

Guide Contents
<a href="#">Troubleshooting Cisco IOS Voice Overview</a>
<a href="#">Debug Command Output on Cisco IOS Voice Gateways</a>
<a href="#">Filtering Troubleshooting Output</a>
<a href="#">Cisco VoIP Internal Error Codes</a>
<a href="#">Troubleshooting Cisco IOS Voice Telephony</a>
<a href="#">Troubleshooting Cisco IOS Voice Protocols</a>
<a href="#">Troubleshooting Cisco IOS Telephony Applications</a>
<a href="#">Monitoring the Cisco IOS Voice Network</a>
<a href="#">Cause Codes and Debug Values</a>

## Contents

- [1 H.323-Related Standards](#)
  - ◆ [1.1 Figure: H.323 Call Flow](#)
  - ◆ [1.2 H.225 Signaling](#)
    - ◇ [1.2.1 Table: H.225 Call Setup Messages](#)
  - ◆ [1.3 H.245 Signaling](#)

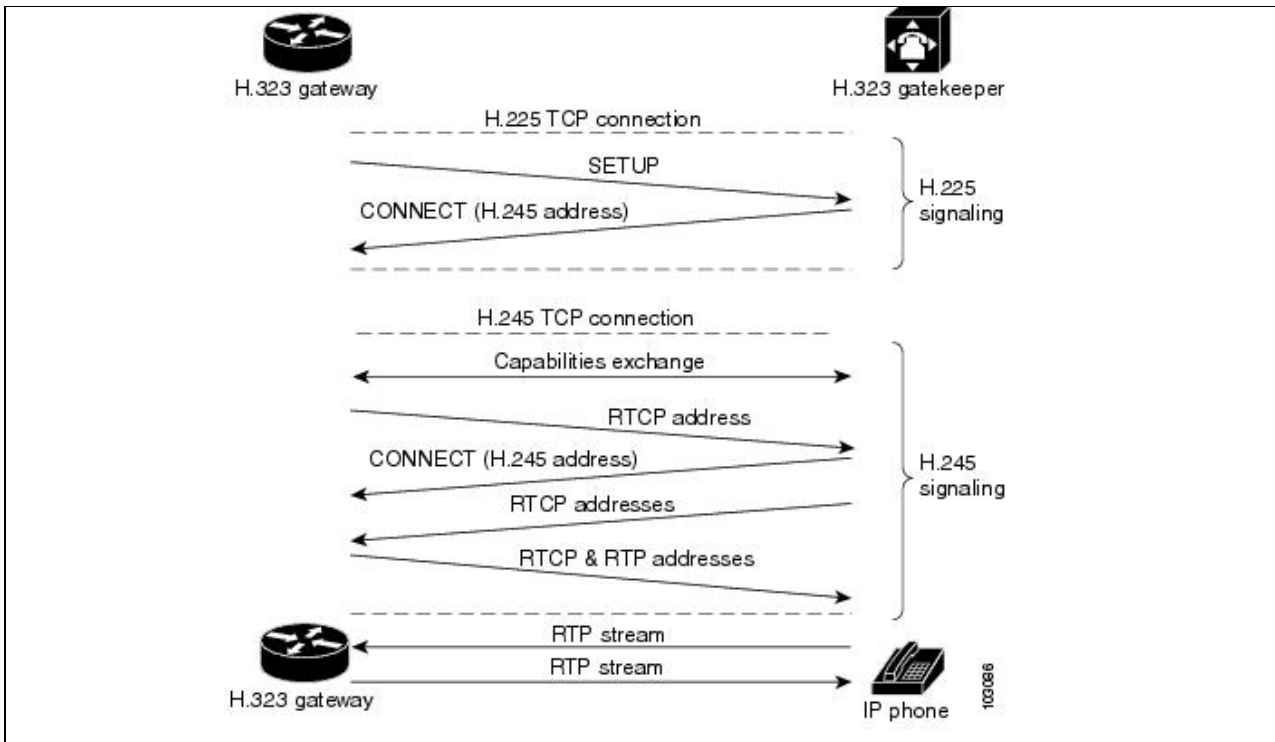
## H.323-Related Standards

Because several standards are involved with setting up a call through an H.323 device, it is important to understand the role each protocol plays to be able to effectively troubleshoot such a call. The following sections describe these standards:

- [H.225 Signaling](#)
- [H.245 Signaling](#)

[Figure: H.323 Call Flow](#) shows the basic call flow for an H.323 call.

**Figure: H.323 Call Flow**



## H.225 Signaling

H.225 is used for call control functions. H.225 is very similar to Q.931. H.225 signaling is carried over a TCP connection. H.323 devices listen to port 1720 for incoming connections and show messages that might be used in an H.225 call setup, such as those shown in [Table: H.225 Call Setup Messages](#). Each message can contain one or more information element (IE). Each IE carries a specific piece of information within an H.225 message. For a complete list of IEs and the coding for each, refer to the ITU-T Q.931 specification.

**Table: H.225 Call Setup Messages**

Message	Description
Setup	This message is sent by a calling H.323 device to indicate its desire to set up a connection to the called device.
Setup Acknowledge	This message typically indicates that the called device wants to do overlap sending and can accept more digits before proceeding with the call.
Call Proceeding	This message is sent by the called device to indicate that it has received all the information it needs to route the call to its destination.
Progress	This message can be sent by an H.323 gateway to indicate a call's progress. You typically see progress messages when internetworking with a non-ISDN network because audio cut-through must be treated differently in this case.
Alerting	This message might be sent by the called phone to indicate that the called phone is being alerted of the incoming call. That is, the phone is ringing.
Connect	This message is sent by the called device to the calling device to indicate that the call has been accepted or answered.
User Information	This message can be sent to provide additional information. It can be used to provide information for call establishment in the case of overlap sending or miscellaneous call-related information. It can also be used to deliver proprietary features. Cisco IOS gateways use this message to get around the fact that H.323 gateways do not normally provide ringback when a call is transferred and also to generate tone on hold.

Release Complete	This message is sent by a device to indicate the call's release.
Status Inquiry	This message can be used to request call status. Normally the device receiving this message responds with a status message indicating the current call state for the specific call reference.
Status	This message is used to respond to an unknown call signaling message or to a Status Inquiry message.
Information	This message is used to send additional information for a call. For example, when using overlap sending, each digit is sent one at a time in an Information message.
Notify	This message is used to notify a device of a change that has occurred in the call.

## H.245 Signaling

H.225 is responsible only for setting up the call and routing it to the proper destination. H.225 does not have any mechanism for exchanging capabilities or setting up and tearing down media streams. The called H.323 device is responsible for sending the IP address and port number that are used to establish the TCP connections for H.245 signaling. This information can be sent by the called device in either the Alerting or Connect message.

When the originating H.323 device receives the IP address and port number for H.245 negotiations, it initiates a second TCP connection to carry out the necessary capabilities exchange and logical channel negotiations. This TCP session is primarily used to do four things:

- Master/slave determination-This is used to resolve conflicts that might exist when two endpoints in a call request the same thing, but only one of the two can gain access to the resource at a time.
- Terminal capabilities exchange-This is one of the most important functions of the H.245 protocol. The two most important capabilities are the supported audio codecs and the basic audio calls.
- Logical channel signaling-This indicates a one-way audio stream. With H.323 version 2, it is possible to open and close logical channels in the middle of a call. Because H.245 messages are independent of the H.225 signaling, a call can still be connected in H.225 even if no logical channels are open. This is typical with such features as hold, transfer, and conference.
- DTMF relay-Because voice networks typically do not carry DTMF tones inband because of compression issues, these tones are carried on the signaling channel. Ensure that the type of DTMF relay configured on your gateway is compatible with your gatekeeper.