoint's RAS port number.
Zone Name	Zone name (gatekeeper ID) which this endpoint registered in.
Type	The endpoint type (terminal, gateway, MCU, and so forth).
F	'S' — Indicates that the endpoint is statically entered from the alias command—rather than dynamically registered through RAS messages. 'O' — Indicates that the endpoint, which is a gateway, has sent notification that it is almost out of resources.

■ show gatekeeper endpoints

Related Commands	Command	Description
	show gatekeeper gw-type-prefix	Display the gateway technology prefix table.
	show gateway	Display current gateway status.
	show gatekeeper zone status	Display current status of zones related to a gatekeeper.

show gatekeeper gw-type-prefix

To display the gateway technology prefix table, use the **show gatekeeper gw-type-prefix EXEC** command.

show gatekeeper gw-type-prefix

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	11.3(2) NA	This command was introduced.
	12.0(5) T	The display format was modified for H.323 V2.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines This command first appeared in the Cisco IOS Release 11.3 NA.

Examples Following is a sample output for a gatekeeper which is controlling two local zones, “sj-gk” and “la-gk”:

```
router#show gatekeeper gw-type-prefix

GATEWAY TYPE PREFIX TABLE
=====
Prefix:12#*      (Default gateway-technology)
  Zone sj-gk master gateway list:
    172.21.13.11:1720 sj-gw1
    172.21.13.22:1720 sj-gw2 (out-of-resources)
    172.21.13.33:1720 sj-gw3
  Zone sj-gk prefix 408..... priority gateway list(s):
  Priority 10:
    172.21.13.11:1720 sj-gw1
  Priority 5:
    172.21.13.22:1720 sj-gw2 (out-of-resources)
    172.21.13.33:1720 sj-gw3
Prefix:7#*      (Hopoff zone la-gk)
Statically-configured gateways (not necessarily currently registered):
  1.1.1.1:1720
  2.2.2.2:1720
  Zone la-gk master gateway list:
    171.69.127.11:1720 la-gw1
    171.69.127.22:1720 la-gw2
```

Field	Description
Prefix	The technology prefix defined with the gw-type-prefix command.
Zone sj-gk master gateway list	A list of all the gateways registered to zone sj-gk with the technology prefix, under which they are listed. (This display shows that gateways sj-gw1, sj-gw2, and sj-gw3 have registered in zone sj-gk with the technology prefix 12#.)
Zone sj-gk prefix 408..... priority gateway list(s)	A list of prioritized gateways to handle calls to area code 408.
Priority 10	Highest priority level. Gateways listed under priority 10 are given the highest priority when selecting a gateway to service calls to the specified area code. (In this display, <i>gateways sj-gw1</i> is given the highest priority to handle calls to the 408 area code.)
Priority 5	Any gateway that does not have a priority level assigned to it defaults to priority 5.
(out-of-resources)	This is an indication that the displayed gateway has sent a “low-in-resources” notification.
(Hopoff la-gk)	Any call specifying this technology prefix should be directed to hop off in the la-gk zone, no matter what the area code of the called number is. (In this display, calls specifying technology prefix 7# are always routed to zone la-gk, regardless of the actual zone prefix in the destination address.)
Aone la-gk master gateway list	A list of all the gateways registered to la-gk with the technology prefix under which they are listed. (This display shows that gateways la-gw1, and la-gw2 have registered in zone la-gk with the technology prefix 7#. No priority lists are displayed here because none were defined for zone la-gk.)
(Default gateway-technology)	If no gateway-type prefix is specified in a called number, then gateways registering with 12# are the default type to be used for the call.
Statically-configured gateways	Lists all IP addresses and port numbers of gateways which are incapable of supplying technology-prefix information when they register. This display shows that when gateways 1.1.1.1:1720 and 2.2.2.2:1720 register, they will be considered to be of type 7#.

Related Commands

Command	Description
show gatekeeper endpoints	Display status of registered endpoints for a gatekeeper.
show gateway	Display current gateway status.
show gatekeeper calls	Display current gatekeeper status for each ongoing call.

show gatekeeper zone status

To display the status of zones related to a gatekeeper, use the **show gatekeeper zone status** EXEC command.

show gatekeeper zone status

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	11.3(2) NA	This command was introduced.
	12.0(5)T	This display format was modified for H.323 V2.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines Use this command to display the status of all zones related to a gatekeeper.

Examples

```
router# show gatekeeper zone status
```

```

                                GATEKEEPER ZONES
                                =====
GK name      Domain Name    RAS Address      PORT  FLAGS  MAX-BW    CUR-BW
-----      -
sj.xyz.com   xyz.com             1.14.93.85      1719  LS          0
SUBNET ATTRIBUTES :
  All Other Subnets :(Enabled)
PROXY USAGE CONFIGURATION :
  inbound Calls from germany.xyz.com :
    to terminals in local zone sj.xyz.com :use proxy
    to gateways in local zone sj.xyz.com :do not use proxy
  Outbound Calls to germany.xyz.com
    from terminals in local zone germany.xyz.com :use proxy
    from gateways in local zone germany.xyz.com :do not use proxy
  Inbound Calls from all other zones :
    to terminals in local zone sj.xyz.com :use proxy
    to gateways in local zone sj.xyz.com :do not use proxy
  Outbound Calls to all other zones :
    from terminals in local zone sj.xyz.com :do not use proxy
    from gateways in local zone sj.xyz.com :do not use proxy
tokyo.xyz.co xyz.com             172.21.139.89   1719  RS          0
milan.xyz.co xyz.com             171.69.57.90   1719  RS          0

```

■ show gatekeeper zone status

Field	Description
GK name	The gatekeeper name (also known as zone name), which is truncated after 12 characters in the display.
Domain Name	The domain with which the gatekeeper is associated.
RAS Address	The RAS address of the gatekeeper.
FLAGS	Displays the following information: S = Static (CLI-configured, not DNS-discovered) L = Local R = Remote
MAX-BW	The maximum bandwidth for the zone, in kbps.
CUR-BW	The current bandwidth in use, in kbps.
SUBNET ATTRIBUTES	A list of subnets controlled by the local gatekeeper.
PROXY USAGE CONFIGURATION	Inbound and outbound proxy policies as configured for the local gatekeeper (or zone).

Related Commands

Command	Description
show gatekeeper endpoints	Display status of registered endpoints for a gatekeeper.
show gateway	Display current gateway status.
show gatekeeper calls	Display current gatekeeper status for each ongoing call.

use-proxy

Use the **use-proxy** command to enable proxy communications for calls between local and remote zones. The **no use-proxy** command has two forms and either removes a proxy configuration entry for a remote zone or disables proxy communications between local and remote zones.

```
use-proxy local-zone-name {default | remote-zone remote-zone-name}{inbound-to | outbound-from}{gateway | terminal}
```

```
no use-proxy local-zone-name remote-zone remote-zone-name [{inbound-to | outbound-from}{gateway | terminal}]
```

Syntax Description

<i>local-zone-name</i>	The gatekeeper's name or zone name, which is usually the fully domain-qualified host name of the gatekeeper. For example, if the domain name is cisco.com, the gatekeeper name might be gk1.cisco.com. However, if the gatekeeper is controlling multiple zones, the gatekeeper's name for each zone should be a unique string that has a mnemonic value.
default	Defines the default proxy policy for all calls that are not defined by a use-proxy command with the remote-zone keyword.
remote-zone <i>remote-zone-name</i>	Defines a proxy policy for calls to or from a specific remote gatekeeper or zone.
inbound-to/outbound-from	Applies the proxy policy to calls that are either inbound to the local zone from a remote zone or outbound from the local zone to a remote zone. Each use-proxy command defines the policy for only one direction.
gateway/terminal	Defines the type of local device to which the policy applies. The gateway option applies the policy only to local gateways; the terminal option applies the policy only to local terminals.

Defaults

The local zone uses proxy for both inbound and outbound calls to and from the local H.323 terminals only. Proxy is not used for both inbound and outbound calls to and from local gateways.

Command Modes

Gatekeeper configuration

Command History

Release	Modification
12.0(5)T	This command was first introduced.
12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines

This command replaces the **zone access** command used in the previous versions of the gatekeeper. When a previous version of gatekeeper is upgraded, any **zone access** commands are translated to **use-proxy** commands. You can use the **show gatekeeper zone status** command to see the gatekeeper proxy configuration.

Examples

In the following example, the local zone, sj.xyz.com is configured to use a proxy for inbound calls from remote zones tokyo.xyz.com and milan.xyz.com to gateways in its local zone. The sj.xyz.com zone is also configured to use a proxy for outbound calls from gateways in its local zone to remote zones tokyo.xyz.com and milan.xyz.com:

```
use-proxy sj.xyz.com remote-zone tokyo.xyz.com inbound-to gateway
use-proxy sj.xyz.com remote-zone tokyo.xyz.com outbound-from gateway
use-proxy sj.xyz.com remote-zone milan.xyz.com inbound-to gateway
use-proxy sj.xyz.com remote-zone milan.xyz.com outbound-from gateway
```

Since the default mode disables proxy communications for all gateway calls, only the gateway call scenarios listed above can use the proxy.

In the next example, the local zone, sj.xyz.com uses a proxy for only those calls that are outbound from H.323 terminals in its local zone to the specified remote zone germany.xyz.com:

```
no use-proxy sj.xyz.com default outbound-from terminal
use-proxy sj.xyz.com remote-zone germany.xyz.com outbound-from terminal
```

Note that any calls inbound to H.323 terminals in the local zone sj.xyz.com from the remote zone germany.xyz.com use the proxy because the default applies.

The following example shows how to remove one or more proxy statements for the remote zone germany.xyz.com from the proxy configuration list:

```
no use-proxy sj.xyz.com remote-zone germany.xyz.com
```

The command above removes all special proxy configurations for the remote zone germany.xyz.com. After you enter a command like this, all calls between the local zone (sj.xyz.com) and germany.xyz.com are processed according to the defaults defined by any **use-proxy** commands that use the **default** option.

To prohibit proxy use for inbound calls to H.323 terminals in a local zone from a specified remote zone, enter a command similar to the following command:

```
no use-proxy sj.xyz.com remote-zone germany.xyz.com inbound-to terminal
```

This command overrides the default and disables proxy use for inbound calls from remote zone germany.xyz.com to all H.323 terminals in the local zone, sj.xyz.com.

Related Commands

Command	Description
show gatekeeper zone status	Display the status of all zones related to a gatekeeper.

zone prefix

To add a prefix to the gatekeeper zone list, use the **zone prefix** gatekeeper configuration command. To remove knowledge of a zone prefix, use the **no** form of this command with the gatekeeper name and prefix. To remove the priority assignment for a specific gateway, use the **no** form of this command with the **gw-priority** option.

```
zone prefix gatekeeper-name e164-prefix [gw-priority pri-0-to-10 gw-alias [gw-alias, ...]]
```

```
no zone prefix gatekeeper-name e164-prefix [gw-priority pri-0-to-10 gw-alias [gw-alias, ...]]
```

Syntax Description

<i>gatekeeper-name</i>	The name of a local or remote gatekeeper, which must have been defined by using the zone local or zone remote command.
<i>e164-prefix</i>	An E.164 prefix in standard form followed by dots (.). Each dot represent a number in the E.164 address. For example, 212..... is matched by 212 and any seven numbers. Note Although a dot representing each digit in an E.164 address is the preferred configuration method, you can also enter an asterisk (*) to match any number of digits.
gw-priority <i>pri-0-to-10 gw-alias</i>	(Optional) Use the gw-priority option to define how the gatekeeper selects gateways in its local zone for calls to numbers beginning with prefix <i>e164-prefix</i> . Do not use this option to set priority levels for a prefix assigned to a remote gatekeeper. Use values between 0 and 10. A 0 value prevents the gatekeeper from using the gateway <i>gw-alias</i> for that prefix. Value 10 places the highest priority on gateway <i>gw-alias</i> . If you do not specify a priority value for a gateway, the value 5 is assigned. To assign the same priority value for one prefix to multiple gateways, list all the gateway names after the <i>pri-0-to-10</i> value. The <i>gw-alias</i> name is the H.323 ID of a gateway that is registered or will register with the gatekeeper. This name is set on the gateway with the h323-gateway voip h.323-id command.

Defaults

No knowledge of its own or any other zone's prefix is defined.

Command Modes

Gatekeeper configuration

Command History

Release	Modification
11.3(6) Q	This command was introduced.
11.3(7) NA	This command was modified for H.323 V1.
12.0(5)T	This display format was modified for H.323 V2.
12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines

This command first appeared in Cisco IOS Releases 11.3(6)Q and 11.3(7)NA.

A gatekeeper can handle more than one zone prefix, but a zone prefix cannot be shared by more than one gatekeeper. If you have defined a zone prefix as being handled by a gatekeeper and now define it as being handled by a second gatekeeper, the second assignment cancels the first.

If you need a gatekeeper to handle more than one prefix, but for cost reasons you want to be able to group its gateways by prefix usage, there are two ways to do it.

The first method is simpler, has less overhead, and is recommended if your gateways can be divided into distinct groups, where each group is to be used for a different set of prefixes. For instance, if a group of gateways is used for calling area codes 408 and 650, and another group is used for calling area code 415, you can use this method. In this case, you define a local zone for each set of prefixes, and have the group of gateways to be used for that set of prefixes register with that specific local zone. Do not define any gateway priorities. All gateways in each local zone are treated equally in the selection process.

However, if your gateways cannot be cleanly divided into non-intersecting groups, (for instance if one gateway is used for calls to 408 and 415 and another gateway is used for calls to 415 and 650, and so on), you can put all these gateways in the same local zone and use the **gw-priority** option to define which gateways will be used for which prefixes.

When choosing a gateway, the gatekeeper first looks for the longest zone prefix match; then it uses the priority and the gateway status to select from the gateways. If all gateways are available, the gatekeeper chooses the highest priority gateway. If all the highest priority gateways are busy (see the gateway **resource threshold** command), a lower priority gateway is selected.

**Note**

Note that the **zone prefix** command matches a prefix to a gateway. It does not register the gateway. The gateway must register with the gatekeeper before calls can be completed through that gateway.

Examples

The following example shows how you can define multiple local zones for separating your gateways:

```
router(config-gk)# zone local gk408or650 xyz.com
router(config-gk)# zone local gk415 xyz.com
router(config-gk)# zone prefix gk408or650 408.....
router(config-gk)# zone prefix gk408or650 650.....
router(config-gk)# zone prefix gk415 415.....
```

Now you can configure all the gateways to be used for area codes 408 or 650 to register with gk408or650 and all gateways to be used for area code 415 to register with gk415. On Cisco voice gateways, you can do this by using the **h323 voip id** command.

The following example shows how you can put all your gateways in the same zone but use the **gw-priority** argument to determine which gateways will be used for calling different area codes.

```
router(config-gk)# zone local localgk xyz.com
router(config-gk)# zone prefix localgk 408.....
router(config-gk)# zone prefix localgk 415..... gw-pri 10 gw1 gw2
router(config-gk)# zone prefix localgk 650..... gw-pri 0 gw1
```

The above commands accomplish the following tasks:

- Domain xyz.com is assigned to gatekeeper localgk
- Prefix 408..... is assigned to gatekeeper localgk, and no gateway priorities are defined for it; therefore, all gateways registering to localgk can be used equally for calls to the 408 area code. No special gateway lists are built for the 408..... prefix; selection is made from the master list for the zone.

- The prefix 415..... is added to gatekeeper localgk, and priority 10 is assigned to gateways gw1 and gw2.
- Prefix 650..... is added to gatekeeper localgk, and priority 0 is assigned to gateway gw1.

A priority 0 is assigned to gateway gw1 to exclude it from the gateway pool for prefix 650..... When gateway gw2 registers with gatekeeper localgk, it is added to the gateway pool for each prefix as follows:

- For gateway pool for 415....., gateway gw2 is set to priority 10.
- For gateway pool for 650....., gateway gw2 is set to priority 5.

To change gateway gw2 from priority 10 for zone 415..... to the default priority 5, enter the following command:

```
no zone prefix localgk 415..... gw-pri 10 gw2
```

To change both gateways gw1 and gw2 from priority 10 for zone 415..... to the default priority 5, enter the following command:

```
no zone prefix localgk 415..... gw-pri 10 gw1 gw2
```

In the preceding example, the prefix 415..... remains assigned to gatekeeper localgk. All gateways that do not specify a priority level for this prefix are assigned a default priority of 5. To remove the prefix and all associated gateways and priorities from this gatekeeper, enter the following command:

```
no zone prefix localgk 415.....
```

Related Commands

Command	Description
resource threshold	Report H.323 resource availability
register	Register or de-register a fully-qualified dial-peer E.164 address with gatekeeper.
show call resource voice threshold	Displays current threshold configuration settings for H.323 gateway.
show gateway	Display current gateway status.

Gateway Command Reference

This section documents new or modified commands for the gateway. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **dtmf-relay**
- **register**
- **resource threshold**
- **show call resource voice stats**
- **show call resource voice threshold**
- **show gateway**
- **timing hookflash-out**

dtmf-relay

Use the **dtmf-relay** command to specify how an H.323 gateway relays DTMF tones through an IP network. Options allow the gateway to forward tones “out-of-band”, or separate from the voice stream. The **no** form of this command removes all signaling options and transmits the DTMF tones as part of the audio stream.

dtmf-relay [cisco-rtp] [h245-signal] [h245-alphanumeric]

no dtmf-relay

Syntax Description	
cisco-rtp	(Optional) Forwards DTMF tones using RTP protocol with a Cisco proprietary payload type.
h245-signal	(Optional) Forwards DTMF tones using the H.245 “signal” User Input Indication method. Supports tones 0-9, *, #, and A-D.
h245-alphanumeric	(Optional) Forwards DTMF tones using the H.245 “alphanumeric” User Input Indication method. Supports tones 0-9, *, #, and A-D.

Defaults DTMF tones are sent “inband”, or left in the audio stream, unless you use this command.

Command Modes EXEC

Command History	Release	Modification
	11.3(2) NA	This command was introduced.
	12.0(5)T	This command was modified for H.323 V2, adding dtmf-relay and h245-signal.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines The **dtmf-relay** command determines the outgoing format of relayed DTMF tones. The gateway automatically accepts all formats.

The gateway only sends DTMF tones in the format you specify if the remote device supports it. If the remote device supports multiple formats, the gateway chooses the format based on the following priority:

1. cisco-rtp (highest priority)
2. h245-signal
3. h245-alphanumeric
4. None – DTMF sent inband

**Note**

The cisco-rtp version of dtmf-relay is a proprietary Cisco implementation and only interoperates between two Cisco AS5300 universal access servers running Cisco IOS Release 12.0(2)XH or between Cisco AS5300 universal access servers or Cisco 2600 or 3600 modular access routers running Cisco IOS Release 12.0(5)T, or later releases. Otherwise, the DTMF relay feature will not function and the gateway will send DTMF tones inband.

Examples

The following are two examples of the **dtmf-relay** command:

- Configuring with dtmf-relay cisco-rtp or h245-signal when sending to dial-peer 103. Enter the configuration commands, one per line.

```
Router# configure terminal
Router(config)# dial-peer voice 103 voip
Router(config-dial-peer)# dtmf-relay cisco-rtp h245-signal
Router(config-dial-peer)# end
Router#
```

- Configuring the gateway to send DTMF inband (the default) when sending to dial-peer 103. Enter the configuration commands, one per line.

```
Router# configure terminal
Router(config)# dial-peer voice 103 voip
Router(config-dial-peer)# no dtmf-relay
Router(config-dial-peer)# end
```

Related Commands

Command	Description
dial-peer	Switch to the voice-port configuration mode from the global configuration mode.

register

Use the **register** dial peer command to configure a gateway to register or deregister a fully-qualified dial-peer E.164 address with a gatekeeper. The **no** form of this command deregisters an E.164 address.

register e164

no register e164

Syntax Description

This command has no keywords or arguments.

Defaults

No E.164 addresses are registered until you enter this command.

Command Modes

Dial-peer configuration

Command History

Release	Modification
12.0(5)T	This command was first introduced.
12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines

Use this command to register the E.164 address of an analog telephone line attached to an FXS port on a router. The gateway automatically registers fully-qualified E164 addresses. Use the **no register e164** command to deregister an address. Use the **register e164** command to register a deregistered address.

Before you automatically or manually register an E.164 address with a gatekeeper, you must create a dial peer (**dial-peer** command), assign an FXS port to the peer (**port** command), and assign an E.164 address by using the **destination-pattern** command. The E.164 address must be a fully-qualified address. For example, +5551212, 5551212, and 4085551212 are fully-qualified addresses; 408555.... is not. E.164 addresses are only registered for active interfaces, which are those that are not shutdown. If an FXS port or its interface is shut down, the corresponding E.164 address is deregistered.



Tips

You can use the show gateway command to find out if the gateway is connected to a gatekeeper and if a fully-qualified E.164 address is assigned to the gateway. Use the **zone-prefix** command at the gatekeeper to define prefix patterns, such as 408555...., that apply to one or more gateways.

Examples

The following command sequence places the gateway in dial-peer configuration mode, assigns a E.164 address to the interface, and registers that address with the gatekeeper:

```
gateway1(config)#dial-peer voice 111 pots
gateway1(config)#port 1/0/0
gateway1(config-dial-peer)#destination-pattern 5551212
gateway1(config-dial-peer)#register e164
```

The following commands deregister an address with the gatekeeper:

```
gateway1(config)#dial-peer voice 111 pots
gateway1(config-dial-peer)#no register e164
```

The following example shows that you must have a connection to a gatekeeper and define a unique E.164 address before you can register an address:

```
gateway1(config)#dial-peer voice 222 pots
gateway1(config)#port 1/0/0
gateway1(config-dial-peer)#destination 919555...
gateway1(config-dial-peer)#register e164
ERROR-register-e164:Dial-peer destination-pattern is not a full E.164
number
gateway1(config-dial-peer)#no gateway
gateway1(config)#dial-peer voice 111 pots
gateway1(config-dial-peer)#register e164
ERROR-register-e164:No gatekeeper
```

Related Commands

Command	Description
destination-pattern	Specify either the prefix or the full E.164 telephone number (depending on your dial plan) to be used for a dial peer.
dial-peer	Switch to the voice-port configuration mode from the global configuration mode.
port	Display threshold configuration settings and status for a H.323 gateway.
show gateway	Displays current gateway status.
zone prefix	Add a prefix to the gatekeeper zone list.

resource threshold

Use the **resource threshold** command to configure a gateway to report H.323 resource availability to the gateway's gatekeeper. The **no** form of this command disables gateway resource-level reporting.

resource threshold [**all**] [**high** *percentage-value*] [**low** *percentage-value*]

no resource threshold

Syntax Description	
[all]	(Optional) Applies the high- and low- parameter settings to all monitored H.323 resources. This is the default condition.
[high <i>percentage-value</i>]	(Optional) A resource utilization level that triggers a Resource Availability Indicator (RAI) message that indicates that H.323 resource use is high. Enter a number between 1 and 100 that represents the high-resource utilization percentage. A 100 value specifies high-resource usage when any H.323 resource is unavailable. The default is 90 percent.
[low <i>percentage-value</i>]	(Optional) Resource utilization level that triggers an RAI message that indicates that H.323 resource usage has dropped below the high usage level. Enter a number between 1 and 100 that represents the acceptable resource utilization percentage. After the gateway sends a high-utilization message, it waits to send the resource recovery message until the resource use drops below the value defined by the low parameter. The default is 90 percent.

Defaults Reports low resources when 90 percent of resources are in use, and reports resource availability when resource use drops below 90 percent.

Command Modes Gateway configuration.

Command History	Release	Modification
	12.0(5)T	This command was first introduced.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines The **resource threshold** command defines the resource load levels that trigger Resource Availability Indicator (RAI) messages. To view the monitored resources, enter the **show gateway** command.

The monitored H.323 resources include DSP channels and DS0s. Use the **show call resource voice stats** command to see the total amount of resources available for H.323 calls.



Note

The DS0 resources that are monitored for H.323 calls are limited to the ones that are associated with a voice POTS dial peer.

See the **dial-peer** configuration commands for details on how to associate a dial peer with a PRI or CAS group.

When any monitored H.323 resources exceed the threshold level defined by the **high** parameter, the gateway sends an RAI message to the gatekeeper with the AlmostOutOfResources field flagged. This message reports high-resource usage.

When all gateway H.323 resources drop below the level defined by the **low** parameter, the gateway sends the RAI message to the gatekeeper with the AlmostOutOfResources field cleared.

When a gatekeeper can choose between multiple gateways for call completion, the gatekeeper uses internal priority settings and gateway resource statistics to determine which gateway to use. When all other factors are equal, a gateway that has available resources will be chosen over a gateway that has reported limited resources.

Examples

The following command defines the H.323 resource limits for a gateway:

```
gateway1(config-gateway)#resource threshold high 70 low 60
```

Related Commands

Command	Description
show gateway	Display current gateway status.
show call resource voice stats	Switch to the voice-port configuration mode from the global configuration mode.
show call resource voice threshold	Display threshold configuration settings and status for a H.323 gateway.

show call resource voice stats

The **show call resource voice stats** command displays resource statistics for an H.323 gateway.

show call resource voice stats

Syntax Description This command has no keywords or arguments.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(5)T	This command was first introduced.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines This command displays the H.323 resources that are monitored when the **resource threshold** command is used to configure and enable resource threshold reporting. The following table describes the resource statistics that appear:

Statistic	Definition
Total channels	Number of physically configured channels for the resource.
Addressable channels	Number of channels that can be used for a specific type of dial-up service, such as H.323 which includes all the DS0 resources that have been associated to a voice POTS dial plan profile.
Inuse channels	Number of addressable channels that are in use. This includes all channels that either have active calls or have been reserved for testing.
Free channels	Number of addressable channels that are free.
Pending channels	Number of addressable channels that are pending in loadware download.
Disabled channels	Number of addressable channels that are physically down or that have been disabled administratively with the shut down or busy out command.

Examples

The following example shows the resource statistics for an H.323 gateway:

```
gateway1#show call resource voice stats
```

```
Resource Monitor - Dial-up Resource Statistics Information:
```

```
DSP Statistics:
```

```
Utilization: 0 percent
Total channels: 48
Inuse channels: 0
Disabled channels 0:
Pending channels: 0
Free channels: 48
```

```
DS0 Statistics:
```

```
Total channels: 0
Addressable channels: 0
Inuse channels: 0
Disabled channels: 0
Free channels: 0
```

Related Commands

Command	Description
resource threshold	Configure a gateway to report H.323 resources.
show call resource voice threshold	Display threshold configuration settings and status for a H.323 gateway.

show call resource voice threshold

The **show call resource voice threshold** command displays the threshold configuration settings and status for an H.323 gateway.

show call resource voice threshold

Syntax Description This command has no keywords or arguments.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(5)T	This command was first introduced.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines This command displays the H.323 resource thresholds that are configured with the **resource threshold** command.

Examples The following example shows the resource threshold settings and status for an H.323 gateway:

```
gateway1#show call resource voice threshold

Resource Monitor - Dial-up Resource Threshold Information:

DS0 Threshold:

Client Type: h323
High Water Mark: 70
Low Water Mark: 60
Threshold State: init
DSP Threshold:

Client Type: h323
High Water Mark: 70
Low Water Mark: 60
Threshold State: low_threshold_hit
```

Related Commands	Command	Description
	resource threshold	Configure a gateway to report H.323 resources.
	show call resource voice stats	Switch to the voice-port configuration mode from the global configuration mode.

show gateway

Use the **show gateway** command to display the current gateway status.

show gateway

Syntax Description This command has no keywords or arguments.

Command Modes Privileged EXEC

Command History	Release	Modification
	11.3(6) NA2	This command was introduced.
	12.0(5)T	This display format was modified for H.323 V2.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines This command displays the current gateway status.

Examples The following example shows the report that appears when the gateway is not registered with a gatekeeper:

```
gateway1#show gateway
Gateway gateway1 is not registered to any gatekeeper
Gateway alias list
H323-ID gateway1
H323 resource thresholding is Enabled but NOT Active
H323 resource threshold values:
DSP: Low threshold 60, High threshold 70
DS0: Low threshold 60, High threshold 70
```

This next example indicates that an E.164 address has been assigned to the gateway:

```
gateway1#show gate
Gateway gateway1 is registered to Gatekeeper gk1
Gateway alias list
E.164 Number 5551212
H323-ID gateway1
```

This example shows the report that appears when the gateway is registered with a gatekeeper and H.323 resource threshold reporting is enabled with the **resource threshold** command:

```
gateway1#show gateway
Gateway gateway1 is registered to Gatekeeper gk1
Gateway alias list
H323-ID gateway1
H323 resource thresholding is Enabled and Active
H323 resource threshold values:
  DSP: Low threshold 60, High threshold 70
  DS0: Low threshold 60, High threshold 70
```

This example shows the report that appears when the gateway is registered with a gatekeeper and H.323 resource threshold reporting is disabled with the **no resource threshold** command:

```
gateway1#show gateway
Gateway gateway1 is registered to Gatekeeper gk1
Gateway alias list
H323-ID gateway1
H323 resource thresholding is Disabled
```

Related Commands

Command	Description
resource threshold	Configure a gateway to report H.323 resources.

timing hookflash-out

Use the **timing hookflash-out** command to specify the duration of hookflash indications that the gateway generates on an FXO interface. The **no** form of this command resets hookflash to the default value.

timing hookflash-out *duration*

no timing hookflash-out

Syntax Description A duration can be between 50 and 500 milliseconds.

Defaults Default value is 300ms.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(5)T	This command was first introduced.
	12.1(5)XM2	The command was introduced for the Cisco AS5350 and CiscoAS5400.

Usage Guidelines This command specifies a duration of hookflash indications. Hookflash indications may be generated when relayed from an IP network during a VoIP call. Depending on the vendor and country, PBXs and switches vary in their definition of the duration of a hookflash. This command allows you to adjust the hookflash duration appropriately for your network.

Examples To implement timing for the hookflash with a duration of 200ms, enter the following command syntax after you have configured voice-port 1/0/0:

```
Router# configure terminal
Router(config)# voice-port 1/0/0
Router(config-voiceport)# timing hookflash-out 200
```

Related Commands	Command	Description
	voice-port	Switch to the voice-port configuration mode from the global configuration mode.

Glossary

CODEC—Compression/decompression software.

DTMF—Dual tone multi-frequency.

E.164—International Telecommunication Union (ITU-T) recommendation for international telecommunication numbering. This recommendation provides the number structure and functionality for the 3 categories of numbers used for international public telecommunication; geographic areas, global services, and networks.

endpoint—An H.323 terminal or gateway. An endpoint can call and be called. It generates and/or terminates the information stream.

gatekeeper—An H.323 entity on the LAN that provides address translation and control access to the LAN for H.323 terminals and gateways. The gatekeeper can provide other services to the H.323 terminals and gateways, such as bandwidth management and locating gateways. A gatekeeper maintains a registry of devices in the multimedia network. The devices register with the gatekeeper at startup, and request admission to a call from the gatekeeper.

gateway—An H.323 endpoint on the LAN that provides real-time, two-way communication between H.323 terminals on the LAN and other ITU-T terminals in the WAN, or to another H.323 gateway. A gateway allows H.323 terminals to communicate with non-H.323 terminals by converting protocols. A gateway is the point at which a circuit-switched call is encoded and repackaged into IP packets.

H.323—An ITU-T standard that describes packet-based video, audio, and data conferencing. H.323 is an umbrella standard that describes the architecture of the conferencing system and refers to a set of other standards (H.245, H.225.0, and Q.931) to describe its actual protocol.

H.323 RAS—Registration, admission, and status. The RAS signaling protocol performs registration, admissions, bandwidth changes, status and disengage procedures between the VoIP gateway and the gatekeeper.

hookflash—A brief on-hook condition that occurs during a call. It is not long enough in duration to be interpreted as a signal to disconnect the call. You can create a hookflash indication by quickly depressing and then releasing the hook on your telephone.

ITU-T—International Telecommunications Union-Telecommunication Standardization Sector.

POTS—Plain Old Telephone Service. Basic telephone service supplying standard single line telephones, telephone lines, and access to the public switched telephone network.

PSTN—Public switched telephone network. PSTN refers to the local telephone company.

QoS—Quality of service, which refers to the measure of service quality provided to the user.

RAI—Resource Availability Indicator. This message type is sent from an H.323 gateway to an H.323 gatekeeper to indicate the availability or unavailability of resources.

RRQ—Registration Request. This message type is sent from an H.323 endpoint to an H.323 gateway.

RTP—Real Time Transport protocol. See RFC 1889.

VoIP—Voice over IP. The ability to carry normal telephone-style voice over an IP-based Internet with POTS-like functionality, reliability, and voice quality. VoIP is a blanket term that generally refers to Cisco's standards based (for example, H.323) approach to IP voice traffic.

zone—A collection of all terminals, gateways, and multipoint control units (MCUs) managed by a single gatekeeper. A zone has only one gatekeeper, can be independent of LAN topology, and can comprise multiple LAN segments that are connected by using routers or other devices.

