AVAYA

Avaya Solution & Interoperability Test Lab

Application Notes for Empirix Hammer G5 with Avaya Aura™ Communication Manager using H.323 Trunk Emulation – Issue 1.0

Abstract

These Application Notes describe the configuration steps required to integrate the Empirix Hammer G5 test system with Avaya Aura™ Communication Manager using H.323 trunk emulation. The Hammer G5 is a VoIP test platform consisting of a collection of applications used to configure the system, create, schedule, and monitor tests, and create reports. In this configuration, the Hammer G5 emulates H.323 trunks, which originate and terminate calls through Avaya Aura™ Communication Manager. While the call is active, it can send DTMF tones and voice media, and provide voice quality metrics. Call progress can also be monitored, and at the completion of the test, test reports can be generated. The Hammer G5 can be used to verify the functionality, reliability and quality of VoIP services and applications running through Avaya Aura™ Communication Manager.

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

JAO; Reviewed:
SPOC 5/21/2010

Solution & Interoperability Test Lab Application Notes
©2010 Avaya Inc. All Rights Reserved.

1 of 37
Hammer-H323-TRK

1 Introduction

These Application Notes describe the configuration steps required to integrate the Empirix Hammer G5 test system with Avaya Aura™ Communication Manager using H.323 trunk emulation. The Hammer G5 is a VoIP test platform consisting of a collection of applications used to configure the system, create, schedule, and monitor tests, and create reports. In this configuration, the Hammer G5 emulates H.323 trunks, which originate and terminate calls through Avaya Aura™ Communication Manager. While the call is active, it can send DTMF tones and voice media, and provide voice quality metrics. Call progress can also be monitored, and at the completion of the test, test reports can be generated. The Hammer G5 can be used to verify the functionality, reliability and quality of VoIP services and applications running through Avaya Aura™ Communication Manager.

The following set of Hammer G5 applications were used during the compliance testing:

- **Hammer Configurator** used to configure and manage the system.
- **Hammer TestBuilder** used to create and run test scripts.
- **Hammer System Monitor** used to monitor call progress.
- **Hammer Call Summary Monitor** used to monitor call completion and to create reports.

A solution using H.323 endpoint emulation on the Empirix Hammer G5 is described in [2] *Application Notes for Empirix Hammer G5 with Avaya Aura™ Communication Manager using H.323 Endpoint Emulation*.

1.1 Interoperability Compliance Testing

The interoperability compliance testing focused on verifying that the Hammer G5 can connect to Communication Manager using H.323 trunks, establish calls, send voice media, provide voice quality metrics, and generate reports. The following features and functionality were covered:

- Originating and terminating calls through Communication Manager.
- Support of G.711 and G.729 codecs.
- Support of direct IP-to-IP media (also known as "Shuffling" which allows IP endpoints to send audio RTP packets directly to each other without using media resources on the Avaya Media Gateway). Calls with Shuffling disabled was also verified.
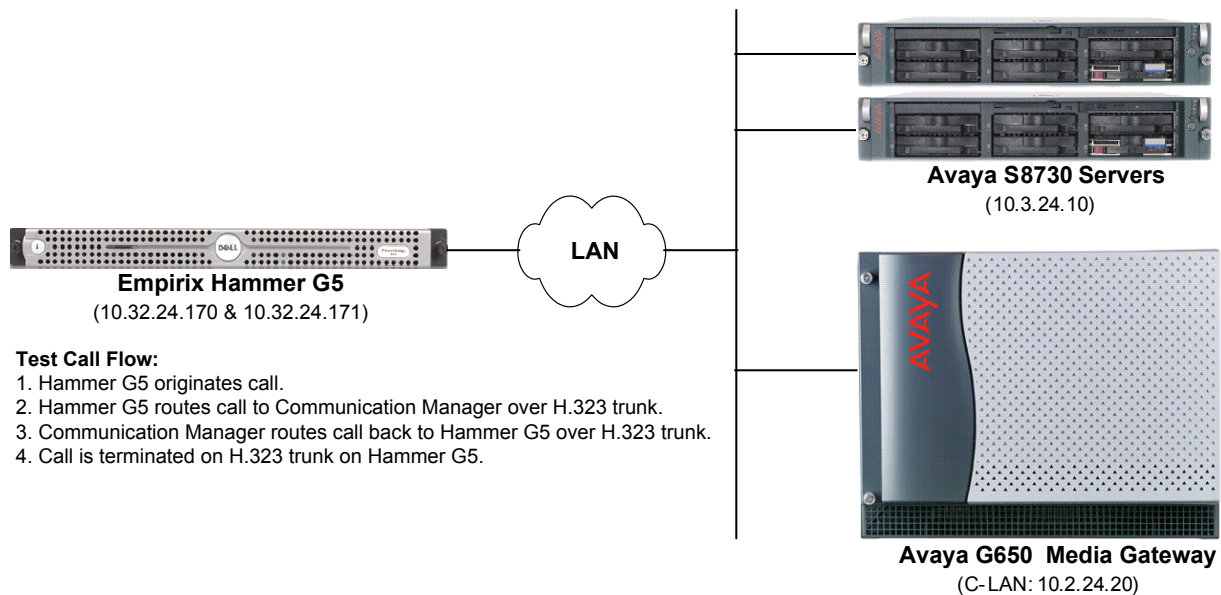- Generating voice quality metrics with Shuffling disabled.

1.2 Support

Technical support on the Empirix Hammer G5 can be obtained via phone, website, or email.

- **Phone:** (781) 266-3202
- **Web:** http://www.empirix.com/support/maintenance.asp
- **Email:** support@support.com

JAO; Reviewed:
SPOC 5/21/2010

Solution & Interoperability Test Lab Application Notes
©2010 Avaya Inc. All Rights Reserved.

2 of 37
Hammer-H323-TRK

2 Reference Configuration

The network diagram below illustrates the test configuration. In this configuration, Avaya Aura™ Communication Manager receives calls from the Hammer G5, which emulates H.323 trunks. Communication Manager routes the calls back to the Hammer G5 over an H.323 trunk. The Hammer G5 then terminates the calls. While the calls are established, the Hammer G5 sends voice media (i.e., RTP traffic) using an audio recording. This allows voice quality metrics to be provided at the end of each call. The Hammer G5 applications running on the Hammer G5 server were used to configure the system, create and monitor the tests, and view the test reports.

Avaya S8730 Servers
(10.3.24.10)

Empirix Hammer G5
(10.32.24.170 & 10.32.24.171)

Test Call Flow:
1. Hammer G5 originates call.
2. Hammer G5 routes call to Communication Manager over H.323 trunk.
3. Communication Manager routes call back to Hammer G5 over H.323 trunk.
4. Call is terminated on H.323 trunk on Hammer G5.

LAN

Avaya G650 Media Gateway
(C-LAN: 10.2.24.20)

Empirix Hammer G5 with Avaya Aura™ Communication Manager

3 Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Equipment	Software
Avaya S8730 Servers	Avaya Aura™ Communication Manager 5.2.1 (R015x.02.1.016.4) with Service Pack 1 (Patch 17959)
Avaya G650 Media Gateway ▪ TN799DP C-LAN Board ▪ TN2302AP Media Processor Board	 HW01 FW031 HW03 FW094
Empirix Hammer G5 running on Microsoft Windows 2003 Server	1.5.8.295

4 Configure Avaya Aura^{TM} Communication Manager

This section provides the procedures for configuring Avaya Aura^{TM} Communication Manager. The procedures include the following areas:

- Administer IP Node Names
- Administer IP Codec Set
- Administer IP Network Region
- Administer H.323 Trunks for Incoming and Outgoing Calls
- Administer Call Routing

Avaya Aura^{TM} Communication Manager is configured through the System Access Terminal (SAT).

4.1 Administer IP Node Names

In the **IP Node Names** form, assign an IP address and host name for the C-LAN board in the Avaya G650 Media Gateway and the incoming and outgoing H.323 trunks to the Hammer G5. The host names will be used throughout the other configuration screens of Communication Manager.

```
change node-names ip                                        Page   1 of   2
                              IP NODE NAMES
    Name               IP Address
Gateway001         10.32.24.1
HammerG5-Inc       10.32.24.170
HammerG5-Out       10.32.24.171
clancrm            10.32.24.20
default            0.0.0.0
medprocrm          10.32.24.21
procr              0.0.0.0
 ( 8 of 8   administered node-names were displayed )
Use 'list node-names' command to see all the administered node-names
Use 'change node-names ip xxx' to change a node-name 'xxx' or add a node-name
```

4.2 Administer IP Codec Set

In the **IP Codec Set** form, specify the audio codec(s) required by the test that will be run on the Hammer G5. The form is accessed via the **change ip-codec-set 1** command. Note the codec set number since it will be used in the IP Network Region covered in the next section. The Hammer G5 supports G.711, G.729AB, G.729A, and G.723 codecs. For the compliance test, the IP codec set form was configured as shown below. The G.729AB entry was changed to G.729A when the G.729A was the codec required.

```
change ip-codec-set 1                                           Page   1 of   2

                          IP Codec Set

    Codec Set: 1

    Audio          Silence      Frames    Packet
    Codec          Suppression  Per Pkt   Size(ms)
 1: G.711MU           n            2         20
 2: G.729AB           n            2         20
 3: G.723-6.3K        n            1         30
```

4.3 Administer IP Network Region

In the **IP Network Region** form, configure the codec set to be used for the Hammer calls and specify whether **IP-IP Direct Audio** (Shuffling) is required for the test. Shuffling allows audio traffic to be sent directly between IP endpoints without using media resources in the Avaya G650 Media Gateway. If voice quality metrics are to be generated by the test, disable Shuffling; otherwise, the audio traffic will not leave the Hammer G5 and the voice quality metrics will not yield accurate results. Shuffling can also be disabled at the trunk level.

```
change ip-network-region 1                                      Page   1 of  19
                            IP NETWORK REGION
  Region: 1
Location:          Authoritative Domain: avaya.com
    Name:
MEDIA PARAMETERS                   Intra-region IP-IP Direct Audio: no
      Codec Set: 1                 Inter-region IP-IP Direct Audio: no
   UDP Port Min: 2048                       IP Audio Hairpinning? y
   UDP Port Max: 3029
DIFFSERV/TOS PARAMETERS                   RTCP Reporting Enabled? y
 Call Control PHB Value: 34       RTCP MONITOR SERVER PARAMETERS
       Audio PHB Value: 46         Use Default Server Parameters? y
       Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 7
       Audio 802.1p Priority: 6
       Video 802.1p Priority: 5     AUDIO RESOURCE RESERVATION PARAMETERS
H.323 IP ENDPOINTS                                  RSVP Enabled? n
  H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
   Keep-Alive Interval (sec): 5
           Keep-Alive Count: 5
```

4.4 Administer H.323 Trunks

Prior to configuring an H.323 trunk group for communication with the Hammer G5, an H.323 signaling group must be configured. This signaling group is used for incoming calls from the Hammer G5. Configure the **Signaling Group** form as shown below. The **Far-end Node Name** field is set to *HammerG5-Inc*, which is associated with IP address 10.32.24.170. Shuffling may be enabled or disabled at the signaling group level or at the IP network region level. After configuring the H.323 trunk group, return to this form and configure the **Trunk Group for Channel Selection** field.

```
add signaling-group 30                                          Page   1 of   5
                               SIGNALING GROUP

 Group Number: 30                  Group Type: h.323
                              Remote Office? n        Max number of NCA TSC: 0
                                     SBS? n           Max number of CA TSC: 0
     IP Video? n                               Trunk Group for NCA TSC:
      Trunk Group for Channel Selection: 30
     TSC Supplementary Service Protocol: a
                        T303 Timer(sec): 10
  H.245 DTMF Signal Tone Duration(msec):
   Near-end Node Name: clancrm              Far-end Node Name: HammerG5-Inc
 Near-end Listen Port: 1720              Far-end Listen Port: 1720
                                         Far-end Network Region: 1
         LRQ Required? n               Calls Share IP Signaling Connection? n
         RRQ Required? n
    Media Encryption? n                       Bypass If IP Threshold Exceeded? n
                                                   H.235 Annex H Required? n
         DTMF over IP: out-of-band      Direct IP-IP Audio Connections? y
 Link Loss Delay Timer(sec): 90                    IP Audio Hairpinning? n
       Enable Layer 3 Test? n               Interworking Message: PROGress
H.323 Station Outgoing Direct Media? n  DCP/Analog Bearer Capability: 3.1kHz
```

Configure the **Trunk Group** form as shown below. This trunk group is used for incoming calls from the Hammer G5. Set the **Group Type** field to *isdn* and the **Carrier Medium** field to *H.323*, set the **Service Type** field to *tie*, specify the signaling group associated with this trunk group in the **Signaling Group** field, and specify the **Number of Members** supported by this H.323 trunk group. Signaling Group 30 is associated with this H.323 trunk group used for incoming calls.

```
add trunk-group 30                                              Page   1 of  21
                               TRUNK GROUP

Group Number: 30                    Group Type: isdn        CDR Reports: y
  Group Name: Hammer G5 Incoming         COR: 1      TN: 1      TAC: 1030
    Direction: two-way      Outgoing Display? n      Carrier Medium: H.323
 Dial Access? n             Busy Threshold: 255  Night Service:
Queue Length: 0
Service Type: tie                     Auth Code? n
                                        Member Assignment Method: auto
                                                  Signaling Group: 30
                                                Number of Members: 10
```

The H.323 signaling group associated with the H.323 trunk group used to route outgoing calls is configured below. This signaling group is used for routing calls to the Hammer G5. Configure the **Signaling Group** form as shown below. The **Far-end Node Name** field is set to *HammerG5-Out*, which is associated with IP address 10.32.24.171. Shuffling may be enabled or disabled at the signaling group level or at the IP network region level. After configuring the H.323 trunk group, return to this form and configure the **Trunk Group for Channel Selection** field.

```
add signaling-group 31                                    Page   1 of   5
                           SIGNALING GROUP

 Group Number: 31                Group Type: h.323
                              Remote Office? n        Max number of NCA TSC: 0
                                      SBS? n          Max number of CA TSC: 0
    IP Video? n                                  Trunk Group for NCA TSC:
      Trunk Group for Channel Selection: 31
    TSC Supplementary Service Protocol: a
                      T303 Timer(sec): 10
  H.245 DTMF Signal Tone Duration(msec):
   Near-end Node Name: clancrm              Far-end Node Name: HammerG5-Out
 Near-end Listen Port: 1720                Far-end Listen Port: 1720
                                          Far-end Network Region: 1
        LRQ Required? n              Calls Share IP Signaling Connection? n
        RRQ Required? n
     Media Encryption? n                   Bypass If IP Threshold Exceeded? n
                                                H.235 Annex H Required? n
          DTMF over IP: out-of-band      Direct IP-IP Audio Connections? y
 Link Loss Delay Timer(sec): 90                   IP Audio Hairpinning? n
        Enable Layer 3 Test? n                  Interworking Message: PROGress
H.323 Station Outgoing Direct Media? n   DCP/Analog Bearer Capability: 3.1kHz
```

Configure the **Trunk Group** form as shown below. This trunk group is used for routing calls to the Hammer G5. Set the **Group Type** field to *isdn* and the **Carrier Medium** field to *H.323*, set the **Service Type** field to *tie*, specify the signaling group associated with this trunk group in the **Signaling Group** field, and specify the **Number of Members** supported by this H.323 trunk group. Signaling Group 31 is associated with this H.323 trunk group used for outgoing calls.

```
add trunk-group 31                                        Page   1 of  21
                             TRUNK GROUP

Group Number: 31                Group Type: isdn         CDR Reports: y
  Group Name: Hammer G5 Outgoing         COR: 1    TN: 1       TAC: 1031
   Direction: two-way       Outgoing Display? n      Carrier Medium: H.323
 Dial Access? n            Busy Threshold: 255  Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n
                                              Member Assignment Method: auto
                                                    Signaling Group: 31
                                                    Number of Members: 10
```

4.5 Administer Call Routing

When originating a call, the Hammer G5 will dial the AAR access code '8' followed by a 5-digit number starting with "256". The **AAR Digit Analysis Table** specifies that for these dialed digits, the call should be routed using Route Pattern 31.

```
change aar analysis 2                                          Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                             Location:  all        Percent Full:    1

           Dialed          Total      Route    Call   Node  ANI
           String        Min  Max   Pattern    Type   Num   Reqd
      2                   7    7      999       aar          n
      256                 5    5      31        aar          n
      3                   7    7      999       aar          n
      4                   5    5      999       aar          n
      5                   7    7      999       aar          n
      6                   7    7      999       aar          n
      8                   7    7      999       aar          n
      9                   7    7      999       aar          n
```

Route Pattern 31 specifies Trunk Group 31 as the outgoing trunk group. The Hammer G5 will terminate any call regardless of the digits received.

```
change route-pattern 31                                        Page   1 of   3
                    Pattern Number: 31   Pattern Name: Hammer G5
                             SCCAN? n     Secure SIP? n
   Grp FRL NPA Pfx Hop Toll No.  Inserted                       DCS/ IXC
   No          Mrk Lmt List Del  Digits                         QSIG
                        Dgts                                     Intw
 1: 31    0                                                       n   user
 2:                                                               n   user
 3:                                                               n   user
 4:                                                               n   user
 5:                                                               n   user
 6:                                                               n   user

    BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature PARM  No. Numbering LAR
    0 1 2 M 4 W    Request                                  Dgts Format
                                                          Subaddress
 1: y y y y y n  n           bothept                                    none
 2: y y y y y n  n           rest                                       none
 3: y y y y y n  n           rest                                       none
 4: y y y y y n  n           rest                                       none
 5: y y y y y n  n           rest                                       none
 6: y y y y y n  n           rest                                       none
```

5 Configure Empirix Hammer G5

This section provides the procedures for configuring the Empirix Hammer G5. The procedures fall into the following areas:

- Configure IP addresses to be used by each Hammer G5 channel.
- Configure the H.323 trunk interface using the **Hammer Configurator**.
- Create and run the test script using the **Hammer TestBuilder**.

Monitoring test call progress is covered in the **Verify Empirix Hammer G5** section (Section 7.2).

Note: Refer to [3] for instructions on installing the Hammer G5 software.

5.1 Configure IP Addresses on Hammer G5 Server

The Hammer G5 server needs to be configured with the IP addresses that it will need for each channel. During the compliance test, 20 H.323 trunk channels were used, but they were arranged into two groups – one for outgoing calls and one for incoming calls. Each group required a unique IP address. Only two IP addresses were required, one per group. The IP address used for the H.323 trunks used for outgoing calls was 10.32.24.170. The IP address used for the H.323 trunk used for incoming calls was 10.32.24.171. These IP addresses were configured in the **Advanced TCP/IP Settings** under Network Connections in Windows 2003 Server.
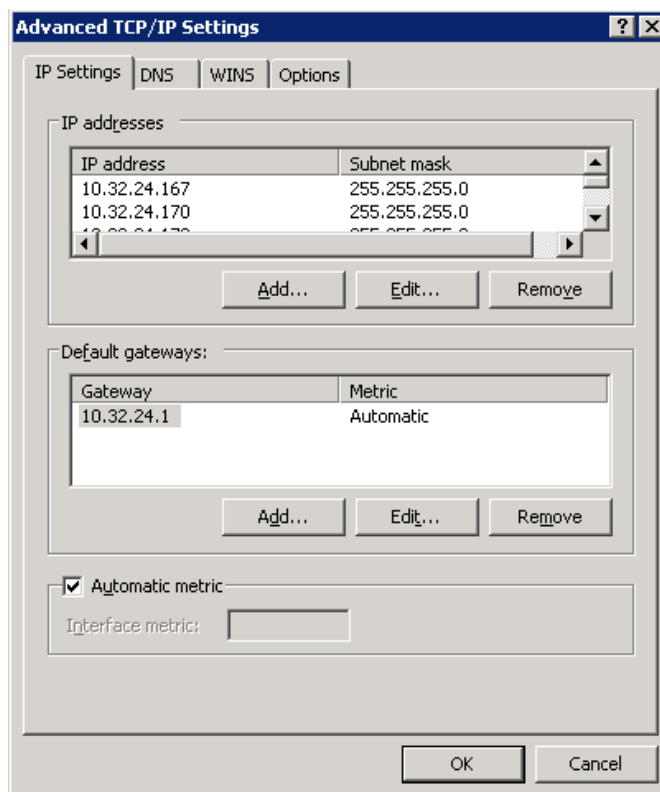
5.1.1 Configure H.323 Trunk Interface

The Empirix Hammer G5 is configured through the **Hammer Configurator**, a graphical user interface, residing on the Hammer G5 server.   From the Hammer G5 server, run the **Hammer Configurator**. The initial window is displayed as follows.
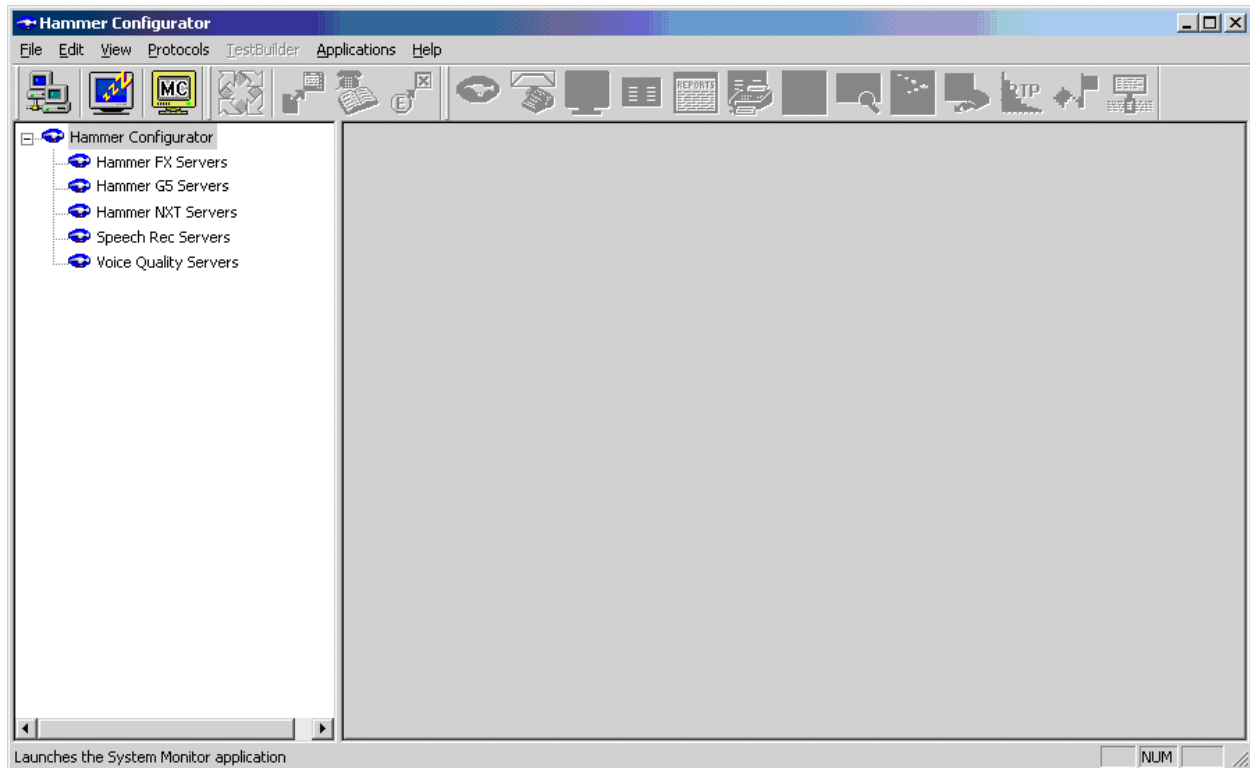
The Hammer G5 must be in **Master Controller Mode**. Verify that it is in Master Controller Mode by clicking the [MC] icon. If the [MC] icon is not displayed, the Hammer G5 is already in Master Controller Mode.

JAO; Reviewed:
SPOC 5/21/2010
Solution & Interoperability Test Lab Application Notes
©2010 Avaya Inc. All Rights Reserved.
11 of 37
Hammer-H323-TRK

Next, select Hammer G5 Servers item in the left pane and then click on **Add a new system**. The **Add/Remove Servers** window will be displayed.
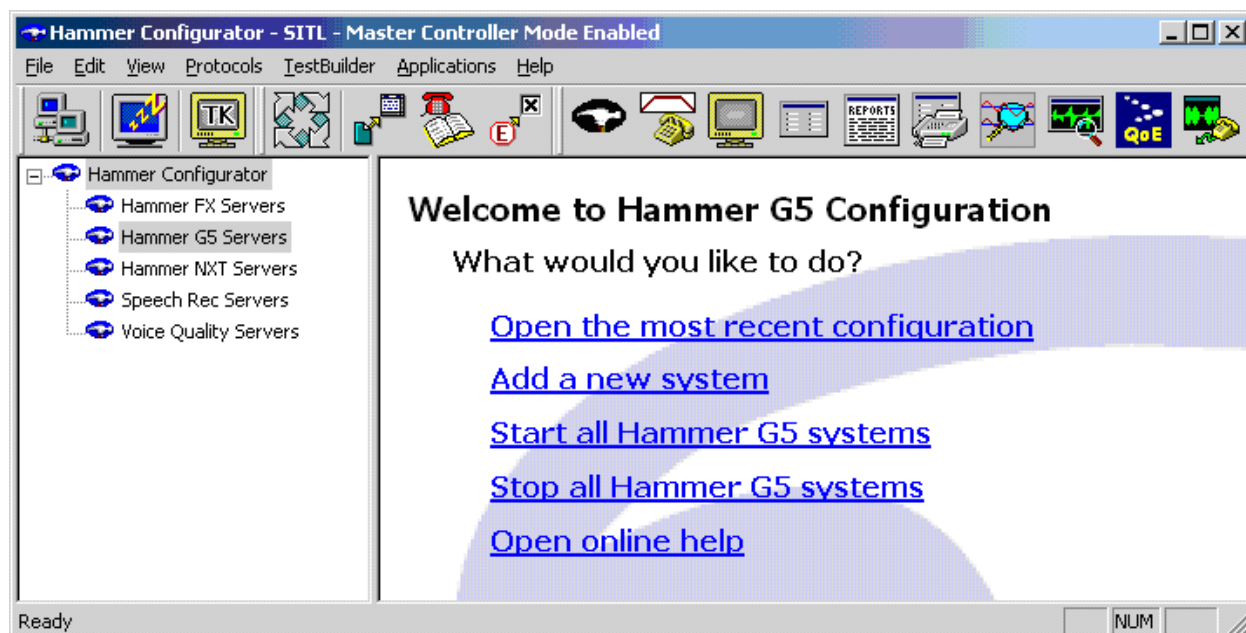
In the **Add/Remove Servers** window, specify a descriptive **Server Name** and the click the **Add** button. The server name will be moved to the **Current Servers** section. Click **OK**.
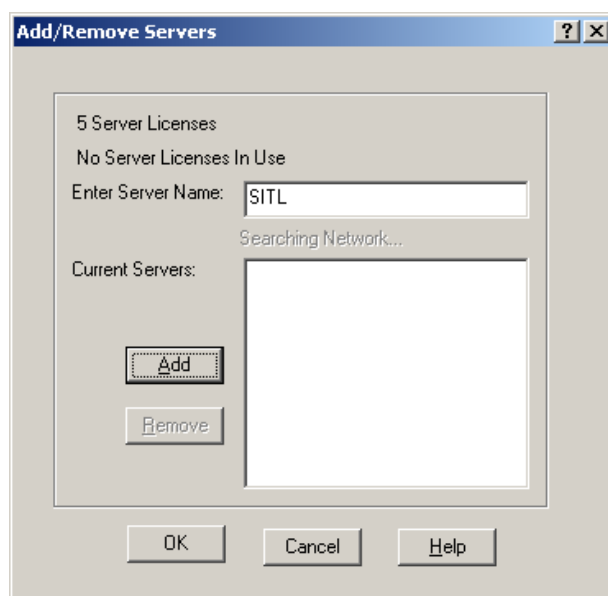
Once the server is added to the system, the server name will appear in the left pane of the **Hammer Configurator**. Expand the server name (e.g., *SITL*) in the left pane and click on *IP Channels Configuration*. The following window will be displayed. Select *Avaya H.323* for the **Signaling Project** and then click **New**.
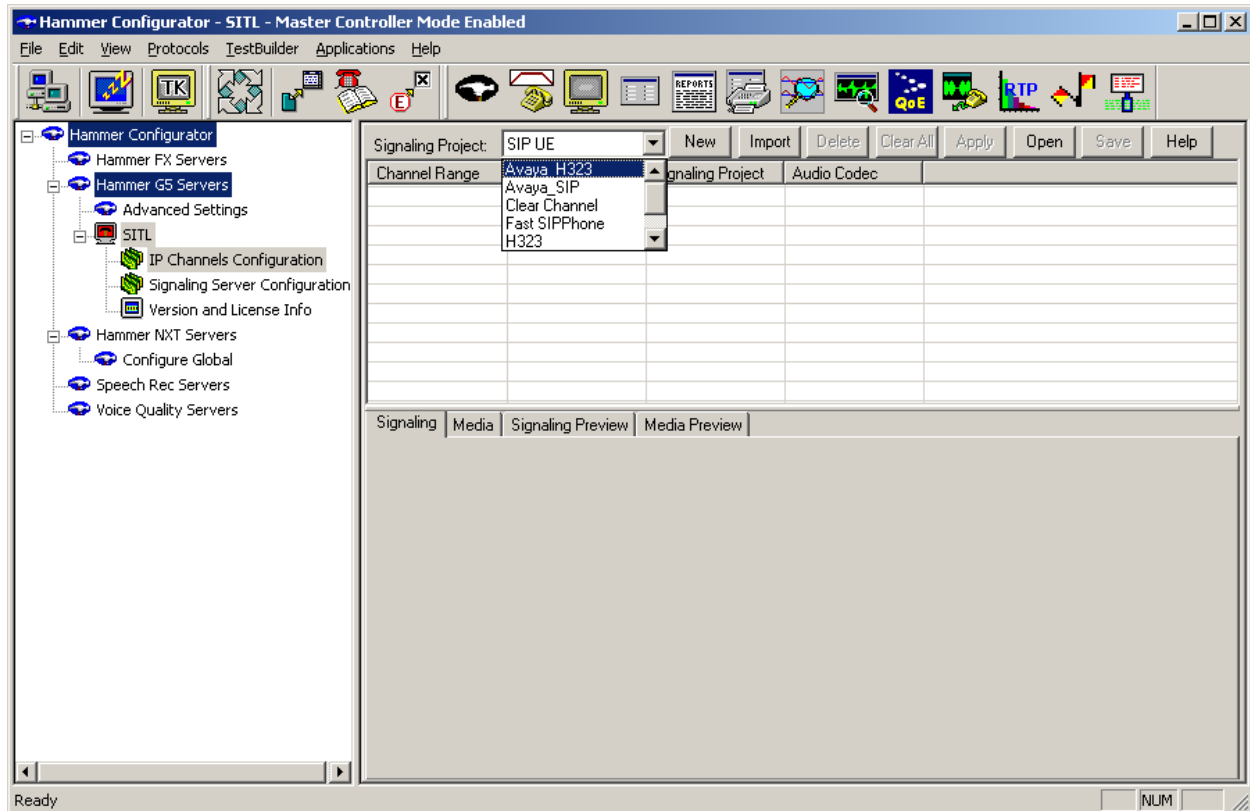
The first line in the grid that is highlighted in the figure below corresponds to the 10 originating channels. To set the number of channels in the group, click on the **Channel Range** cell in the grid and enter the number "10". The following fields in the **Signaling** tab should then be set as follows:

- **State Machine** should be set to *Avaya H323 Trunk*.
- **ANI** can be set to any digits.
- **Network Connection** should be set to the appropriate network interface on the server.
- **Local Trunk IP** should be set to the IP address of the group (e.g., 10.32.24.170)
- **Subnet Mask** should be set to the network mask (e.g., 255.255.255.0).
- **Avaya CM IP Address** should be set to the C-LAN IP address if a G650 Media Gateway is used.
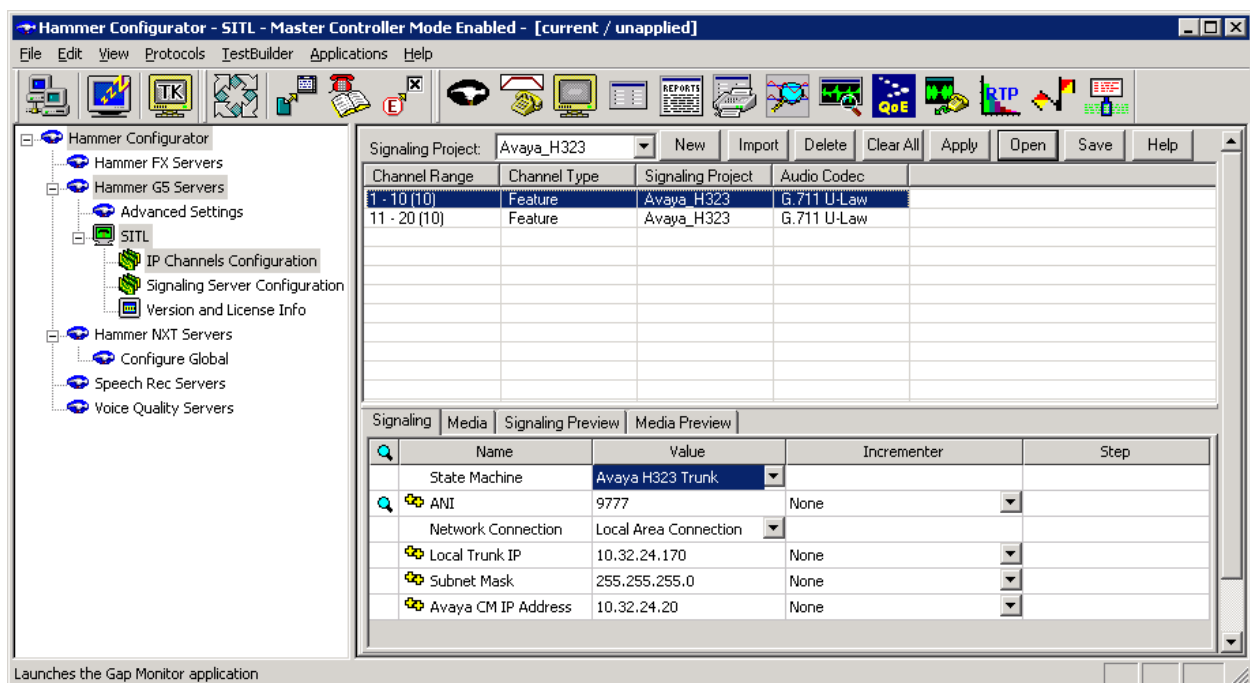
In the **Media** tab of the 10 originating channels, configure the fields as follows:

- **Audio Codec** should be set to the appropriate codec for the test. G711, G729, and G.723 codecs are supported.
- **Frequency [ms]** should be set to the appropriate value for the specified codec. It should match the Packet Size [ms] field in the **IP Codec Set** form on Communication Manager for the specified codec.
- **Network Connection** should specify the appropriate network interface.
- **Source IP Address** should be set to the IP address of the group (e.g., 10.32.24.170).
- **Media Profile** should be set to one that specifies the codec configured in the **Audio Codec** field.
- The remaining fields should be configured as shown.
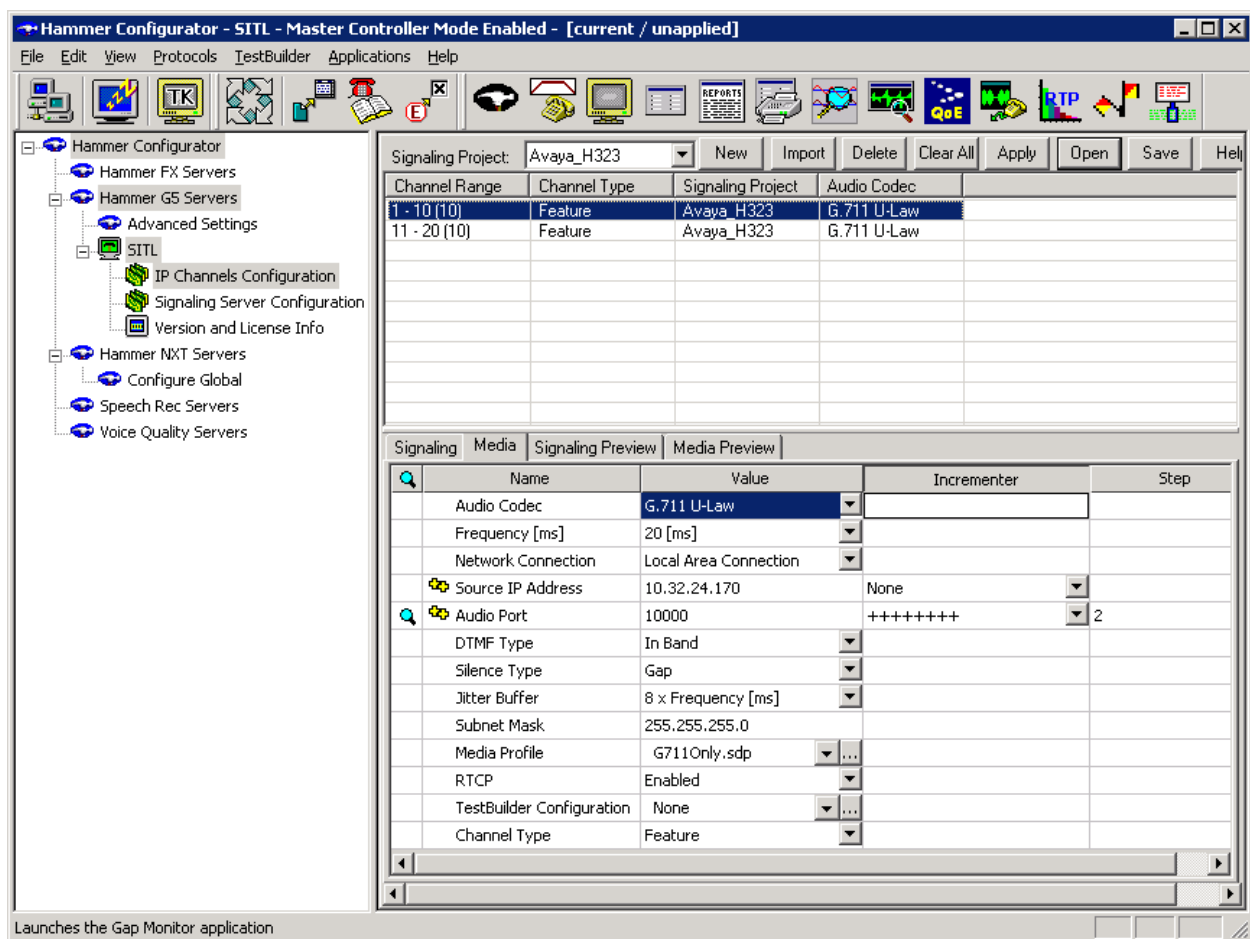
The second line in the grid that is highlighted in the figure below corresponds to the second group of channels that will terminate the calls. Set the **Channel Range** cell to the number of channels in this group. The configuration of the **Signal** tab is similar to the one for the group of originating channels with the exception that the **ANI** and **Local Trunk IP** fields will be different.

Solution & Interoperability Test Lab Application Notes
©2010 Avaya Inc. All Rights Reserved.
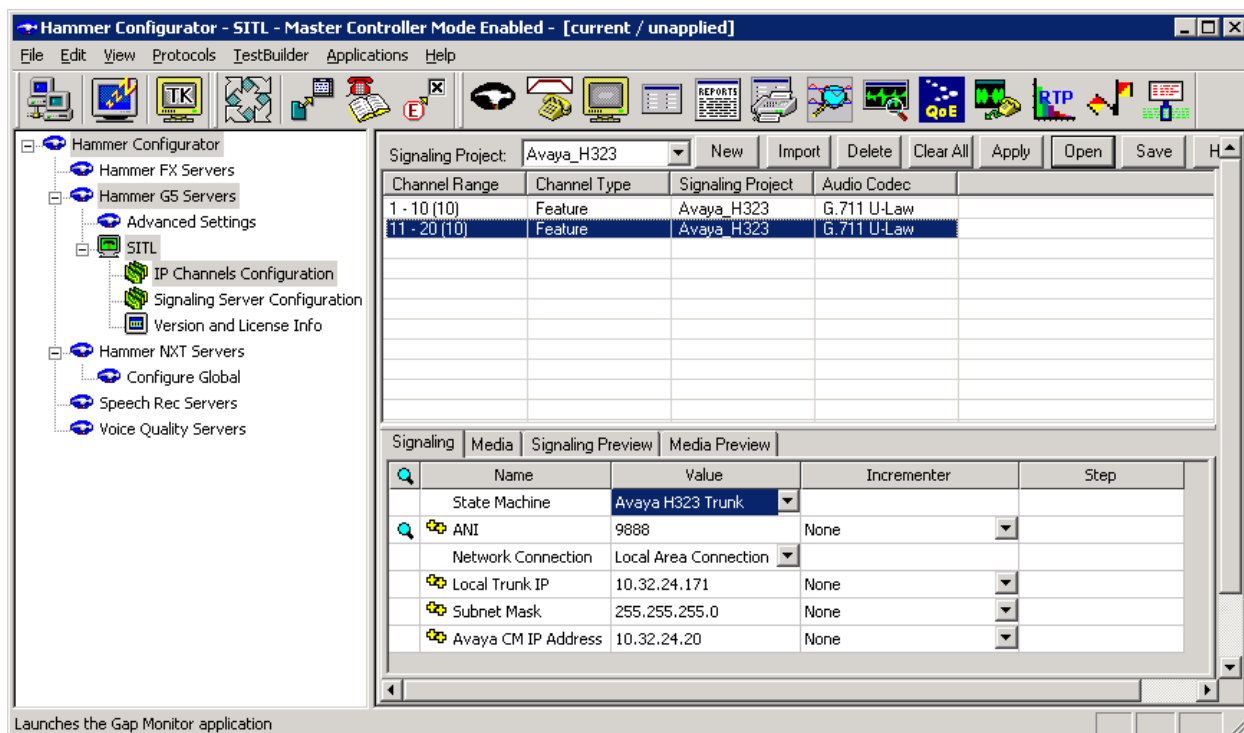
The **Media** tab for the group of terminating channels is shown below. The configuration is similar to the one for the group of originating channels except for the **Source IP Address** field.
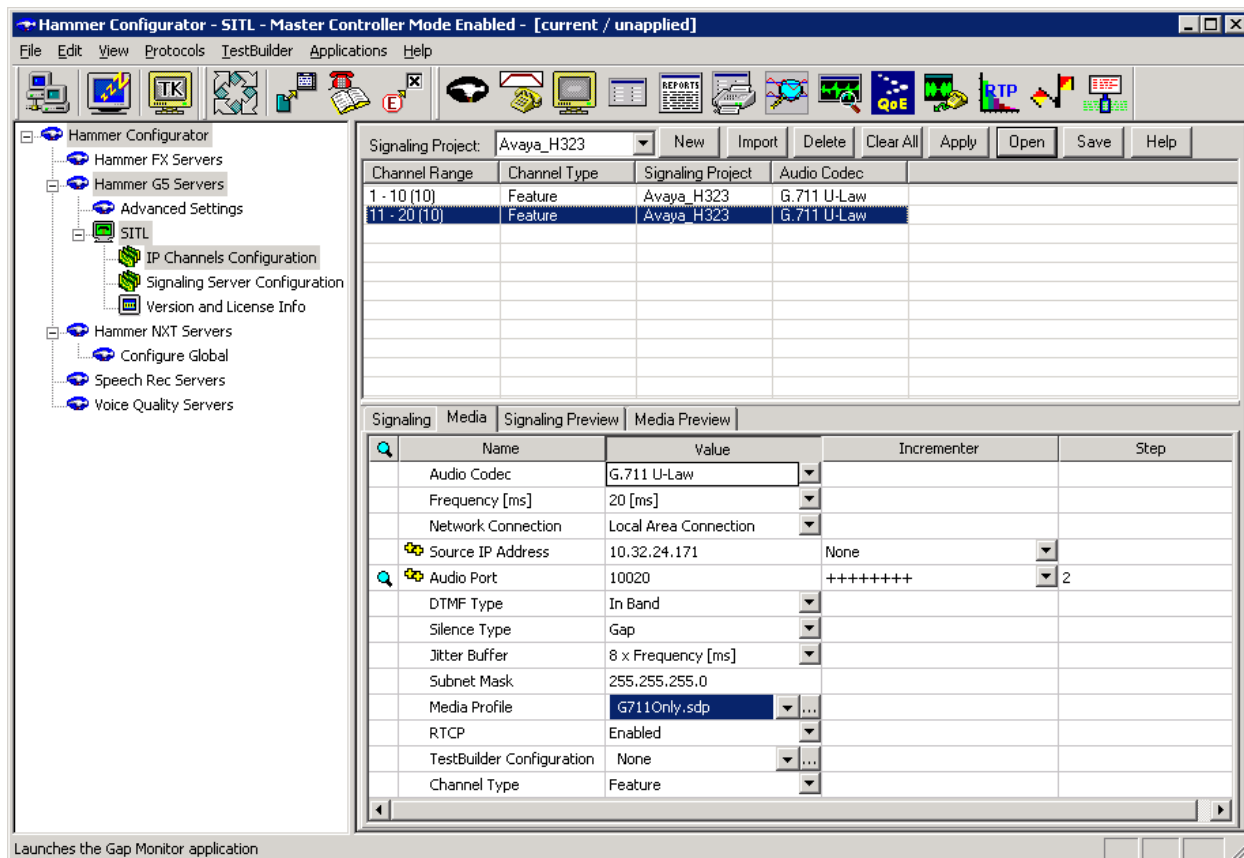
The following windows show the configuration of the **Media Profile** used in the **Media** tab above for the two channel groups. To access this window, click on the ellipses button (…) in the Media tab. By default, there are **Media Profiles** for each audio codec type so this configuration is not required since the profiles are available out-of-box. It is presented for informational purposes. Click on the **Audio Description** button to view the codecs that will be advertised by the Hammer G5 when placing a call.

The following window shows the codecs selected for this profile. This **Media Profile** was already created and named G711Only.sdp. It specifies G.711U and RFC 2833. When done, click **OK** to return to the previous window. Additional media profiles can be created and saved by selecting the desired codecs in this window and then clicking the **Save** button in the previous window.

This completes the configuration of the H.323 trunk interface. This configuration should be saved by clicking the **Save** button on the **Hammer Configurator** window.

The configuration needs to be applied to the server for the changes to take effect. Click on the **Apply** button in the **Hammer Configurator** window. The following window is displayed as the configuration is being applied to the server.
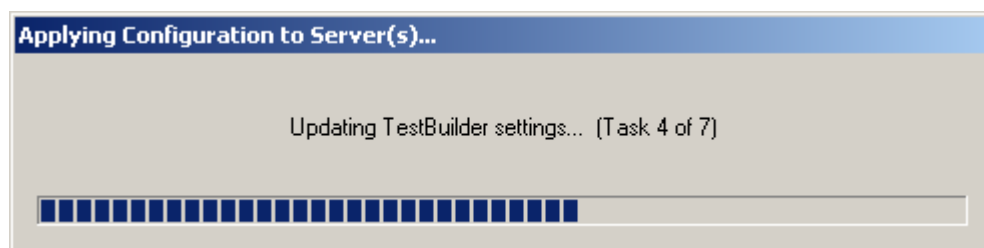
Check that the system has been started by clicking on the server name (e.g., SITL) in the left pane of the **Hammer Configurator**. If the current status is "System Is Stopped", click the **Start system** button to start the system. When the system is started, it should appear as shown below and should also specify which configuration has been applied. The configuration performed above was saved as "H323_20_TRK-TRK".
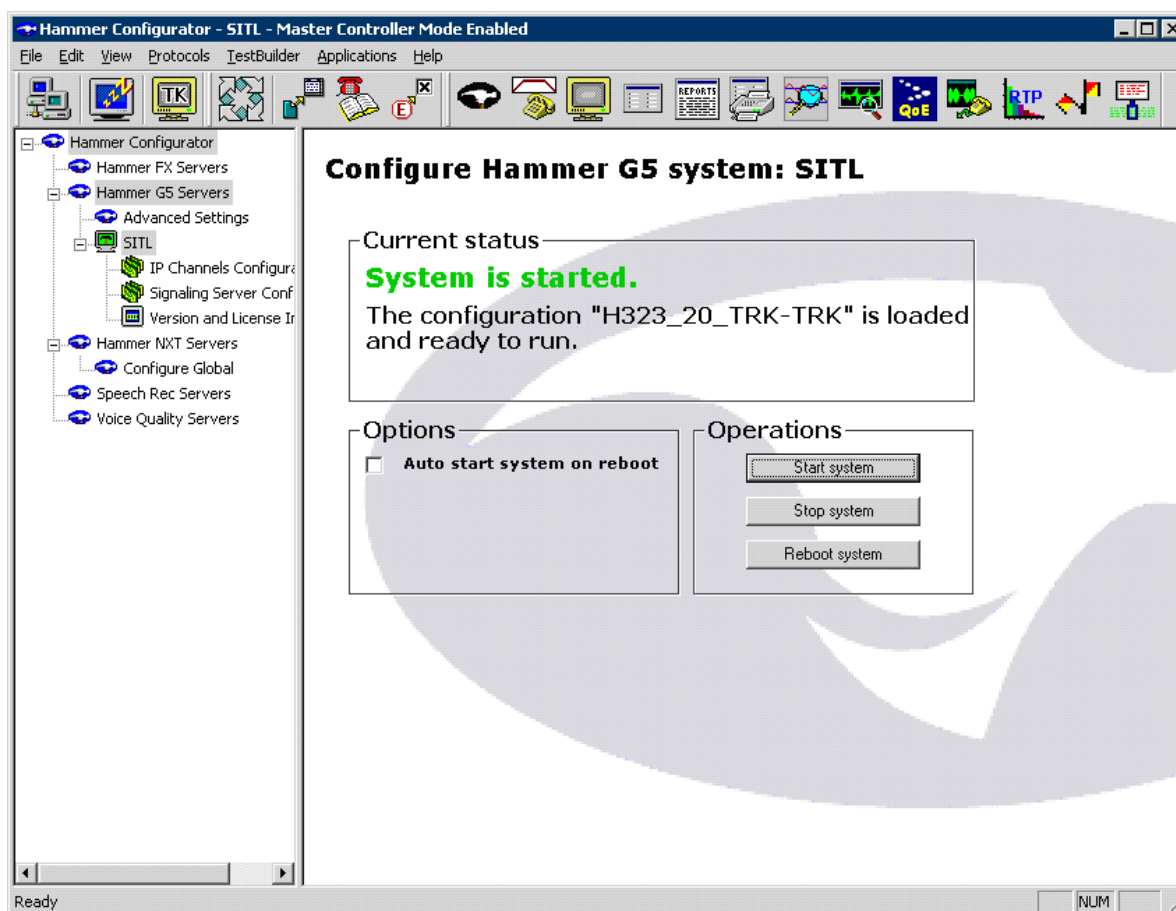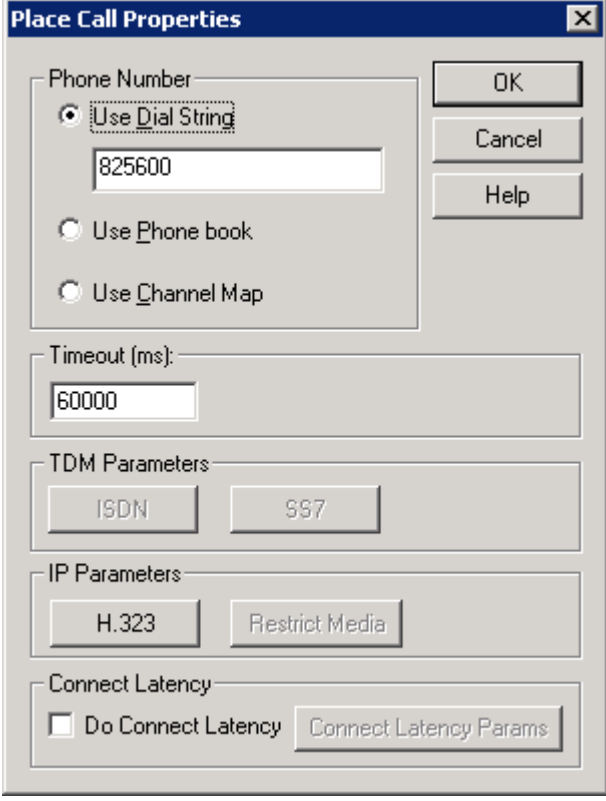
5.2 Configure and Run the Test Script

This section covers the configuration of a test script. The sample test script covered here establishes a VoIP call between two H.323 trunks on the Hammer G5, followed by the originating side playing an audio prompt to the far-end so that voice quality metrics (e.g., PESQ score) can be obtained. The test script is configured with the **Hammer TestBuilder** application and is displayed in a ladder diagram shown below. Each action in the test script can be configured by double clicking on it. For detailed instructions on how to create the test script, refer to [4]. Each test step is examined below as a brief tutorial, but test scripts will vary depending on the customer's requirements.
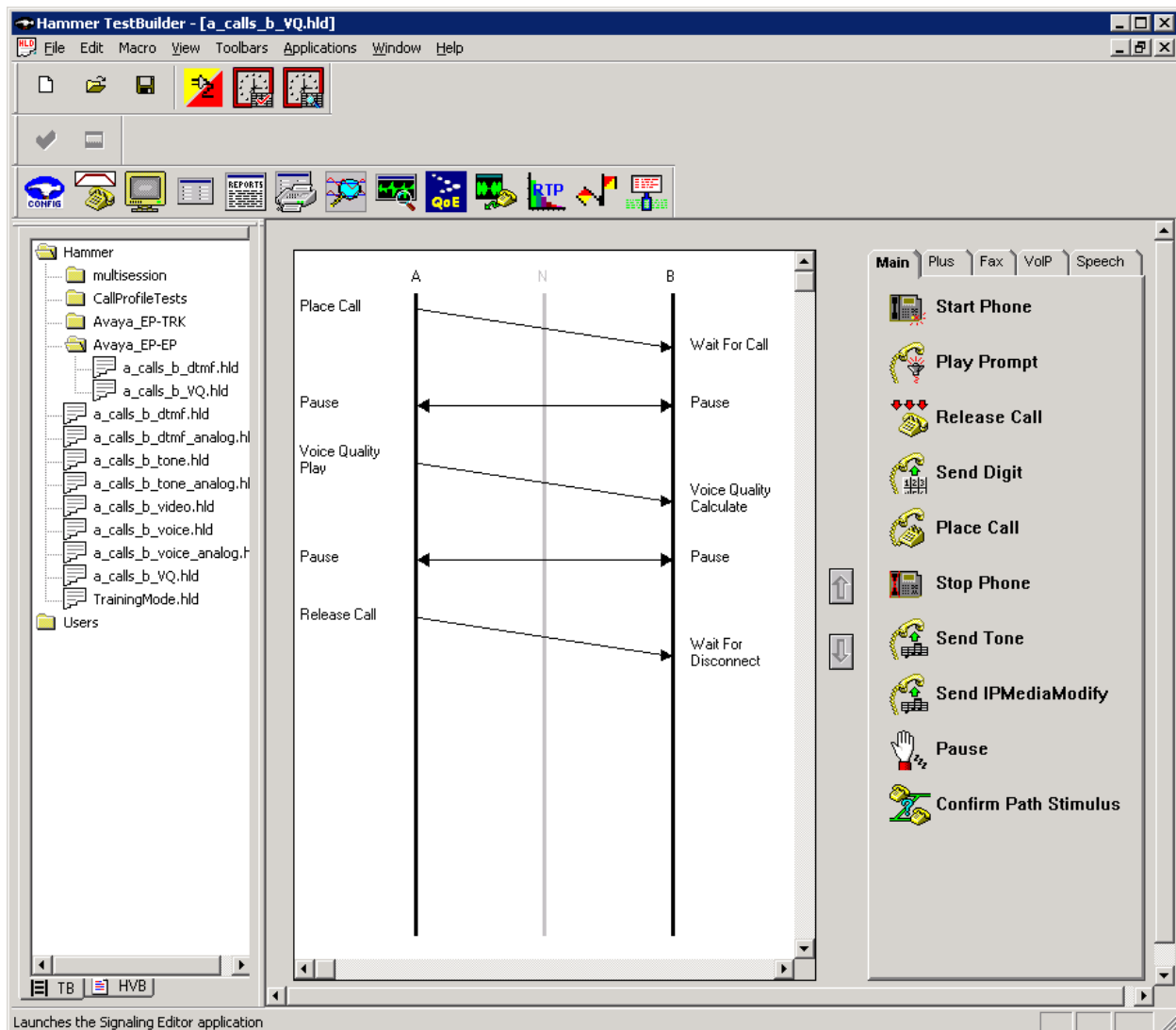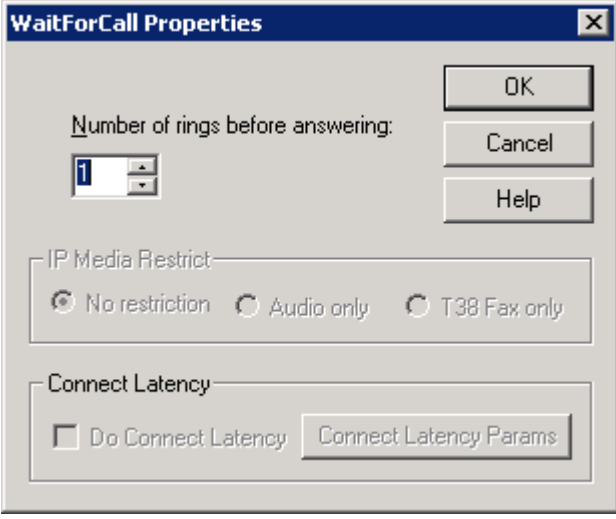
In the sample test script configured above, the A-side (originating H.323 trunk) places a call to the B-side (terminating H.323 trunk) using the **Place Call** action. The **Place Call** properties can be configured by double-clicking on the action in the ladder diagram. The **Place Call Properties** is configured to dial the same digits for every call. In this example, the Hammer G5 dials the AAR access code '8' followed by "25600".

The B-side then waits for one ring before answering the call as configured in the **Wait for Call** action.

After the call is established, the A-side pauses for 4 seconds before proceeding.
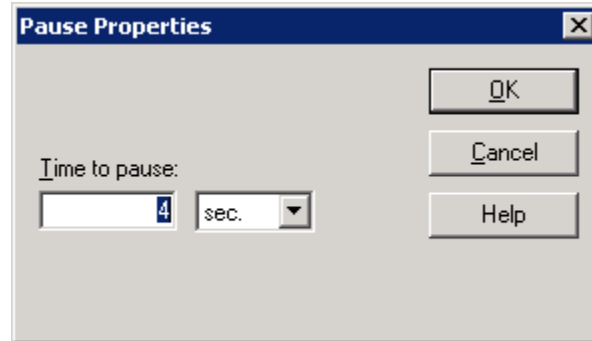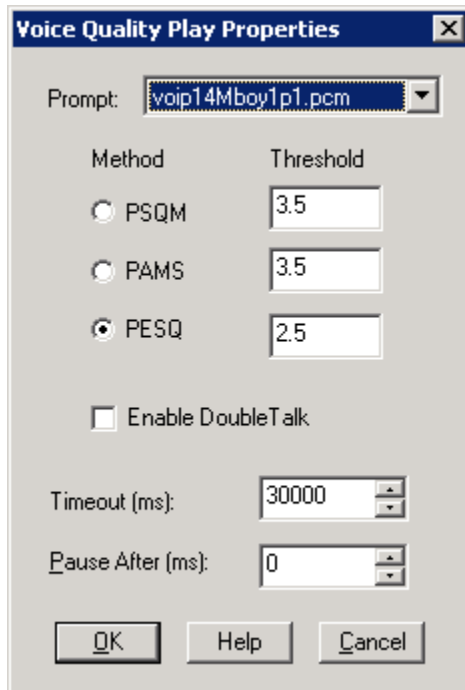
After the call is established, the B-side pauses for 2 seconds before proceeding.   The B-side waits for less time because it needs to start listening for the audio prompt before the A-side starts to play it.
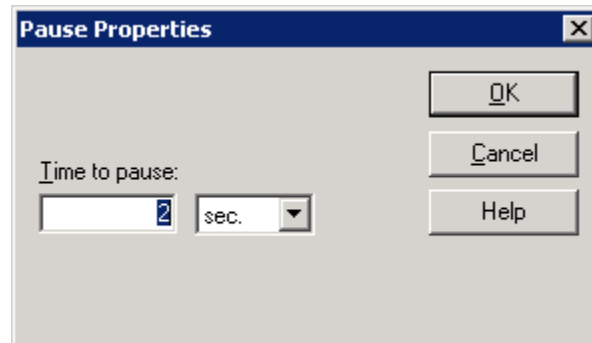
Important Note: In order for the call to succeed, the B-side needs to start listening for the audio prompt before the A-side starts to play it. During the compliance test, the B-side started to listen for the prompt about 2 seconds before the A-side started to play it. This can be controlled by the length of the **Pause** step described above. However, the B-side should not start listening too early (e.g., 5 seconds before the A-side starts playing the prompt or the call will most likely fail).
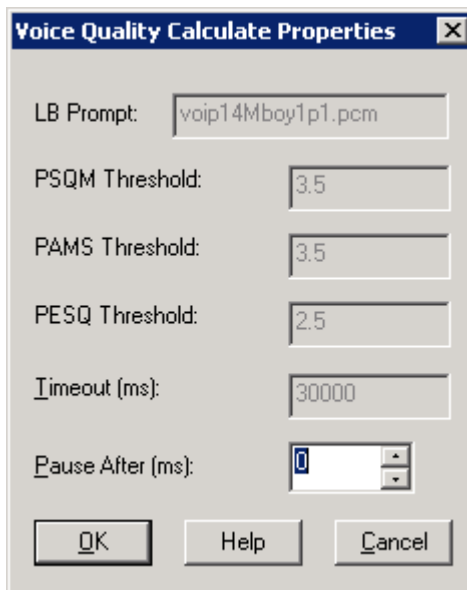
After the pause by the A-side, it starts to play the audio prompt specified in the **Prompt** field of the **Voice Quality Play Properties** window. The action properties also specify that a PESQ score should be provided.

The B-side starts to listen to prompt to calculate the voice quality score.

After the audio prompt is played the voice quality score is calculated, the A-side pauses for 3 seconds as shown below before releasing the call.

Pause Properties

Time to pause:

3 | sec.

OK
Cancel
Help
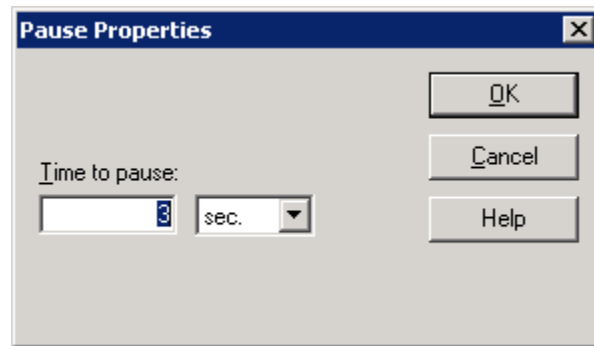
The B-side pauses for 1 second before releasing the call.

Pause Properties

Time to pause:

1 | sec.

OK
Cancel
Help
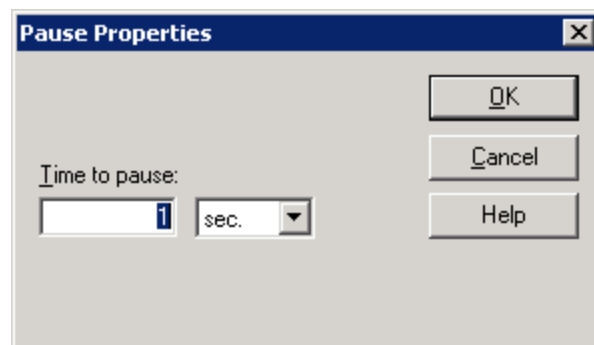
The last step of the test script is to release the call.

Wait For Disconnect Properties

Timeout (ms): 0

OK
Cancel
Help
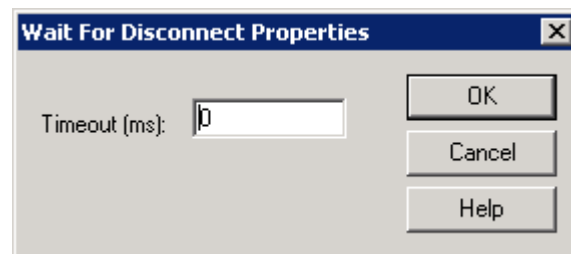
Once the test script is configured, save it from the **Hammer TestBuilder** application. Anytime a change is made to the test script, it needs to be saved before it can be run. In this example, the test script was saved as "a_calls_b_VQ.hld".

To run the test, right-mouse click on the test script in the left pane of the **Hammer TestBuilder** window and navigate to **Schedule→Edit & Run**. To re-run the test, the user can simply select **Schedule→Run**, if no changes are required.
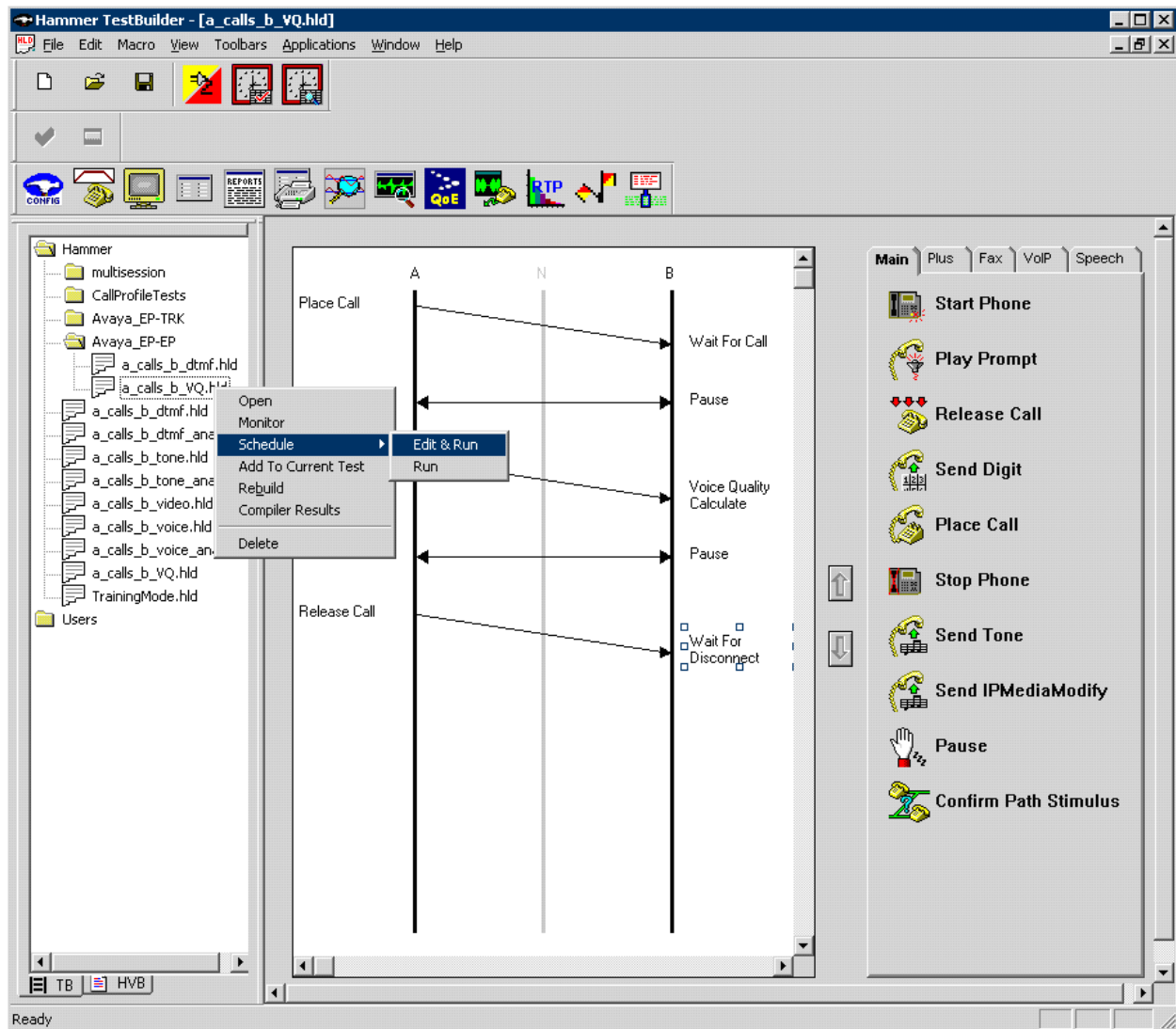
In the **Properties** window, set the **Loop Count** to the appropriate value to control the number of times the test should run. Setting this field to "-1" will allow the test to run forever. Setting this field to a specific number will run the test for the many iterations and then stop. The **Guard Time (ms)** field specifies how long to wait before the test is run again on the same channel. The **Stagger** section allows the user to specify how long to wait before the test is run on the next channel. Next, click on the ellipses button (…) in the **Channels** section to assign channels to the **A-Side** and **B-Side**. No phone book was specified since one wasn't used. The dialed digits were specified in the **Place Call** action of the test script.

Important Note: The **Guard Time** and **Stagger** parameters should be carefully considered for every test. A test script could fail because the configuration under test cannot handle the load generated by the Hammer G5. These parameters can slow down the test to a rate that can be reasonably handled by the test configuration.

In the **Channel Browser**, select the channels in **Channel Group 0** and assign it to the **A-Side** by clicking on the appropriate right arrow.
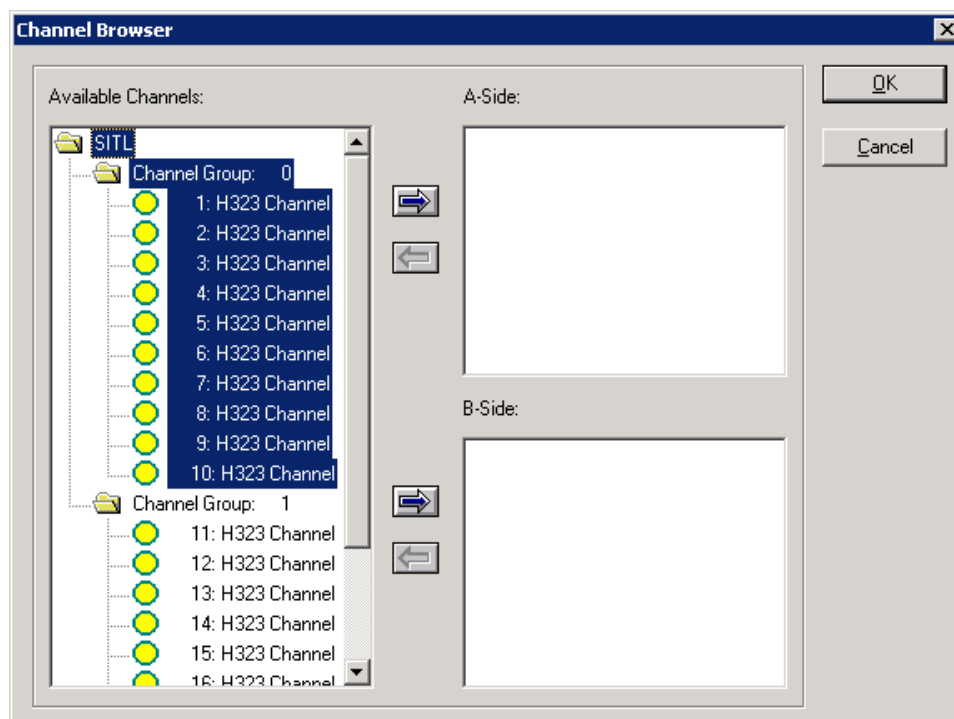
Select the channels in **Channel Group 1** and assign it to the **B-Side** by clicking on the appropriate right arrow.
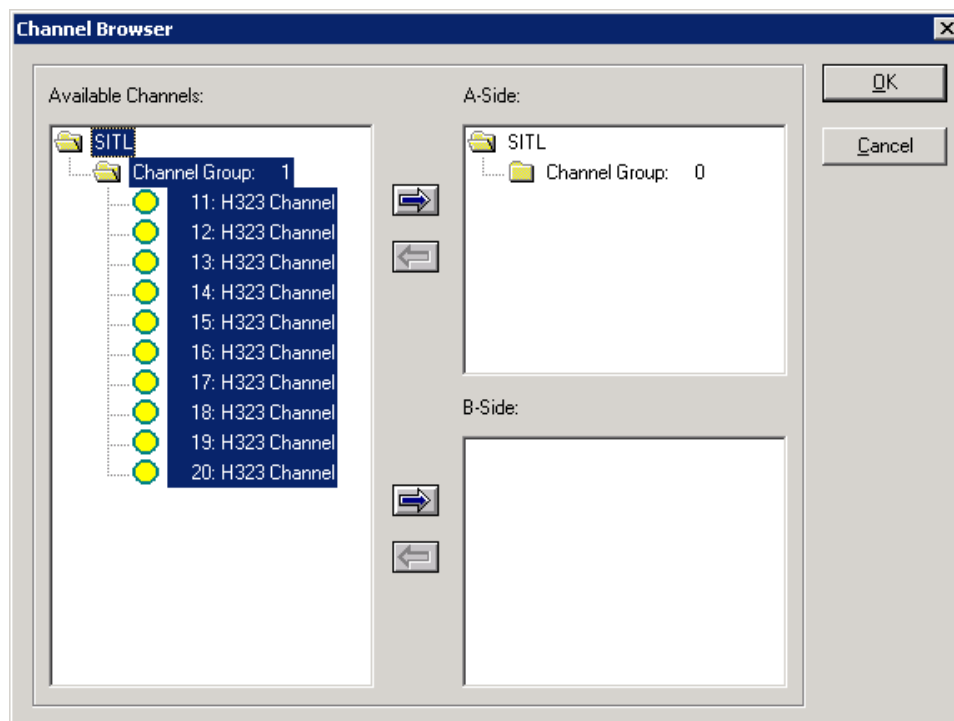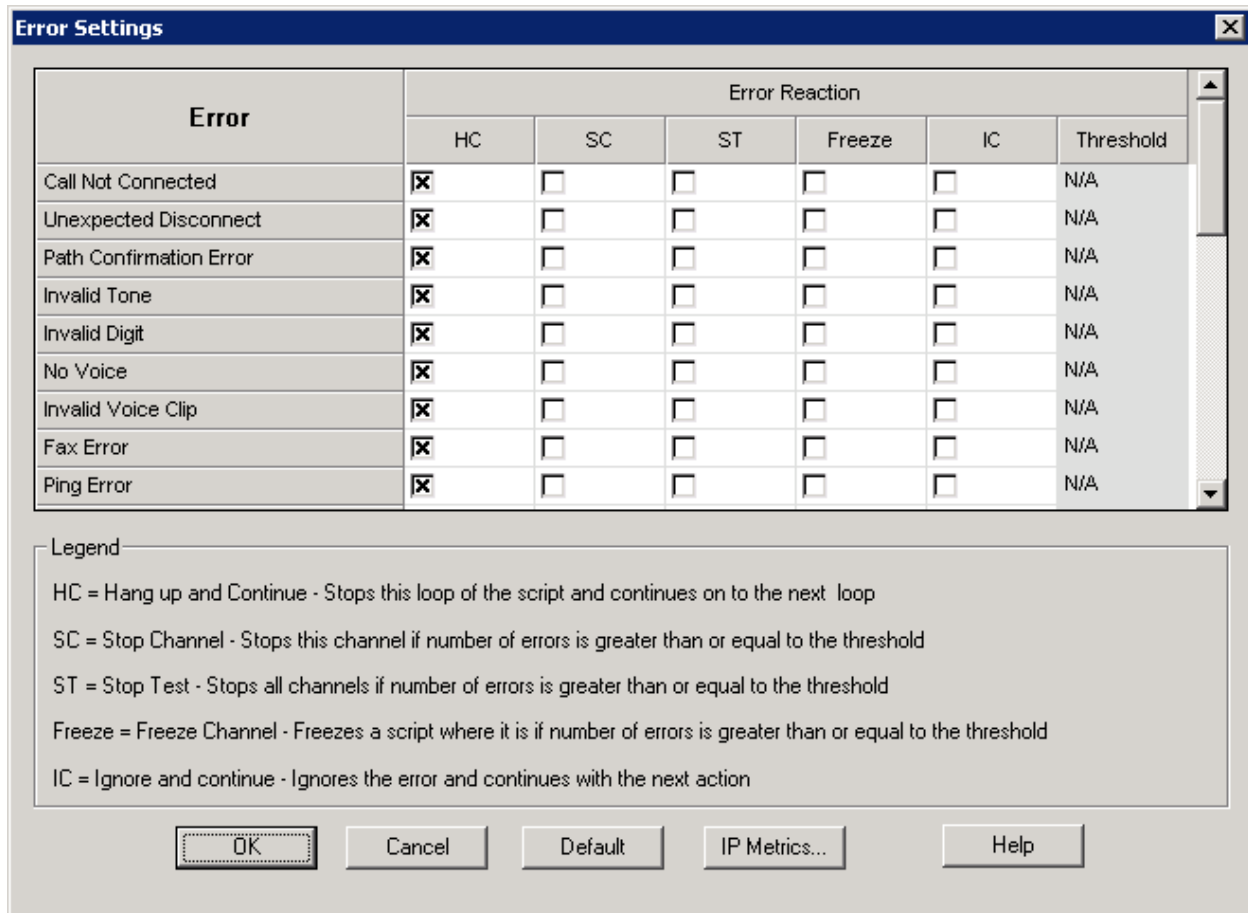
After assigning the channels to the **A-Side** and **B-Side**, the **Channel Browser** window should appear as follows. Click **OK** to return to the **Properties** window.
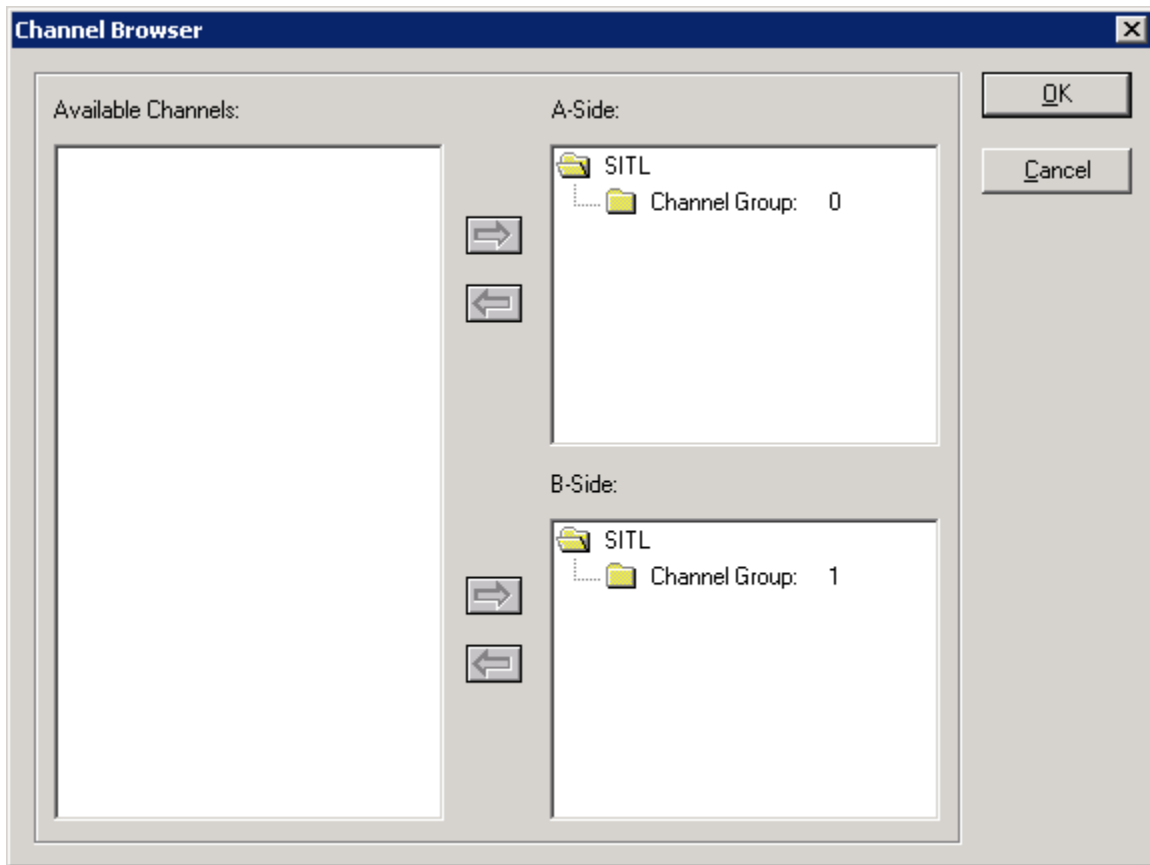
In the **Properties** window, click **OK** to start the test. Monitoring the test progress is covered in the **Verify Empirix Hammer G5** section (Section 7.2).

Helpful Tip: Once a test starts to run, if an error is encountered on a particular channel, the test will stop running on that channel unless the Hammer G5 is configured to continue running. To allow a test to continue running after an error occurs, modify the **Error Settings** by clicking on

the ⓔ icon on the **Hammer Configurator**. Click on the **HC** checkbox for each error type. This will allow the test to hang up and continue when an error occurs.

Error	Error Reaction					
	HC	SC	ST	Freeze	IC	Threshold
Call Not Connected	☒	☐	☐	☐	☐	N/A
Unexpected Disconnect	☒	☐	☐	☐	☐	N/A
Path Confirmation Error	☒	☐	☐	☐	☐	N/A
Invalid Tone	☒	☐	☐	☐	☐	N/A
Invalid Digit	☒	☐	☐	☐	☐	N/A
No Voice	☒	☐	☐	☐	☐	N/A
Invalid Voice Clip	☒	☐	☐	☐	☐	N/A
Fax Error	☒	☐	☐	☐	☐	N/A
Ping Error	☒	☐	☐	☐	☐	N/A

Legend

HC = Hang up and Continue - Stops this loop of the script and continues on to the next loop

SC = Stop Channel - Stops this channel if number of errors is greater than or equal to the threshold

ST = Stop Test - Stops all channels if number of errors is greater than or equal to the threshold

Freeze = Freeze Channel - Freezes a script where it is if number of errors is greater than or equal to the threshold

IC = Ignore and continue - Ignores the error and continues with the next action

[OK]   [Cancel]   [Default]   [IP Metrics...]   [Help]

6 General Test Approach and Test Results

Interoperability compliance testing covered feature and serviceability testing. The feature testing was conducted by originating and terminating calls using the H.323 trunk channels on the Hammer G5 and establishing the calls through Communication Manager. The interoperability compliance testing focused on the following areas:

- Generation of moderate call load from the Hammer G5 to Communication Manager via the H.323 trunk interface with the call being terminated on the Hammer G5.
- Support of the G.711MU, G.729AB, G.729A, and G.723-6.3K audio codecs.
- Voice quality as measured by PESQ scores and path confirmation.
- Support of non-direct audio, and direct audio with media shuffling.
- Recovery from adverse conditions during a load test.

The compliance test also covered monitoring various reports on the Hammer G5 during and after the test runs, and checking the status of various H.323 resources on Communication Manager.

The serviceability testing focused on verifying the ability of the Hammer G5 to recover from adverse conditions, such as disconnecting the Ethernet cable. Disconnecting the Ethernet cable would obviously cause errors in the test run, but the test would continue to run if configured to do so, otherwise the test would stop running after encountering errors.

All test cases passed. Empirix Hammer G5 was successfully compliance tested with Avaya Aura™ Communication Manager using H.323 trunk emulation.

7 Verification Steps

This section provides the tests that can be performed to verify proper configuration of Avaya Aura™ Communication Manager and Empirix Hammer G5.

7.1 Verify Avaya Aura™ Communication Manager

To verify the status of the H.323 trunks to the Hammer G5 are in the *in-service/idle* state the **status trunk** command may be used. This command only requires the trunk group number.

When the Hammer G5 is running a test script, the **status trunk** command may be used to view the active call status. This command requires that the trunk member on the call be specified.

```
status trunk 30/1                                           Page   1 of   4
                              TRUNK STATUS

 Trunk Group/Member: 0030/001            Service State: in-service/active
              Port: T00124          Maintenance Busy? no
 Signaling Group ID: 30                    CA-TSC state: none

   IGAR Connection? no

   Connected Ports: T00141
```

Page 2 of the **status trunk** command indicates the codec being used for the call and whether the call is shuffled.

```
status trunk 30/1                                           Page   2 of   4
                           CALL CONTROL SIGNALING

Near-end Signaling Loc: 01A0417
  Signaling   IP Address                          Port
   Near-end:  10.32.24.20                        : 1720
    Far-end:  10.32.24.170                       : 22952
 H.245 Near:
  H.245 Far:
   H.245 Signaling Loc:          H.245 Tunneled in Q.931? no

 Audio Connection Type: ip-tdm        Authentication Type: None
    Near-end Audio Loc: 01A0501              Codec Type: G.711MU
   Audio      IP Address                          Port
  Near-end:  10.32.24.21                        : 2736
   Far-end:  10.32.24.170                       : 10012

 Video Near:
  Video Far:
 Video Port:
  Video Near-end Codec:           Video Far-end Codec:
```

7.2 Verify Empirix Hammer G5

Call progress can be seen in the **Hammer System Monitor**. The call log for an originating channel may be logged to the left window and the call log for a terminating channel may be logged to the right window. This call monitor is useful for checking that the terminating channel is listening prior to the originating channel playing the prompt when a voice quality score is required.
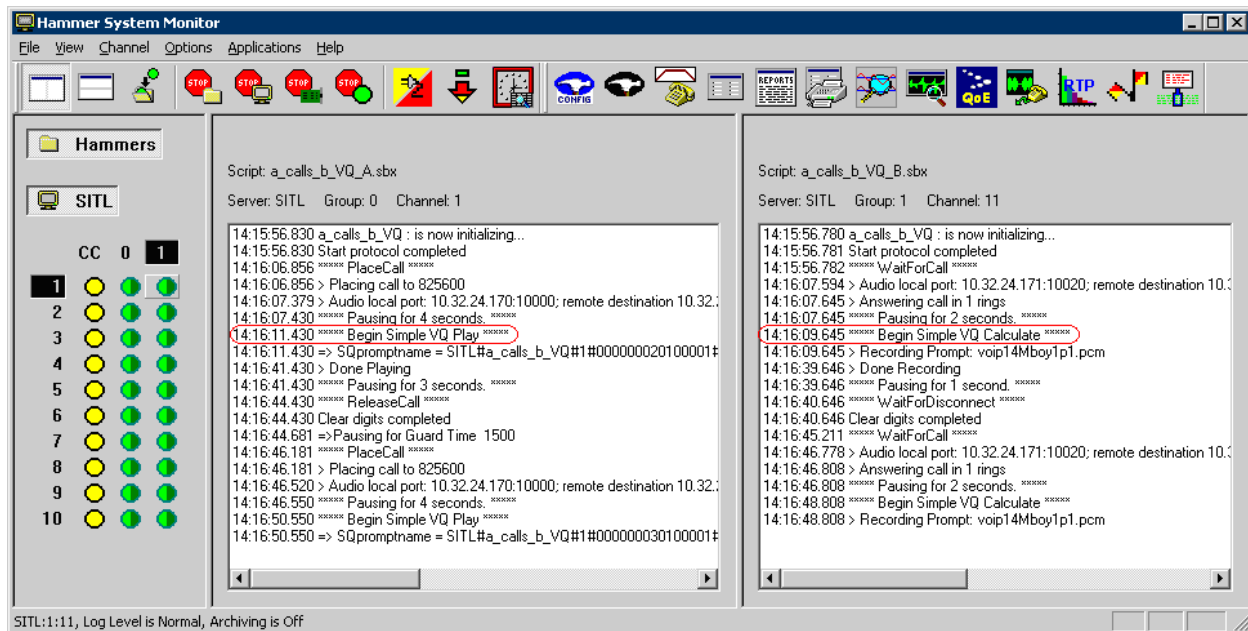

The **System Monitor** can be used to verify that a call was shuffled. This is noted by the Hammer G5 displaying the local and remote destinations in the call log.
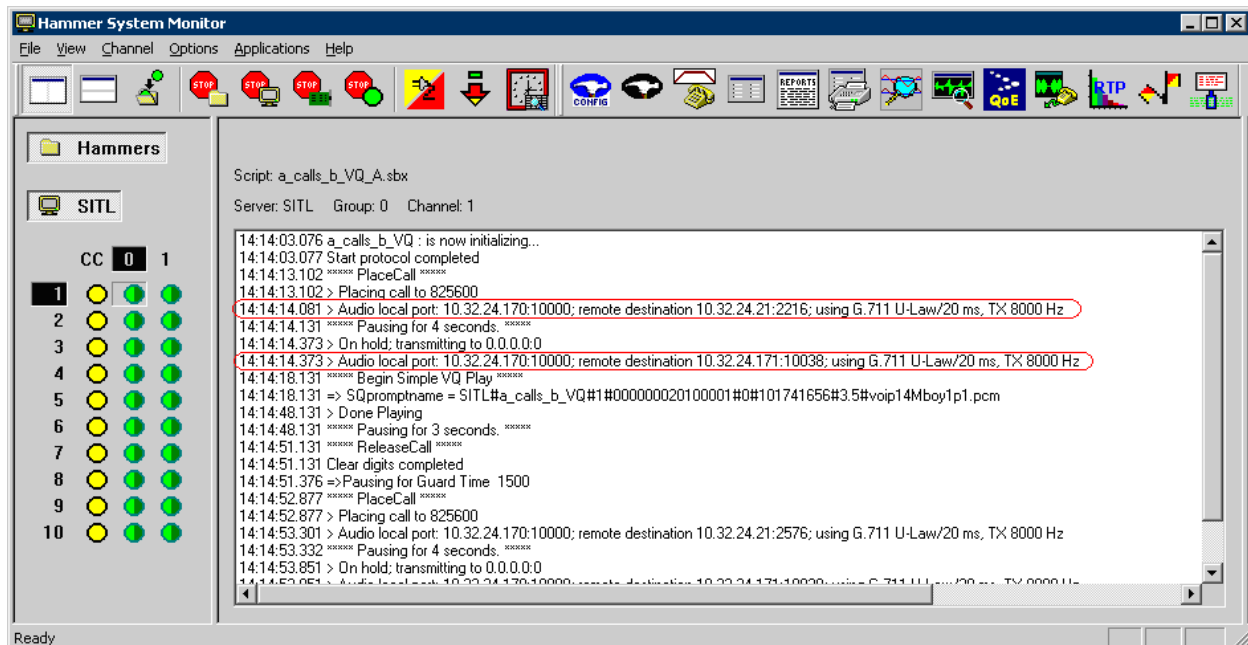
The **Hammer Call Summary Monitor** may be used to get a test status overview, including the number of call attempts, number of failed calls, PESQ scores, amongst other useful metrics.
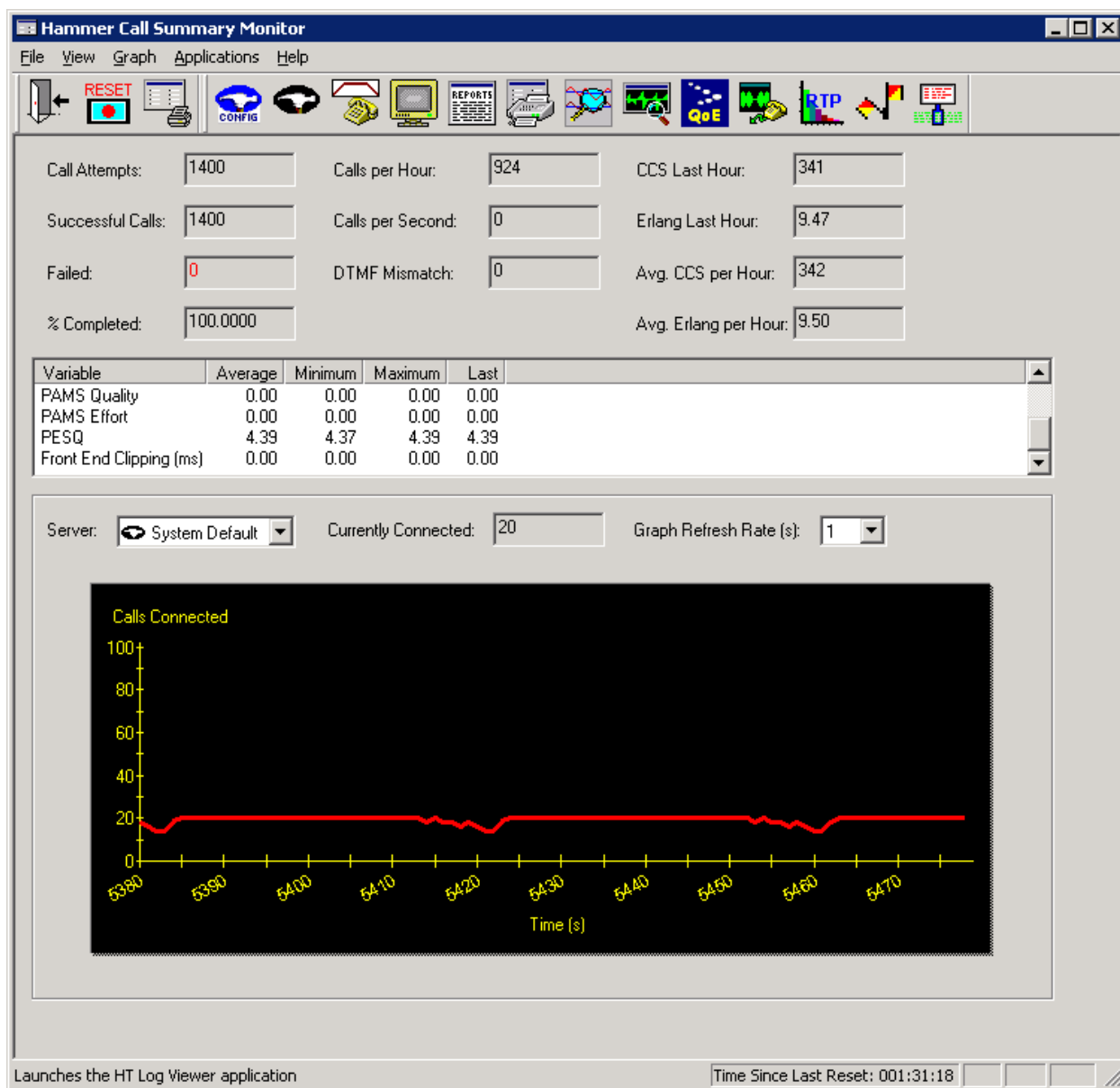
Hammer Reports can be generated by clicking on the **Reports** icon in the **Hammer Call Summary Monitor**. Various reports are available, such as the **VQ Summary** report shown below, which displays the PESQ score for the calls on each channel.
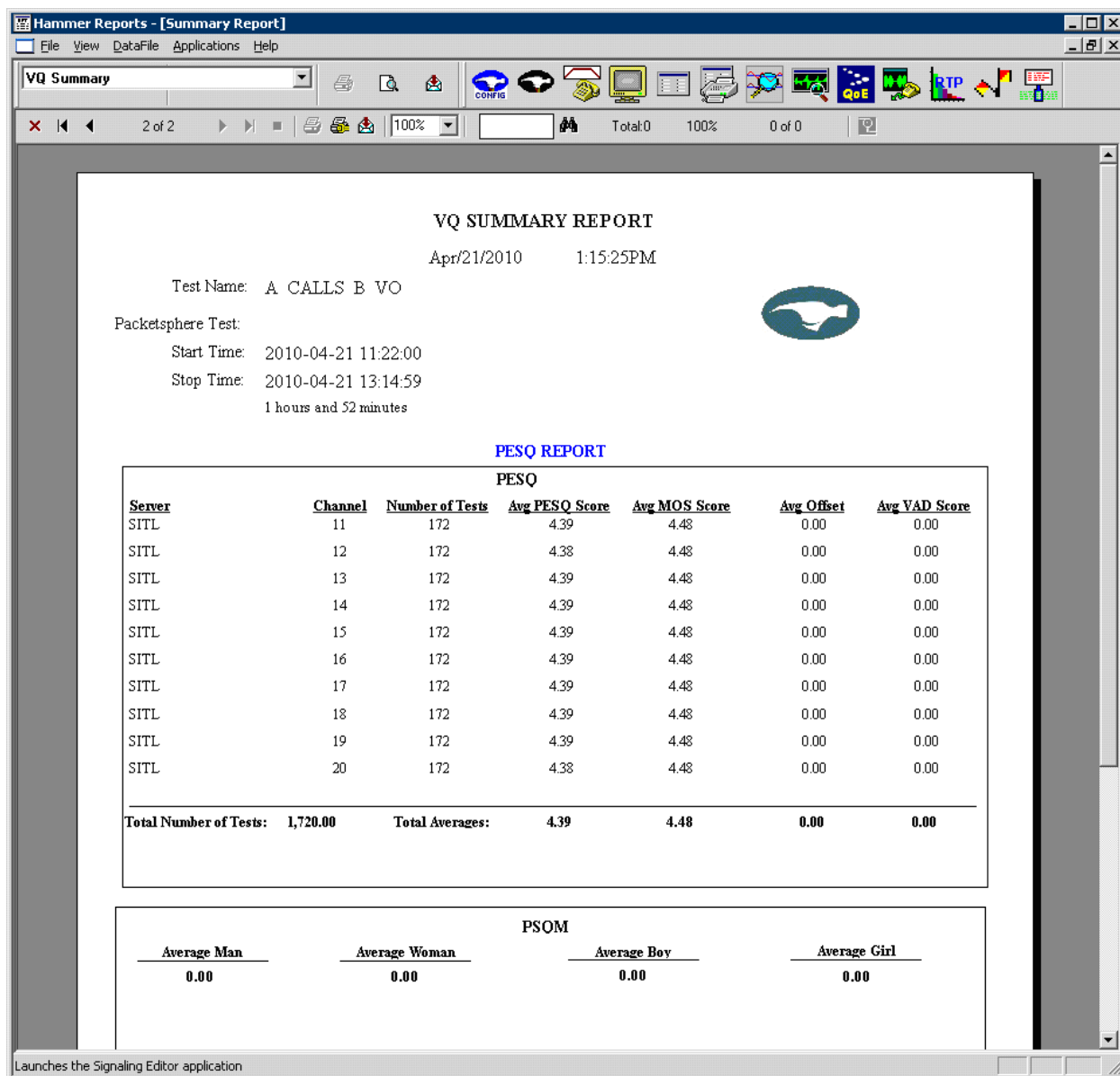
8 Conclusion

These Application Notes describe the configuration steps required to integrate the Empirix Hammer G5 with Avaya Aura™ Communication Manager using H.323 trunk emulation. The Hammer G5 was able to successfully establish calls through Communication Manager, generate voice quality metrics, monitor the calls, and generate reports. All feature and serviceability test cases were completed successfully.

9 References

This section references the product documentation relevant to these Application Notes.

[1] *Administering Avaya Aura^{TM} Communication Manager*, Document 03-300509, Issue 5.0, Release 5.2, May 2009, available at http://support.avaya.com.
[2] *Application Notes for Empirix Hammer G5 with Avaya Aura™ Communication Manager using H.323 Endpoint Emulation*, Issue 1.0, available at http://www.avaya.com.
[3] *Installation Guide Hammer G5^{TM},* Revision B, June 2009, available from Empirix.
[4] *Getting Started Guide Hammer G5^{TM},* Document Number 565-005-62, Revision E, June 2009, available from Empirix.

JAO; Reviewed:
SPOC 5/21/2010

Solution & Interoperability Test Lab Application Notes
©2010 Avaya Inc. All Rights Reserved.

37 of 37
Hammer-H323-TRK