



## Case Study: Troubleshooting Intercluster Phone Calls

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The case study in this section examines a Cisco IP Phone that is calling another Cisco IP Phone that is located in a different cluster. This type of call is also known as an intercluster Cisco IP Phone call.

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### Sample Topology

The following sample topology gets used in this case study. Two clusters, each having two Cisco CallManagers, and also Cisco IOS Gateways and a Cisco IOS Gatekeeper are in place.

### Intercluster H.323 Communication

The Cisco IP Phone in Cluster 1 makes a call to the Cisco IP Phone in Cluster 2. Intercluster Cisco CallManager communication takes place using the H.323 Version 2 protocol. A Cisco IOS Gatekeeper also serves for admission control.

The Cisco IP Phone can connect to the Cisco CallManager via Skinny Station protocol, and the Cisco CallManager can connect with the Cisco IOS Gatekeeper by using the H.323 Registration, Admission, and Status (RAS) protocol. The admission request message (ARQ) gets sent to the Cisco IOS Gatekeeper, which sends the admission confirmed message (ACF) after making sure the intercluster call can be made using H.323 version 2 protocol. Once this happens, the audio path gets made by using the RTP protocol between Cisco IP Phones in different clusters.

## Call Flow Traces

This section discusses the call flow by using SDI trace examples captured in the CCM000000000 file. The traces discussed in this case study focus only on the call flow itself.

In this call flow, a Cisco IP Phone (2002) located in Cluster 2 is calling a Cisco IP Phone (1001) located in Cluster 1. Remember that you can follow a device through the trace by looking at the TCP handle value, time stamp, or name of the device. The TCP handle value for the device remains the same until the device is rebooted or goes offline.

In the following traces, the Cisco IP Phone (2002) has gone off hook. The trace shows the unique messages, TCP handle, and the calling number, which displays on the Cisco IP Phone. The following debug output shows the called number (1001), H.225 connect, and H.245 confirm messages. The codec type is G.711 mu-law.

```
16:06:13.921 CCM|StationInit - InboundStim - OffHookMessageID
tcpHandle=0x1c64310
16:06:13.953 CCM|Out Message -- H225ConnectMsg -- Protocol=
H225Protocol
16:06:13.953 CCM|Ie - H225UserUserIe IEData= 7E 00 37 05 02 C0 06
16:06:13.953 CCM|StationD - stationOutputCallInfo CallingPartyName=,
CallingParty=2002, CalledPartyName=1001, CalledParty=1001,
tcpHandle=0x1c64310
16:06:14.015 CCM|H245Interface(2) OLC indication chan number = 2
16:06:14.015 CCM|StationD - stationOutputOpenReceiveChannel
tcpHandle=0x1c64310 myIP: e74610ac (172.16.70.231)
16:06:14.015 CCM|StationD - ConferenceID: 0 msecPacketSize: 20
compressionType: (4)Media_Payload_G711Ulaw64k
16:06:14.062 CCM|StationInit - InboundStim -
StationOpenReceiveChannelAckID tcpHandle=0x1c64310, Status=0,
IpAddr=0xe74610ac, Port=20444, PartyID=2
```

```
16:06:14.062 CCM|H245Interface(2) paths established ip = e74610ac,  
port = 20444  
16:06:14.187 CCM|H245Interface(2) OLC outgoing confirm ip = fc4610ac,  
port = 29626
```

The following traces show the calling and called party number, which associates with an IP address and a hexadecimal value.

```
16:06:14.187 CCM|StationD - stationOutputStartMediaTransmission  
tcpHandle=0x1c64310 myIP: e74610ac (172.16.70.231)  
16:06:14.187 CCM|StationD - RemoteIpAddr: fc4610ac (172.16.70.252)
```

The following traces show the packet sizes and the MAC address of the Cisco IP Phone (2002). The disconnect, then on-hook messages, follow these traces.

```
RemoteRtpPortNumber: 29626 msecPacketSize: 20  
compressionType:(4)Media_Payload_G711Ulaw64k  
16:06:16.515 CCM| Device SEP003094C26105 , UnRegisters with SDL Link  
to monitor NodeID= 1  
16:06:16.515 CCM|StationD - stationOutputCloseReceiveChannel  
tcpHandle=0x1c64310 myIP: e74610ac (172.16.70.231)  
16:06:16.515 CCM|StationD - stationOutputStopMediaTransmission  
tcpHandle=0x1c64310 myIP: e74610ac (172.16.70.231)  
16:06:16.531 CCM|In Message -- H225ReleaseCompleteMsg -- Protocol=  
H225Protocol  
16:06:16.531 CCM|Ie - Q931CauseIe -- IEData= 08 02 80 90  
16:06:16.531 CCM|Ie - H225UserUserIe -- IEData= 7E 00 1D 05 05 80 06  
16:06:16.531 CCM|Locations:Orig=1 BW=64Dest=0 BW=-1 (-1 implies  
infinite bw available)  
16:06:16.531 CCM|MediaManager - wait_AuDisconnectRequest - StopSession  
sending disconnect to (64,2) and remove connection from list  
16:06:16.531 CCM|MediaManager - wait_AuDisconnectReply - received all  
disconnect replies, forwarding a reply for party1(16777219) and  
party2(16777220)  
16:06:16.531 CCM|MediaCoordinator - wait_AuDisconnectReply - removing  
MediaManager(2) from connection list  
16:06:16.734 CCM|StationInit - InboundStim - OnHookMessageID  
tcpHandle=0x1c64310
```

## Failed Call Flow

The following section describes an unsuccessful intercluster call flow, as seen in the SDI trace. In the following traces, the Cisco IP Phone (1001) goes off hook. A TCP handle gets assigned to the Cisco IP Phone.

```
16:05:33.468 CCM|StationInit - InboundStim - OffHookMessageID
tcpHandle=0x4fbbc30
16:05:33.468 CCM|StationD - stationOutputDisplayText
tcpHandle=0x4fbbc30, Display= 1001
16:05:33.484 CCM|StationD - stationOutputSetLamp stim: 9=Line
instance=1 lampMode=LampOn tcpHandle=0x4fbbc30
```

In the following traces, the user dials the called number (2000) of the Cisco IP Phone, and the process of digit analysis tries to match the number.

```
16:05:33.484 CCM|Digit analysis: match(fqcn="", cn="1001", pss="",
dd="")
16:05:33.484 CCM|Digit analysis:
potentialMatches=PotentialMatchesExist
16:05:35.921 CCM|Digit analysis: match(fqcn="", cn="1001", pss="",
dd="2")
16:05:35.921 CCM|Digit
analysis:potentialMatches=ExclusivelyOffnetPotentialMatchesExist
16:05:36.437 CCM|Digit analysis: match(fqcn="", cn="1001", pss="",
dd="20")
16:05:36.437 CCM|Digit
analysis:potentialMatches=ExclusivelyOffnetPotentialMatchesExist
16:05:36.656 CCM|Digit analysis: match(fqcn="", cn="1001", pss="",
dd="200")
16:05:36.656 CCM|Digit
analysis:potentialMatches=ExclusivelyOffnetPotentialMatchesExist
16:05:36.812 CCM|Digit analysis: match(fqcn="", cn="1001", pss="",
dd="2000")
```

The digit analysis has now completed, and the results appear in the following traces. It is important to note that the following `PotentialMatches=NoPotentialMatchesExist` reference indicates that the Cisco CallManager cannot match this directory number. Finally, a reorder tone gets sent to the calling party (1001), which is followed by an on-hook message.

```
16:05:36.812 CCM|Digit analysis: analysis results
16:05:36.812 CCM||PretransformCallingPartyNumber=1001
|CallingPartyNumber=1001
|DialingPattern=2XXX
|DialingRoutePatternRegularExpression=(2XXX)
|PotentialMatches=NoPotentialMatchesExist
```

```
|CollectedDigits=2000
16:05:36.828 CCM|StationD - stationOutputCallInfo
CallingPartyName=1001, CallingParty=1001, CalledPartyName=,
CalledParty=2000, tcpHandle=0x4fbbc30
16:05:36.828 CCM|StationD - stationOutputStartTone: 37=ReorderTone
tcpHandle=0x4fbbc30
16:05:37.953 CCM|StationInit - InboundStim - OnHookMessageID
tcpHandle=0x4fbbc30
```

Failed Call Flow