



T.37/T.38 Fax Gateway for Cisco 2600 Series Routers and Cisco 3600 Series Routers

Feature History

Release	Modification
12.1(3)XI	This feature was introduced on the Cisco AS5300 Universal Access Server.
12.1(5)T	This feature was integrated into the Cisco IOS Release 12.1(5)T and was supported on the Cisco AS5300 Universal Access Server.
12.1(5)XM	Support was added for the Cisco AS5800 Universal Access Server.
12.1(5)XM2	Support was added for the Cisco AS5350 and Cisco AS5400 Universal Access Servers.
12.2(2)XB1	This feature was implemented on the Cisco AS5850 Universal Access Server.
12.2(8)T	The T.37/T.38 Fax Gateway feature was support on the Cisco 2600 series and Cisco 3600 series routers.

This document describes the T.37/T.38 Fax Gateway feature for the Cisco 2600 series and Cisco 3600 series routers in Cisco IOS Release 12.2(8)T. This document includes the following sections:

- [Feature Overview, page 2](#)
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Feature Overview

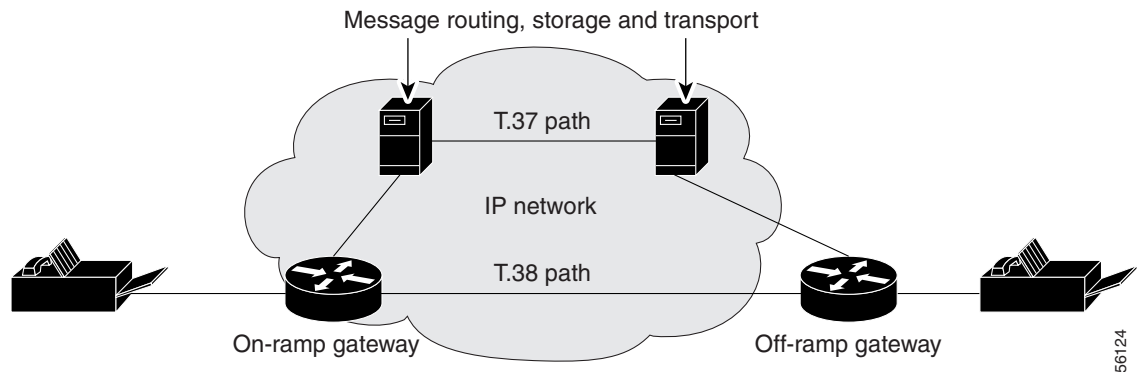
This feature adds fax detection and Store-and-Forward Fax to the Cisco 2600 series and Cisco 3600 series routers. Store-and-Forward Fax, previously documented in the *Cisco IOS Multiservice Applications Configuration Guide*, enables Cisco 2600 series routers and Cisco 3600 series routers to send and receive faxes across packet-based networks. When equipped with Digital and Analog voice network modules, these routers support configuration of the T.37/T38 Fax Gateway. Supported network modules are NM-HDV with voice interface cards (VIC) for Digital T1 connections and Voice 2V with voice interface cards (VIC) FXS for Analog connections. VWIC and VIC FXS are the voice interface cards within the network modules.

Voice network modules installed in Cisco 2600 series or Cisco 3600 series routers convert telephone voice signals into data packets that can be transmitted over an IP network. VWICs/VICs work with existing telephone and fax equipment, and are compatible with H.323 standards for audio and video conferencing.

When the Cisco 2600 series or Cisco 3600 series is equipped with network modules, it supports carrier-class Voice over IP (VoIP) and fax over IP services. Since the Cisco 2600 series routers and Cisco 3600 series routers are H.323 compliant, they support a family of industry-standard voice codecs and provide echo cancellation and Voice Activity Detection (VAD)/silence suppression. There is an Interactive Voice Response (IVR) application that provides voice prompts and digit collection in order to authenticate the user and identify the call destination.

Figure 1 highlights the real-time (T.38 path) versus the Store-and-Forward processing (T.37 path) for fax transactions over IP networks.

Figure 1 Real-time versus Store-and-Forward Fax Processing



Previously, fax over IP used a proprietary protocol and an H.323 connection, represented by the T.37 path in the diagram. The T.37 path used the Extended Simple Mail Transfer Protocol (ESMTP) store-and-forward method. The on-ramp gateway router accepted fax data from the PSTN or a fax machine connected to the analog line.

The router converted the fax data into a TIFF attachment in a MIME e-mail message and transmitted the attachment to a store-and-forward SMTP server. These servers would deliver the faxmail message to the off-ramp gateway router. Once the off-ramp gateway router received the faxmail message, it processed the message and initiated a session with the destination fax machine.

The T.38 path will take precedence over the T.37 path whenever possible. This means that as a fax session is being set up, the sending gateway will first communicate using the T.38 path. If the communication fails, the sending gateway will rollover to the Cisco T.37 path if it is configured to rollover.

**Note**

It is strongly recommended that the Cisco 2600 series and Cisco 3600 series packet filters be configured to accept only incoming SMTP connections from trusted mailers (off-ramp gateway).

To configure Store-and-Forward Fax, the VoIP software component must be installed and functional on the Cisco 2600 series routers and Cisco 3600 series routers.

Using Interactive Voice Response for Call Processing

Interactive Voice Response (IVR) applications control calls in the T.37/T.38 Fax Gateway. They can be assigned to specific ports or invoked based on DNIS and accommodate many gateway services by customizing the presentation of the interfaces to callers.

IVR uses Tool Control Language (TCL) scripts to gather information. For example, a TCL script plays when the caller receives a voice-prompt to enter a specific type of information, such as a PIN. After the caller inputs the PIN, TCL collects the digits and forwards the digits to the server for storage and retrieval.

**Note**

All IVR scripts are modified and secured with a proprietary Cisco locking mechanism. Only Cisco internal technical support personnel can open and modify these scripts.

Benefits

Cost Savings and Port Density

The cost of maintaining two architectures, one for voice and one for fax, is eliminated. Service providers can use a single port for both voice, fax relay, and Store-and-Forward Fax. For smaller points of presence, the single-port configuration for both technologies is even more significant because mixed traffic can be handled more efficiently (only a single pool of ports versus splitting traffic across two pools).

Single Number for Voice and Fax Access

Service providers can offer the new service of a single number for subscriber voice and fax access. The applications that use a single number for voice and fax require only half as many Dialed Number Identification Service (DNIS) numbers and dial peers as would be required with separate voice and fax applications.

Switch from Fax Relay to Fax Store-and-Forward

Service providers can offer applications that require toggling from voice to fax.

Restrictions

The Cisco gateway must be equipped with 128 MB of Random Access Memory (RAM).

The Cisco 3660 gateway must be equipped with 256 MB of Random Access Memory (RAM) in the following situations:

- When a maximum of 192 Store-and-Forward Fax simultaneous sessions is required.
- If Interactive Voice Response (IVR) Version 2.0 is required.

Related Features and Technologies

Store-and-Forward Fax and Fax Relay make use of and are related to the following features and technologies:

- Dial peers
- Destination Patterns and Prefixes
- Number Expansion
- Cisco Voice over IP (VoIP)
- Interactive Voice Response (IVR)
- Authentication, Authorization, and Accounting (AAA) security services
- RADIUS security server protocol

Related Documents

For more information about voice configuration, see the following Cisco IOS Release 12.2 guides:

- *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2
- *Cisco IOS Voice, Video, and Fax Command Reference*, Release 12.2

For related information on this feature, refer to the following documents:

- *Cisco IOS Multiservice Applications Configuration Guide*, Release 12.1
- *Cisco IOS Multiservice Applications Command Reference*, Release 12.1
- *Cisco IOS Security Configuration Guide*, Release 12.2
- *Cisco IOS Security Command Reference*, Release 12.2

The following online feature documentation and installation guides describe the configuration and installation of hardware components:

- For information about installing Cisco 2600 series hardware, see the documents listed at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis2600/index.htm

- For information about installing Cisco 3600 series hardware, see the documents listed at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3600/index.htm

Supported Platforms

- Cisco 2600
- Cisco 3600

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Supported Standards, MIBs, and RFCs

Standards

- ITU-T.37—*Procedures for the Transfer of Facsimile Data Via Store-and-forward on the Internet*, June 1998
- ITU-T.38—*Procedures for Real-time Group 3 Facsimile Communication over IP Networks*, June 1998
- ITU-T.38—*Procedures for Real-time Group 3 Facsimile Communication over IP Networks, Amendment 1*, April 1999
- ITU-T.38—*Revised Annex B of Recommendation T.38*, November 1998

MIBs

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

RFCs

- RFC 821, *Simple Mail Transfer Protocol*
- RFC 822, *Standard for the Format of ARPA Internet Text Messages*
- RFC 1652, *SMTP Service Extension for 8bit-MIME Transport*

- RFC 1869, *SMTP Service Extensions*
- RFC 1891, *SMTP Service Extension for Delivery Status Notifications*
- RFC 1892, *The Multipart/Report Content Type for the Reporting of Mail System Administrative Messages*
- RFC 1893, *Enhanced Mail System Status Codes*
- RFC 1894, *An Extensible Message Format for Delivery Status Notifications*
- RFC 1896, *The Text/Enriched MIME Content-Type*
- RFC 2034, *SMTP Service Extension for Returning Enhanced Error Codes*
- RFC 2045, *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*
- RFC 2046, *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*
- RFC 2047, *MIME (Multipurpose Internet Mail Extensions) Part Three: Message Header Extensions for Non-ASCII Text*
- RFC 2197, *SMTP Service Extension for Command Pipelining*
- RFC 2298, *An Extensible Message Format for Message Disposition Notifications*
- RFC 2301, *File Format for Internet Fax*
- RFC 2302, *Tagged Image File Format (TIFF) - Image/TIFF MIME Sub-Type Registration*
- RFC 2303, *Minimal PSTN Address Format in Internet Mail*
- RFC 2304, *Minimal Fax Address Format in Internet Mail*
- RFC 2305, *A Simple Mode of Fax Using Internet Mail*
- RFC 2532, *Extended Facsimile Using Internet Mail*

Store-and-Forward Fax is also compliant with the SMTP requirements in RFC 1123, *Requirements for Internet Hosts—Application and Support*.

Prerequisites

Before configuring the T.37/T.38 Fax Gateway on a Cisco 2600 series or Cisco 3600 series router, the following task must be completed:

- [Configuring the Fax Gateway to Support IVR](#)

Configuration Tasks

The configuration tasks that must be performed are:

- [Configuring the Fax Gateway to Support IVR](#)
- [Enabling T.37 Functionality](#)
- [Configuring IVR Functionality](#)
- [Configuring the On-Ramp Gateway](#)
- [Configuring the Off-Ramp Gateway](#)
- [Configuring the Gateway Security](#)
- [Configuring MDN](#)
- [Configuring DSN](#)

Configuring the Fax Gateway to Support IVR

Before configuring the Cisco gateway to support IVR, perform the following:

- Configure VoIP to support H.323-compliant gateways, including specific devices in the network to act as gateways, such as configuring dial peers and voice ports.
- Configure a TFTP or RTSP server to perform storage and retrieval of the required audio files.
- Download the appropriate classic or TCL IVR script from the CCO Software Support Center. Use the **copy** command to copy the audio file (.au file) to Flash memory, and the **audio-prompt load** command to read it into RAM.
- Ensure that the audio files are in the proper format. The IVR prompts require audio file (.au) format with 8-bit, u-law, and 8-kHz encoding. To encode the audio files, we recommend that one of these two audio tools (or a similar tool of comparable quality) be used:
 - Cool Edit, manufactured by Syntrillium Software Corporation.
 - AudioTool, manufactured by Sun Microsystems.
- Ensure that the access platform has a minimum of 16 MB of Flash memory and 128 MB of DRAM.
- Install and configure the appropriate RADIUS security server in the network. The version of RADIUS must be able to support IETF-Supported VSAs, which are implemented by using IETF RADIUS Attribute 26.

Enabling T.37 Functionality

To enable T.37 functionality, use the following command in global configuration mode:

Command	Purpose
Router(config)# fax interface-type { fax-mail }	Enables T.37 functionality for Cisco 2600 series and Cisco 3600 series.

Configuring IVR Functionality

To configure IVR functionality using either classic or TCL scripts, perform the following:

- Create an application that interacts with the appropriate classic or TCL script. Use **show call application voice** to view the contents of the TCL IVR script.
- Define and pass the defined parameter values to the application. Depending on the selected TCL script, these values can include the language of the audio file and the location of the audio file. [Table 1 on page 9](#) lists the required TCL scripts and the parameter values.
- Associate the application to the incoming POTS dial peer.
- Define the appropriate method lists using AAA so that RADIUS is identified as the security protocol performing accounting.

To configure IVR functionality, use the following commands, beginning in privileged EXEC mode:


	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode.
Step 2	Router(config)# call application voice <i>application-name location</i>	Defines the name to be referenced and indicates the URL of the IVR script to be used.
		 <p>Note The <i>application-name</i> is a user-defined name which, once defined, is referenced in all other IVR commands except for application, which is used with the on-ramp MMOIP dial peer.</p>
Step 3	Router(config)# call application voice <i>application-name set-location language category location</i>	(Optional) Defines the location, language, and category of the audio files and passes that information to the application.
Step 4	Router(config)# aaa new-model	(Optional) Enables AAA security and accounting services.
Step 5	Router(config)# gw-accounting h323	(Optional) Enables gateway-specific H.323 accounting.
Step 6	Router(config)# aaa authentication login h323 radius	(Optional) Defines a method list called h323 where RADIUS is defined as the only method of login authentication.
Step 7	Router(config)# aaa accounting connection h323 start-stop radius	(Optional) Defines a method list called h323 where RADIUS is used to perform connection accounting, providing start-stop records.
Step 8	Router(config)# radius-server host ip-address auth-port number acct-port number	(Optional) Identifies the RADIUS server and the ports that is used for authentication and accounting services.
Step 9	Router(config)# radius-server key key	(Optional) Specifies the password used between the gateway and the RADIUS server.
Step 10	Router(config)# dial peer voice number pots	Changes mode to dial peer configuration.
Step 11	Router(config-dial-peer)# port port number	Defines the voice port associated with the POTS dial peer.
Step 12	Router(config-dial-peer)# ctrl + z	Exits to privileged EXEC mode.

Table 1 lists the required TCL scripts for fax applications on T.37 functionality.

Table 1 Required TCL Scripts for T.37

TCL Script Name	Description —Summary	Commands to Configure
app_libretto_onramp9.tcl	Authenticates the account and PIN using the following: prompt-user, ANI, DNIS, gateway ID, redialer ID, and redialer DNIS.	None
app_libretto_offramp5.tcl	Authenticates the account and PIN using the following: envelope-from, envelope-to, gateway ID, and x-account ID.	None
fax_rollover_on_busy.tcl	Used for on-ramp T.38 fax rollover to T.37 fax when the destination fax line is busy.	voice hunt user-busy

Use the following commands to verify the IVR configuration:

- **Show running configuration** – verifies the configuration parameters.
- **Show call application voice summary** – displays a list of all voice applications.
- **Show call application voice** – shows the contents of the script.
- **Show dial-peer voice** – verifies that dial peer is operational.

Configuring the On-Ramp Gateway

When acting as the on-ramp gateway, the Cisco gateway receives faxes from end users, converts them into TIFF files, creates standard MIME e-mail messages, attaches the TIFF files to the e-mail messages, and forwards the fax-mail messages to the designated SMTP server for storage.

The gateway uses the sending MTA and dial peers to complete these tasks. The sending MTA, which is the Cisco gateway, defines delivery parameters associated with the e-mail message to which the fax TIFF file is attached. The delivery parameters include defining a return e-mail path or designating a destination mail server.

To configure the on-ramp gateway, perform the tasks described in the following sections:

- [Configuring the Called Subscriber Number](#)
- [Configuring the Sending MTA](#)
- [Configuring the POTS Dial Peer](#)
- [Configuring the MMoIP Dial Peer](#)
- [Verifying the On-Ramp Gateway Configuration](#)

Configuring the Called Subscriber Number

The called subscriber number is the number displayed in the LCD of the fax device when a fax is sent to a recipient. Typically, with a standard Group 3 fax device, this is the telephone number associated with the receiving fax device. To configure the called subscriber number, use the following commands beginning in privileged EXEC mode:

	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode.
Step 2	Router(config)# fax receive called-subscriber { \$d\$ <i>string</i> }	Defines the number that is displayed in the LCD of the sending fax machine. This parameter defines the called subscriber identification (CSI).



Note Not all fax machines support this feature.

Configuring the Sending MTA

MTAs define the elements of the e-mail message to which the fax TIFF file is attached, which includes:

- Originator
- Subject of the message
- Destination mail server
- Return path
- Postmaster (default mail station for undeliverable messages)
- E-mail header information
- Address to which any disposition notices are sent



Note The **mta send mail-from username** and **mta send mail-from hostname** commands configure the From: username. The To: address is configured with **session target** and is the on-ramp gateway MMoIP dial peer.

To configure the sending MTA, use the following commands in global configuration mode:

Command	Purpose
Step 1 Router(config)# mta send mail-from <i>hostname string</i>	<p>Specifies the originator (host name) of the e-mail fax message. This information appears in the RFC 822 From: field and the RFC 821 MAIL FROM field of the e-mail fax message. This information is also used for generating DSNs.</p> <p>When the mta send mail-from hostname command is configured, the configured host name is used with the mta send mail-from username command to form a complete e-mail address, like faxuser@onramp-gateway.com.</p>
Step 2 Router(config)# mta send mail-from { <i>username string</i> username \$s\$ }	<p>Specifies the originator (username portion) of the e-mail fax message. This information appears in the RFC 822 From: field and the RFC 821 MAIL FROM field of the e-mail fax message. This information is also used for generating DSNs.</p> <p>When the mta send mail-from username command is configured, the configured username is used with the mta send mail-from hostname command to form a complete e-mail address, like faxuser@onramp-gateway.com.</p>
Step 3 Router(config)# mta send server { <i>host-name</i> <i>IP-address</i> }	<p>Specifies the destination server.</p> <p>DNS MX records are not used to determine the IP address of the host specified with the mta send server command.</p>
Step 4 Router(config)# mta send subject <i>string</i>	<p>Defines the text that appears in the Subject field of the e-mail fax message.</p>
Step 5 Router(config)# mta send postmaster <i>e-mail-address</i>	<p>Defines address to be used as the mta send mail-from address if the evaluated string is blank. An address such as fax-administrator@example.com is recommended (where company.com is replaced with the domain name, and fax-administrator is aliased to the person responsible for the operation of the Cisco gateway fax functions).</p> <p>At some sites this may be the same person as the e-mail postmaster, but at most sites this is likely to be a different person.</p>
Step 6 Router(config)# mta send origin-prefix <i>string</i>	<p>(Optional) Defines additional identifying information to be prepended to the e-mail header.</p>
Step 7 Router(config)# mta send return-receipt-to { <i>hostname string</i> <i>username string</i> }	<p>(Optional) Specifies the address where MDNs are sent.</p>

Configuring the POTS Dial Peer

To configure the POTS dial peer, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> pots	Defines the POTS dial peer tag number and enters dial-peer configuration mode.
Step 2	Router(config-dial-peer)# application <i>name</i>	Associates a specific IVR application with this dial peer. The out-bound keyword is not used with the POTS dial peers, but is used in the MMoIP dial peer configuration. This name must match the application name set when configuring the IVR functionality.
Step 3	Router(config-dial-peer)# information-type fax	Identifies calls associated with this dial peer as fax transmissions, rather than voice calls. The voice calls feature cannot be used on the FSX port.
Step 4	Router(config-dial-peer)# incoming called-number <i>string</i>	(Optional) Defines the telephone number associated with the POTS dial peer. In Store-and-Forward Fax, if DID is enabled, the incoming called number (DNIS number) is used to match the destination pattern of outgoing MMoIP dial peers.
Step 5	Router(config-dial-peer)# port <i>voice-port-number</i>	Specifies the voice port through which the outgoing fax calls for this dial peer are routed.
Step 6	Router(config-dial-peer)# max-conn <i>number</i>	(Optional) Defines the maximum number of on-ramp connections used simultaneously on this Cisco gateway to send fax-mail.
Step 7	Router(config-dial-peer)# exit	Exits dial-peer configuration mode.

Configuring the MMoIP Dial Peer

To configure the MMoIP dial peer, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> mmoip	Defines the MMoIP dial peer tag number and enters dial-peer configuration mode.
Step 2	Router(config-dial-peer)# application <i>name</i> [out-bound]	Associates a specific IVR application with this dial peer. If the out-bound keyword is used, the named application handles the MMoIP dial peer in the outgoing mode.
Step 3	Router(config-dial-peer)# destination-pattern [+] <i>string</i>	Identifies the destination fax telephone number. If DNIS has been enabled, this number should be the same as the configured incoming called number. If DNIS is not enabled, this should be the number from the redialer DNIS.
Step 4	Router(config-dial-peer)# session target { mailto: { <i>name</i> \$d\$ }@ domain-name ipv4: <i>destination-address</i> dns: { \$s\$. \$d\$. \$u\$. \$e\$.} <i>host-name</i> loopback:rtp loopback:compressed loopback:uncompressed }	Defines the destination e-mail address for the fax-mail, which is the e-mail address identifying the SMTP server.
Step 5	Router(config-dial-peer)# session protocol smtp	Identifies the session protocol being used between the on-ramp gateway and the remote mail server as SMTP.

	Command	Purpose
Step 6	Router(config-dial-peer)# image encoding { mh mr mmr passthrough }	Selects a specific encoding method for the fax-mail messages forwarded using this dial peer.
Step 7	Router(config-dial-peer)# image resolution { fine standard super-fine passthrough }	Selects a specific resolution for the TIFF images attached to the fax-mail message forwarded using this dial peer.
Step 8	Router(config-dial-peer)# max-conn <i>number</i>	(Optional) Defines the maximum number of connections used simultaneously on this Cisco gateway to send fax-mail.
Step 9	Router(config-dial-peer)# dsn { delay failure success }	(Optional) Requests that a delivery status notification (DSN) be generated by the last hop mailer if the delivery was successful. This DSN is sent to the address specified by the mta send mail-from command. Three types of DSNs can be requested: delay, failure, and success. DSN must be supported by the remote mail server.
Step 10	Router(config-dial-peer)# mdn	(Optional) Requests that a message disposition notification (MDN) be generated by the mail user agent when the message is processed (typically opened or read). The MDN is generated by the receiving mail user agent and sent to the address defined by the mta send return-receipt-to command. Return receipt must be supported and initiated by the receiving e-mail client.
Step 11	Router(config-dial-peer)# exit	Exits dial-peer configuration mode.

Verifying the On-Ramp Gateway Configuration

To verify the on-ramp gateway configuration, perform the following:

- Use **debug fmsp send t30** to verify the configured called-subscriber number.
- Check the configured called subscriber number by sending a fax and checking the number in the sending machine LCD if the fax machine is equipped with an LCD.



Note Not all fax machines support this feature.

- Use **show dialplan number fax** to verify that Store-and-Forward Fax dial peers have been configured correctly.
- Use **debug fmsp receive all** to display Class 2 fax tracing information on all on-ramp fax connections.
- Use **debug foip onramp** to monitor the event and decode the tear down.
- Use **debug mta send all** to display output for all of the on-ramp client connections (messages exchanged, for example, the handshake) between the e-mail server and the on-ramp gateway.
- Use **debug mta send rcpt-to** to display output for a specific on-ramp SMTP client connection during e-mail transmission.
- Test connectivity between the on-ramp gateway and the e-mail server by sending a test e-mail to a specified e-mail address and using **debug mmoip send email**.
- Make a POTS call and listen for a secondary dial tone to determine if DID is enabled or disabled. If DID is disabled, the server presents a dial tone to collect the digits.



Note This step only refers to configuring the T1 port. DID cannot be enabled on the FSX port.

Configuring the Off-Ramp Gateway

Off-ramp faxing requires that the Cisco gateway act as an off-ramp gateway to dial the POTS and communicate with a remote fax machine (Group 3 fax device), using standard fax protocols. The off-ramp gateway provides the following functionality:

- Converts a fax-mail TIFF file (or plain text file) into a standard format and delivers it to the recipient. Store-and-Forward Fax does not alter the TIFF or plain text file in any way from its original format when converting it into a standard fax format. The off-ramp gateway uses the receiving MTA and dial peers to perform the conversion.
- Delivers an e-mail message as a standard fax transmission. The Cisco gateway generates information that is appended to the top of each faxed page (text-to-fax pages) and creates a fax cover sheet. The off-ramp gateway uses the receiving MTA, dial peers, and commands specific to formatting the appended information and generating a fax cover sheet to deliver e-mail messages as fax transmissions.
- Uses only POTS dial peers to define the line characteristics between the forwarding off-ramp gateway and the fax device. As an option, the MMoIP dial peers can be configured to define fax compression schemes and resolution. This option is useful only if those parameters are to be altered for the received fax-mails.

- Defines the parameters associated with the gateway SMTP server, using the receiving MTAs. This can be its SMTP host aliases, which can be different than its normal DNS host names, or internal Cisco IOS host name.

**Note**

Off-ramp faxing activities are not mutually exclusive. An e-mail can be sent as a fax and a TIFF file can be attached to it. When the Cisco gateway converts the e-mail to fax format, it also converts the attached TIFF file to standard Group 3 fax format.

The off-ramp POTS dial peer defines the telephone number of the destination fax device. Because a destination pattern is defined for an outbound POTS peer, number expansion can be used.

To configure the off-ramp gateway, perform the tasks in the following sections:

- [Configuring the Transmitting Subscriber Number](#)
- [Configuring the Fax Transmission Speed](#)
- [Configuring the Receiving Mail Transfer Agent](#)
- [Configuring the POTS Dial Peer](#)
- [Configuring the MMoIP Dial Peer](#)
- [Configuring the Faxed Header Information](#) (fax transmission originates as an e-mail message)
- [Configuring the Fax Cover Page Information](#) (fax transmission originates as an e-mail message)
- [Verifying the Off-Ramp Gateway Configuration](#)

Configuring the Transmitting Subscriber Number

You can configure the off-ramp gateway to convert a fax TIFF file to a standard fax or send an e-mail message as a fax by configuring the transmitting subscriber number.

The transmitting subscriber number is displayed in the LCD of the receiving fax device. Typically, with a standard Group 3 fax device, this is the telephone number associated with the transmitting or sending fax device.

To configure the transmitting subscriber number, use the following commands beginning in privileged EXEC mode:

	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode.
Step 2	Router(config)# fax send transmitting-subscriber { \$d\$ <i>string</i> }	Defines the number that appears in the LCD of the receiving fax device. This parameter defines the transmitting subscriber identification (TSI).

Configuring the Fax Transmission Speed

You can control the maximum speed of the fax transmission if the off-ramp gateway is sending faxes into an area where the fax transmission speed is always negotiated down to a slower speed.

To configure the fax transmission speed, use the following command in global configuration mode:

Command	Purpose
Router(config)# fax send max-speed {2400 4800 9600 12000 14400}	Specifies the maximum speed at which an off-ramp fax is sent.

Configuring the Receiving Mail Transfer Agent

To configure the receiving MTA, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# mta receive aliases <i>string</i>	<p>Defines a host name to be used as an alias for the off-ramp Cisco gateway device. You can define up to ten different aliases.</p> <p>The Cisco gateway SMTP server only accepts incoming mail if the destination host name of the incoming mail matches one of the aliases that has been configured by the mta receive aliases command.</p> <p>This command does not automatically include reception for a domain IP address—it must be explicitly added. If you add an IP address, you must enclose the address in brackets as follows: [xxx.xxx.xxx.xxx].</p>
Step 2	Router(config)# mta receive generate-mdn	(Optional) Configures the Cisco gateway to generate an MDN message when requested to do so. You can enable or disable this feature depending on the types of mailers in use.
Step 3	Router(config)# mta receive maximum-recipients <i>number</i>	Defines the number of simultaneous SMTP recipients handled by this device. This is intended to limit the number of resources allocated for fax transmissions.

Configuring the POTS Dial Peer

To configure the POTS dial peer for the off-ramp gateway, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> pots	Defines the POTS dial peer tag number and enters dial-peer configuration mode.
Step 2	Router(config-dial-peer)# application <i>name</i>	Associates a specific IVR application with this dial peer. The out-bound keyword is not used with POTS dial peers, but it is used with MMoIP dial peers.
Step 3	Router(config-dial-peer)# destination-pattern <i>[+]string</i>	Identifies the destination fax telephone number.
Step 4	Router(config-dial-peer)# port <i>voice-port-number</i>	Specifies the voice port through which the outgoing fax calls for this dial peer are routed.
Step 5	Router(config-dial-peer)# prefix <i>number</i>	(Optional) Specifies the prefix of the dialed digits associated with this dial peer. If you configure a prefix when an outgoing call is initiated, the prefix <i>string</i> value is added to the telephone interface, before the telephone number that has been configured for this dial peer. This command does not apply to the FSX port.
Step 6	Router(config-dial-peer)# exit	Exits dial-peer configuration mode.

Configuring the MMoIP Dial Peer

To configure the off-ramp gateway MMoIP dial peer, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer voice <i>number</i> mmoip	Defines the MMoIP dial peer tag number and enters dial-peer configuration mode
Step 2	Router(config-dial-peer)# application <i>name</i> [out-bound]	Associates a specific IVR application with this dial peer. If the out-bound keyword is used, the named application uses the MMoIP dial peer in the outgoing mode.
Step 3	Router(config-dial-peer)# information-type fax	Identifies calls associated with this dial peer as fax transmissions, rather than voice calls.
Step 4	Router(config-dial-peer)# incoming called-number <i>string</i>	(Optional) Identifies the destination fax telephone number.
Step 5	Router(config-dial-peer)# image resolution { fine standard super-fine passthrough }	Specifies the fax image resolution for TIFF files associated with this MMoIP dial peer.
Step 6	Router(config-dial-peer)# image encoding { mh mr mmr passthrough }	Specifies the type of encoding to be used for TIFF files associated with this MMoIP dial peer.
Step 7	Router(config-dial-peer)# exit	Exits dial-peer configuration mode.



Note

When configuring the MMoIP dial peer, ensure that the incoming called number command value and the configured destination telephone number (corresponding on-ramp POTS dial peer) match.

Configuring the Faxed Header Information

Store-and-Forward Fax converts standard e-mail messages into fax transmissions. When a fax is sent using a standard Group 3 device, there is usually header information appended to the top of each faxed cover and text page indicating the telephone number of the sending fax device, the date, and the time of transmission. These faxes require that header information is appended to each faxed page.

Store-and-Forward Fax requires that you configure the header information. Also, the destination address of an e-mail message can control the cover page generation on a per-recipient basis.



Note

Because the off-ramp gateway does not alter fax TIFF attachments, the header information cannot be configured for faxes being converted from TIFF files to standard fax transmissions.

To configure faxed header information, use the following commands in global configuration mode:

Command	Purpose
<p>Step 1 Router(config)# fax send center-header {\$a\$ \$d\$ \$p\$ \$s\$ \$t\$ <i>string</i>}</p>	<p>Specifies the header information to be displayed in the center position. The wildcards used in this command are used to insert the following information:</p> <ul style="list-style-type: none"> • \$a\$—date • \$d\$—destination address • \$s\$—sender address • \$p\$—page count • \$t\$—transmission time <p>Use the <i>string</i> argument in this command to insert personalized text string.</p>
<p>Step 2 Router(config)# fax send right-header {\$a\$ \$d\$ \$p\$ \$s\$ \$t\$ <i>string</i>}</p>	<p>Specifies the header information to be displayed on the right. The wildcards used in this command are used to insert the following information:</p> <ul style="list-style-type: none"> • \$a\$—date • \$d\$—destination address • \$s\$—sender address • \$p\$—page count • \$t\$—transmission time <p>Use the <i>string</i> argument in this command to insert personalized text string.</p>
<p>Step 3 Router(config)# fax send left-header {\$a\$ \$d\$ \$p\$ \$s\$ \$t\$ <i>string</i>}</p>	<p>Specifies the header information to be displayed on the left. The wildcards used in this command are used to insert the following information:</p> <ul style="list-style-type: none"> • \$a\$—date • \$d\$—destination address • \$s\$—sender address • \$p\$—page count • \$t\$—transmission time <p>Use the <i>string</i> variable in this command to insert personalized text string.</p>

Configuring the Fax Cover Page Information

The off-ramp gateway can create fax cover pages for faxes that originate from e-mail messages.



Note

Because the off-ramp gateway does not alter fax TIFF attachments, the cover pages cannot be configured for faxes being converted from TIFF files to standard fax transmissions.

To configure fax cover page information, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# fax send coverpage enable	Enables the off-ramp gateway to send a cover sheet with faxes that originate from e-mail messages.
Step 2	Router(config)# fax send coverpage comment <i>string</i>	(Optional) Adds personalized text in the title field of the fax cover sheet.
Step 3	Router(config)# fax send coverpage show-detail	(Optional) Prints all of the e-mail header information as part of the fax cover sheet text.

The destination address of an e-mail message can control the cover page generation on a per-recipient basis. Use the **fax send coverpage e-mail-controllable** command to configure the router to defer to the cover page setting in the e-mail header.

For example, if the address has the cover parameter set to no, the parameter overrides the setting for the **fax send coverpage enable** command, and the off-ramp gateway does not generate a fax cover page. If the address has the cover parameter set to yes, the off-ramp gateway defers the setting configured in the e-mail address and generates a cover page. [Table 2](#) contains examples of what you can enter in the e-mail To: field.

Table 2 To: Field Entry Examples

To: Field Entries	Descriptions
FAX=+1-312-555-3260@fax.com	Fax sent to an E.164-compliant long distance telephone number in the United States. If the fax coverpage enable command has been configured, Store-and-Forward Fax generates a fax cover page.
FAX=+1-312-555-3260/cover=no@fax.com	Fax sent to an E.164-compliant long distance telephone number in the United States. In this example, the fax coverpage enable command is superseded by the cover=no statement. No cover page is generated.
FAX=+1-312-555-3260/cover=yes@fax.com	Fax sent to an E.164-compliant long distance telephone number in the United States. In this example, the fax coverpage enable command is superseded by the cover=yes statement. Store-and-Forward Fax generates a fax cover page.
FAX=+49-515-555-5637@faxgateway.com	Fax sent to an E.164-compliant long distance telephone number in Germany.
FAX=+61-2-555-8765@fax.host.com	Fax sent to an E.164-compliant long distance telephone number in Australia.
FAX=+33-65-555-5555@fax.com	Fax sent to an E.164-compliant long distance telephone number in France.

To configure the router to defer to the cover page setting in the e-mail header, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# fax send coverpage enable	Enables the off-ramp gateway to send a cover page with faxes that originate from e-mail messages.
Step 2	Router(config)# fax send coverpage e-mail controllable	Configures the router to defer to the cover page setting in the e-mail header. For example, if the address has a parameter set to cover=no or cover=yes, e-mail header overrides the setting for the fax send coverpage enable command.

Verifying the Off-Ramp Gateway Configuration

Perform the following to verify the off-ramp gateway configuration:

- Use **debug fmsp send t30** to check the transmitting subscriber number configuration.
- Use **debug fmsp send all** to display Class 2 fax protocol tracing information for all off-ramp faxing activities.
- Use **debug foip onramp** to monitor the event and decode the tear down.
- Use **debug mta receive all** to view output relating to the activity on the SMTP server (messages exchanged, for example, the handshake) between the e-mail server and the off-ramp gateway.
- Use **debug dmsp doc-to-fax text-to-fax** to view information relating to the off-ramp text-to-fax conversion.
- Use **debug dmspdoc-to-fax tiff reader** to display on-ramp TIFF reader output.
- Use **debug dmsp fax-to-doc tiff writer** to display on-ramp TIFF writer output.

To check whether the fax cover page generates correctly, send an e-mail message to the off-ramp gateway. To check if the fax-mail is processed correctly, request a return receipt in the e-mail message and send a fax-mail using a mail client, such as Eudora to the off-ramp gateway. The destination e-mail address must have the appropriate fax=user@receive alias to be allowed.

Configuring the Gateway Security

To configure gateway security, perform the tasks in the following sections:

- [Configuring On-Ramp Gateway Security](#)
- [Configuring Off-Ramp Gateway Security](#)
- [Configuring the ACLs](#)
- [Configuring the Gateway for TCL Application Files](#)

Configuring On-Ramp Gateway Security

On-ramp security controls who can send fax messages to the network and is facilitated by AAA security services using either RADIUS or TACACS+ as the local security protocol. On-ramp faxing is a client of the authentication server, whether RADIUS or TACACS+. User information is forwarded to the AAA interface, which is then forwarded as an authentication request to the security server.

Authentication must be completed before the first page of faxed material is accepted from the modem by the Fax Application Process (FAP). If a response is not received from the AAA server before the first page is received, the fax modem disconnects the call.

To configure on-ramp security, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# aaa new model	Enables AAA security services.
Step 2	Router(config)# mmoip aaa method fax authentication <i>method-list-name</i>	Defines the name of the method list to be used for Store-and-Forward Fax AAA authentication.
Step 3	Router(config)# mmoip aaa method fax accounting <i>method-list-name</i>	Defines the name of the method list to be used for Store-and-Forward Fax AAA accounting.
Step 4	Router(config)# aaa authentication login { default <i>list-name</i> } <i>method1</i> [<i>method2...</i>]	Creates a local authentication method list and enables authentication.
Step 5	Router(config)# aaa accounting { system network exec connection commands level } { default <i>list-name</i> } { stop-only } [<i>method1</i> [<i>method2...</i>]]	Creates an accounting method list and enables accounting. We recommend the following configuration: aaa accounting connection list-name stop-only .
Step 6	Router(config)# radius-server host { <i>hostname</i> <i>ip-address</i> } [auth-port <i>port-number</i>] [acct-port <i>port-number</i>]	Specifies the IP address or host name of the remote RADIUS server host and assigns authentication and accounting destination port numbers. Typical authentication and accounting destination ports are 1645 and 1646.
Step 7	Router(config)# radius-server key <i>string</i>	Specifies the shared secret text string used between the router and the RADIUS server.
Step 8	Router(config)# radius-server vsa send accounting	Enables the network universal access server to recognize and use accounting Vendor-Specific Attributes (VSAs) as defined by RADIUS IETF attribute 26.
Step 9	Router(config)# radius-server vsa send authentication	Enables the network universal access server to recognize and use authentication VSAs as defined by RADIUS IETF attribute 26.

Configuring Off-Ramp Gateway Security

Off-ramp security controls who can send outgoing fax messages and is facilitated by AAA security services using either RADIUS or TACACS+. Authentication begins as soon as a fax e-mail message header is received from the e-mail server on the off-ramp gateway. The Cisco AS5300 Universal Access Server does not dial the destination fax device until authentication for each fax-mail is successfully completed.

The on-ramp gateway inserts the value that was configured for the **mmoip aaa receive-id primary** command in the X-account-ID field of the e-mail header. This X-account ID field contains the value that is used for authentication and accounting by the on-ramp gateway.

For example, if the **mmoip aaa receive-id primary** command is set to **gateway**, the on-ramp gateway name (for example, hostname.domain-name) is inserted in the X-account-ID field of the e-mail header of the fax-mail message.

If the configured gateway value in the X-account-ID field should be used, the **mmoip aaa send-id primary** command must be configured with the **account-id** keyword. This keyword enables Store-and-Forward Fax to generate end-to-end authentication and accounting tracking records. If authentication is not configured on the on-ramp gateway, the X-account-ID field is left blank.



Note

We recommend that Access Control Lists (ACLs) be configured to restrict which IP addresses can connect to the SMTP port (port 25). For information about configuring ACLs, refer to the *Cisco IOS Security Configuration Guide*.



Note

We recommend that the Cisco AS5300 Universal Access Server be configured to act as an off-ramp gateway and only accept incoming SMTP connections from trusted mailers. Configure packet filters to permit only certain trusted IP addresses to send faxes to the Store-and-Forward Fax off-ramp gateway.

To configure off-ramp security, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# aaa new model	Enables AAA security services.
Step 2	Router(config)# mmoip aaa method fax authentication method-list-name	Defines the name of the method list to be used for Store-and-Forward Fax AAA authentication.
Step 3	Router(config)# mmoip aaa method fax accounting method-list-name	Defines the name of the method list to be used for Store-and-Forward Fax AAA accounting.
Step 4	Router(config)# aaa authentication login {default list-name} method1 [method2...]	Creates a local authentication method list and enables authentication.
Step 5	Router(config)# aaa accounting {system network exec connection commands level} {default list-name} {stop-only} [method1 [method2...]]	Creates an accounting method list and enables accounting. We recommend that aaa accounting connection list-name stop-only be used.
Step 6	Router(config)# radius-server host {hostname ip-address} [auth-port port-number] [acct-port port-number]	Specifies the IP address or host name of the remote RADIUS server host and assigns authentication and accounting destination port numbers. Typical authentication and accounting destination ports are 1645 and 1646.
Step 7	Router(config)# radius-server key string	Specifies the shared secret text string used between the router and the RADIUS server.

	Command	Purpose
Step 8	Router(config)# radius-server vsa send accounting	Enables the network universal access server to recognize and use accounting VSAs as defined by RADIUS IETF attribute 26.
Step 9	Router(config)# radius-server vsa send authentication	Enables the network universal access server to recognize and use authentication VSAs as defined by RADIUS IETF attribute 26.

Configuring the ACLs

Incoming ACLs can be used on Ethernet or FastEthernet interfaces to filter SMTP traffic for Store-and-Forward Fax. We recommend that ACLs be configured to restrict access to the SMTP port (port 25) to only trusted e-mail servers.

Creating ACLs is a relatively complicated task and beyond the scope of this document. The following example, though, provides a starting point.

The following example shows how to restrict access to the SMTP port 25 to a trusted e-mail server (IP address 10.0.0.1):

```

! Enter global configuration mode.
configure terminal
!
! Configure ACLs to restrict access to the SMTP port (port 25) to only "trusted"
! e-mail servers. Depending on the topology of your particular network, replace the
! any keyword with the destination IP addresses of the Ethernet and FastEthernet
! interfaces. Define all trusted e-mail servers using the tcp host ip-address
! portion of this command.
access-list 100 permit tcp host 10.0.0.1 any eq smtp
access-list 100 deny tcp any any eq smtp
access-list 100 permit ip any any
!
! Enter interface configuration mode for Ethernet interface 0.
interface ethernet 0
! Apply the access list to this interface.
access-group 100 in
!
! Enter interface configuration mode for FastEthernet interface 0.
interface fastethernet 0
! Apply the access list to this interface.
access-group 100 in
    
```

For complete information about configuring ACLs, refer to the relative chapters in the *Cisco IOS Security Configuration Guide*.

Configuring the Gateway for TCL Application Files

To configure gateway security for the TCL application files being used for fax calls on T.37 functionality, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# call application voice application-name accounting enable	Enables AAA accounting services for the named application.
Step 2	Router(config)# call application voice application-name accounting-list method-list-name	Defines the name of the method list to be used for AAA accounting with fax applications on T.37 functionality.

	Command	Purpose
Step 3	Router(config)# call application voice <i>application-name authentication enable</i>	Enables AAA authentication services for the named application.
Step 4	Router(config)# call application voice <i>application-name authen-list method-list-name</i>	Specifies the name of an authentication method list for the named application.
Step 5	Router(config)# call application voice <i>application-name authen-method id</i>	Specifies the name of the authentication method for the named application. Valid authentication ids are prompt-user, gateway, ani, dnis, redialer-id, and redialer DNIS.

Configuring MDN

One basic e-mail operation that Store-and-Forward Fax supports is MDN (return receipt). Described in RFC 2298, MDN indicates that the e-mail message has been opened. A sender requests that an MDN be returned when the receiver opens an e-mail message.

The MDN is initiated by the sending e-mail client, and the return receipt is generated by the receiving e-mail client. Most PC-based e-mail software applications, such as Eudora, Netscape Messenger, and Microsoft Outlook,) generate MDNs.

The MDN is sent to an address chosen by the sender and the following header is included in the e-mail header of the message:

```
Disposition-Notification-To:
```

This header is followed by the address of the sender.

RFC 2298 requires that the receiver can prevent the automatic generation of an MDN. Because of the requirement, it is difficult to determine whether or not the user has actually received the e-mail message. For example, the recipient can always choose not to respond to MDN requests, or the recipient software cannot understand or accept MDN requests.

To configure MDN for Store-and-Forward Fax, configure the MDN elements on both the on-ramp and off-ramp gateways.

The required tasks are:

- [Configuring the On-Ramp Gateway Elements for MDN](#)
- [Configuring the Off-Ramp Gateway Element for MDN](#)
- [Verifying MDN Configuration](#)

Configuring the On-Ramp Gateway Elements for MDN

To configure the on-ramp gateway to support MDN, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# mta send return-receipt-to username <i>string</i>	Specifies the user name address where MDNs are sent. If this field is left blank, the on-ramp gateway inserts the postmaster address in this field as a default.
Step 2	Router(config)# mta send return-receipt-to hostname <i>string</i>	Specifies the host name address where MDNs are sent. If this field is left blank, the on-ramp gateway inserts the postmaster address in this field as a default.

	Command	Purpose
Step 3	Router(config)# dial-peer voice <i>number</i> mmoip	Defines the MMoIP dial peer tag number and enters dial-peer configuration mode.
Step 4	Router(config-dial-peer)# mdn	Requests that an MDN be sent to the destination(s) defined by the mta send return-receipt-to command.

Configuring the Off-Ramp Gateway Element for MDN

To configure the off-ramp gateway to support MDN, use the following command in global configuration mode:

Command	Purpose
Router(config)# mta receive generate-mdn	Specifies that the Cisco 2600 series or Cisco 3600 series router acting as the off-ramp gateway will respond to a request for an MDN.

Verifying MDN Configuration

Perform the following to verify the MDN configuration:

- Use **show dial-peer voice** and look at the disposition notification field to verify if DSN is enabled or disabled.
- Use **show running-config** to verify that **mta send return-receipt-to username**, **mta send return-receipt-to hostname**, and **mta receive generate-mdn** have been configured.
- Send a fax to the on-ramp gateway. When the destination e-mail account client opens and responds to the MDN request, check the return-receipt-to user account for the MDN response message.
- Send a fax to the off-ramp gateway with MDN requested (return receipt). After the off-ramp gateway has processed the fax-mail message, check the original From user’s account for the MDN response message.

Configuring DSN

DSNs are messages or responses that are automatically generated and sent to the sender or originator of an e-mail message by the SMTP server, notifying the sender of the status of the e-mail message. The on-ramp DSN request is included as part of the fax-mail message sent by the on-ramp gateway when the matching MMoIP dial peer has been configured. The on-ramp DSN response is generated by the SMTP server when the fax-mail message is accepted. The DSN is sent back to the user defined in the **mta send mail-from** command.

The off-ramp DSN is requested by the e-mail client. The DSN response is generated by the off-ramp gateway when it receives a request as part of the fax-mail message. DSNs can only be generated if the mail client on the SMTP server is capable of responding to a DSN request. Because the SMTP server generates the DSNs, you need to configure both the mail from: and rcpt to: commands for the DSN feature to be operational, for example:

```
mail from: <user@mail-server.company.com>
rcpt to: <fax=555-1212@company.com> NOTIFY=SUCCESS,FAILURE,DELAY
```

Three different states can be reported back to the sender as follows:

- Delay—message delivery was delayed.
- Success—message was successfully delivered to the recipient mailbox.
- Failure—SMTP server was unable to deliver the message to the recipient.



Note

Because the delivery states are not mutually exclusive, configure Store-and-Forward Fax to generate the messages for all or any combination of these events.

To configure DSN, use the following commands beginning in global configuration mode:

Command	Purpose
Step 1 Router(config)# mta send mail-from {hostname string}	Specifies the originator (host name portion) of the e-mail fax message. This information appears in the RFC 822 From: field and the RFC 821 MAIL FROM field of the e-mail fax message. This information is also used for generating DSNs. When the mta send mail-from hostname command is configured, the configured host name is used with the mta send mail-from username command to form a complete e-mail address, like faxuser@onramp-gateway.com.
Step 2 Router(config)# mta send mail-from {username string username \$\$}	Specifies the originator (username portion) of the e-mail fax message. This information appears in the RFC 822 From: field and the RFC 821 MAIL FROM field of the e-mail fax message. If the wild card \$\$ is used, a transmission report is sent to the originating fax machine. This information is also used for generating DSNs. When you configure the mta send mail-from username command, the username configured is used with the mta send mail-from hostname command to form a complete e-mail address, like faxuser@onramp-gateway.com.
Step 3 Router(config)# dial-peer voice number mmoip	Defines the MMoIP dial peer tag number and enters dial-peer configuration mode.
Step 4 Router(config-dial-peer)# dsn {delay success failure}	Requests that a DSN be sent to the destination(s) defined by the mta send mail-from command.

Verifying DSN Configuration

Perform the following tasks to verify the DSN configuration:

- Use **show dial-peer voice** and look at the delivery status notification field.
- Use **show running-config** to verify that **mta send mail-from username** and **mta send mail-from hostname** have been configured. If these commands are not configured, the DSN is delivered to the postmaster defined by the **mta send postmaster** command.
- Use **show running-config** to verify that **mta send return-receipt-to username**, **mta send return-receipt-to hostname**, and **mta receive generate-mdn** have been configured.

- Send a fax to the on-ramp gateway. When the destination e-mail server receives the fax-mail message and responds to the DSN request, check the mail-from or postmaster user account for the DSN response message. The mail-from or postmaster user account could be a fax machine.
- Send a fax-mail message to the off-ramp gateway with DSN requested (rcpt to:<fax=555-1212@company.com> NOTIFY=SUCCESS, FAILURE, DELAY). After the off-ramp gateway has processed the fax-mail message, check the original From user's account for the DSN response message.

Configuration Examples

The example covers the T.37 onramp, offramp and T.38 fallback to T.37 features over PRI, CAS-FGD and Analog FXS signalling types.

```

!
version 12.2
no service single-slot-reload-enable
service timestamps debug datetime msec
service timestamps log uptime
no service password-encryption
!
hostname faxgate-3660-1
!
logging buffered 10000 debugging
logging rate-limit console 10 except errors
enable secret 5 $1$J.ez$AsdH0bxxtAIsFsRalb4w0
enable password cisco
!
username all
!
!
memory-size iomem 40
clock timezone PST -8
voice-card 1
!
voice-card 3
!
ip subnet-zero
!
!
no ip domain-lookup
ip domain-name cisco.com
ip host yushiro 223.255.254.254
!
no ip dhcp-client network-discovery
no mgcp timer receive-rtcp
isdn switch-type primary-4ess
isdn voice-call-failure 0
call rsvp-sync
call application voice off_ramp tftp://255.255.254.254/script/t37_offramp.nchen.tcl
call application voice app_lib_rollover
tftp://255.255.254.254/script/fax_rollover_on_busy.tcl
call application voice on_ramp tftp://255.255.254.254/script/t37_onramp14.nchen.tcl
call application voice on_ramp language 1 en
call application voice on_ramp set-location en 0 tftp://255.255.254.254/audio/
call application voice r39 tftp://255.255.254.254/script/fax_detect_2.1.2.0.tcl
call application voice r39 prompt tftp://225.255.254.254/audio/en_listen_first.au
call application voice r39 mode connect-first
call application voice r39 language 1 en

```

```

call application voice r39 set-location en 0
tftp://255.255.254.254/audio/en_listen_first.au
!
voice service voip
  fax protocol t38 ls-redundancy 2 hs-redundancy 2
  h323 call start fast
!
!
!
!
!
fax receive called-subscriber $d$
fax interface-type fax-mail
mta send server 1.2.129.200
mta send subject "Faxgate - Regression"
mta send postmaster devtest@faxgate.com
mta send mail-from hostname faxgate.com
mta send mail-from username devtest
mta send return-receipt-to hostname faxgate.com
mta send return-receipt-to username devtest
mta receive aliases [1.2.129.1]
mta receive aliases [1.2.129.200]
mta receive maximum-recipients 100
!
!
controller T1 1/0
  framing sf
  linecode ami
!
controller T1 1/1
  framing esf
  linecode b8zs
  ds0-group 0 timeslots 1-24 type e&m-wink-start
!
controller T1 3/0
  framing esf
  linecode b8zs
  pri-group timeslots 1-24
!
controller T1 3/1
  framing esf
  linecode b8zs
  ds0-group 0 timeslots 1-24 type e&m-fgd
!
interface FastEthernet0/0
  ip address 1.2.129.1 255.255.0.0
  speed auto
  half-duplex
!
interface FastEthernet0/1
  ip address 172.19.149.110 255.255.255.0
  duplex auto
  speed auto
!
interface Serial3/0:23
  no ip address
  no logging event link-status
  isdn switch-type primary-4ess
  isdn incoming-voice voice
  isdn T310 60000
  no cdp enable
!
ip default-gateway 1.2.0.1
ip classless

```

```

ip route 0.0.0.0 0.0.0.0 1.2.0.1
ip route 171.0.0.0 255.0.0.0 FastEthernet0/1
ip route 223.255.254.254 255.255.255.255 1.2.0.1
no ip http server
!
!
!
snmp-server packetsize 4096
snmp-server manager
!
!
voice-port 1/1:0
!
voice-port 2/0/0
!
voice-port 2/0/1
!
voice-port 2/1/0
!
voice-port 2/1/1
!
voice-port 3/0:23
!
voice-port 3/1:0
!
dial-peer cor custom
!
!
! Dial-peer mmoip for offramp
dial-peer voice 68 mmoip
  application off_ramp
  incoming called-number .
  information-type fax

! Dial-peer pots for offramp (PRI)
dial-peer voice 70 pots
  destination-pattern 321....
  direct-inward-dial
  port 3/0:23
  forward-digits 0
  prefix 321
!
! Dial-peer pots for offramp (FGD)
dial-peer voice 80 pots
  destination-pattern 521....
  direct-inward-dial
  port 1/1:0
  forward-digits 0
  prefix 521
!
! Dial-peer pots for offramp (FXS)
dial-peer voice 90 pots
  destination-pattern 621....
  port 2/1/0
  forward-digits all
!
!
! Dial-peer mmoip for onramp
dial-peer voice 67 mmoip
  application fax_on_vfc_onramp_app out-bound
  destination-pattern .....
  information-type fax
  session target mailto:devtest@[1.2.129.200]
!

```

```

! Dial-peer pots for onramp (PRI)
dial-peer voice 69 pots
  application on_ramp
  max-conn 100
  destination-pattern 321....
  direct-inward-dial
  port 3/0:23
  forward-digits 0
  prefix 321
!
! Dial-peer pots for onramp (FGD)
dial-peer voice 79 pots
  application on_ramp
  max-conn 100
  destination-pattern 521....
  direct-inward-dial
  port 3/1:0
  forward-digits 0
  prefix 521
!
! Dial-peer pots for onramp (FXS)
dial-peer voice 89 pots
  application on_ramp
  max-conn 100
  destination-pattern 621....
  port 2/0/0
  forward-digits all
!

! Dial-peer pots for T.38 Fallback to T.37 (PRI)
dial-peer voice 75 pots
  application app_lib_rollover
  port 3/0:23
!

! Dial-peer pots for T.38 Fallback to T.37 (FGD)
dial-peer voice 85 pots
  application app_lib_rollover
  port 3/1:0
!

! Dial-peer pots for T.38 Fallback to T.37 (FXS)
dial-peer voice 65 pots
  application app_lib_rollover
  port 2/0/1
!

! Dial-peer voip for T.38
dial-peer voice 71 voip
  preference 1
  destination-pattern 9.....
  playout-delay maximum 300
  fax protocol t38 ls-redundancy 2 hs-redundancy 2
!
! Dial-peer voip for T.37
dial-peer voice 66 mmoip
  preference 2
  application fax_on_vfc_onramp_app out-bound
  destination-pattern 9.....
  information-type fax
  session target mailto:devtest@[1.2.129.200]
!
!
line con 0

```

```

exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
password lab
login
!
!
end

```

This example covers the T.37 onramp with AAA functionality using Radius server over PRI signalling.

```

!
version 12.2
no service single-slot-reload-enable
service timestamps debug datetime msec
service timestamps log uptime
no service password-encryption
!
hostname Faxgate-3660-2
!
logging buffered 4096 alerts
logging rate-limit console 10 except errors
aaa new-model
aaa authentication login h323 group radius local
aaa authorization exec fax_list group radius
aaa authorization exec fax group radius
aaa authorization exec h323 group radius
aaa accounting connection fax stop-only group radius
aaa accounting connection fax_list stop-only group radius
aaa accounting connection h323 stop-only group radius
!
!
!
memory-size iomem 30
voice-card 3
!
voice-card 5
!
ip subnet-zero
!
!
no ip domain-lookup
!
no ip dhcp-client network-discovery
no mgcp timer receive-rtcp
isdn switch-type primary-4ess
isdn voice-call-failure 0
call rsvp-sync
call application voice off_ramp tftp://255.255.254.254/faxacct-test/t37_offramp.0.0.6.tcl
call application voice app_lib_rollover
tftp://255.255.254.254/faxacct-test/fax_rollover_on_busy.tcl
call application voice on_ramp tftp://255.255.254.254/faxacct-test/t37_onramp14.tcl
call application voice on_ramp accounting enable
call application voice on_ramp access-method prompt-user
call application voice on_ramp authen-list fax_list
call application voice on_ramp authen-method prompt-user
call application voice on_ramp authentication enable
call application voice on_ramp language 1 en
call application voice on_ramp set-location en 0 tftp://255.255.254.254/audio/en/
!
voice service voip

```

```

fax protocol t38 ls-redundancy 2 hs-redundancy 2
h323 call start fast
!
!
!
!
!
fax receive called-subscriber $d$
fax send max-speed 12000
fax send right-header From:$s$
fax send coverpage enable
fax send coverpage show-detail
fax send coverpage email-controllable
fax send coverpage comment This is a Off-Ramp call cover page
fax interface-type fax-mail
mta send server 1.2.129.200
mta send subject "3660-Offramp"
mta send postmaster devtest@faxgate.com
mta send mail-from hostname faxgate.com
mta send mail-from username devtest
mta receive aliases [1.2.129.200]
mta receive aliases [1.2.129.2]
mta receive maximum-recipients 20
!
controller T1 5/0
 framing esf
 clock source internal
 linecode b8zs
 pri-group timeslots 1-24
!
!
interface FastEthernet0/0
 ip address 1.2.129.2 255.255.0.0
 speed auto
 half-duplex
!
interface Serial5/0:23
 no ip address
 no logging event link-status
 isdn switch-type primary-4ess
 isdn incoming-voice voice
 isdn T310 60000
 no cdp enable
!
ip default-gateway 1.2.0.1
ip classless
ip route 0.0.0.0 0.0.0.0 1.2.0.1
ip route 223.255.254.254 255.255.255.255 1.2.0.1
no ip http server
!
!
!
snmp-server packetsize 4096
snmp-server manager
!
radius-server host 1.4.174.1 auth-port 1645 acct-port 1646
radius-server retransmit 3
radius-server key cisco
radius-server vsa send accounting
radius-server vsa send authentication
!
voice-port 5/0:23
!
dial-peer cor custom

```

```

!
!
dial-peer voice 69 pots
  application on_ramp
  incoming called-number .
  destination-pattern 9.....
  port 5/0:23
!
dial-peer voice 67 mmoip
  application fax_on_vfc_onramp_app out-bound
  destination-pattern .
  information-type fax
  session target mailto:thsu@[1.2.129.200]
  dsn delayed
  dsn success
  dsn failure
!
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
!
!
end

```

The following examples show configuration for NM-HDV T.38 Rollover to T.37 on the Cisco 2600 series router and Cisco 3600 series router.

```

fax interface-type fax-mail
voice service voip
  fax protocol t38 ls-redundancy 0 hs-redundancy 0

call application voice app_libretto_offramp5
tftp://dirt/libretto-test/app_libretto_offramp5.tcl

call application voice app_onramp9 tftp://dirt/nchen/onramp13.nc.tcl
call application voice app_onramp9 language 1 en
call application voice app_onramp9 accounting-list fax
call application voice app_onramp9 set-location en 0 tftp://dirt/cchiu/WV/en_new/
call application voice app_lib_rollover tftp://dirt/libretto-test/
fax_rollover_on_busy.tcl

fax receive called-subscriber $d$
fax send transmitting-subscriber $$
fax send left-header $$
fax send center-header $t$
fax send right-header Page: $p$
fax send coverpage enable
fax send coverpage email-controllable
fax send coverpage comment Cisco cover page comment
mta receive aliases [1.14.120.2]
mta send server faxgate_smtp_server
mta send subject "T.38 Rollover to T.37 testing on T1 CAS FGD"
mta send origin-prefix Cisco Fax
mta send postmaster postmaster nchen@cisco.com
mta send mail-from hostname faxgate_test
mta send mail-from username fax-user
mta send return-receipt-to hostname return.host.com
mta send return-receipt-to username $$
mta receive aliases bock.cisco.com
mta receive aliases cisco.com

```

```

mta receive maximum-recipients 200
mta receive generate-mdn

controller T1 1/1
  framing esf
  clock source line primary
linecode b8zs
pri-group timeslots 1-24

interface Ethernet0
  ip address 1.14.120.2 255.255.0.0
  no ip directed-broadcast

interface Serial3/0:23
  no ip address
  ip mroute-cache
  no logging event link-status
  isdn switch-type primary-5ess
  isdn incoming-voice modem
  fair-queue 64 256 0
  no cdp enable

! The following configuration command must be set for T.38 rollover to T.37
voice hunt user-busy
!
! Inbound peer for T.38/T.37 onramp rollover operation
! This peer includes the TCL application for rollover operation
dial-peer voice 70 pots
  application app_lib_rollover
  port 3/0:23

! Outbound peer for T.38 ingress gateway
! This peer requires lower preference number then next matching peer
dial-peer voice 71 voip
  preference 1
  destination-pattern 3746096
  session target ipv4:1.14.120.109
  fax protocol t38 ls-redundancy 0 hs-redundancy 0

! Outbound peer for T.37 onramp operation
dial-peer voice 72 mmoip
  preference 2
  ! The application name below must be exactly as shown!
  application fax_on_vfc_onramp_ap out-bound
  destination-pattern 3746096
  session target mailto:$d$@mail-server.cisco.com
  information-type fax

```

The following examples show configuration for NM-HDV T.38 on the Cisco 2600 series router and Cisco 3600 series router.

```

fax interface-type fax-mail

service timestamps debug uptime
service timestamps log uptime

hostname fax-gateway

enable password lab

```

```

!
username betatest password 0 password

ip subnet-zero
ip host dirt 223.255.254.254
ip host faxgate_smtp_server 172.28.129.150
ip domain-name cisco.com
ip name-server 1.14.116.1

! used for fallback from T.38 fax relay to T.37 fax
voice hunt user-busy

! global service for fax relay
voice service voip
    fax protocol t38 ls_redundancy 0 hs_redundancy 0

call application voice app_libretto_offramp
tftp://dirt/libretto-test/app_libretto_offramp5.tcl
call application voice app_libretto_offramp authen-list fax
call application voice app_libretto_offramp authen-method gateway
call application voice app_libretto_offramp accounting-list fax

call application voice app_onramp tftp://dirt/nchen/onramp13.nc.tcl
call application voice app_onramp authen-list fax
call application voice app_onramp authen-method gateway
call application voice app_onramp language 1 en
call application voice app_onramp accounting-list fax
call application voice app_onramp set-location en 0 tftp://dirt/cchiu/WV/en_new/
call application voice app_lib_rollover tftp://dirt/libretto-test/
fax_rollover_on_busy.tcl

fax receive called-subscriber $d$
fax send transmitting-subscriber $$s
fax send left-header $$s
fax send center-header $t$
fax send right-header Page: $p$
fax send coverpage enable
fax send coverpage email-controllable
fax send coverpage comment Cisco cover page comment
mta receive aliases [1.14.120.2]
mta send server faxgate_smtp_server
mta send subject "SN testing on T1 CAS FGD"
mta send origin-prefix Cisco Fax
mta send postmaster postmaster nchen@cisco.com
mta send mail-from hostname faxgate_test
mta send mail-from username fax-user
mta send return-receipt-to hostname return.host.com
mta send return-receipt-to username $$s
mta receive aliases bock.cisco.com
mta receive aliases cisco.com
mta receive maximum-recipients 200
mta receive generate-mdn

controller T1 1/1
    framing esf
    clock source line primary
    linecode b8zs
    ds0-group 0 timeslots 1-24 type e&m-fgd

interface Ethernet0
    ip address 1.14.120.2 255.255.0.0
    no ip directed-broadcast

interface FastEthernet0

```

```

no ip address
no ip directed-broadcast
shutdown
duplex auto
speed auto

ip default-gateway 1.14.0.1
ip classless
ip route 223.255.254.0 255.255.255.0 1.14.0.1
no ip http server

voice-port 1/1:0

! Inbound peer for T.37 onramp operation
dial-peer voice 2 pots
  application app_onramp
  incoming called-number 5.....
  direct-inward-dial
  port 1/1:0
!
! Outbound peer for T.37 onramp operation
dial-peer voice 3 mmoip
  ! The application name below must be exactly as shown!
  application fax_on_vfc_onramp_ap out-bound
  destination-pattern 57108..
  session target mailto:$d$email-server.cisco.com
! MDN and DSN configuration can be set in this peer

! Inbound peer for T.37 offramp operation
dial-peer voice 21 mmoip
  application app_libretto_offramp
  incoming called-number 5.....
  information-type fax
!
! Outbound peer for T.37 offramp operation
dial-peer voice 20 pots
  destination-pattern 5.....
  port 1/1:0
  prefix 5

```

The following set of 3 peers are for onramp T.38 fax rollover to T.37 fax. Rollover occurs when the destination fax line is busy. The following configuration command must be set for T.38 rollover to T.37.

```

voice hunt user-busy

! Inbound peer for T.38/T.37 onramp rollover operation
! This peer includes the TCL application for rollover operation
dial-peer voice 70 pots
  application app_lib_rollover
  incoming called-number 5.....
  port 1/1:0

! Outbound peer for T.38 ingress gateway
! This peer requires lower preference number than next matching peer
dial-peer voice 71 voip
  preference 1
  destination-pattern 3746096
  session target ipv4:1.14.120.109
  fax protocol t38 ls_redundancy 0 hs_redundancy 0

! Outbound peer for T.37 onramp operation
dial-peer voice 72 mmoip
  preference 2
  ! The application name below must be exactly as shown!

```

```
application fax_on_vfc_onramp_ap out-bound
destination-pattern 3746096
session target mailto:$d@mail-server.cisco.com
information-type fax
!
```

Command Reference

This section documents modified commands used with the T.37/T.38 Fax Gateway feature. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

Modified

- [fax interface-type](#)

fax interface-type

To enable the T.37 functionality (Store-and-Forward Fax), use the **fax interface-type** command in configuration mode. To disable T.37 functionality, use the **no** form of this command.

```
fax interface-type { fax-mail }
```

```
no fax interface-type { fax-mail }
```

Syntax Description	fax-mail	Enables T.37 functionality for Cisco 2600 series and Cisco 3600 series.
Defaults	The default is determined by the hardware available in the router and is fax-mail when used in a router having only voice modules.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.1(3)XI	This command as fax interface-type vfc was introduced on the Cisco AS5300 Universal Access Server.
	12.1(5)T	This command as fax interface-type vfc was integrated into the Cisco IOS Release 12.1(5)T.
	12.2(8)T	The vfc keyword was changed to fax-mail and was integrated in Cisco IOS Release 12.2(8)T for Cisco 2600 series and Cisco 3600 series routers.
Usage Guidelines	Use the fax interface-type fax-mail command to set the voice module in the router as the interface through which to send and receive fax messages.	
Examples	The following example shows the interface configured for fax mail: Router# fax interface-type fax-mail	
Related Commands	Command	Description
	fax interface-type modem	Sets the type of interface for the fax to a modem in the Cisco AS5300 Universal Access Server using a modem.

Glossary

AAA—Authentication, Authorization, and Accounting. AAA is a suite of network security services which provides the primary framework through which access control can be set up on a Cisco router or universal access server.

ANI—Automatic Number identification.

CED—Called station identification. A 3-second, 2100 Hz tone generated by a fax machine answering a call, which is used in the hand-shaking used to set the call; the response from a called fax machine to a CNG tone.

CLI—Command Language Interpreter. Basic Cisco IOS configuration and management interface.

CNG—the 1100Hz tone that a fax machine uses to signal to a caller (human) that the calling party is a fax. The tone cycles on for .5 second, and then off for 3 seconds, for up to 30 seconds. This is part of the T.30 specification.

Dial peer—an addressable call endpoint. In Voice over IP (VoIP), there are two types of dial peers: POTS and VoIP.

DNIS—Dialed Number Identification Service.

DSN—Delivery Status Notification (RFC1891).

DSP—digital signal processor. This term is used to refer to the actual microprocessor on which the modulation/demodulation process is executed.

DTMF—Dual Tone Multiple Frequency.

E.164—eight-byte public network addressing recommendation defined by the International Telecommunication Union (ITU-T) for international telecommunication numbering.

ESMTP—Extended SMTP. A method for extending SMTP to include richer mail features such as delivery notification, capabilities negotiation and session delivery

Fallback—fax delivery mode where the receiver is busy. The fax is delivered to a disk server and delivered in s&f mode.

Fax mail—an SMTP or ESMTP e-mail message that is produced by a T.37 onramp gateway or an e-mail message sent to a T.37 offramp gateway.

Fax relay—a mechanism on Cisco VoIP gateways to locally terminate a fax call on the Digital Signal Processor (DSP), essentially emulating the remote fax machine; the fax is then transmitted over IP in a real-time manner.

FTSP —Fax Telephony Service Provider.

H.323—an International Telecommunication Union (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.

IVR—Interactive Voice Response.

MIME—Multipurpose Internet Mail Extensions. A standard MIME e-mail message is created and attached with the TIFF file to form a fax mail to the messaging infrastructure of a designated SMTP server.

MMoIP—Multimedia Mail over Internet Protocol. Dial peer specific to Store-and-Forward Fax. The MMoIP dial peer is the vehicle you use to assign particular line characteristics (such as a destination telephone number) to the connection between the Cisco voice gateway and the SMTP mail server during on-ramp faxing.

MSP—Media Service Provider.

MTA—Mail Transfer Agent.

Offramp—the function of converting an Internet image format into a suitable Group 3 format and transmitting it over the PSTN.

Onramp —the function of receiving a Group 3 fax image and converting it into a format suitable for Internet transmission.

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.

RDNIS—Redirected DNIS. Number that identifies the original dialed number of a call that is redirected to a voice, fax, or e-mail server, usually because the number is busy or does not answer. RDNIS is carried in the Cisco proprietary data fields in H.323-standard signalling protocols over the packet network to the server.

RTP—real-time transport protocol. Defined by RFC 1890, a session-layer protocol used in IP networks for real-time traffic such as voice and video.

RTSP—Real-time Streaming Protocol.

Redialer—An interface hardware device that interconnects between a fax device and a PSTN network that maps the numbers that a user dials to reach a specific destination to a different number, and forwards the dialed digits to that new number, transparent to the user.

S&F Fax—delivery mode where the fax is stored on a disk server and delivered some time after the sender disconnected.

SMTP—Simple Mail Transport Protocol.

SPI—service provider interface.

T.33—ITU Recommendation T.33 defines application rules for the routing of Group 3 facsimile messages using the Subaddress (SUB) signal as defined in Recommendation T.30. The aspects that are addressed include placement of telephone address components (phone extensions and secondary dialing numbers) within the SUB frame, encoding and decoding rules, and an outline of the facsimile routing procedure.

T.37—ITU Recommendation T.37 describes the features necessary for the Store-and-Forward 'Simple' mode of operation of facsimile document transmission via Internet Mail. The general guidelines for the modes of operation of facsimile over the Internet are contained in Recommendation F.185.

T.38—ITU Recommendation 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 using IP protocols. The recommendation allows the use of either TCP or UDP depending on the service environment.

T.4—Standardization of Group 3 facsimile terminals for document transmission

TCL—Tool Command Language. Language in which IVR scripts are written.

TFTP—Trivial File Transfer Protocol. Method used to copy files to and from routers.

TIFF-f—Tagged Image File Format for Fax (profile f)

TSP—Telephony Service Provider

UM—Unified Message

UOne—Unified Open Network Exchange

VIC—Voice interface card

TSP—Telephony Service Provider

VIC—Voice interface card

VGW—Cisco Voice Gateway

VWIC—Voice/WAN interface card