



Configuring and Debugging Fax Services

The Cisco ATA provides two modes of fax services that are capable of internetworking with Cisco IOS gateways over IP networks. These modes are called *fax pass-through mode* and *fax mode*.

With *fax pass-through mode*, the Cisco ATA encodes fax traffic within the G.711 voice codec and passes it through the Voice Over IP (VoIP) network as though the fax were a voice call. This mode uses the Cisco proprietary *fax upspeed* method.

With *fax mode*, the Cisco ATA presents itself as a device capable of using only G.711 codecs; therefore, no codec renegotiation or switchover is required. This places minimum functionality and configuration requirements on remote gateways. *Fax mode* is recommended for environments in which G.711 fax upspeed is not available for the supporting Cisco gateways.

This section contains the following topics:

- [Using Fax Pass-through Mode, page 7-1](#)
- [Using FAX Mode, page 7-6](#)
- [Debugging the Cisco ATA 186/188 Fax Services, page 7-7](#)



Note

The term *Cisco ATA* is used throughout this manual to refer to both the Cisco ATA 186 and the Cisco ATA 188, unless differences between the Cisco ATA 186 and Cisco ATA 188 are explicitly stated.

Using Fax Pass-through Mode

Fax pass-through mode allows for maximum codec flexibility because users may set up a voice call using any voice codec, then renegotiate to a G.711 codec for the fax session. To use *fax pass-through mode*, first configure the Cisco ATA and supporting Cisco gateways to support the Cisco-proprietary G.711 fax upspeed method. Then, disable fax relay on the far-end gateway—either for the entire gateway or for the dial peer engaged in the fax call with the Cisco ATA.

The fax upspeed method allows you to use low bit-rate codecs such as G.723 and G.729 for voice calls, and G.711 codecs for fax calls. With a fax call, the Cisco ATA detects a 2100-Hz CED tone or V.21 preamble flag, then informs the remote gateway of its intent to switchover to G.711 via a peer-to-peer message. This type of message, carried as a Named Signaling Event (NSE) within the RTP stream, is used for all fax event signaling. The Cisco ATA can initiate and respond to NSEs and can function as either an originating or terminating gateway.

**Note**

The Cisco ATA can also accept standard-based protocol-level codec switch requests, but cannot send such requests. Therefore, to interoperate with a Cisco gateway, use the Cisco-proprietary codec switch.

This section contains the following topics:

- [Configuring the Cisco ATA for Fax Pass-through mode, page 7-2](#)
- [Configuring Cisco IOS Gateways to Enable Fax Pass-through, page 7-3](#)

Configuring the Cisco ATA for Fax Pass-through mode

Fax Pass-through mode requires configuring two configuration parameters:

[AudioMode, page 7-2](#)

[ConnectMode, page 7-3](#)

AudioMode

Description

The AudioMode parameter is a 32-bit value. The lower 16 bits apply to the **Phone 1** port of the Cisco ATA and the upper 16 bits apply to the **Phone 2** port of the Cisco ATA.

Example

The following is an example of configuring the **Phone 1** port of the Cisco ATA for *fax pass-through mode*:

```
0xxxxx0015
```

Translation

This setting translates to the following bitmap:

```
xxxx xxxx xxxx xxxx 0000 0000 0001 0101
```

- Bit 0 = 1—Enables G.711 silence suppression (VAD)
- Bit 2 = 1—Enables Fax CED tone detection and switchover upon detection
- Bit 4 = 1, Bit 5 = 0—DTMF transmission method = out-of-band through negotiation
- Bit 6 = Bit 7 = 0—Hookflash transmission method = disable sending out hookflash

**Note**

The values `xxxx` in the example apply to the **Phone 2** port of the Cisco ATA.

To configure the same value for the **Phone 2** port of the Cisco ATA, the value would be `0x0015xxxx`. The configuration of one port is independent from the configuration of the other port.

ConnectMode

Description

The ConnectMode parameter is a 32-bit value. The parameter settings apply to both lines of the Cisco ATA. Configure ConnectMode after configuring AudioMode for *fax pass-through mode*. Cisco recommends you use the following ConnectMode setting to interoperate with a Cisco IOS gateway.

Recommended Setting

```
0x90000400
```

Translation

This setting translates to the bitmap:

```
1001 0000 0000 0000 0000 0100 0000 0000
```

Bit 2 and bits 7 through 15 are the only relevant bits for *fax pass-through mode*. These bits from the example are isolated below:

```
xxxx xxxx xxxx xxxx 0000 0100 0xxx x0xx
```

- Bit 2 = 0—Uses RTP payload number 126/127 for fax upspeed to G.711 μ -law/G.711A-law. Set this value to 1 if you want to use RTP payload number 0/8 for fax upspeed.
- Bit 7 = 0—Disables fax pass-through redundancy. Set this bit to 1 to enable redundancy. With redundancy enabled, the Cisco ATA sends each packet twice. Because of bandwidth and transmission time costs, use this option only if network quality is poor and all other gateways used in the network support this feature.
- Bits {12, 11, 10, 9, 8} = {0, 0, 1, 0, 0}—Sets the offset to NSE payload-type number 96 to 4. Setting the offset to 4 results in the Cisco ATA sending an NSE payload-type value of 100 by default. Valid offset values range from 2 to 23 (NSE payload type value of 98 to 119). Set this value to match the value for your Cisco gateways.
Most Cisco MGCP-based gateways, such as Cisco 6608, use NSE payload type 101 by default. Most Cisco H.323/SIP-based gateways use NSE payload type 100 by default.
- Bit 13 = 0—Uses G.711 μ -law for fax pass-through upspeed. Set this bit to 1 to use G.711A for fax pass-through upspeed.
- Bit 14 = Bit 15 = 0—Enables *fax pass-through mode* using the Cisco proprietary method (recommended). Set both of these bits to 1 to disable *fax pass-through mode*.

Configuring Cisco IOS Gateways to Enable Fax Pass-through

To configure your IOS gateways to network with Cisco ATA, do the following:

Procedure

-
- Step 1** [Enable Fax Pass-through Mode, page 7-4](#)
- Step 2** [Disable Fax Relay Feature, page 7-5](#)
-

**Note**

For detailed information on setting up your IOS gateways and on feature availability, refer to the document *Cisco Fax Services over IP*.

Enable Fax Pass-through Mode

The supporting Cisco gateway can enable *fax pass-through mode* using system-level or dial-peer-level commands.

System Level commands

Enable the fax pass-through feature using the following system-level commands:

Procedure

Step 1 Run the following command:

```
voice service voip
```

Step 2 Run the following command:

```
modem passthrough NSE [payload-type number] codec {g711μ/law | g711alaw} [redundancy] [maximum-sessions value]
```

The definitions of the command parameters are as follows:

- The **payload-type** parameter default is 100. Valid values are from 98 to 119. The NSE payload number must be the same on both the Cisco ATA and the Cisco gateway.
- The **codec** parameter must be G.711μ-law for faxes sent over a T1 trunk or G.711A-law for faxes sent over an E1 trunk.
- The **redundancy** parameter enables RFC 2198 packet redundancy. It is disabled by default.
- The **maximum sessions** parameter defines the number of simultaneous fax pass-through calls with redundancy. The default is 16. Valid values are 1 to 26.

When using the **voice service voip** and **modem passthrough nse** commands on a terminating gateway to globally set up fax or modem pass-through with NSEs, you must also ensure that each incoming call will be associated with a VoIP dial peer to retrieve the global fax or modem configuration. You associate calls with dial peers by using the **incoming called-number** command to specify a sequence of digits that incoming calls can match. You can ensure that all calls will match at least one dial peer by using the following commands:

```
Router(config)# dial-peer voice tag voip
Router(config-dial-peer)# incoming called-number .
```

Step 3 For the Cisco ATA ConnectMode parameter, turn off bits 14 and 15. This enables the sending of fax pass-through signals and the detection of incoming fax pass-through signals using the Cisco proprietary method.

**Note**

The NSE payload-type number, fax pass-through codec (G.711μ-law or G.711A-law) and redundancy parameters must have the same settings for the Cisco ATA that they have for supporting Cisco gateways.

Dial-Peer Level Commands

You can enable *fax pass-through mode* for communication between a Cisco IOS gateway and the specified Cisco ATA using the following dial-peer level commands:

Procedure

- Step 1** Perform the command:
- ```
dial-peer voice tag voip
```
- Step 2** Perform the command:
- ```
modem passthrough {NSE [payload-type number] codec {g711μlaw | g711alaw} [redundancy] | system}
```
- a. The default of this command is:
- ```
modem passthrough system
```
- When using the default configuration, the dial-peer fax pass-through configuration is defined by the **voice service voip** command. When the **system** option is used, no other parameters are available.
- When the NSE is configured in the fax pass-through command at the dial-peer level, the fax pass-through definition in the **dial-peer** command takes priority over the definition in the **voice service voip** command.
- b. The **payload-type number**, **codec**, and **redundancy** parameters can also be used.
- For example, the command:
- ```
modem passthrough NSE codec g711μlaw
```
- means that the Cisco ATA will use the NSE payload-type number 100, G.711μ-law codec, and no redundancy in *fax pass-through mode*.
- Step 3** When setting up dial-peer for fax pass-through, it is necessary to set up a pair of dial-peers for inbound and outbound calls between the Cisco ATA and Cisco IOS gateways. You do this by specifying the **destination-pattern** and **incoming-called number**. The **destination-pattern** should point to the Cisco ATA, while the incoming-called number should apply to all numbers that the Cisco ATA is allowed to dial.
-

Disable Fax Relay Feature

Fax relay may be enabled by default for some IOS gateways. If you do not disable the fax relay feature, it may override the precedence of fax/modem pass-through and cause the fax transmission to fail. It is necessary to disable fax relay at the dial-peer or system level with the following command:

```
fax rate disable
```

Using FAX Mode

Use *fax mode* when the gateways in the network do not support *fax pass-through mode* or dial-peer configuration.

You can set one or both lines of the Cisco ATA to G.711-only *fax mode*. This mode allows the fax machine connected to the Cisco ATA to communicate directly with the far endpoint with no fax signaling event occurring between the two gateways.

This section contains the following topics:

- [Configuring the Cisco ATA for Fax Mode, page 7-6](#)
- [Configuring the Cisco ATA for Fax Mode on a Per-Call Basis, page 7-7](#)
- [Configuring the Cisco IOS Gateway for Fax Mode, page 7-7](#)

Configuring the Cisco ATA for Fax Mode

G.711-only *fax mode* operation requires configuration of one parameter—**AudioMode**.

Description

The AudioMode parameter is a 32-bit value. The lower 16 bits apply to the **Phone 1** port of the Cisco ATA, and the upper 16 bits to the **Phone 2** port. The following is an example of the **Phone 1** port of the Cisco ATA configured for G.711-only *fax mode*:

Example

```
0xXXXX0012
```

Translation

This setting translates to the bitmap:

```
xxxx xxxx xxxx xxxx 0000 0000 0001 0010
```

- Bit 0 = 0—Disables G.711 silence suppression (VAD).
- Bit 1 = 1—Uses G.711 only, does not user the low bit-rate codec.
- Bit 2 = 0—Disables Fax CED tone detection.
- Bit 4 = 1, Bit 5 = 0—DTMF transmission method: out-of-band through negotiation
- Bit 6 = Bit 7 = 0—Hookflash transmission method: disables sending out hookflash



Note

The values `xxxx` in the example do not apply to the **Phone 1** port of the Cisco ATA.

To configure the same value for the **Phone 2** port of the Cisco ATA, the value would be `0x0012xxxx`. The configuration of one port is independent from the configuration of the other port.



Note

The AudioMode configuration overrides the values of the following three parameters: RxCodec, TxCodec, and LBRCodec. For example, if these three parameters are each set to 0 (for G.723), the Cisco ATA would still use G.711 if AudioMode is set to `0x00120012`. With this configuration, the Cisco ATA sends both G.711 μ -law and G.711A-law as preferred codecs to a peer voice gateway.

Configuring the Cisco ATA for Fax Mode on a Per-Call Basis



Note The per-call-basis *fax mode* feature is only available for the H.323 and SIP protocols.

If you want to activate *fax mode* on a per-call basis, configure the following parameters:

Procedure

-
- Step 1** **CallFeatures** and **PaidFeatures** Bit 15 (for line1—mask 0x8000) and Bit 31 (for line2—mask 0x80000000) = 1: This sets the default to enable *fax mode* on a per-call basis.
- Step 2** **AudioMode** Bit 2 = 0: This disables fax CED tone detection.
- Step 3** **CallCmd** includes ***99;xA** (99 is the default; the value can be changed to any prefix code.)
-

To activate a call from your fax machine, enter ***99** (default), then enter the telephone number to which you want to send the fax. The next call will automatically revert to normal mode.

Configuring the Cisco IOS Gateway for Fax Mode

On the Cisco gateway, disable both fax relay and fax pass-through at the dial-peer level or system level with the following commands:

Procedure

-
- Step 1** Run the command:
fax rate disable
- Step 2** Run the command:
no modem passthrough
-

Debugging the Cisco ATA 186/188 Fax Services

This section includes the following debugging topics for fax services:

- [Common Problems When Using IOS Gateways, page 7-7](#)
- [Using prserv for Diagnosing Fax Problems, page 7-9](#)
- [Using rtpcatch for Diagnosing Fax Problems, page 7-12](#)

Common Problems When Using IOS Gateways

[Table 7-1](#) lists typical problems and actions that might solve these problems for situations in which the Cisco ATA is using fax over a Cisco IOS gateway.

Table 7-1 Solving Common Fax Problems

Problem	Action
The far-end gateway is not loaded with correct software image.	Cisco recommends IOS version 12.2 (11)T or higher for the Cisco 2600 and Cisco 3600, and IOS version 12.1 (3)T or higher for Cisco AS5300. The Cisco 6608 supports both the NSE and NTE methods of <i>fax pass-through mode</i> , beginning with software version D004030145S16608. To use <i>fax pass-through mode</i> with the Cisco 6608, the user must select 6608 NSE mode, and the NSE payload type must be reconfigured to match the Cisco ATA.
The Cisco ATA is not loaded with the proper software.	Cisco recommends using software version 2.14 or higher.
User is operating Cisco ATA software on an outdated model.	Cisco recommends using Cisco ATA models 186-I1, 186-I2, 188-I1, or 188-I2 (hardware platforms).
The Cisco ATA is not configured for <i>fax mode</i> or <i>fax pass-through mode</i> .	For <i>fax mode</i> , the AudioMode configuration parameter should be set to 0xXXXX0012 (X = value not applicable) for the Phone 1 port of the Cisco ATA, and 0x0012XXXX for the Phone 2 port. For <i>fax pass-through mode</i> , AudioMode should be set to 0xXXXX0015 for the Phone 1 port of the Cisco ATA, and 0x0015XXXX for the Phone 2 port.
The remote gateway is not configured for modem/ <i>fax pass-through mode</i> .	When the Cisco ATA is configured for <i>fax pass-through mode</i> , all remote gateways must be configured with modem/ <i>fax pass-through mode</i> either on a dial-peer level or system level.
Fax relay is not disabled on the remote gateway.	Fax relay is enabled by default on some Cisco gateways. When fax relay is enabled, it can override <i>fax pass-through mode</i> and cause fax failure. Examples of the CLI commands to disable fax relay for IOS gateways are as follows: <ul style="list-style-type: none"> • fax rate disable for H.323/SIP gateways • mgcp fax t38 inhibit for MGCP gateways
Fax/modem pass-through method on the remote gateway is not compatible with the Cisco NSE-based method.	Some Cisco gateways (such as Cisco VG248, and Cisco 6608) may use signaling messages based on RFC2833 for G.711 upspeed when loaded with older software images. This method is incompatible with the Cisco NSE-based method. You must check to make sure that the image on your gateway supports the Cisco NSE-based fax/modem pass-through. Otherwise, you must configure the Cisco ATA to use <i>fax mode</i> .
NSE payload types differ between gateways.	The Cisco ATA has a configurable NSE packet payload-type value whose default is 100. This value is compatible with the implementations of most Cisco gateways. However, some Cisco gateways use 101 as the NSE payload type. Ensure that all gateways in your environment use the same NSE payload type if you wish to successfully use <i>fax pass-through mode</i> .

Using prserv for Diagnosing Fax Problems

This section contains the following topics:

- [prserv Overview, page 7-9](#)
- [Analyzing prserv Output for Fax Sessions, page 7-9](#)

prserv Overview

prserv is a tool that runs on a Microsoft Windows-based PC and serves as a log server that captures debug information that the Cisco ATA sends to your PC IP address/port. The debug information is saved into a readable text file.

To enable your Cisco ATA to send debug information, you need to set the **NPrintf** configuration parameter to your PC IP address and an available port, as shown in the following procedure:

Procedure

-
- Step 1** <IP address>.<port>
<IP address> is the IP address of your PC.
<port> is any unused port (any number from 1024 to 65535) on your PC.



Note You can the Nprintf parameter on the Cisco ATA configuration web page or with the TFTP-based configuration method.

- Step 2** To operate the debug capture program prserv.exe, place the prserv program in a folder on your PC. At the DOS prompt, enter:
C:>prserv <port>
<port> is the port number you have selected. If <port> is omitted, the default port number is 9001.
-

As prserv receives debug information from the Cisco ATA, it displays the information on the DOS screen and saves it to the output file <port>.log.

Once you are finished capturing debug information, you can stop prserv by entering Ctrl-C at the DOS prompt. If you restart the process without changing the name of the log file, any new debug information is appended to the end of the original file.

Analyzing prserv Output for Fax Sessions

The debug log obtained from **prserv** is for detecting simple configuration problems.



Note A comprehensive understanding of the fax events requires the use of the **rtpcatch** tool (see the “[Using rtpcatch for Diagnosing Fax Problems](#)” section on page 7-12).

[Table 7-2](#) lists log events relevant to analyzing a fax session.

Table 7-2 Debug Log Examples

Log event	Description
[<i>ch</i>] Enable encoder < <i>pt</i> >	Voice encoder type <i>pt</i> is enabled for the channel <i>ch</i> , where <i>pt</i> can be 0 for G.711 μ -law, 4 for G.723.1, 8 for G.711A-law, and 18 for G.729. For example, [0]Enable encoder 4 indicates that the Cisco ATA transmitted G.723.1-encoded voice packets.
[<i>ch</i>] DPKT 1st: < <i>timestamp1</i> > < <i>timestamp2</i> >, <i>pt</i> < <i>pt</i> >	The first voice packet that the Cisco ATA received was of RTP payload type <i>pt</i> for the channel <i>ch</i> with timestamp of <i>timestamp1</i> , and the local decoding timestamp was set to <i>timestamp2</i> . For example, [0]DPKT 1st: 1491513359 1491512639, <i>pt</i> 4 indicates that the first RTP packet that the Cisco ATA received was G.723.1-encoded for channel 0.
[<i>ch</i>] codec: < <i>pt1</i> > => < <i>pt2</i> >	Voice codec switchover occurred. The voice encoder type switched from <i>pt1</i> to <i>pt2</i> for the channel <i>ch</i> . For example, [0]codec: 4 => 0 indicates that the local voice encoder on the Cisco ATA switched from G.723.1 to G.711 μ -law.
[<i>ch</i>] Rx MPT PT=< <i>NSEpt</i> > NSE pkt < <i>event</i> >	Channel <i>ch</i> received an NSE packet of <i>event</i> with payload type of <i>NSEpt</i> . For <i>event</i> , c0XXXXXX indicates a CED tone event, and c1XXXXXX indicates a phase reversal event. For example, [0]Rx MPT PT=100 NSE pkt c0000000 indicates that the Cisco ATA received a CED tone event NSE packet with payload type of 100.
[<i>ch</i>] Tx MPT PT=< <i>pt</i> > NSE pkt < <i>event</i> >	Channel <i>ch</i> transmitted an NSE packet of <i>event</i> with payload type of <i>NSEpt</i> . For <i>event</i> , c0XXXXXX indicates a CED tone event, and c1XXXXXX indicates a phase reversal event. For example, [0]Tx MPT PT=100 NSE pkt c0000000 indicates that the ATA transmitted a CED tone event NSE packet with payload type of 100.

Debugging FAX Pass-through Mode

When the Cisco ATA is configured to use *fax pass-through mode*, the fax call session can be established with an arbitrary voice codec. Once the voice call has been established, fax machines can signal their presence by means of a CED tone or V.21 preamble flag, after which the gateways send NSE packets to initiate switchover.



Note

For *fax pass-through mode*, check the Cisco ATA debug log to verify that it is acting as an originating gateway as well as a terminating gateway.

Terminating-Gateway Example

When the Cisco ATA is used as a terminating gateway for a fax session, make sure the following conditions are true:

- The Cisco ATA transmits CED-tone-event NSE packets.
- The encoder switchover to G.711 occurs during the NSE-packet transaction.

An example debug log for a terminating gateway scenario is show below:

```
[0]Tx MPT PT=100 NSE pkt c0000000
[0]codec: 4 => 0
[0]Rx MPT PT=100 NSE pkt c0000000
```



Note

The NSE response to the CED tone event is not mandatory; some gateways may not send back an NSE response.

Originating-Gateway Example

When the Cisco ATA is used as an originating gateway for a fax session, make sure that the following conditions are true:

- The Cisco ATA receives and responds to CED-tone-event NSE packets.
- The NSE payload type is the same for the received and transmitted NSE packets.
- The encoder switchover to G.711 occurs during NSE-packet transaction.

An example debug log for an originating gateway scenario is shown below:

```
[0]Rx MPT PT=100 NSE pkt c0000000
[0]Tx MPT PT=100 NSE pkt c0000000
[0]codec: 4 => 0
[0]Rx MPT PT=100 NSE pkt c0000000
[0]Rx MPT PT=100 NSE pkt c0000000
```



Note

If your gateway is using a legacy IOS software image, it may not send NSE packets but instead may rely on a straightforward codec switchover mechanism. In this case, a codec switchover event occurs rather than an NSE packet transaction.

Possible Reasons for Failure

If your Cisco ATA does not receive CED-tone-event NSE packets and codec switchover does not occur, the failure may be due to the following reasons:

- The terminating gateway is not configured with fax/modem pass-through.
- The *fax pass-through mode* used by the terminating gateway may not be compatible with the Cisco NSE method.

If the log shows proper NSE packet transaction and G.711 upspeed for your fax session but the session still fails, check that the following conditions are true:

- The Cisco ATA software image version is 2.14 or above.
- The Cisco ATA model number is ATA186-I1, ATA186-I2, ATA188-I1, or ATA188-I2.
- The fax relay option for the remote gateways has been disabled.

Debugging FAX Mode

When the Cisco ATA is configured with *fax mode*, only G.711 codecs are used. You must confirm that only 0 (for G.711 μ -law) or 8 (for G.711A-law) appear in the `Enable encoder` and `DPKT 1st` debug lines. The following example of a debug log shows that G.711 μ -law is used:

```
[0]Enable encoder 0
[0]DPKT 1st: 1491513359 1491512639, pt 0
```

If the numeric codes for the G.711 codecs do not appear in the log, you need to check your **AudioMode** parameter setting on the Cisco ATA.

If the correct G.711 codecs appear in the log but your fax sessions still fail, check that the following conditions are true:

- The Cisco ATA software image version is 2.14 or above.
- The Cisco ATA model number is ATA186-I1, ATA186-I2, ATA 188-I1, or ATA188-I2.
- The fax relay option for the remote gateways has been disabled.

Using rtpcatch for Diagnosing Fax Problems

This section contains the following topics:

- [rtpcatch Overview, page 7-12](#)
- [Example of rtpcatch, page 7-13](#)
- [Analyzing rtpcatch Output for Fax Sessions, page 7-16](#)
- [Using rtpcatch to Analyze Common Causes of Failure, page 7-18](#)
- [rtpcatch Limitations, page 7-20](#)

rtpcatch Overview

rtpcatch is a tool that provides comprehensive information for a VoIP connection. The tool runs on a Microsoft Windows-based PC and is capable of parsing an output capture file from Network Associates (NAI) Sniffer Pro and identifies significant fax pass-through and fax relay events.

Major functions

rtpcatch includes the following major functions:

- Reads session data from Sniffer Pro capture files.
- Analyzes media streams.
- Stores media streams to files.
- Reports RTP statistics such as the number of RTP packets, the number of RTP frames, the number of lost packets, the number of filler packets during silence suppression periods, and the number of erased packets.

How to Use

To use **rtpcatch**, follow these steps:

Procedure

-
- Step 1** Create a working directory for **rtpcatch** and place the executable file rtpcatch.exe in this directory.
 - Step 2** Copy your Network Associates Sniffer Pro capture files into this directory.
 - Step 3** At the DOS prompt of this directory, enter the following command:

```
:>rtpcatch <cap_file> [<prefix>] [options]
```

- **<cap_file>** is the NAI Sniffer capture file.
- **<prefix>** is the prefix prepended to the output filenames.

Output Files

The output files of **rtppatch** include a summary file and audio stream files.

The summary file is **<prefix>.sum** if **<prefix>** is specified, otherwise it is **file.sum**.

Stream files are labeled with an integer tag beginning with 00. Stream files are also tagged with the extension **pcm** for G.711A/G.711 μ -law, **723** for G723.1, **729** for G729, **t38** for T.38, and **cfr** for Cisco Fax Relay.

Options

rtppatch options include:

- **-fax**—to output the fax events for a connection.

The output includes "FAX summary 1" as the interleaved event list for all directions, and "FAX summary 2" as the event list for each direction. The reported events include voice codec change, NSE signalling, and fax relay events.

- **-port <port0> <port1>**—to discard any packets sent from/to this port.

If the NAI Sniffer capture file includes Cisco ATA **prserv** packets, these packets can interfere with **rtppatch** analysis. Some **prserv** packets might be interpreted as NTE or NSE events. To prevent such interference, you can either disable debugging output on the Cisco ATA (do this by setting the **Nprintf** configuration parameter to 0), configure your NAI Sniffer to filter out the **prserv** packets, or run **rtppatch** with the **-port** options.



Note

rtppatch works best for analyzing a single VoIP session. Command-line options can be entered in any order.

Example of rtppatch

The section contains an example of using **rtppatch** and includes an explanation of its output:

Output

```
C:\>rtppatch faxpassthru -fax

[ 25]open file: 00.723, (G723) 2.213:10000 => 2.116:10002
[ 26]open file: 01.723, (G723) 2.116:10002 => 2.213:10000
[ 29] <00> 1 silence pkts from TS 1760 (seq# 3)
[ 42] <00> 2 silence pkts from TS 4400 (seq# 9)
[ 47] <00> 2 silence pkts from TS 5600 (seq# 11)
[ 55] <00> 2 silence pkts from TS 7760 (seq# 15)
[ 101]open file: 02.pcm, (G711u) 2.116:10002 => 2.213:10000
[ 106] <02> 2 lost pkts from seq# 39
[ 107]open file: 03.pcm, (G711u) 2.213:10000 => 2.116:10002
[ 110] <03> 1 silence pkts from TS 19440 (seq# 41)
```

----- Summary -----

```

Input file: faxpassthru.cap

<00.723>: (G723) 2.213:10000 => 2.116:10002
        total 38 pkts(70 frames), lost 0 pkts, fill 7 silence pkts

<01.723>: (G723) 2.116:10002 => 2.213:10000
        total 38 pkts(76 frames), lost 0 pkts, fill 0 silence pkts

<02.pcm>: (G711u) 2.116:10002 => 2.213:10000
        total 2181 pkts(2181 frames), lost 2 pkts, fill 0 silence pkts

<03.pcm>: (G711u) 2.213:10000 => 2.116:10002
        total 2179 pkts(2179 frames), lost 0 pkts, fill 1 silence pkts

----- FAX Summary 1 -----

[ 25]<2.213=>2.116> Codec G723
[ 26]<2.116=>2.213> Codec G723
[ 101]<2.116=>2.213> Codec G711u/D
[ 102]<2.116=>2.213> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 103]<2.116=>2.213> NSE PT 100, EVT 193: ECAN OFF, Phase Reversal Detected
[ 105]<2.213=>2.116> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 107]<2.213=>2.116> Codec G711u/D

----- FAX Summary 2 -----

PATH: 2.213:10000 => 2.116:10002
[ 25]Codec G723
[ 105]NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 107]Codec G711u/D

PATH: 2.116:10002 => 2.213:10000
[ 26]Codec G723
[ 101]Codec G711u/D
[ 102]NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 103]NSE PT 100, EVT 193: ECAN OFF, Phase Reversal Detected

```

Explanation

The output is printed on screen and saved in the file file.sum.

The following lines are described:

- [25]open file: 00.723, (G723) 2.213:10000 => 2.116:10002
This indicates that **rtptcatch** reached NAI Sniffer packet number 25 and opened a new file named 00.723 to store an audio stream consisting of G.723-compressed data. The audio path originates from the IP address ending with 2.213 and port 10000 (written as <2.213:1000>) and terminates at the IP address ending with 2.116 and port 10002.
- [29] <00> 1 silence pkts from TS 1760 (seq# 3)
This indicates that **rtptcatch** detected one silence RTP packet in the audio path <00> and the silence packet began at timestamp 1760. This occurred at packet number 29 with the RTP sequence number 3.
- [106] <02> 2 lost pkts from seq# 39
This indicates that **rtptcatch** detected two lost RTP packets in the audio path <02>. The missing packets began with sequence number 39. This occurred at packet number 106.

- ----- Summary -----

```
Input file: faxpassthru.cap
<00.723>: (G723) 2.213:10000 => 2.116:10002
total 38 pkts(70 frames), lost 0 pkts, fill 7 silence pkts
```

This indicates that the input filename is faxpassthru.cap. The output file 00.723 contains the G.723-compressed stream from <2.123:10000> to <2.116:10002>; 38 packets (70 frames) were processed by **rtptime**. No lost packets were detected and seven silence packets were found.

- ----- FAX Summary 1 -----

```
[ 25]<2.213=>2.116> Codec G723
[ 26]<2.116=>2.213> Codec G723
[ 101]<2.116=>2.213> Codec G711u/D
[ 102]<2.116=>2.213> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 103]<2.116=>2.213> NSE PT 100, EVT 193: ECAN OFF, Phase Reversal Detected
[ 105]<2.213=>2.116> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 107]<2.213=>2.116> Codec G711u/D
```

This indicates that the audio streams originating at <2.213> and <2.216> are G.723-compressed. The audio stream from <2.116> was then up-spiced to G.711 μ -law at packet number 101. The NSE signaling packets were sent at packet number 102, 103 and 105. Finally, the audio stream from <2.113> was up-spiced to G.711 μ -law.

- ----- FAX Summary 2 -----

```
PATH: 2.213:10000 => 2.116:10002
[ 25]Codec G723
[ 105]NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 107]Codec G711u/D
PATH: 2.116:10002 => 2.213:10000
[ 26]Codec G723
[ 101]Codec G711u/D
[ 102]NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 103]NSE PT 100, EVT 193: ECAN OFF, Phase Reversal Detected
```

This summarizes the fax events for each path.

The audio stream events reported by **rtptime** include:

- beginning of new audio codec
- silence packets
- lost packets
- erased packets (as in G.729)

The NSE events reported by **rtptime** include:

- event 32, Fax Mode, CED tone Detected (RFC2833)
- event 34, Modem Mode, ANSam tone Detected (RFC2833)
- event 192, Up-Speed, CED tone Detected
- event 193, ECAN OFF, Phase Reversal Detected
- event 194, ECAN ON, Silence Detected
- event 200, T38 Fax Mode, V.21 Detected
- event 201, T38 Fax Mode ACK
- event 202, T38 Fax Mode NACK

- event 203, Modem Relay Mode, CM Tone Detected
- event Cisco Fax Relay (with RTP payload type 96)
- event Cisco Fax Relay ACK (with RTP payload type 97)

Analyzing rtpcatch Output for Fax Sessions

The following examples show the proper fax events when gateways are configured to operate in the following modes:

- Cisco ATA *fax mode*
- Cisco ATA *fax pass-through mode*
- T.38 fax relay mode
- Cisco fax relay mode

Example 7-1 Fax Mode

```
----- FAX Summary 1 -----
[ 25]<2.131=>3.200> Codec G711u
[ 26]<3.200=>2.131> Codec G711u
```

Analysis

Both sides use G.711 for the entire fax session.

Example 7-2 Fax Pass-through Mode

```
----- FAX Summary 1 -----
[ 25]<2.213=>2.116> Codec G723
[ 26]<2.116=>2.213> Codec G723
[ 101]<2.116=>2.213> Codec G711u/D
[ 102]<2.116=>2.213> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 103]<2.116=>2.213> NSE PT 100, EVT 193: ECAN OFF, Phase Reversal Detected
[ 105]<2.213=>2.116> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 107]<2.213=>2.116> Codec G711u/D
```

Analysis

- Both sides initially use G.723.
- <2.116> switches to G.711 μ -law using a dynamic payload type.
- NSE signaling packets are sent from <2.116>.
- An optional NE signaling packet is sent from <2.213>.
- <2.113> switches to G.711 μ -law using a dynamic payload type.



Note

EVT 193 may not appear for some fax transmission.

Example 7-3 Fax Pass-through Mode

```
----- FAX Summary 1 -----
[ 37]<3.200=>2.53> Codec G723
[ 41]<2.53=>3.200> Codec G723
```

```
[ 136]<3.200=>2.53> Codec G711u/D
[ 137]<3.200=>2.53> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 140]<2.53=>3.200> Codec G711u/D
```

Analysis

- Both sides initially use G.723.
- <3.200> switches to G.711 μ -law using a dynamic payload type.
- NSE signaling packets are sent from <3.200>.
- <2.53> switches to G.711 μ -law using a dynamic payload type.

Example 7-4 T38 Fax Relay Mode

```
----- FAX Summary 1 -----
[ 15]<2.53=>3.99> Codec G711u
[ 486]<3.99=>2.53> Codec G711u
[ 1277]<3.99=>2.53> Codec T38
[ 1278]<2.53=>3.99> Codec T38
```

Analysis

- Both sides initially use G.711 μ -law.
- Both sides switch to T.38

Example 7-5 Cisco Fax Relay

```
----- FAX Summary 1 -----
[ 8]<2.53=>3.99> Codec G711u
[ 248]<3.99=>2.53> Codec G711u
[ 798]<2.53=>3.99> NSE PT 96, Cisco Fax Relay
[ 799]<3.99=>2.53> NSE PT 97, EVT 192: Up-Speed, CED tone Detected
[ 800]<2.53=>3.99> NSE PT 97, Cisco Fax Relay ACK
[ 801]<2.53=>3.99> Codec C_FxRly
[ 803]<3.99=>2.53> NSE PT 96, EVT 192: Up-Speed, CED tone Detected
[ 804]<2.53=>3.99> NSE PT 97, Cisco Fax Relay ACK
[ 805]<3.99=>2.53> Codec C_FxRly
```

Analysis

- Both sides initially use G.711 μ -law.
- NSE signaling packets are sent between <2.53> and <3.99>.
- Both sides switch to Cisco fax relay.

Using rtpcatch to Analyze Common Causes of Failure

The following examples show the **rtpcatch** output of failed fax sessions. <3.200> is ATA; <2.53> is a Cisco gateway.

Example 7-6 Cisco ATA Configuration Failure

```
----- FAX Summary 1 -----
[  37]<2.53=>3.200> Codec G723
[  39]<3.200=>2.53> Codec G723
```

Analysis

- <2.53> is the originating gateway and <3.200> is the terminating Cisco ATA.
- The Cisco ATA and the <2.53> gateway use G.723 codec.

Possible Causes for Failure

- The Cisco ATA is not configured with *fax mode* or *fax pass-through mode*.
- If the Cisco ATA is the gateway for a fax sender, the remote gateway is not configured with *fax pass-through mode*.

Example 7-7 Fax Mode Failure

```
----- FAX Summary 1 -----
[  37]<2.53=>3.200> Codec G711
[  39]<3.200=>2.53> Codec G711
[ 1820]<2.53=>3.200> NSE PT 96, Cisco Fax Relay
[ 1966]<2.53=>3.200> NSE PT 96, Cisco Fax Relay
```

Analysis

- <2.53> is the originating gateway and <3.200> is the terminating Cisco ATA.
- The Cisco ATA and the <2.53> gateway begin with G.711 codec.
- The <2.53> gateway sends Cisco fax relay event packets.

Possible Cause for Failure

- Cisco fax relay option is not disabled on the gateway.

Example 7-8 Fax Pass-through Mode Failure

```
----- FAX Summary 1 -----
[  2]<2.53=>3.200> Codec G723
[  4]<3.200=>2.53> Codec G723
[ 106]<3.200=>2.53> Codec G711u/D
[ 107]<3.200=>2.53> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 1436]<3.200=>2.53> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
```

Analysis

- <2.53> is the originating gateway, and <3.200> is the terminating Cisco ATA.
- The Cisco ATA upspeeds to G.711 μ -law and sends G.711 upspeed NSE signaling packets.
- The <2.53> gateway does not respond to the NSE signaling packets.

Possible Causes for Failure

- Fax/modem pass-through option is not enabled on the gateway.
- Fax/modem pass-through NSE payload type are configured differently on the Cisco ATA and the gateway.

Example 7-9 Fax Pass-through Mode Failure

```

----- FAX Summary 1 -----
[ 37]<2.53=>3.200> Codec G723
[ 39]<3.200=>2.53> Codec G723
[ 143]<3.200=>2.53> Codec G711u/D
[ 144]<3.200=>2.53> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 1602]<3.200=>2.53> NSE PT 100, EVT 192: Up-Speed, CED tone Detected
[ 1604]<2.53=>3.200> Codec G711u/D
[ 1820]<2.53=>3.200> NSE PT 96, Cisco Fax Relay
[ 1966]<2.53=>3.200> NSE PT 96, Cisco Fax Relay

```

Analysis

- <2.53> is the originating gateway, and <3.200> is the terminating Cisco ATA.
- The Cisco ATA upspeeds to G.711 μ -law and sends G.711 upspeed NSE signaling packets.
- The <2.53> gateway upspeeds to G.711 μ -law and then sends Cisco fax relay event packets.

Possible Cause for Failure

- Cisco fax relay option is not disabled on the gateway.

Example 7-10 Fax Pass-through Mode Failure

```

----- FAX Summary 1 -----
[ 33]<3.200=>2.53> Codec G729
[ 39]<2.53=>3.200> Codec G729
[ 562]<2.53=>3.200> NTE PT 101, EVT 34: Modem Mode, ANSam tone Detected (RFC2833)
[ 563]<2.53=>3.200> NTE PT 101, EVT 34: Modem Mode, ANSam tone Detected (RFC2833)
[ 565]<2.53=>3.200> NTE PT 101, EVT 34: Modem Mode, ANSam tone Detected (RFC2833)
[ 566]<2.53=>3.200> Codec G711u/D
[ 568]<2.53=>3.200> NTE PT 101, EVT 34: Modem Mode, ANSam tone Detected (RFC2833)
[ 580]<3.200=>2.53> Codec G711u/D

```

Analysis

- <3.200> is the originating Cisco ATA, and <2.53> is the terminating gateway.
- Both sides initially use G.729.
- <2.53> gateway sends NTE signaling packets, then upspeeds to G.711 μ -law.
- <3.200>The Cisco ATA switches to G.711 μ -law also, but never sends NTE signaling packets.
- Fax transmission fails because <2.53> gateway does not receive any NTE packets, and it drops the fax call.

Possible Cause for Failure

- The Cisco ATA does not support the NTE signaling method and requires that the gateways use the NSE signaling method.

rtpcatch Limitations

- **rtpcatch** performs optimally when analyzing capture files containing only one VoIP session.
- **rtpcatch** detects only G.711A, G.711 μ -law, G.723, G.729, T.38, Cisco fax relay, modem pass-through with or without redundancy packets, RTCP packets and NSE packets.
- **rtpcatch** can handle a maximum of 20 prserv ports using the -port option.
- **rtpcatch** may not detect T.38 packets correctly.