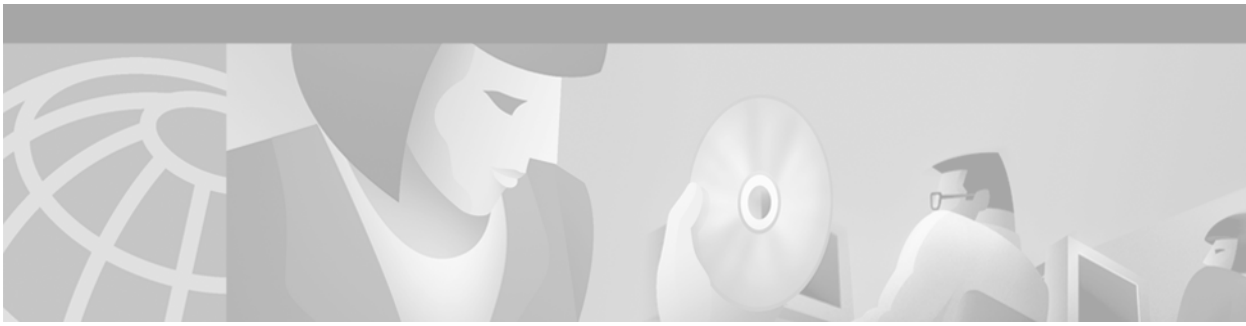

PSTN Fallback Enhancement

Feature History

Release	Modification
12.1(3)T	The PSTN Fallback feature was introduced on Cisco 2600 series and Cisco 3600 series routers and Cisco MC3810 multiservice concentrators.
12.2(2)T	The **call fallback** command was introduced.
12.2(2)XA	The **call fallback reject-cause-code** command was introduced.

This document describes an enhancement to the PSTN Fallback feature that is the **call fallback reject-cause-code** command. This document includes the following sections:

Feature Overview

The PSTN Fallback feature monitors congestion in the IP network and redirects calls to the Public Switched Telephone Network (PSTN) or rejects calls on the basis of network congestion. The fallback subsystem has a network traffic cache that maintains the Calculated Planning Impairment Factor (ICPIF) or delay/loss values for various destinations. Performance is improved because each new call to a well-known destination does not have to wait on a probe to be admitted and the value is usually cached from a previous call.

ICPIF calculates an impairment factor for every piece of equipment along the voice path and then adds them up to get the total impairment value. Refer to International Telecommunication Union (ITU) standard G.113 for more information. The ITU assigns a value to the types of impairment, such as noise, delay, and echo.

The ICPIF method of determining the impairment value was introduced for compatibility with Cisco H.323 applications. Part of ICPIF includes a concept of Total Impairment Value that is a function of loss of packets, delay of packets, and codecs used based on the round-trip reports from Service Assurance Agent (SAA).

SAA is a network congestion analysis mechanism that provides delay, jitter, and packet loss information for the configured IP addresses. SAA is based on a client/server protocol defined on the User Datagram Protocol (UDP). UDP is a connectionless transport layer protocol in the TCP/IP protocol stack. UDP is a simple protocol that exchanges datagrams without acknowledgments or guaranteed delivery, requiring that error processing and retransmission be handled by other protocols. The SAA probe packets go out on randomly selected ports from the top end of the audio UDP port range.

The information that the SAA probes gather is used to calculate the ICPIF or delay/loss values that are stored in a fallback cache, where they remain until the cache ages out or overflows. Until an entry ages out, probes are sent periodically for that particular destination. This time interval is user configurable.

With this feature enhancement, you can also configure codes that indicate the cause of the network rejection; for example, packets that are lost or that take too long to be transmitted. A default cause code of 49 displays the message “Quality of Service Unavailable.”

Benefits

The PSTN Fallback feature and enhancement provide the following benefits:

- Automatically routes a call to an alternate destination when the data network is congested at the time of the call setup.
- Enables the service provider to give a reasonable guarantee about the quality of the conversation to its Voice over IP (VoIP) users at the time of call admission.
- Provides delay, jitter, and packet loss information for the configured IP addresses.
- Caches call values from previous calls. New calls do not have to wait for probe results before they are admitted.
- Enables a user-configurable cause code display that indicates the type of call rejection.

Restrictions

The PSTN Fallback feature has the following restrictions:

- When detecting network congestion, the PSTN fallback feature does nothing to the existing call. It affects only subsequent calls.
- Only a single ICPIF/delay-loss value is allowed per system.
- A small additional call setup delay can be expected for the first call to a new IP destination.
- PSTN fallback is supported for H.323 VoIP calls only.

Caution Configuring **call fallback active** in a gateway creates an SAA jitter probe against other (target) gateways to which the calls are sent. In order for the **call fallback active** to work properly, the target gateways must have the **rtr responder** command (in Cisco IOS releases prior to 12.3(14)T) or the **ip sla monitor responder** command (in Cisco IOS Release 12.3(14)T or later) in their configurations. If one of these commands is not included in the configuration of each target gateway, calls to the target gateway will fail.

Related Documents

PSTN Fallback Documents

- "Configuring Trunk Connections and Conditioning Features" chapter in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Cisco IOS Release 12.2

Platform Documents

- *Software Configuration Guide for Cisco 2600 Series and Cisco 3600 Series Routers*
- *Cisco MC3810 Multiservice Concentrator Software*

Voice over IP Documents

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

Voice over ATM Documents

- *Voice over ATM on Cisco 3600 Series Routers*
- *Configuring Voice over ATM for the Cisco MC3810 Multiservice Concentrator*

Calculated Planning Impairment Factor Documents

- *Managing Voice Quality with Cisco Voice Manager (CVM) and Telemate*

Service Assurance Agent Documents

- "Configuring Trunk Connections and Conditioning Features" chapter in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Cisco IOS Release 12.2

Supported Platforms

- Cisco 2600 series
- Cisco 3600 series
- Cisco MC3810

Platform Support Through 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 Feature Navigator. Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

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.

To access 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.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of May 2001, Feature Navigator supports M, T, E, S, and ST releases. You can access Feature Navigator at the following URL:

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

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

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

No new or modified RFCs are supported by this feature.

Prerequisites

Before you can configure the PSTN fallback enhancement, you must have already configured PSTN fallback and VoIP. For more information, see the "Configuring Trunk Connections and Conditioning Features" chapter in the *Cisco IOS Voice, Video, and Fax Configuration Guide* and the *Cisco IOS Voice, Video, and Fax Command Reference*.

Configuration Tasks

See the following sections for configuration tasks for the PSTN Fallback enhancement feature. Each task in the list is identified as either required or optional.

- Configuring the PSTN Cause Code, page 5 (required)
- Verifying PSTN Fallback Configuration, page 5 (optional)

Configuring the PSTN Cause Code

To configure the PSTN cause code, use the following command in global configuration mode:

Command	Purpose
`Router (config)# call fallback reject-cause-code` *number*	Configures the cause code that displays when congestion thresholds are reached. The *number* argument represents any cause code defined in Q.850 (ITU standard for Q.931 call control) except the code for normal call clearing (cause code 16).

Verifying PSTN Fallback Configuration

To verify the PSTN Fallback configuration, use the following commands in EXEC mode as needed:

Command	Purpose
`Router# show call fallback cache`	Displays the current ICPIF estimates for all IP addresses in the call fallback cache.
`Router# show call fallback config`	Displays the current configuration.
`Router# show call fallback stats`	Displays the call fallback statistics.
`Router# show running-config`	Displays the running configuration and the configured cause code.

Command Reference

This section documents modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **call fallback reject-cause-code**

call fallback reject-cause-code

To enable a call fallback reject cause code in case of network congestion, use the **call fallback reject-cause-code** command in global configuration mode. To reset the call fallback reject cause code to the default (49), use the **no** form of this command.

call fallback reject-cause-code *number*

no call fallback reject-cause-code *number*

Syntax Description

number	Specifies the cause code defined in the International Telecommunication Union (ITU) standard Q.850 except the code for normal call clearing, which is code 16. The default value is 49. See Table 1 for ITU cause code numbers.

Defaults

49 (Quality of Service is unavailable)

Command Modes

Global configuration

Command History

Release	Modification
12.2(2)XA	This command was introduced on Cisco 2600 and 3600 series routers and Cisco MC3810 multiservice concentrators.

Usage Guidelines

Enabling the **call fallback reject-cause-code** command determines the code to display when calls are rejected because of probing of network conditions.

Note Connected calls are not affected by this feature.

Table 1 lists the ITU cause codes and their associated displayed messages and meanings.

Table 1 ITU Cause Codes, Messages, and Meanings

Cause Code	Displayed Message	Meaning
1	Unallocated (unassigned) number	Indicates that the called party cannot be reached because, although the called party number is in a valid format, it is not currently allocated (assigned).
2	No route to specified transit network (national use)	Indicates that the equipment that is sending this cause has received a request to route the call through a particular transit network that it does not recognize. The equipment that is sending this cause does not recognize the transit network either because the transit network does not exist or because that particular transit network, while it does exist, does not serve the equipment that is sending this cause. This cause is supported on a network-dependent basis.
3	No route to destination	Indicates that the called party cannot be reached because the network through which the call has been routed does not serve the destination desired. This cause is supported on a network-dependent basis.
4	Send special information tone	Indicates that the called party cannot be reached for reasons that are of a long-term nature and that the special information tone should be returned to the calling party.
5	Misdialed trunk prefix (national use)	Indicates the erroneous inclusion of a trunk prefix in the called party number.
6	Channel unacceptable	Indicates that the channel most recently identified is not acceptable to the sending entity for use in this call.
7	Call awarded and being delivered in an established channel	Indicates that the user has been awarded the incoming call and that the incoming call is being connected to a channel that is already established to that user for similar calls (for example, packet-mode X.25 virtual calls).
8	Preemption	Indicates that the call is being preempted.
9	Preemption - circuit reserved for reuse	Indicates that the call is being preempted and that the circuit is reserved for reuse by the preempting exchange.
16	Normal call clearing	Indicates that the call is being cleared because one of the users involved in the call has requested that the call be cleared. Under normal situations, the source of this cause is not the network.

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
17	User busy	Indicates that the called party is unable to accept another call because the user busy condition has been encountered. This cause value may be generated by the called user or by the network. If the user determines the busy, it is noted that the user equipment is compatible with the call.
18	No user responding	Indicates when a called party does not respond to a call establishment message with either an alerting or a connect indication within the prescribed period of time allocated.
19	No answer from user (user alerted)	Indicates when the called party has been alerted but does not respond with a connect indication within a prescribed period of time. **Note** This cause is not necessarily generated by ITU standard Q.931 procedures but may be generated by internal network timers.
20	Subscriber absent	Indicates when a mobile station has logged off, when radio contact is not obtained with a mobile station, or when a personal telecommunication user is temporarily not addressable at any user-network interface.
21	Call rejected	Indicates that the equipment that is sending this cause does not wish to accept this call although it could have accepted the call because the equipment that is sending this cause is neither busy nor incompatible. The network may also generate this cause, indicating that the call was cleared because of a supplementary service constraint. The diagnostic field may contain additional information about the supplementary service and reason for rejection.
22	Number changed	Indicates when the called-party number indicated by the calling party is no longer assigned. The new called-party number may optionally be included in the diagnostic field. If a network does not support this cause value, cause No. 1, an unallocated (unassigned) number, shall be used.
26	Non-selected user clearing	Indicates that the user has not been awarded the incoming call.

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
27	Destination out of order	Indicates that the destination indicated by the user cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signaling message was unable to be delivered to the remote party; for example, a physical layer or data link layer failure at the remote party, or the equipment of the user is offline.
28	Invalid number format (address incomplete)	Indicates that the called party cannot be reached because the called party number is not in a valid format or is not complete.
29	Facility rejected	Indicates when a supplementary service requested by the user cannot be provided by the network.
30	Response to STATUS ENQUIRY	Indicates when the reason for generating the STATUS message was the prior receipt of a STATUS ENQUIRY message.
31	Normal, unspecified	Reports a normal event only when no other cause in the normal class applies.
34	No circuit/channel available	Indicates that there is no appropriate circuit or channel presently available to handle the call.
38	Network out of order	Indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; for example, immediately reattempting the call is not likely to be successful.
39	Permanent frame mode connection out-of-service	Indicates in a STATUS message that a permanently established frame mode connection is out-of-service (for example, due to equipment or section failure) (see the ITU standard, Annex A/Q.933).
40	Permanent frame mode connection operational	Indicates in a STATUS message to indicate that a permanently established frame mode connection is operational and capable of carrying user information (see the ITU standard, Annex A/Q.933).
41	Temporary failure	Indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; for example, the user may wish to try another call attempt almost immediately.
42	Switching equipment congestion	Indicates that the switching equipment that is generating this cause is experiencing a period of high traffic.

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
43	Access information discarded	Indicates that the network could not deliver access information to the remote user as requested, that is, user-to-user information, low layer compatibility, high layer compatibility, or subaddress, as indicated in the diagnostic. It is noted that the particular type of access information discarded is optionally included in the diagnostic.
44	Requested circuit/channel not available	Indicates when the circuit or channel indicated by the requesting entity cannot be provided by the other side of the interface.
46	Precedence call blocked	Indicates that there are no preemptable circuits or that the called user is busy with a call of an equal or higher preemptable level.
47	Resource unavailable, unspecified	Reports a resource-unavailable event only when no other cause in the resource-unavailable class applies.
49	Quality of Service not available	Reports that the requested Quality of Service, as defined in ITU recommendation X.213, cannot be provided (for example, throughput or transit delay cannot be supported).
50	Requested facility not subscribed	Indicates that the user has requested a supplementary service that is implemented by the equipment that generated this cause but that the user is not authorized to use this service.
53	Outgoing calls barred within CUG	Indicates that although the calling party is a member of the closed user group (CUG) for the outgoing CUG call, outgoing calls are not allowed for this member of the CUG.
55	Incoming calls barred within CUG	Indicates that although the called party is a member of the CUG for the incoming CUG call, incoming calls are not allowed for this member of the CUG.
57	Bearer capability not authorized	Indicates that the user has requested a bearer capability that is implemented by the equipment that generated this cause but that the user is not authorized to use this capability.
58	Bearer capability not presently available	Indicates that the user has requested a bearer capability that is implemented by the equipment that generated this cause but that is not available at this time.
62	Inconsistency in designated outgoing access information and subscriber class	Indicates that there is an inconsistency in the designated outgoing access information and subscriber class.
63	Service or option not available, unspecified	Reports a service or option not available event only when no other cause in the service or option not available class applies.

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
65	Bearer capability not implemented	Indicates that the equipment that is sending this cause does not support the bearer capability requested.
66	Channel type not implemented	Indicates that the equipment that is sending this cause does not support the channel type requested.
69	Requested facility not implemented	Indicates that the equipment that is sending this cause does not support the requested supplementary service.
70	Only restricted digital information bearer capability is available (national use)	Indicates that the calling party has requested an unrestricted bearer service but that the equipment that is sending this cause supports only the restricted version of the requested bearer capability.
79	Service or option not implemented, unspecified	Reports a service or option not implemented event only when no other cause in the service or option not implemented class applies.
81	Invalid call reference value	Indicates that the equipment that is sending this cause has received a message with a call reference that is not currently in use on the user-network interface.
82	Identified channel does not exist	Indicates that the equipment that is sending this cause has received a request to use a channel not activated on the interface for a call. For example, if a user has subscribed to those channels on a PRI numbered from 1 to 12 and the user equipment or the network attempts to use channels 13 through 23, this cause is generated.
83	A suspended call exists, but this call identity does not	Indicates that a call resume has been attempted with a call identity that differs from that in use for any presently suspended call(s).
84	Call identity in use	Indicates that the network has received a call suspended request that contains a call identity (including the null call identity) that is already in use for a suspended call within the domain of interfaces over which the call might be resumed.
85	No call suspended	Indicates that the network has received a call resume request that contains a call identity information element that presently does not indicate any suspended call within the domain of interfaces over which calls may be resumed.
86	Call having the requested call identity has been cleared	Indicates that the network has received a call resume request that contains a call identity information element that indicates a suspended call that has in the meantime been cleared while suspended (either by network timeout or by the remote user).

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
87	User not member of CUG	Indicates that the called user for the incoming CUG call is not a member of the specified CUG or that the calling user is an ordinary subscriber that is calling a CUG subscriber.
88	Incompatible destination	Indicates that the equipment that is sending this cause has received a request to establish a call that has low layer compatibility, high layer compatibility, or other compatibility attributes (for example, data rate) that cannot be accommodated.
90	Non-existent CUG	Indicates that the specified CUG does not exist.
91	Invalid transit network selection (national use)	Indicates that a transit network identification was received that is of an incorrect format as defined in ITU standard Annex C/Q.931.
95	Invalid message, unspecified	Reports an invalid message event only when no other cause in the invalid message class applies.
96	Mandatory information element is missing	Indicates that the equipment that is sending this cause has received a message that is missing an information element that must be present in the message before that message can be processed.
97	Message type non-existent or not implemented	Indicates that the equipment that is sending this cause has received a message with a message type that it does not recognize because this is a message not defined or defined but not implemented by the equipment that is sending this cause.
98	Message not compatible with call state or message type non-existent or not implemented	Indicates that the equipment that is sending this cause has received a message that the procedures do not indicate as a permissible message to receive while in the call state, or that a STATUS message that indicates an incompatible call state was received.
99	Information element/parameter non-existent or not implemented	Indicates that the equipment that is sending this cause has received a message that includes information elements or parameters not recognized because the information element identifiers or parameter names are not defined or are defined but not implemented by the equipment sending the cause. This cause indicates that the information elements or parameters were discarded. However, the information element is not required to be present in the message for the equipment that is sending the cause to process the message.

Table 1 ITU Cause Codes, Messages, and Meanings (continued)

Cause Code	Displayed Message	Meaning
100	Invalid information element contents	Indicates that the equipment that is sending this cause has received an information element that it has implemented; however, one or more fields in the information element are coded in a way that has not been implemented by the equipment that is sending this cause.
101	Message not compatible with call state	Indicates that a message has been received that is incompatible with the call state.
102	Recovery on timer expired	Indicates that a procedure has been initiated by the expiration of a timer in association with error-handling procedures.
103	Parameter non-existent or not implemented - passed on	Indicates that the equipment that is sending this cause has received a message that includes parameters not recognized because the parameters are not defined or are defined but not implemented by the equipment that is sending the cause. The cause indicates that the parameters were ignored. In addition, if the equipment that is sending this cause is an intermediate point, this cause indicates that the parameters were passed on unchanged.
110	Message with unrecognized parameter discarded	Indicates that the equipment that is sending this cause has discarded a received message that includes a parameter that is not recognized.
111	Protocol error, unspecified	Reports a protocol error event only when no other cause in the protocol error class applies.
127	Interworking, unspecified	Indicates that there has been interworking with a network that does not provide causes for actions it takes. Thus, the precise cause for a message that is being sent cannot be ascertained.

Examples

The following example enables the **call fallback reject-cause-code** command and specifies cause code 34:

```
Router(config)# call fallback reject-cause-code 34
```

Related Commands

Command	Description
call fallback cache-size	Specifies the call fallback cache size for network traffic probe entries.
call fallback cache-timeout	Specifies the time after which the cache entries of network conditions are purged.
call fallback instantaneous-value-weight	Specifies that the call fallback subsystem take an average from the last two cache entries for call requests.
call fallback jitter-probe num-packets	Specifies the number of packets in a jitter probe used to determine network conditions.

Command	Description
call fallback jitter-probe precedence	Specifies the priority of the jitter-probe transmission.
call fallback jitter-probe priority-queue	Assigns a priority queue for jitter-probe transmissions.
call fallback key-chain	Specifies MD5 authentication for sending and receiving SAA probes.
call fallback map address-list	Specifies that the call fallback router keep a cache table by IP addresses of distances for several destination peers sitting behind the router.
call fallback map subnet	Specifies that the call fallback router keep a cache table by subnet addresses of distances for several destination peers sitting behind the router.
call fallback probe-timeout	Sets the timeout for an SAA probe for call fallback purposes.
call fallback threshold delay loss	Specifies that the call fallback threshold use only packet delay and loss values.
call fallback threshold icpif	Specifies that call fallback use the ICPIF threshold.
show call fallback config	Displays the call fallback configuration.