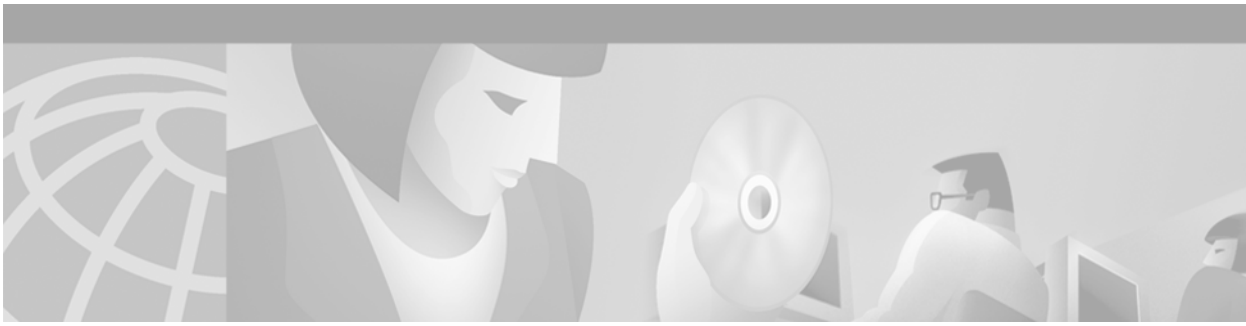

T.38 Fax Relay for Voice over IP H.323

Document Update Alert

This document was originally produced for Cisco IOS Release 12.1(3)T. This feature has been updated in subsequent releases, and more recent documentation is available.

If you are using Cisco IOS Release 12.3 or higher, refer to the following documentation in the *Cisco Fax Services over IP Application Guide*, Cisco IOS Voice Configuration Library, Release 12.3:

- Configuring T.38 Fax Relay

If you are using Cisco IOS Release 12.2 or higher, refer to the following documentation in the Configuring Fax Applications chapter of the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2:

- T.38 Fax Relay for VoIP H.323

This feature module describes ITU-T T.38 Fax Relay for Voice over IP (VoIP) H.323 gateway support on Cisco 2600 series, Cisco 3600 series, Cisco 7200 series and Cisco MC3810 series multiservice gateways in Cisco IOS Release 12.1(3)T. This document includes the following sections:

Feature Overview

The T.38 Fax Relay for VoIP H.323 feature provides standards-based Fax Relay protocol support on Cisco2600 series, Cisco3600 series, Cisco 7200 series and CiscoMC3810 series multiservice gateways. The Cisco proprietary Fax Relay solution is sometimes not an ideal solution for Enterprise and Service

Provider customers who have implemented a mixed vendor network. Because the T.38 Fax Relay protocol is standards based, Cisco gateways and gatekeepers will now be able to interoperate with third-party T.38-enabled gateways and gatekeepers in a mixed vendor network where real time Fax Relay capabilities are required.

Figure 1 shows an IP network in a mixed vendor network with T.38 Fax Relay capabilities.

Figure 1 IP Network for T.38 Fax Relay

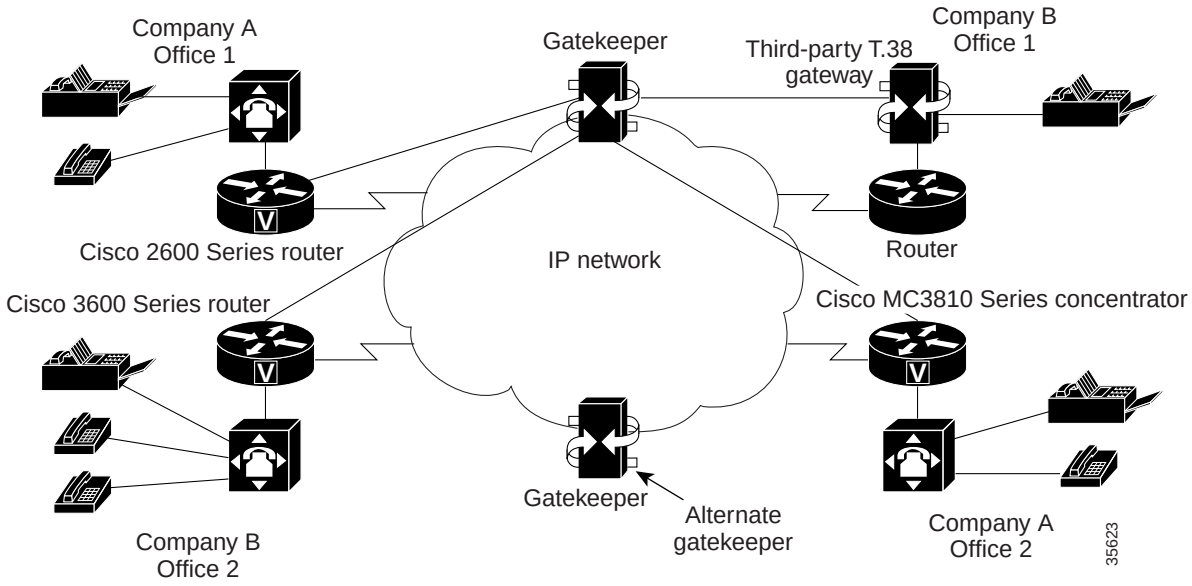

Figure 1 shows an IP H.323 network with Cisco and third-party gateways and gatekeepers all capable of T.38 Fax Relay functionality. By using T.38 Fax Relay, all gateways and gatekeepers in this network are able to send faxes to other remote offices, or to the offices of another company on the IP network.

For example, when a fax is sent from the originating gateway, an initial voice call is established. The terminating gateway, detects the fax tone generated by the answering fax machine. The VoIP H.323 call stack then starts a T.38 mode request using H.245 procedures. If the opposite end of the call acknowledges the T.38 mode request, the initial audio channel is closed and a T.38 Fax Relay channel is opened. When the fax transmission is completed, the call is reverted back to voice mode.

Benefits

Interoperability

The Cisco 2600 series, Cisco3600 series, Cisco 7200 series and CiscoMC3810 series multiservice gateways with ITU-T T.38 Fax Relay capability can interoperate with third-party gateways and gatekeepers over an IP H.323 network. The goal is to work with third-party gateways and gatekeepers to provide ITU-T standards based T.38 Fax Relay services for multi-vendor networks.

Toll Bypass

The Cisco 2600 series, Cisco3600 series, Cisco 7200 series and CiscoMC3810 series multiservice gateways provide standards-based toll by-pass for both fax and voice calls. In addition to existing voice and fax toll bypass capabilities, the multiservice gateways provide toll bypass for Fax Relay with the standards-based ITU-T T.38 Fax Relay implementation.

Restrictions

- Only User Datagram Protocol (UDP) is implemented for T.38 Fax Relay for VoIP H.323 gateway support on the multiservice gateways for the Cisco IOS Release 12.1(3)T; TCP T.38 Fax Relay is not supported.

Note The transport protocols specified in the ITU-T Recommendation for T.38 are Transmission Control Protocol (TCP) and UDP; however, only UDP is supported for the Cisco IOS Release 12.1(3)T. For further information on T.38 protocol, refer to ITU-T Recommendation.

- You must complete voice interoperability testing with third-party gateways and gatekeepers before configuring the T.38 Fax Relay for VoIP H.323 feature in your network because different companies are allowed to select certain parts of H.323 and T.38 to implement into their gateways and gatekeepers.
- T.38 Fax Relay interoperability requires H.323 Version 2.
- T.38 Fax Relay is not supported on Cisco MC3810 series concentrators with VCM (Voice Compression Module).
- T.38 Fax Relay is not supported by Multimedia Conference Manager (MCM) H.323 proxy in Cisco IOS Release 12.1(3)T.
- T.38 Fax Relay is not supported in conjunction with MGCP, SGCP, or SIP in Cisco IOS Release 12.1(3)T.

Related Features and Technologies

- Cisco VoIP
- H.323 Version 2

Related Documents

For more information about voice technologies, refer to the *Cisco IOS Multiservice Applications Configuration Guide* and the *Cisco IOS Multiservice Command Reference* for Cisco IOS Release 12.1.

Supported Platforms

- Cisco 2600 series
- Cisco 3600 series
- Cisco 7200 series
- Cisco MC3810 series, Cisco MC3810 v3 high-density compression module (HCM) based

Supported Standards, MIBs, and RFCs

Standards

ITU-T Recommendation for T.38

MIBs

No new MIB enhancements. The T.38 fax calls use the pre-existing voice MIBs.

For descriptions of supported MIBs and how to use MIBs, go to the Cisco MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

None.

Prerequisites

- Cisco IOS Release 12.1(3)T running on your platform.
- Working VoIP H.323 network for voice calls.
- Complete voice interoperability testing with third-party gateways and gatekeepers before configuring the T.38 Fax Relay for VoIP H.323 feature.
- Complete the dial plan for your company.
- 64 MB minimum memory requirement.

Note Although 96 to 128 MB memory requirement is recommended, the memory requirement is dependent on the platform and the number of calls anticipated to be made through the system.

Configuration Tasks

You need to configure T.38 Fax Relay in both the originating and terminating gateways for the T.38 Fax Relay for VoIP H.323 to operate. To specify the global default fax protocol for all the VoIP dial peers, configure the dial peers in global configuration mode. To specify the fax protocol for a specific VoIP dial peer, configure the dial peer in dial-peer configuration mode.

Note When T.38 Fax Relay is configured under the **dial-peer voice** configuration, the configuration for the specific dial peer takes precedence over the global configuration under the **voice service voip** command.

See the following sections for the T.38 Fax Relay configuration. Each task in the list indicates if the task is required or optional:

- Configuring T.38 Fax Relay for VoIP H.323 Globally (Required)
- Configuring T.38 Fax Relay for a Specific Dial Peer (Optional)

Configuring T.38 Fax Relay for VoIP H.323 Globally

To configure T.38 Fax Relay for VoIP H.323 for all the connections of a gateway, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# voice service voip`	Enters the voice-service configuration mode.
Step 2	`Router(config-voi-serv)# fax protocol {cisco | t38 [ls_redundancy value] [hs_redundancy value]}`	Specifies the global default fax protocol for all the VoIP dial peers. The **t38** keyword enables the T.38 Fax Relay protocol. The **cisco** keyword selects the original Cisco proprietary fax protocol. Optional parameters **ls_redundancy** and **hs_redundancy** are used to send redundant T.38 fax packets. **Note** The **ls_redundancy** and **hs_redundancy** parameters are applicable only to the T.38 Fax Relay protocol. The **ls_redundancy** parameter refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol. For the **ls_redundancy** parameter, the *value* can be from 0 to 5. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay. The **hs_redundancy** parameter refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data. For the **hs_redundancy** parameter, the *value* can be from 0 to 2. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay. **Note** Setting the **hs_redundancy** parameter greater than 0 will cause a significant increase in the network bandwidth consumed by the fax call.

	Command	Purpose
Step 3	`Router(config-voi-serv)# exit`	Exits the voice-service configuration mode and returns to the global configuration mode.
Step 4	`Router(config)# exit`	Exits the global configuration mode.

Note Repeat the configuration steps on both the originating and terminating gateways.

Configuring T.38 Fax Relay for a Specific Dial Peer

Note When T.38 Fax Relay is configured under the **dial-peer voice** configuration, the configuration for the specific dial peer takes precedence over the global configuration under the **voice service voip** command.

To configure T.38 Fax Relay for VoIP H.323 for a specific dial peer, use the following commands beginning in dial-peer configuration mode:

	Command	Purpose
Step 1	`Router(config)# dial-peer voice tag voip`	Enters dial-peer configuration mode.
Step 2	`Router(config-dial-peer)# fax protocol {cisco | t38 [ls_redundancy value] [hs_redundancy value] | system}`	Specifies the fax protocol for a dial peer. The **t38** keyword enables the T.38 Fax Relay protocol. The **cisco** keyword selects the original Cisco proprietary fax protocol. When the **system** keyword is selected in the dial peer, it specifies the global default fax protocol used by a dial peer, set by the **fax protocol t.38** command. Optional parameters **ls_redundancy** and **hs_redundancy** are used to send redundant T.38 fax packets. **Note** The **ls_redundancy** and **hs_redundancy** parameters are applicable only to the T.38 Fax Relay protocol. The **ls_redundancy** parameter refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol. For the **ls_redundancy** parameter, the *value* can be from 0 to 5. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay. The **hs_redundancy** parameter refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data. For the **hs_redundancy** parameter, the *value* can be from 0 to 2. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay. **Note** Setting the **hs_redundancy** parameter greater than 0 will cause a significant increase in the network bandwidth consumed by the fax call.
Step 3	`Router(config-dial-peer)# fax rate {12000 | 14400 | 2400 | 4800 | 7200 | 9600} {disable | voice} [bytes rate]`	Selects the maximum fax transmission speed for a dial peer.
Step 4	`Router(config-dial-peer)# exit`	Exits the dial-peer configuration mode and returns to the global configuration mode.
Step 5	`Router(config)# exit`	Exits the global configuration mode.

Note Repeat the configuration steps on both the originating and terminating gateways.

Verifying T.38 Fax Relay for VoIP H.323

To verify that T.38 Fax Relay for VoIP H.323 feature is enabled, follow these steps:

Step 1 Enter the **show run** command to verify the configuration.

Step 2 Enter the **show dial-peer voice** command to verify that T.38 Fax Relay is enabled.

Troubleshooting Tips

To troubleshoot the T.38 Fax Relay for VoIP H.323 feature, perform the following steps:

- Make sure that you can make a voice call.
- Make sure that T.38 Fax Relay for VoIP H.323 is configured on both the originating and terminating gateways.
- Make sure that the fax protocol is configured as T.38 either at the global configuration mode or at the dial-peer configuration mode for both the originating and terminating gateways.
- Use the **debug vtsp session**, **debug cch323 session**, and the **debug cch323 h245** commands to debug a problem.
- Use the **debug voip ccapi inout** command to debug problems while making the call.

Monitoring and Maintaining T.38 Fax Relay for VoIP H.323

Command	Purpose
`Router# show run`	Displays the current configuration.
`Router# show dial-peer voice [number | summary]`	Displays configuration information for dial peers. The *number* argument specifies a specific dial peer from 1- 32767. When you use the **summary** keyword, the output displays a summary of all dial peers.

Configuration Examples

This section provides a sample configuration examples of T.38 Fax Relay:

```
Router# show run
Building configuration...

Current configuration:
!

.....

!
voice service voip
```

```
 fax protocol t38
!

.....

!
interface Ethernet0/0
 ip address 10.0.47.47 255.255.0.0
 h323-gateway voip interface
 h323-gateway voip id ipaddr 10.0.47.36 1719
 h323-gateway voip h323-id 36402
!

.....

!
dial-peer voice 14151 voip       !!! Uses t38 fax from voice service voip
 destination-pattern 14151..
 session target ras
!
dial-peer voice 14152 voip       !!! Uses Cisco fax for a specific dial peer
 destination-pattern 14152..
 session target ras
 fax protocol cisco
!
gateway
!
!
.....

!
end
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the *Cisco IOS Multiservice Applications Command Reference* for Cisco IOS Release 12.1.

Note The modified command is marked by an asterisk.

- **fax protocol (voice-service)**
- **fax protocol (dial-peer)**
- **fax rate***
- **voice service**

fax protocol (voice-service)

To specify the global default fax protocol for all the VoIP dial peers, use the **fax protocol** command in voice-service configuration mode. To return to the default fax protocol, use the **no** form of this command.

fax protocol {**cisco** | **t38** [**ls_redundancy** *value*] [**hs_redundancy** *value*]}

no fax protocol

Syntax Description

cisco	Cisco proprietary fax protocol.
t38	ITU-T T.38 standard fax protocol.
ls_redundancy *value*	(Optional) Low-speed redundancy for the T.38 fax protocol. The *value* can be from 0 to 5. The default is 0. The **ls_redundancy** parameter refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol.
hs_redundancy *value*	(Optional) High-speed redundancy for the T.38 fax protocol. The *value* can be from 0 to 2. The default is 0. The **hs_redundancy** parameter refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data.

Defaults

Cisco fax protocol

Command Modes

Voice-service configuration

Command History

Release	Modification
Release 12.1(3)T	This command was introduced on the Cisco 2600 series routers, Cisco 3600 series routers,Cisco 7200 series and Cisco MC3810 concentrators.

Usage Guidelines

Use the **fax protocol t38** command to configure T.38 Fax Relay for VoIP. The **t38** keyword enables the T.38 Fax Relay protocol. The **cisco** keyword selects the original Cisco proprietary fax protocol. When the **system** keyword is selected in the dial peer, it specifies the global default fax protocol used by a dial peer, set by the **fax protocol t.38** command. Optional parameters **ls_redundancy** and **hs_redundancy** are used to send redundant T.38 fax packets.

Note The **ls_redundancy** and **hs_redundancy** parameters are applicable only to T.38 Fax Relay protocol.

The **ls_redundancy** parameter refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol. For the **ls_redundancy** parameter, the *value* can be from 0 to 5. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay.

The **hs_redundancy** parameter refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data. For the **hs_redundancy** parameter, the *value* can be from 0 to 2. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay.

Note Setting the **hs_redundancy** parameter greater than 0 will cause a significant increase in the network bandwidth consumed by the fax call.

Examples

The following example shows T.38 fax protocol for VoIP in a global configuration mode:

```
Router(config)# voice service voip
Router(config-voi-serv)# fax protocol t38
```

Related Commands

Command	Description
fax protocol (dial-peer)	Specifies the fax protocol for a specific VoIP dial peer.

fax protocol (dial-peer)

To specify the fax protocol for a specific VoIP dial peer, use the **fax protocol** command in dial-peer configuration mode. To return to the default fax protocol, use the **fax protocol system** command. To disable T.38 fax protocol for a specific dial peer, use the **no** form of this command.

fax protocol {**cisco** | **t38** [**ls_redundancy** *value*] [**hs_redundancy** *value*] | **system**}

no fax protocol

Syntax Description

cisco	Cisco proprietary fax protocol.
t38	ITU-T T.38 standard fax protocol.
ls_redundancy *value*	(Optional) Low-speed redundancy for the T.38 fax protocol. The *value* can be from 0 to 5. The default is 0. The **ls_redundancy** parameter refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol.
hs_redundancy *value*	(Optional) High-speed redundancy for the T.38 fax protocol. The *value* can be from 0 to 2. The default is 0. The **hs_redundancy** parameter refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data.
system	Global fax protocol when neither **cisco** or **t38** is specified. The value is taken from the global configuration by default.

Defaults

Default is **fax protocol system**.

Command Modes

Dial-peer configuration

Command History

Release	Modification
Release 12.1(3)T	This command was introduced on the Cisco 2600 series routers, Cisco 3600 series routers, Cisco 7200 series and Cisco MC3810 concentrators.

Usage Guidelines

Use the **fax protocol t38** command to configure T.38 Fax Relay for a specific dial peer. The **t38** keyword enables the T.38 Fax Relay protocol. The **cisco** keyword selects the original Cisco proprietary fax protocol. When the **system** keyword is selected in the dial peer, it specifies the global default fax protocol used by a dial peer, set by the **fax protocol t.38** command. Optional parameters **ls_redundancy** and **hs_redundancy** are used to send redundant T.38 fax packets.

Note The **ls_redundancy** and **hs_redundancy** parameters are applicable only to T.38 Fax Relay protocol.

The **ls_redundancy** refers to data redundancy in the low-speed V.21 based T.30 fax machine protocol. For the **ls_redundancy**, the *value* can be from 0 to 5. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay.

The **hs_redundancy** refers to data redundancy in the high-speed V.17, V.27, and V.29 T.4 or T.6 fax machine image data. For the **hs_redundancy**, the *value* can be from 0 to 2. The default is 0 (no redundancy). The parameter *value* sets the redundancy factor for the T.38 Fax Relay.

Note Setting the **hs_redundancy** greater than 0 will cause a significant increase in the network bandwidth consumed by the fax call.

Examples

The following example shows T.38 Fax Relay for VoIP in dial-peer configuration mode:

```
Router(config)# dial-peer voice 99 voip
Router(config-dial-peer)# fax protocol t38
```

Related Commands

Command	Description
fax rate	Establishes the rate at which a fax is sent to the specified dial peer.

fax rate

To establish the rate at which a fax is sent to the specified dial peer, use the **fax rate** dial-peer configuration mode command. To reset the dial peer for voice calls, use the **no** form of the command.

fax rate {**12000** | **14400** | **2400** | **4800** | **7200** | **9600**} {**disable** | **voice**} [**bytes** *rate*]

no fax rate

Syntax Description

12000	Specifies a fax transmission speed of 12,000 bits per second (bps).
14400	Specifies a fax transmission speed of 14,400 bps.
2400	Specifies a fax transmission speed of 2400 bps.
4800	Specifies a fax transmission speed of 4800 bps.
7200	Specifies a fax transmission speed of 7200 bps.
9600	Specifies a fax transmission speed of 9600 bps.
disable	Disables Fax Relay transmission capability.
voice	Specifies the highest possible transmission speed allowed by the voice rate. For example, if the voice codec is G.711, fax transmission may occur up to 14400 bps since 14400 bps is less than the 64k voice rate. If the voice codec is G.729 (8k), the fax transmission speed will be 7200 bps.
bytes *rate*	(Optional) Specifies fax packetization rate, in milliseconds. Range is 20 to 48. Default is 20. • For Cisco fax relay, this keyword-argument pair is valid only on Cisco 2600 series, Cisco 3600 series, Cisco 5300, and Cisco 7200 series routers. • For T.38 fax relay, this keyword-argument pair is valid only on Cisco 5350, Cisco 5400, and Cisco 5850 routers. For other routers, the packetization rate for T.38 fax relay is fixed at 40 ms and cannot be changed.

Defaults

Voice calls

Command Modes

Dial-peer configuration mode.

Command History

Release	Modification
11.3(1)T	This command was introduced as **fax-rate** command.
12.0(2)XH	The fax transmission rate of 12000 was added.
12.0(4)T	This command was supported on the Cisco MC3810.
12.1(3)T	The command name changed from **fax-rate** command to **fax rate** command (non-hyphenated).

Usage Guidelines

Use the **fax rate** command to specify the fax transmission rate to the specified dial peer.

The values for this command apply only to the fax transmission speed and do not affect the quality of the fax itself. The higher transmission speed values (14,400 bps) provide a faster transmission speed but monopolize a significantly large portion of the available bandwidth. The lower transmission speed values (2400 bps) provide a slower transmission speed and use a relatively smaller portion of the available bandwidth.

Note The fax call will not get compressed using the **ip rtp header-compression** command, because User Datagram Protocol (UDP) is being used and not Real-time Transport Protocol (RTP). For example, 9600 fax call will take about 24 kbps.

If the fax rate transmission speed is set higher than the codec rate in the same dial peer, the data sent over the network for fax transmission will be above the bandwidth reserved for Resource Reservation Protocol (RSVP).

Tip Because a large portion of the available network bandwidth will be monopolized by the fax transmission, Cisco does not recommend setting the fax rate value higher than the value of the selected codec. If the fax rate value is set lower than the codec value, faxes will take longer to send but will use less bandwidth.

The **voice** keyword specifies the highest possible transmission speed allowed by the voice rate. For example, if the voice codec is G.711, the fax transmission may occur up to 14400 bps since 14400 bps is less than the 64k voice rate. If the voice codec is G.729 (8k), the fax transmission speed will be 7200 bps.

Examples

The following example shows a fax rate transmission speed of 9600 bps for faxes sent using a dial peer:

```
Router(config)# dial-peer voice 100 voip
Router(config-dial-peer)# fax rate 9600
```

The following example sets a fax rate transmission speed at 12000 bps and the packetization rate at 20 milliseconds:

```
Router(config-dial-peer)# fax rate 12000 bytes 20
```

Related Commands

Command	Description
codec (dial-peer)	Specifies the voice coder rate of speech for a dial peer.
fax protocol (dial-peer)	Specifies the fax protocol for a specific VoIP dial peer.

voice service

To enter the voice-service configuration mode and specify the voice encapsulation type, use the **voice service** global configuration command. To exit the voice-service configuration mode, use the **exit** command.

voice service voip

Syntax Description

voip	Specifies Voice over IP parameters.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(1)XA	This command was introduced for VoATM on the Cisco MC3810 concentrators.
12.1(2)T	This command was implemented in Cisco IOS Release 12.1(2)T on the Cisco MC3810 concentrators.
12.1(3)T	This command was implemented in Cisco IOS Release 12.1(3)T for VoIP on the Cisco 2600 series routers, Cisco 3600 series routers, Cisco 7200 series and Cisco MC3810 concentrators.

Usage Guidelines

Use the **voice service** command to switch to the voice-service configuration mode from the global configuration mode and to specify a voice encapsulation type. Use the **exit** command to exit the voice-service configuration mode and return to the global configuration mode.

Examples

The following example shows how to access the voice-service configuration mode and specify VoIP parameters, beginning in global configuration mode:

```
Router(config)# voice service voip
Router(config-voice-service)#
```

Related Commands

Command	Description
modem passthrough	Configures modem pass through over VoIP.
fax protocol	Specifies the global default fax protocol for all the VoIP dial peers.

Glossary

ANI—Automatic Number Identification (ANI) is a service that provides the receiver of a telephone call with the number of the calling phone. The service is often provided by sending the digital tone multi frequency (DTMF) tones with the call. Users of ANI can screen callers with this information.

DSP—digital signal processor.

H.235—H.235 provides security for the RAS signaling between H.323 endpoints and gatekeepers so that only duly authenticated and authorized endpoints are able to use Gatekeeper resources.

H.323—ITU-T Recommendation for "Visual Telephony System" and equipment for local area networks which provide a non-guaranteed quality of service.

HCM—High-density Compression Module.

MCM—Multimedia Conference Manager.

OLC—Open Logical Channel.

RSVP—Resource Reservation Protocol.

T.30—ITU-T Recommendation for analog phone line Group 3 facsimile terminals.

T.38 Fax—ITU-T Recommendation for T.38 describes the features necessary to transfer facsimile documents in real-time between two standard Group 3 facsimile terminals over the Internet or other networks by using IP protocols. The recommendation allows the use of either TCP or UDP depending on the service environment.

VCM—Voice Compression Module.