



Case Study: Troubleshooting Cisco Unified IP Phone Calls

This appendix contains two case studies for troubleshooting Cisco Unified IP Phones.

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Troubleshooting Intracluster Cisco Unified IP Phone Calls

The case study in this section discusses in detail the call flow between two Cisco Unified IP Phones within a cluster, called an intracluster call. This case study also focuses on Cisco Unified Communications Manager and Cisco Unified IP Phone initialization, registration, and keepalive processes. A detailed explanation of an intracluster call flow follows the discussion.

Related Topics

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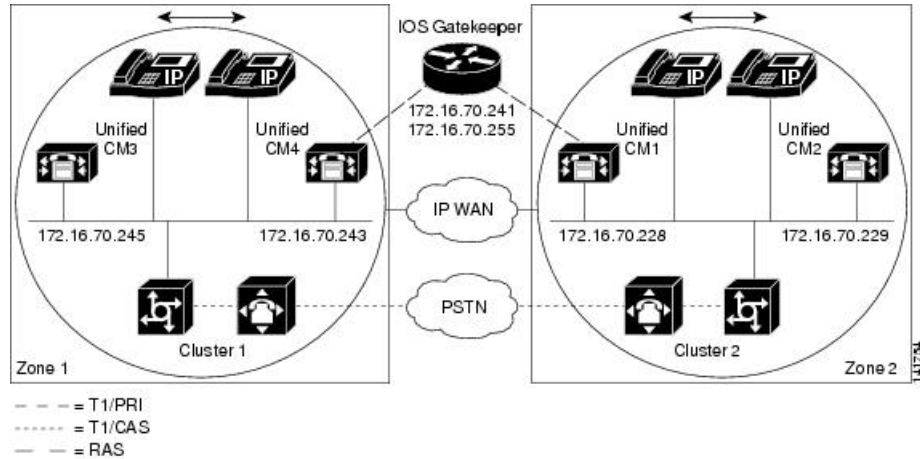
Sample Topology

You have two clusters that are named Cluster 1 and Cluster 2; the two Cisco Unified Communications Managers in Cluster 1 are called Unified CM3 and Unified CM4, while the two Cisco Unified Communications Managers in Cluster 2 are called Unified CM1 and Unified CM2.

The traces that are collected for this case study come from Unified CM1, which is located in Cluster 2, as shown in the following figure. The two Cisco Unified IP Phones in Cluster 2 provide the basis for the call

flow. The IP addresses of these two Cisco Unified IP Phones specify 172.16.70.230 (directory number 1000) and 172.16.70.231 (directory number 1001), respectively.

Figure 1: Sample Topology of Intracluster Cisco Unified IP Phone-to-Cisco Unified IP Phone Calls



Cisco Unified IP Phone Initialization Process

The following procedure explains in detail the Cisco Unified IP Phone initialization (or boot up) process.

Procedure

- 1 If you have set the appropriate options in DHCP server (such as Option 066 or Option 150), the Cisco Unified IP Phone sends a request at initialization to the DHCP server to get an IP address, Domain Name System (DNS) server address, and TFTP server name or address. It also gets a default gateway address if you have set these options in the DHCP server (Option 003).
- 2 If DHCP sends a DNS name of the TFTP sever, you need a DNS server IP address to map the name to an IP address. Bypass this step if the DHCP server sends the IP address of the TFTP server. In this case study, the DHCP server sent the IP address of TFTP because DNS was not configured.
- 3 If the DHCP reply does not include a TFTP server name, the Cisco Unified IP Phone uses the default server name.
- 4 The configuration file (.cnf) gets retrieved from the TFTP server. All .cnf files have the name SEP<mac_address>.cnf. If this is the first time that the phone is registering with the Cisco Unified Communications Manager, a default file, SEPdefault.cnf, gets downloaded to the Cisco Unified IP Phone. In this case study, the first Cisco Unified IP Phone uses the IP address 172.16.70.230 (its MAC address is SEP0010EB001720), and the second Cisco Unified IP Phone uses the IP address 172.16.70.231 (its MAC address is SEP003094C26105).
- 5 All .cnf files include the IP address(es) for the primary and secondary Cisco Unified Communications Manager(s). The Cisco Unified IP Phone uses this IP address to contact the primary Cisco Unified Communications Manager and to register.
- 6 After the Cisco Unified IP Phone connects and registers with Cisco Unified Communications Manager, the Cisco Unified Communications Manager tells the Cisco Unified IP Phone which executable version (called a load ID) to run. If the specified version does not match the executing version on the Cisco Unified

IP Phone, the Cisco Unified IP Phone will request the new executable from the TFTP server and reset automatically.

Cisco Unified Communications Manager Initialization Process

This section explains the initialization process of Cisco Unified Communications Manager with the help of traces that are captured from Unified CM1 (identified by the IP address 172.16.70.228). As described previously, SDI traces provide a very effective troubleshooting tool because they detail every packet that is sent between endpoints.

This section describes the events that occur when Cisco Unified Communications Manager is initialized. Understanding how to read traces will help you to properly troubleshoot the various Cisco Unified Communications Manager processes and the effect of those processes on services such as conferencing and call forwarding.

The following messages from the Cisco Unified Communications Manager SDI trace utility show the initialization process on one of the Cisco Unified Communications Managers, in this case, Unified CM1.

- The first message indicates that Cisco Unified Communications Manager started its initialization process.
- The second message indicates that Cisco Unified Communications Manager read the default database values (for this case, it is the primary or publisher database).
- The third message indicates Cisco Unified Communications Manager received the various messages on TCP port 8002.
- The fourth message shows that, after receiving to these messages, Cisco Unified Communications Manager added a second Cisco Unified Communications Manager to its list: Unified CM2 (172.16.70.229).
- The fifth message indicates that Cisco Unified Communications Manager has started and is running Cisco Unified Communications Manager version 3.1(1).

```
16:02:47.765 CCM|CMPProcMon - Communications ManagerState Changed -
Initialization Started.16:02:47.796 CCM|NodeId: 0, EventId: 107
EventClass: 3 EventInfo: Cisco CCMDatabase Defaults Read
16:02:49.937 CCM| SDL Info - NodeId: [1], Listen IP/Hostname:
[172.16.70.228], Listen Port: [8002]
16:02:49.984 CCM|dBProcs - Adding SdLink to NodeId: [2], IP/Hostname:
[172.16.70.229]
16:02:51.031 CCM|NodeId: 1, EventId: 1 EventClass: 3 EventInfo:
Cisco CallManager Version=<3.1(1)> started
```

Self-Starting Processes

After Cisco Unified Communications Manager is up and running, it starts several other processes within itself. Some of these processes follow, including MulticastPoint Manager, UnicastBridge Manager, digit analysis, and route list. You will find that the messages that are described during these processes are very useful when you are troubleshooting a problem that is related to the features in Cisco Unified Communications Manager.

For example, assume that the route lists are not functioning and are unusable. To troubleshoot this problem, you would monitor these traces to determine whether the Cisco Unified Communications Manager started

RoutePlanManager and if it is trying to load the RouteLists. The following sample configuration shows that RouteListName="ipwan" and RouteGroupName="ipwan" are loading and starting.

```
16:02:51.031 CCM|MulicastPointManager - Started16:02:51.031
CCM|UnicastBridgeManager - Started
16:02:51.031 CCM|MediaTerminationPointManager - Started
16:02:51.125 CCM|MediaCoordinator(1) - started
16:02:51.125 CCM|NodeId: 1, EventId: 1543 EventClass: 2 EventInfo:
Database manager started
16:02:51.234 CCM|NodeId: 1, EventId: 1542 EventClass: 2 EventInfo:
Link manager started
16:02:51.390 CCM|NodeId: 1, EventId: 1541 EventClass: 2 EventInfo:
Digit analysis started
16:02:51.406 CCM|RoutePlanManager - Started, loading RouteLists
16:02:51.562 CCM|RoutePlanManager - finished loading RouteLists
16:02:51.671 CCM|RoutePlanManager - finished loading RouteGroups
16:02:51.671 CCM|RoutePlanManager - Displaying Resulting RoutePlan
16:02:51.671 CCM|RoutePlanServer - RouteList Info, by RouteList and
RouteGroup Selection Order
16:02:51.671 CCM|RouteList - RouteListName="ipwan"
16:02:51.671 CCM|RouteList - RouteGroupName="ipwan"
16:02:51.671 CCM|RoutePlanServer - RouteGroup Info, by RouteGroup and
Device Selection Order
16:02:51.671 CCM|RouteGroup - RouteGroupName="ipwan"
```

The following trace shows the RouteGroup that is adding the device 172.16.70.245, which is Unified CM3 that is located in Cluster 1 and is considered an H.323 device. In this case, the RouteGroup gets created to route calls to Unified CM3 in Cluster 1 with Cisco IOS Gatekeeper permission. If a problem occurs while the call is being routed to a Cisco Unified IP Phone that is located in Cluster 1, the following messages would help you find the cause of the problem.

```
16:02:51.671 CCM|RouteGroup - DeviceName="172.16.70.245"16:02:51.671
CCM|RouteGroup -AllPorts
```

Part of the initialization process shows that Cisco Unified Communications Manager is adding "Dns" (Directory Numbers). By reviewing these messages, you can determine whether the Cisco Unified Communications Manager read the directory number from the database.

```
16:02:51.671 CCM|NodeId: 1, EventId: 1540 EventClass: 2 EventInfo:
Call control started16:02:51.843 CCM|ProcessDb - Dn = 2XXX,
Line = 0, Display = , RouteThisPattern, NetworkLocation = OffNet,
DigitDiscardingInstruction = 1, WhereClause =
16:02:51.859 CCM|Digit analysis: Add local pattern 2XXX , PID: 1,80,1
16:02:51.859 CCM|ForwardManager - Started
16:02:51.984 CCM|CallParkManager - Started
16:02:52.046 CCM|ConferenceManager - Started
```

In the following traces, the Device Manager in Cisco Unified Communications Manager statically initializes two devices. The device with IP address 172.17.70.226 represents a gatekeeper, and the device with IP address 172.17.70.245 gets another Cisco Unified Communications Manager in a different cluster. That Cisco Unified Communications Manager gets registered as an H.323 Gateway with this Cisco Unified Communications Manager.

```
16:02:52.250 CCM|DeviceManager: Statically Initializing Device;
DeviceName=172.16.70.22616:02:52.250 CCM|DeviceManager: Statically
Initializing Device; DeviceName=172.16.70.245
```

Cisco Unified Communications Manager Registration Process

Another important part of the SDI trace involves the registration process. When a device is powered up, it gets information using DHCP, connects to the TFTP server for its .cnf file, and then connects to the Cisco Unified Communications Manager that is specified in the .cnf file. The device could be an MGCP gateway, a Skinny gateway, or a Cisco Unified IP Phone. Therefore, you need to be able to discover whether devices successfully registered on the Cisco network.

In the following trace, Cisco Unified Communications Manager received new connections for registration. The registering devices comprise MTP_nsa-cm1 (MTP services on Unified CM1) and CFB_nsa-cm1 (Conference Bridge service on Unified CM1). Although these are software services that are running on Cisco Unified Communications Manager, they get treated internally as different external services and therefore get assigned a TCPHandle, socket number, and port number as well as a device name.

```
16:02:52.750 CCM|StationInit - New connection accepted. DeviceName=,
TCPHandle=0x4fbaa00, Socket=0x594, IPAddr=172.16.70.228, Port=3279,
StationD=[0,0,0]16:02:52.750 CCM|StationInit - New connection accepted.
DeviceName=, TCPHandle=0x4fe05e8, Socket=0x59c, IPAddr=172.16.70.228,
Port=3280, StationD=[0,0,0]
16:02:52.781 CCM|StationInit - Processing StationReg. regCount: 1
DeviceName=MTP_nsa-cm1, TCPHandle=0x4fbaa00, Socket=0x594,
IPAddr=172.16.70.228, Port=3279, StationD=[1,45,2]
16:02:52.781 CCM|StationInit - Processing StationReg. regCount: 1
DeviceName=CFB_nsa-cm1, TCPHandle=0x4fe05e8, Socket=0x59c,
IPAddr=172.16.70.228, Port=3280, StationD=[1,96,2]
```

Cisco Unified Communications Manager KeepAlive Process

The station, device, or service and the Cisco Unified Communications Manager use the following messages to maintain a knowledge of the communications channel between them. The messages begin the keepalive sequence that ensures that the communications link between the Cisco Unified Communications Manager and the station remains active. The following messages can originate from either the Cisco Unified Communications Manager or the station.

```
16:03:02.328 CCM|StationInit - InboundStim - KeepAliveMessage - Forward
KeepAlive to StationD. DeviceName=MTP_nsa-cm2, TCPHandle=0x4fa7dc0,
Socket=0x568, IPAddr=172.16.70.229, Port=1556,
StationD=[1,45,1]16:03:02.328 CCM|StationInit - InboundStim -
KeepAliveMessage - Forward KeepAlive to StationD. DeviceName=CFB_nsa-cm2,
TCPHandle=0x4bf8a70, Socket=0x57c, IPAddr=172.16.70.229, Port=1557,
StationD=[1,96,1]
16:03:06.640 CCM|StationInit - InboundStim - KeepAliveMessage - Forward
KeepAlive to StationD. DeviceName=SEP0010EB001720, TCPHandle=0x4fbb150,
Socket=0x600, IPAddr=172.16.70.230, Port=49211, StationD=[1,85,2]
16:03:06.703 CCM|StationInit - InboundStim - KeepAliveMessage - Forward
KeepAlive to StationD. DeviceName=SEP003094C26105, TCPHandle=0x4fbbc30,
Socket=0x5a4, IPAddr=172.16.70.231, Port=52095, StationD=[1,85,1]
```

The messages in the following trace depict the keepalive sequence that indicates that the communications link between the Cisco Unified Communications Manager and the station is active. Again, these messages can originate from either the Cisco Unified Communications Manager or the station.

```

16:03:02.328 CCM|MediaTerminationPointControl - stationOutputKeepAliveAck
tcpHandle=4fa7dc016:03:02.328 CCM|UnicastBridgeControl -
stationOutputKeepAliveAck tcpHandle=4bf8a70
16:03:06.703 CCM|StationInit - InboundStim - IpPortMessageID: 32715(0x7fcb)
tcpHandle=0x4fbbc30
16:03:06.703 CCM|StationD - stationOutputKeepAliveAck tcpHandle=0x4fbbc30

```

Cisco Unified Communications Manager Intracluster Call Flow Traces

The following SDI traces explore the intracluster call flow in detail. You can identify Cisco Unified IP Phones in the call flow by the directory number (dn), tcpHandle, and IP address. A Cisco Unified IP Phone (dn: 1001, tcpHandle: 0x4fbbc30, IP address: 172.16.70.231) that is located in Cluster 2 calls another Cisco Unified IP Phone in the same cluster (dn=1000, tcpHandle= 0x4fbb150, IP address= 172.16.70.230). 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.

The following traces show that the Cisco Unified IP Phone (1001) has gone off hook. The following trace shows the unique messages, TCP handle, and the called number, which display on the Cisco Unified IP Phone. No calling number displays at this point because the user has not tried to dial any digits. The following information displays in the form of Skinny Station messages between the Cisco Unified IP Phones and the Cisco Unified Communications Manager.

```

16:05:41.625 CCM|StationInit - InboundStim - OffHookMessageID
tcpHandle=0x4fbbc3016:05:41.625 CCM|StationD - stationOutputDisplayText
tcpHandle=0x4fbbc30, Display= 1001

```

The next trace shows Skinny Station messages that go from Cisco Unified Communications Manager to a Cisco Unified IP Phone. The first message turns on the lamp on the calling party Cisco Unified IP Phone.

```

16:05:41.625 CCM|StationD - stationOutputSetLamp stim: 9=Line instance=1
lampMode=LampOn tcpHandle=0x4fbbc30

```

Cisco Unified Communications Manager uses the stationOutputCallState message to notify the station of certain call-related information.

```

16:05:41.625 CCM|StationD - stationOutputCallState tcpHandle=0x4fbbc30

```

Cisco Unified Communications Manager uses the stationOutputDisplayPromptStatus message to cause a call-related prompt message to display on the Cisco Unified IP Phone.

```

16:05:41.625 CCM|StationD - stationOutputDisplayPromptStatus
tcpHandle=0x4fbbc30

```

Cisco Unified Communications Manager uses the stationOutputSelectSoftKey message to cause the Skinny Station to choose a specific set of soft keys.

```

16:05:41.625 CCM|StationD - stationOutputSelectSoftKeys tcpHandle=0x4fbbc30

```

Cisco Unified Communications Manager uses the next message to instruct the Skinny Station about the correct line context for the display.

```

16:05:41.625 CCM|StationD - stationOutputActivateCallPlane
tcpHandle=0x4fbbc30

```

The following message indicates that the digit analysis process is ready to identify incoming digits and check them for potential routing matches in the database. The entry, cn=1001, represents the calling party number where dd="" represents the dialed digit, which would show the called party number. The phone sends StationInit messages, Cisco Unified Communications Manager sends StationD messages, and Cisco Unified Communications Manager performs digit analysis.

```
16:05:41.625 CCM|Digit analysis: match(fqcn="", cn="1001", pss="", dd="")
16:05:41.625 CCM|Digit analysis:
potentialMatches=PotentialMatchesExist
```

The following debug message shows that the Cisco Unified Communications Manager is providing inside dial tone to the calling party Cisco Unified IP Phone.

```
16:05:41.625 CCM|StationD - stationOutputStartTone: 33=InsideDialTone
tcpHandle=0x4fbbc30
```

After Cisco Unified Communications Manager detects an incoming message and recognizes that the keypad button 1 has been pressed on the Cisco Unified IP Phone, it immediately stops the output tone.

```
16:05:42.890 CCM|StationInit - InboundStim - KeypadButtonMessageID
kpButton: 1 tcpHandle=0x4fbbc30
16:05:42.890 CCM|StationD - stationOutputStopTone tcpHandle=0x4fbbc30
16:05:42.890 CCM|StationD - stationOutputSelectSoftKeys tcpHandle=0x4fbbc30
16:05:42.890 CCM|Digit analysis: match(fqcn="", cn="1001", pss="", dd="1")
16:05:42.890 CCM|Digit analysis: potentialMatches=PotentialMatchesExist
16:05:43.203 CCM|StationInit - InboundStim - KeypadButtonMessageID
kpButton: 0 tcpHandle=0x4fbbc30
16:05:43.203 CCM|Digit analysis: match(fqcn="", cn="1001", pss="", dd="10")
16:05:43.203 CCM|Digit analysis: potentialMatches=PotentialMatchesExist
16:05:43.406 CCM|StationInit - InboundStim - KeypadButtonMessageID
kpButton: 0 tcpHandle=0x4fbbc30
16:05:43.406 CCM|Digit analysis: match(fqcn="", cn="1001", pss="", dd="100")
16:05:43.406 CCM|Digit analysis: potentialMatches=PotentialMatchesExist
16:05:43.562 CCM|StationInit - InboundStim - KeypadButtonMessageID
kpButton: 0 tcpHandle=0x4fbbc30
16:05:43.562 CCM|Digit analysis: match(fqcn="", cn="1001", pss="", dd="1000")
```

After the Cisco Unified Communications Manager receives enough digits to match, it provides the digit analysis results in a table format. Cisco Unified Communications Manager ignores any extra digits that are pressed on the phone after this point because a match already has been found.

```
16:05:43.562 CCM|Digit analysis: analysis results
16:05:43.562 CCM||PretransformCallingPartyNumber=1001
|CallingPartyNumber=1001
|DialingPattern=1000
|DialingRoutePatternRegularExpression=(1000)
|PotentialMatches=PotentialMatchesExist
|DialingSdlProcessId=(1,38,2)
|PretransformDigitString=1000
|PretransformPositionalMatchList=1000
|CollectedDigits=1000
|PositionalMatchList=1000
|RouteBlockFlag=RouteThisPattern
```

The next trace shows that Cisco Unified Communications Manager is sending out this information to a called party phone (the tcpHandle number identifies the phone).

```
16:05:43.578 CCM|StationD - stationOutputCallInfo CallingPartyName=1001,
  CallingParty=1001, CalledPartyName=1000, CalledParty=1000,
  tcpHandle=0x4fbb150
```

The next trace indicates that Cisco Unified Communications Manager is ordering the lamp to blink for incoming call indication on the called party Cisco Unified IP Phone.

```
16:05:43.578 CCM|StationD - stationOutputSetLamp stim: 9=Line instance=1
  lampMode=LampBlink tcpHandle=0x4fbb150
```

In the following traces, Cisco Unified Communications Manager provides ringer, display notification, and other call-related information to the called party Cisco Unified IP Phone. Again, you can see that all messages get directed to the same Cisco Unified IP Phone because the same tcpHandle gets used throughout the traces.

```
16:05:43.578 CCM|StationD - stationOutputSetRinger: 2=InsideRing
  tcpHandle=0x4fbb150
16:05:43.578 CCM|StationD - stationOutputDisplayNotify
  tcpHandle=0x4fbb150
16:05:43.578 CCM|StationD - stationOutputDisplayPromptStatus
  tcpHandle=0x4fbb150
16:05:43.578 CCM|StationD - stationOutputSelectSoftKeys tcpHandle=0x4fbb150
```

Notice that Cisco Unified Communications Manager also provides similar information to the calling party Cisco Unified IP Phone. Again, the tcpHandle differentiates between Cisco Unified IP Phones.

```
16:05:43.578 CCM|StationD - stationOutputCallInfo CallingPartyName=1001,
  CallingParty=1001, CalledPartyName=, CalledParty=1000,
  tcpHandle=0x4fbbc30
16:05:43.578 CCM|StationD - stationOutputCallInfo
  CallingPartyName=1001, CallingParty=1001, CalledPartyName=1000,
  CalledParty=1000, tcpHandle=0x4fbbc30
```

In the next trace, Cisco Unified Communications Manager provides an alerting or ringing tone to the calling party Cisco Unified IP Phone and provides notification that the connection has been established.

```
16:05:43.578 CCM|StationD - stationOutputStartTone: 36=AlertingTone
  tcpHandle=0x4fbbc30
16:05:43.578 CCM|StationD - stationOutputCallState
  tcpHandle=0x4fbbc30
16:05:43.578 CCM|StationD - stationOutputSelectSoftKeys tcpHandle=0x4fbbc30
16:05:43.578 CCM|StationD - stationOutputDisplayPromptStatus
  tcpHandle=0x4fbbc30
```

At this point, the called party Cisco Unified IP Phone goes off hook; therefore, Cisco Unified Communications Manager stops generating the ringer tone to calling party.

```
16:05:45.140 CCM|StationD - stationOutputStopTone tcpHandle=0x4fbbc30
```

In the following messages, Cisco Unified Communications Manager causes the Skinny Station to begin receiving a Unicast RTP stream. To do so, Cisco Unified Communications Manager provides the IP address of the called party as well as codec information and packet size in msec (milliseconds). PacketSize designates an integer that contains the sampling time, in milliseconds, that is used to create the RTP packets.



Note

This value normally gets set to 30 msec. In this case, it gets set to 20 msec.


```
16:05:45.140 CCM|StationD - stationOutputOpenReceiveChannel
tcpHandle=0x4fbbc30 myIP: e74610ac (172.16.70.231)16:05:45.140 CCM|StationD
- ConferenceID: 0 msecPacketSize: 20
compressionType:(4)Media_Payload_G711Ulaw64k
```

Similarly, Cisco Unified Communications Manager provides information to the called party (1000).

```
16:05:45.140 CCM|StationD - stationOutputOpenReceiveChannel
tcpHandle=0x4fbb150 myIP: e64610ac (172.16.70.230)16:05:45.140 CCM|StationD
- ConferenceID: 0 msecPacketSize: 20
compressionType:(4)Media_Payload_G711Ulaw64k
```

Cisco Unified Communications Manager received the acknowledgment message from called party for establishing the open channel for RTP stream, as well as the IP address of the called party. This message informs the Cisco Unified Communications Manager of two pieces of information about the Skinny Station. First, it contains the status of the open action. Second, it contains the receive port address and number for transmission to the remote end. The IP address of the transmitter (calling part) of the RTP stream specifies ipAddr, and PortNumber specifies the IP port number of the RTP stream transmitter (calling party).

```
16:05:45.265 CCM|StationInit - InboundStim - StationOpenReceiveChannelAckID
tcpHandle=0x4fbb150, Status=0, IpAddr=0xe64610ac, Port=17054, PartyID=2
```

Cisco Unified Communications Manager uses the following messages to order the station to begin transmitting the audio and video streams to the indicated remote Cisco Unified IP Phone IP address and port number.

```
16:05:45.265 CCM|StationD - stationOutputStartMediaTransmission
tcpHandle=0x4fbbc30 myIP: e74610ac (172.16.70.231)16:05:45.265 CCM|StationD
- RemoteIpAddr: e64610ac (172.16.70.230) RemoteRtpPortNumber: 17054
msecPacketSize: 20 compressionType:(4)Media_Payload_G711Ulaw64k
```

```
16:03:25.328 CCM|StationD(1): TCPPid=[1.100.117.1]
OpenMultiReceiveChannel conferenceID=16777217 passThruPartyID=1000011
compressionType=101(Media_Payload_H263) qualifierIn=?. myIP: e98e6b80
(128.107.142.233) |<CT::1,100,11,1.1><IP::><DEV::>
```

```
16:03:25.375 CCM|StationInit: TCPPid=[1.100.117.1]
StationOpenMultiMediaReceiveChannelAck Status=0, IpAddr=0xe98e6b80,
Port=65346, PartyID=16777233|<CT::1,100,105,1.215><IP::128.107.142.233>
```

```
16:03:25.375 CCM|StationD(2): TCPPid = [1.100.117.2]
star_StationOutputStartMultiMediaTransmission conferenceID=16777218
passThruPartyID=16777250 remoteIpAddress=e98e6b80(66.255.0.0)
remotePortNumber=65346 compressType=101(Media_Payload_H263) qualifierOut=?.
myIP: e98e6b80
(128.107.142.233) |<CT::1,100,105,1.215><IP::128.107.142.233>
```

In the following traces, the previously explained messages get sent to the called party. The messages that indicate that the RTP media stream started between the called and calling party follow these messages.

```
16:05:45.312 CCM|StationD - stationOutputStartMediaTransmission
tcpHandle=0x4fbb150 myIP: e64610ac (172.16.70.230)16:05:45.328 CCM|StationD
- RemoteIpAddr: e74610ac (172.16.70.231) RemoteRtpPortNumber: 18448
msecPacketSize: 20 compressionType:(4)Media_Payload_G711Ulaw64k
16:05:46.203 CCM|StationInit - InboundStim - OnHookMessageID
tcpHandle=0x4fbbc30
```

The calling party Cisco IP Phone finally goes on hook, which terminates all the control messages between the Skinny Station and Cisco Unified Communications Manager as well as the RTP stream between Skinny Stations.

```
16:05:46.203 CCM|StationInit - InboundStim - OnHookMessageID  
tcpHandle=0x4fbbc30
```

Troubleshooting Intercluster Cisco Unified IP Phone Calls

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

Related Topics

- [Call Flow Traces, on page 10](#)
- [Failed Call Flow, on page 12](#)
- [Intercluster H.323 Communication, on page 10](#)
- [Sample Topology, on page 10](#)

Sample Topology

The following sample topology gets used in this case study. Two clusters, each having two Cisco Unified Communications Managers, 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 Unified IP Phone in Cluster 2. Intercluster Cisco Unified Communications Manager communication takes place by using the H.323 Version 2 protocol. A Cisco IOS Gatekeeper also serves for admission control.

The Cisco Unified IP Phone can connect to the Cisco Unified Communications Manager using Skinny Station protocol, and the Cisco Unified Communications Manager 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 that the intercluster call can be made by using H.323 version 2 protocol. After this happens, the audio path gets made by using the RTP protocol between Cisco Unified IP Phones in different clusters.

Call Flow Traces

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

In this call flow, a Cisco Unified IP Phone (2002) that is located in Cluster 2 calls a Cisco Unified 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 Unified IP Phone (2002) went off hook. The trace shows the unique messages, TCP handle, and the calling number, which displays on the Cisco Unified IP Phone. The following debug output shows the called number (1001), H.225 connect, and H.245 confirm messages. The codec type specifies G.711 mu-law.

```
16:06:13.921 CCM|StationInit - InboundStim - OffHookMessageID
tcpHandle=0x1c6431016:06:13.953 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_G711Ulaw64k16:06:16.515 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 Unified IP Phone (1001) goes off hook. A TCP handle gets assigned to the Cisco Unified IP Phone.

```
16:05:33.468 CCM|StationInit - InboundStim - OffHookMessageID
tcpHandle=0x4fbbc3016:05:33.468 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 Unified 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")
```

Now that the digit analysis is completed, the results display in the following traces. Keep in mind that the following PotentialMatches=NoPotentialMatchesExist reference indicates that the Cisco Unified Communications Manager 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 results16:05:36.812
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
```