



Avaya Solution & Interoperability Test Lab

Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager 6.2 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. Hammer G5 is a test solution for understanding how IP-based systems will behave in the real world. Hammer G5 can be used to assess and monitor network performance, reliability and quality of VoIP services in an Avaya IP telephony network. In this configuration, the Hammer G5 emulates H.323 trunks that originate and terminate calls through Avaya Aura® Communication Manager. While the call is active, Hammer G5 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 provides a collection of applications used to configure the system; create, schedule, and monitor tests; and create reports.

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.

1 Introduction

These Application Notes describe the configuration steps required to integrate the Empirix Hammer G5 test system with Avaya Aura® Communication Manager 6.2 using H.323 trunk emulation. Hammer G5 is a test solution for understanding how IP-based systems will behave in a production environment. Hammer G5 can be used to assess and monitor network performance, reliability and quality of VoIP services in an Avaya IP telephony network. In this configuration, the Hammer G5 emulates H.323 trunks that originate and terminate calls through Avaya Aura® Communication Manager. While the call is active, Hammer G5 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 provides a collection of applications used to configure the system; create, schedule, and monitor tests; and create reports.

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.

Below is a list of related Application Notes.

- *Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager using H.323 Endpoint Emulation [2]*
- *Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using SIP Trunk Emulation [3]*
- *Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using SIP Endpoint Emulation [4]*

2 General Test Approach and Test Results

DevConnect Compliance Testing is conducted jointly by Avaya and DevConnect members. The jointly-defined test plan focuses on exercising APIs and/or standards-based interfaces pertinent to the interoperability of the tested products and their functionalities. DevConnect Compliance Testing is not intended to substitute full product performance or feature testing performed by DevConnect members, nor is it to be construed as an endorsement by Avaya of the suitability or completeness of a DevConnect member's solution.

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

2.1 Interoperability Compliance Testing

The interoperability compliance testing focused on verifying that the Hammer G5 can register with Avaya Aura® Communication Manager as H.323 endpoints, establish calls, send voice media, and provide voice quality metrics. The following features and functionality were covered:

- Originating and terminating calls through Avaya Aura® Communication Manager.
- Support of G.711mu-law 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 and IP Audio Hairpinning disabled were also verified.
- Generating voice quality metrics with Shuffling disabled.
- DTMF support.
- Originating calls from H.323 trunks and terminating calls on H.323 trunks, H.323 endpoints, SIP trunks, and SIP endpoints.

Note: Performance and load testing was not the focus of the compliance test.

2.2 Test Results

All test cases passed. Empirix Hammer G5 was successful in originating calls using H.323 trunk emulation and terminating calls on channels emulating H.323 trunks, H.323 endpoints, SIP trunks, and SIP endpoints. It was observed that after reconnecting the Ethernet cable or re-establishing network connectivity, while a test script was running, required the channels to be unregistered and the configuration to be re-applied.

Note: Communication Manager does not shuffle calls between a SIP trunk and H.323 trunk. This is per design. If the originating endpoint on Hammer is a SIP endpoint, note that the call arrives on Communication Manager via a SIP trunk. Therefore, a call from a SIP endpoint to an H.323 trunk is essentially a call from a SIP trunk to an H.323 trunk and the call is not shuffled.

2.3 Support

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

- **Phone:** +1-781-266-3202
- **Web:** <http://www.empirix.com/support/maintenance.asp>
- **Email:** support@support.com

3 Reference Configuration

The network diagram below illustrates the test configuration. In this configuration, Communication Manager receives calls from the Hammer G5, which emulates H.323 trunks. Communication Manager routes the call back to Hammer G5 over a H.323 trunk. Hammer G5 then terminates the calls. The calls can be terminated to another H.323 trunk, H.323 endpoint, SIP trunk, or SIP endpoint¹. While the calls are established, Hammer G5 can send DTMF and/or voice media (i.e., RTP traffic) using an audio recording. A voice quality test 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.

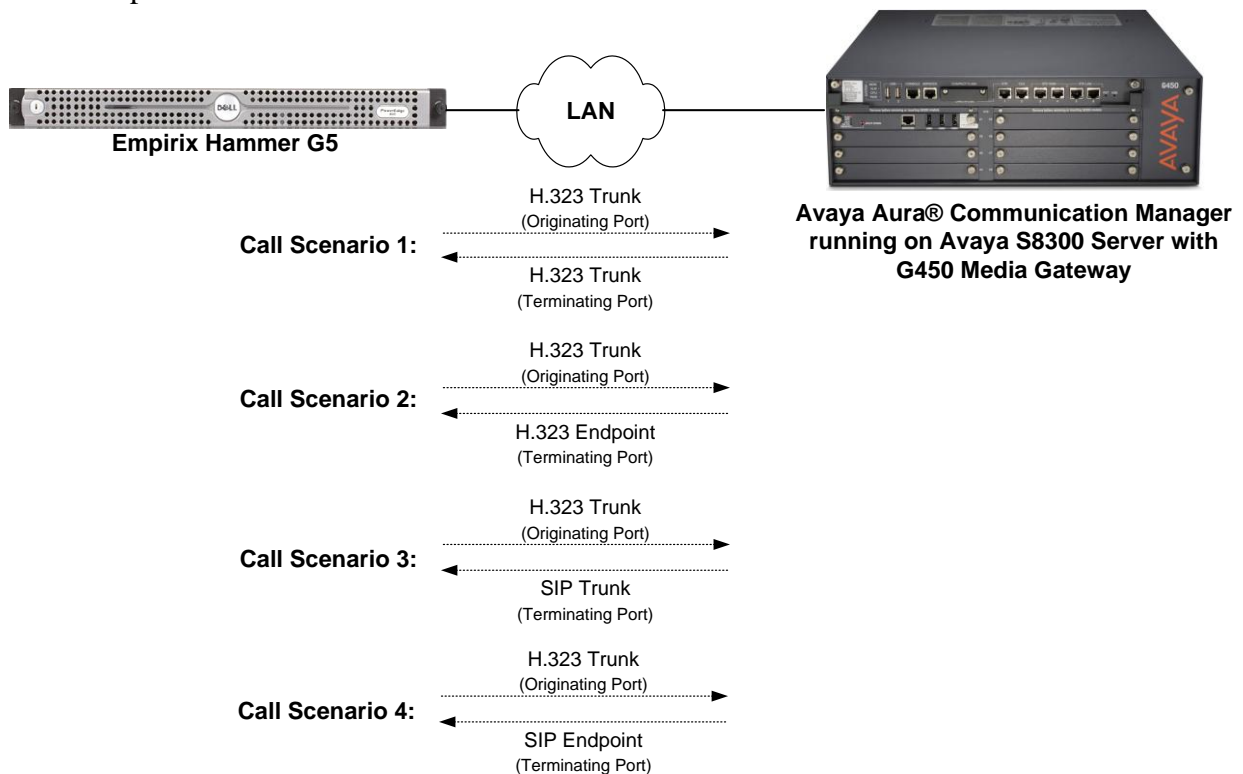


Figure 1: Empirix Hammer G5 with Avaya Aura® Communication Manager

¹ To terminate the call to a SIP trunk or endpoint, Avaya Aura® Session Manager is required, but is not shown in the configuration diagram.

4 Equipment and Software Validated

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

Equipment/Software	Release/Version
Avaya Aura® Communication Manager running on S8300 Server with G450 Media Gateway	6.2 SP 3 (R016x.02.0.823.0 with Patch 19926)
Avaya Aura® Session Manager	6.2 (6.2.3.0.623006)
Empirix Hammer G5 running on Microsoft Windows Server 2003 with 2 GHz Intel Xeon CPU and 4 GB of RAM	1.7.2.281

5 Configure Avaya Aura® Communication Manager

This section provides the procedures for configuring Communication Manager. The configuration was performed using the System Access Terminal (SAT). 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

5.1 Administer IP Node Names

In the **IP Node Names** form, assign an IP address and host name for the S8300 Server and the incoming and outgoing H.323 trunks associated with 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
BR110-SM              10.32.32.78
HammerG5-Inc        192.168.100.170
HammerG5-Out        192.168.100.171
default              0.0.0.0
devcon-asm           10.32.24.235
devcon13             10.32.24.20
lz-asm               192.168.100.235
procr                192.168.100.10
procr6               ::

( 9 of 9 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
```

5.2 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. For the compliance test, G.711mu-law, G.729AB, and G.729A codecs were used. In the IP codec set form, specify the appropriate codec being used by the Hammer test. Below is the IP codec set configured for **G.711mu-law**.

```
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:
3:
```

5.3 Administer IP Network Region

In the **IP Network Region** form, specify the codec set to be used for 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 G450 Media Gateway. Note that if Shuffling is enabled, audio traffic does not egress the Hammer G5 since the call would be shuffled.

```
change ip-network-region 1                               Page 1 of 20

                                IP NETWORK REGION

Region: 1
Location: 1      Authoritative Domain: devcon.com
Name:
MEDIA PARAMETERS                                Intra-region IP-IP Direct Audio: yes
Codec Set: 1      Inter-region IP-IP Direct Audio: yes
UDP Port Min: 2048      IP Audio Hairpinning? y
UDP Port Max: 65535
DIFFSERV/TOS PARAMETERS
Call Control PHB Value: 46
Audio PHB Value: 46
Video PHB Value: 26
802.1P/Q PARAMETERS
Call Control 802.1p Priority: 6
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
```

5.4 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 192.168.100.170. Shuffling may be enabled or disabled at the signaling group level or at the IP network region level. Configure other fields in **bold** as shown below. After configuring the H.323 trunk group, return to this form and configure the **Trunk Group for Channel Selection** field.

```
add signaling-group 70                                     Page 1 of 6
                                                         SIGNALING GROUP
Group Number: 70           Group Type: h.323
  SBS? n                   Remote Office? n             Max number of NCA TSC: 0
  Q-SIP? n                 Max number of CA TSC: 0
  IP Video? n              Trunk Group for NCA TSC:
  Trunk Group for Channel Selection: 70      X-Mobility/Wireless Type: NONE
  TSC Supplementary Service Protocol: a         Network Call Transfer? n
                                               T303 Timer(sec): 10
H.245 DTMF Signal Tone Duration(msec):
  Near-end Node Name: procr                 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
                                               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 70 is associated with this H.323 trunk group used for incoming calls.

```
add trunk-group 70                                       Page 1 of 21
                                                         TRUNK GROUP
Group Number: 70           Group Type: isdn           CDR Reports: y
Group Name: Hammer - Incoming  COR: 1             TN: 1         TAC: 1070
  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: 70
                                               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 192.168.100.171. 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 71                                     Page 1 of 6
                                SIGNALING GROUP

Group Number: 71                Group Type: h.323
  SBS? n                        Remote Office? n          Max number of NCA TSC: 0
  Q-SIP? n                      Max number of CA TSC: 0
  IP Video? n                   Trunk Group for NCA TSC:
  Trunk Group for Channel Selection: 71      X-Mobility/Wireless Type: NONE
  TSC Supplementary Service Protocol: a      Network Call Transfer? n
                                           T303 Timer(sec): 10

H.245 DTMF Signal Tone Duration(msec):
Near-end Node Name: procr          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

                                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 71 is associated with this H.323 trunk group used for outgoing calls.

```

add trunk-group 71                                       Page 1 of 21
                                TRUNK GROUP

Group Number: 71                Group Type: isdn          CDR Reports: y
  Group Name: Hammer - Outgoing  COR: 1                  TN: 1          TAC: 1071
  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: 71
                                Number of Members: 10

```

5.5 Administer Call Routing

When originating a call, the Hammer G5 will dial the AAR access code '8' followed by "45000". The **AAR Digit Analysis Table** specifies that for these dialed digits, the call should be routed using Route Pattern 71.

```
change aar analysis 4
```

Page 1 of 2

AAR DIGIT ANALYSIS TABLE						
Location: all				Percent Full: 2		
Dialed String	Total		Route Pattern	Call Type	Node Num	ANI Reqd
	Min	Max				
43000	5	5	60	aar		n
45000	5	5	71	aar		n
46	5	5	60	aar		n
47	5	5	80	aar		n
48	5	5	50	aar		n
49	5	5	60	aar		n
5	7	7	254	aar		n
6	5	5	2	aar		n
7	5	5	3	aar		n
8	7	7	254	aar		n
9	7	7	254	aar		n

Route Pattern 71 specifies Trunk Group 71 as the outgoing trunk group. The Hammer G5 will terminate any call regardless of the digits received.

```
change route-pattern 71
```

Page 1 of 3

Pattern Number: 71 Pattern Name: To Hammer									
SCCAN? n Secure SIP? n									
Grp No	FRL	NPA	Pfx Mrk	Hop Lmt	Toll List	No. Del	Inserted Digits	DCS/ QSIG	IXC Intw
1:	71	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. Dgts	Numbering Format	LAR
0	1	2	M	4	W	Request				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

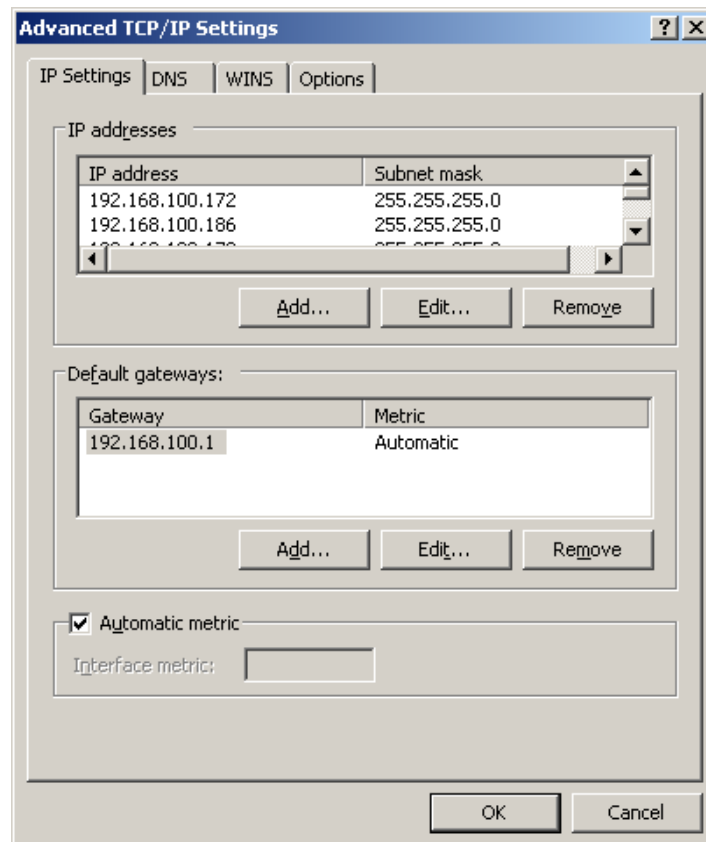
6 Configure Empirix Hammer G5

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

- Assign unique IP addresses to each Hammer G5 channel.
- Configure the H.323 trunk interface using the **Hammer Configurator**.
- Save and apply the Hammer configuration and start the Hammer server.
- Create and run the test script using the **Hammer TestBuilder**.

6.1 Configure IP Addresses on Hammer G5 Server

The Hammer G5 server needs to be configured with the IP addresses 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 192.168.100.170. The IP address used for the H.323 trunk used for incoming calls was 192.168.100.171. These IP addresses are configured in the **Advanced TCP/IP Settings** under Network Connections in Windows Server 2003.



6.2 Configure System

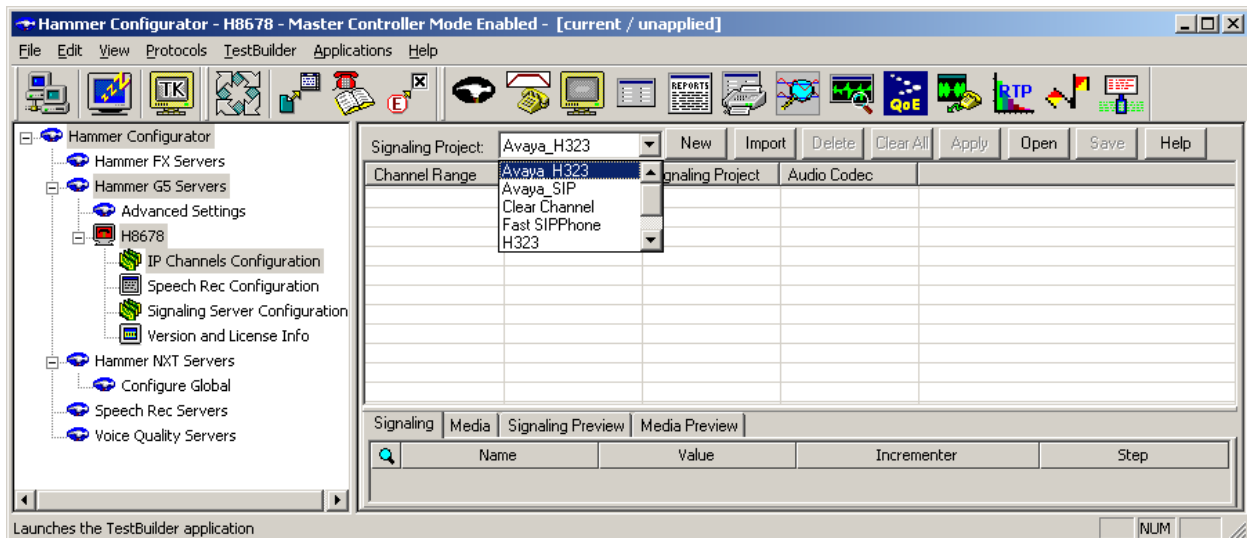
This section covers the configuration of originating and terminating channels on Hammer G5. In this configuration, the originating channels emulate H.323 endpoints (described in **Section** Error! Reference source not found.). The terminating channels can emulate H.323 trunks, H.323 endpoints, SIP trunks, or SIP endpoints. These Application Notes will explicitly describe the configuration for terminating calls to H.323 trunks in **Section 6.2.2.1**. In addition, it will provide references to other Application Notes for configuring terminating channels as H.323 endpoints, SIP trunks, or SIP endpoints in **Sections** Error! Reference source not found., Error! Reference source not found., and **6.2.2.3**, respectively. Only one of those sections needs to be followed depending on the configuration desired.

6.2.1 Configure Originating Channels – H.323 Trunks

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 following screen is displayed.

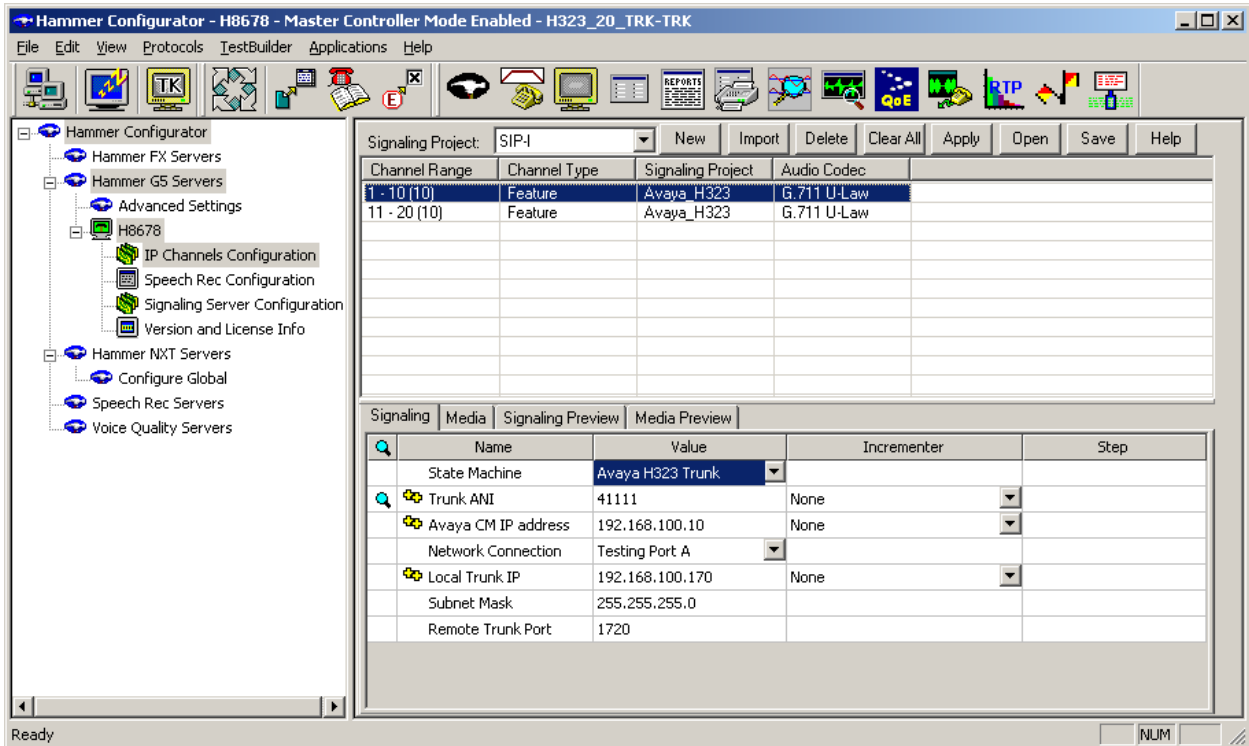
Note: It is assumed that Hammer G5 is already in **Master Controller Mode**. To verify, check that the title bar of the **Hammer Configurator** indicates *Master Controller Mode Enabled* as shown below. It is also assumed that a system was already added to the configuration. In this configuration, the system name is *H8678*, which corresponds to the server name.

In the **Hammer Configurator**, the server name will appear in the left pane of the **Hammer Configurator**. Expand the server name (e.g., *H8678*) 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**.



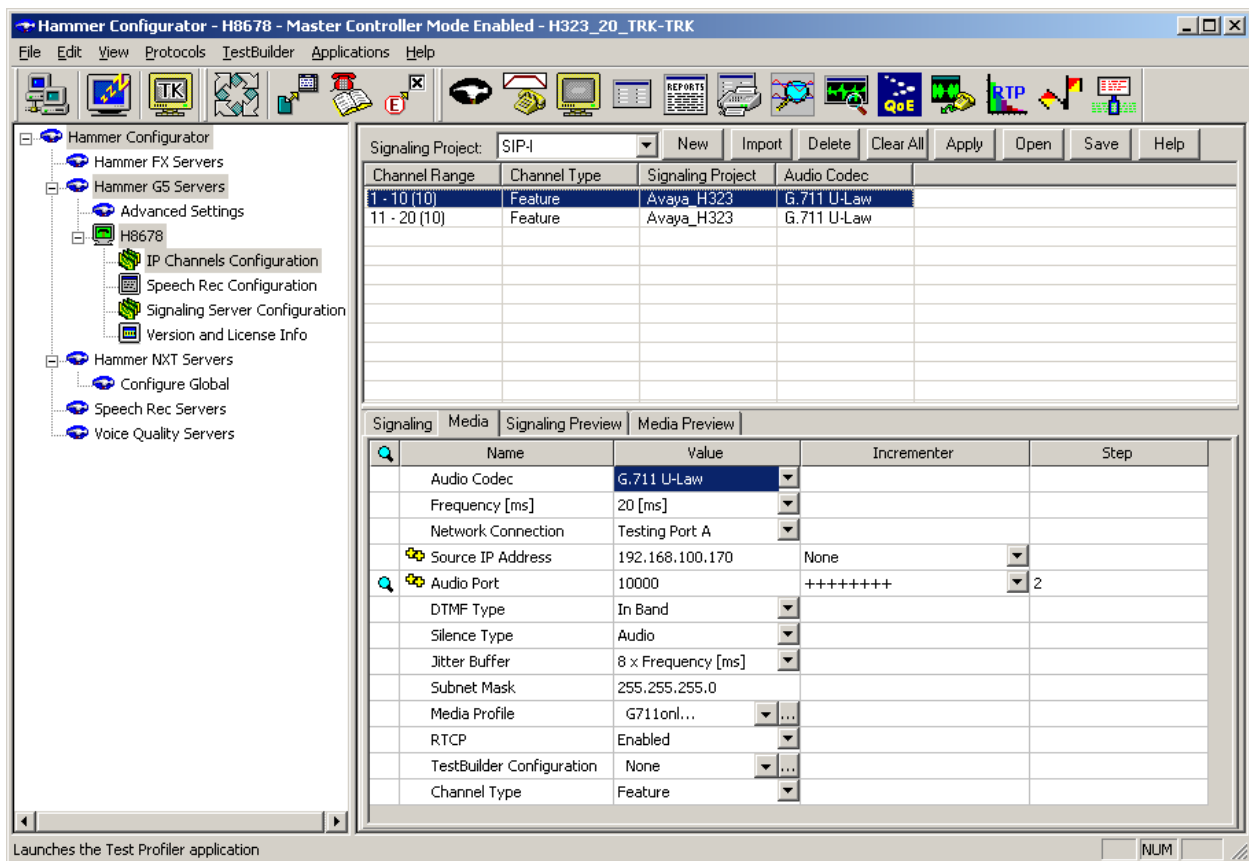
The first line in the grid that is highlighted in the figure below corresponds to the 10 originating channels. To set the number of channels in the group, click on the **Channel Range** cell in the grid and enter the number “10”. The following fields in the **Signaling** tab should then be set as follows:

- **State Machine** should be set to *Avaya H323 Trunk*.
- **Trunk ANI** can be set to any digits.
- **Avaya CM IP Address** should be set to the S8300 Server IP address (e.g., *192.168.100.10*). Use the C-LAN IP address if a C-LAN card is being used in a G650 Media Gateway.
- **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., *192.168.100.170*).
- **Subnet Mask** should be set to the network mask (e.g., *255.255.255.0*).
- **Remote Trunk Port** should be set to the H.323 signaling port (e.g., *1720*).



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 U-Law, G729AB, and G.729A were used during the compliance testing.
- **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., 192.168.100.170).
- **Media Profile** should be set to one that specifies the codec configured in the **Audio Codec** field. See **Appendix A** for instructions on configuring a **Media Profile**.
- The default values for the remaining fields may be used as shown.



6.2.2 Configure Terminating Channels

During the compliance test, the originating channels emulated H.323 trunks with the calls terminating on H.323 trunks, H.323 endpoints, SIP trunks, or SIP endpoints. Select one of the following subsections depending on the configuration desired.

- **Section 6.2.2.1** for terminating calls on H.323 trunks.
- **Section 6.2.2.2** for terminating calls on H.323 endpoints.
- **Section 6.2.2.3** for terminating calls on SIP trunks.
- **Section 6.2.2.4** for terminating calls on SIP endpoints.

Note: Ensure that the originating and terminating channels are assigned unique IP addresses.

6.2.2.1 Configure Terminating Channels – H.323 Trunks

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 **Trunk ANI** and **Local Trunk IP** fields will be different.

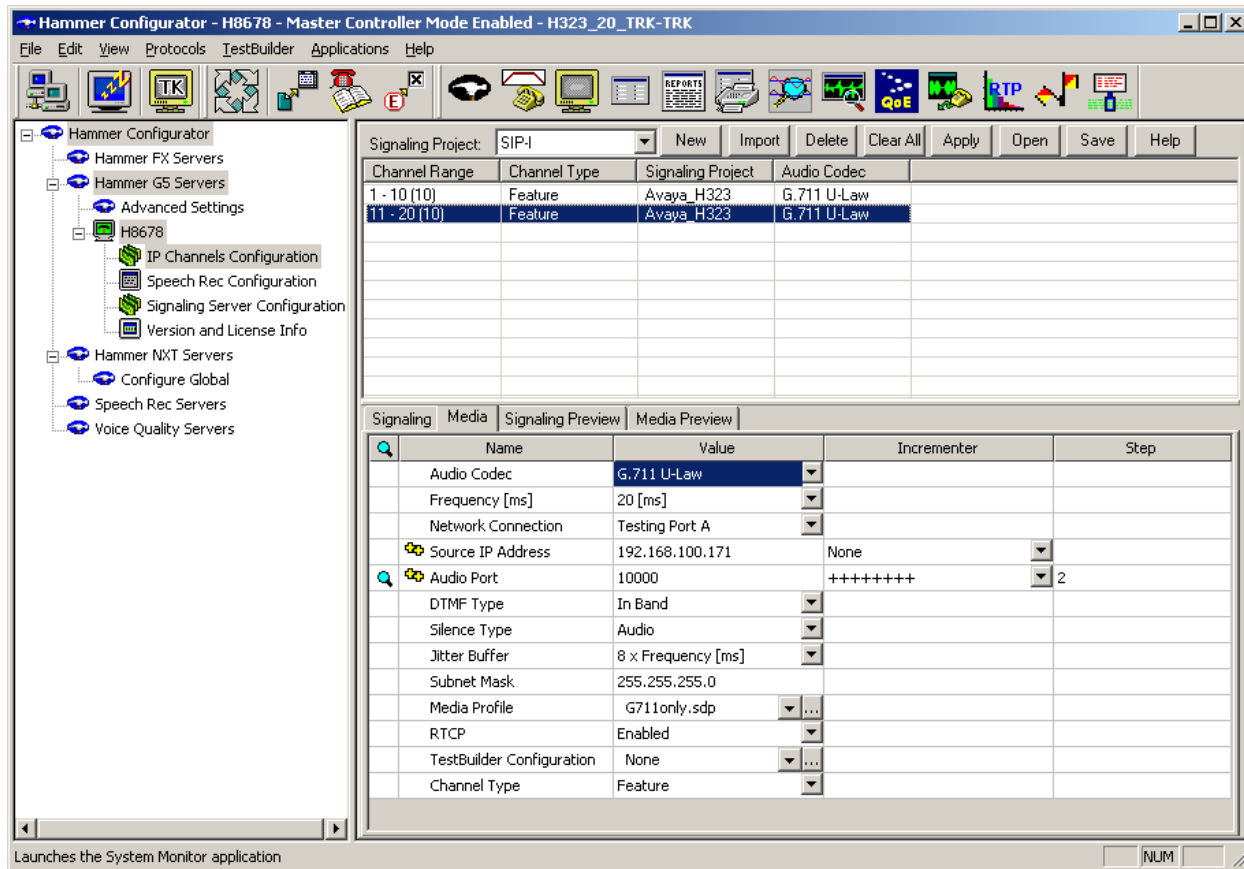
The screenshot shows the Hammer Configurator interface. The left sidebar displays a tree view with 'H8678' expanded to show 'IP Channels Configuration'. The main window has a 'Signaling Project' dropdown set to 'SIP-I'. Below this is a table with the following data:

Channel Range	Channel Type	Signaling Project	Audio Codec
1 - 10 (10)	Feature	Avaya_H323	G.711 U-Law
11 - 20 (10)	Feature	Avaya_H323	G.711 U-Law

Below the table are tabs for 'Signaling', 'Media', 'Signaling Preview', and 'Media Preview'. The 'Signaling' tab is active, showing a configuration table:

Name	Value	Incrementer	Step
State Machine	Avaya H323 Trunk		
Trunk ANI	45000	None	
Avaya CM IP address	192.168.100.10	None	
Network Connection	Testing Port A		
Local Trunk IP	192.168.100.171	None	
Subnet Mask	255.255.255.0		
Remote Trunk Port	1720		

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.



6.2.2.2 Configure Terminating Channels – H.323 Endpoints

To terminate the calls to H.323 endpoints follow the instructions described in [2], specifically:

- **Section 5.3** describes how to configure H.323 stations on Communication Manager.
- **Section 6.2.2.1** describes how to configure terminating H.323 endpoints on Hammer G5.
- **Section 6.2.3** describes the PhoneBook configuration for routing calls to H.323 endpoints.
- **Section 6.4** describes how to use the PhoneBook when running a test script.

The configuration described in all the aforementioned sections of [2] must be completed for terminating calls to H.323 endpoints.

6.2.2.3 Configure Terminating Channels – SIP Trunks

To terminate the calls to SIP trunks follow the instructions described in [3], specifically:

- **Section 5** describes how to configure call routing on Communication Manager.
- **Section 6** describes how to configure SIP trunks to Hammer G5 on Session Manager.
- **Section 7.2.2.1** describes how to configure terminating SIP trunks on Hammer G5.
- **Section 7.4** describes how to specify the dialed digits when running a test script.

The configuration described in all the aforementioned sections of [3] must be completed for terminating calls to SIP trunks.

6.2.2.4 Configure Terminating Channels – SIP Endpoints

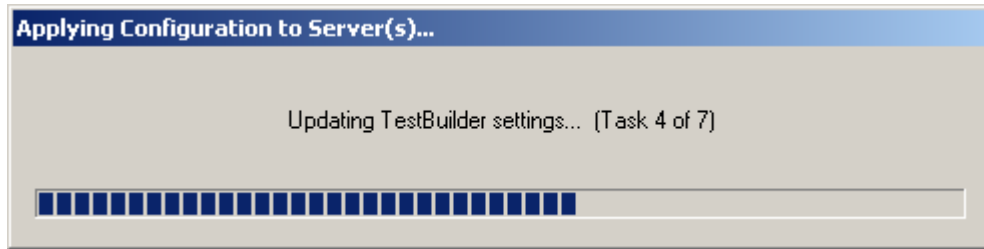
To terminate the calls to SIP endpoints follow the instructions described in [4], specifically:

- **Section 5** describes how to configure SIP trunk to Session Manager, SIP stations, and call routing on Communication Manager.
- **Section 6** describes how to configure Session Manager, including the SIP trunk to Communication Manager and SIP endpoints. This section needs to be configured in its entirety.
- **Section 7.2.2.1** describes how to configure terminating SIP endpoints on Hammer G5.
- **Section 7.2.3** describes how to configure the PhoneBook.
- **Section 7.4** describes how to disable the **Do Connect Latency** option (required) and how to specify the dialed digits when running a test script.

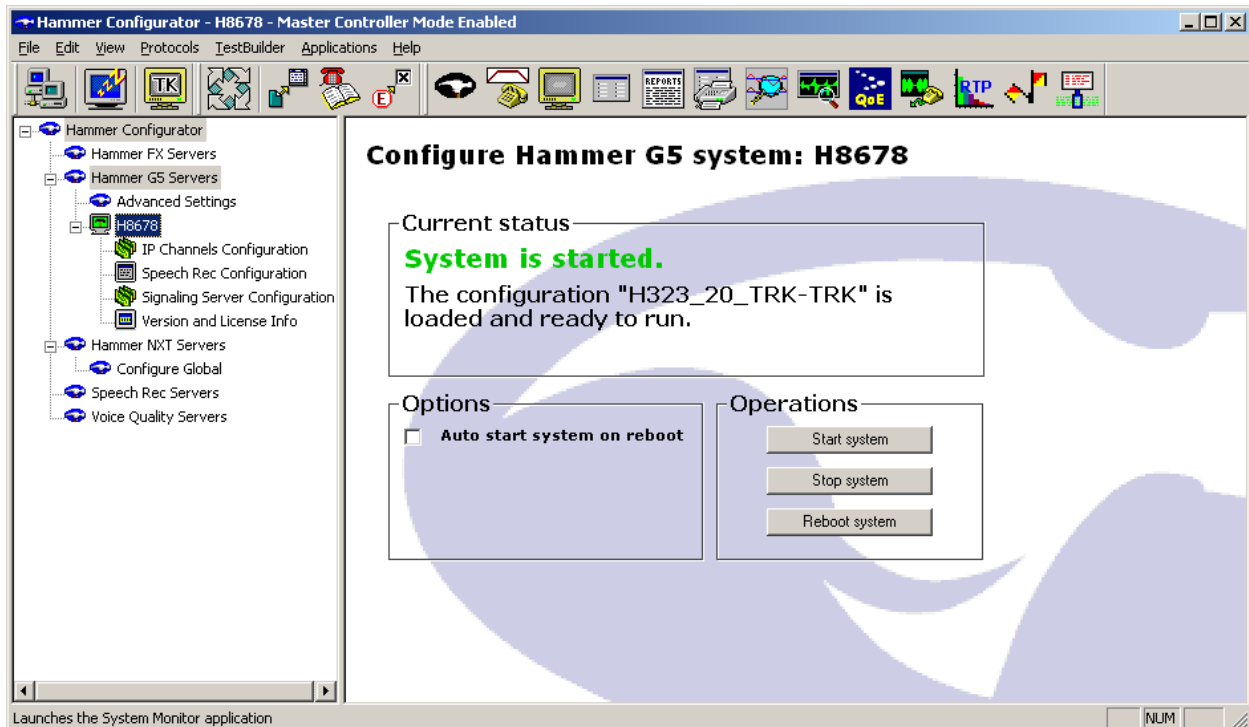
The configuration described in all the aforementioned sections of [4] must be completed for terminating calls to H.323 trunks.

6.3 Applying the Hammer G5 Configuration

This completes the configuration of Hammer G5. 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., *H8678*) 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*.

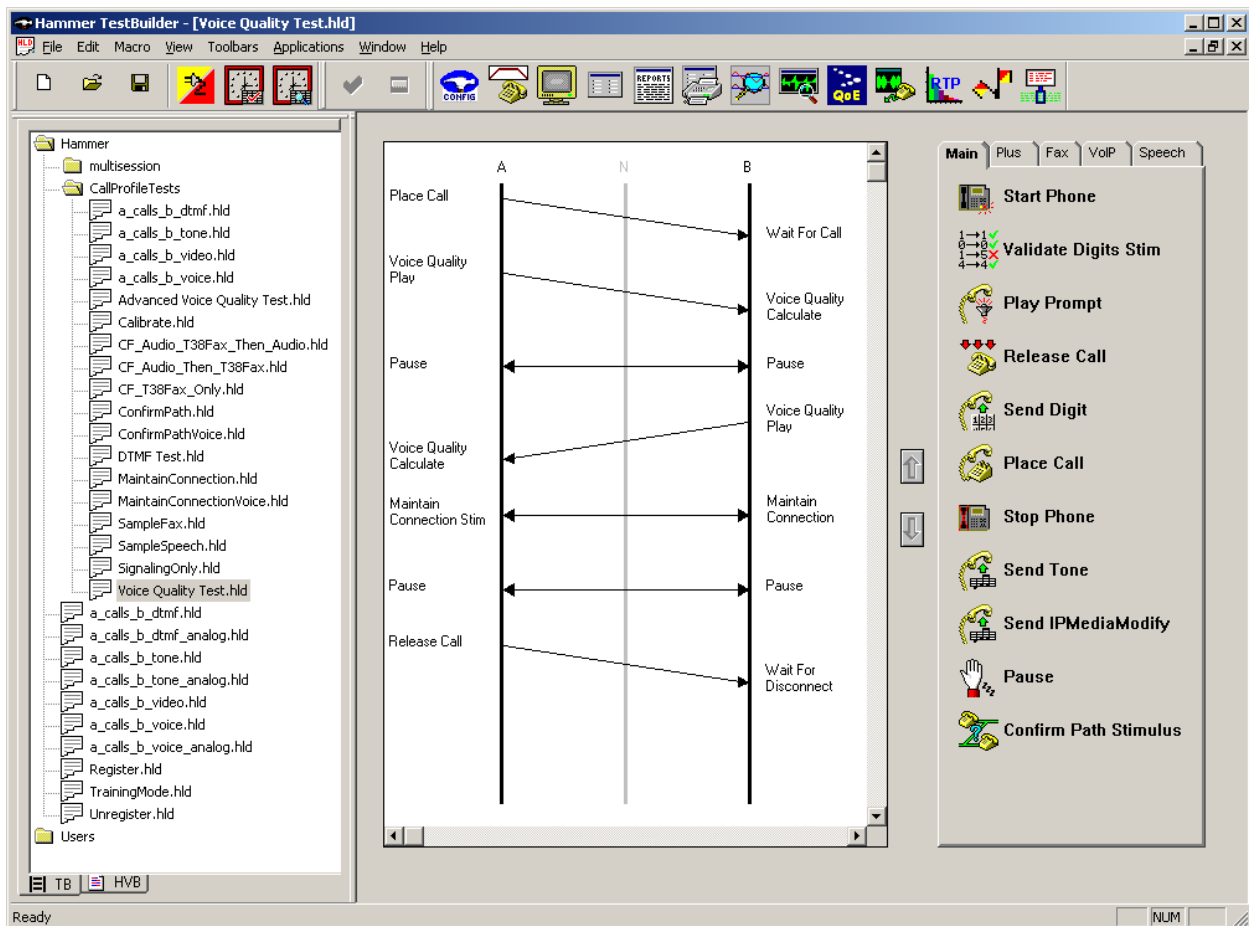


6.4 Configure and Run the Test Script

For the compliance test, two default test scripts were used:

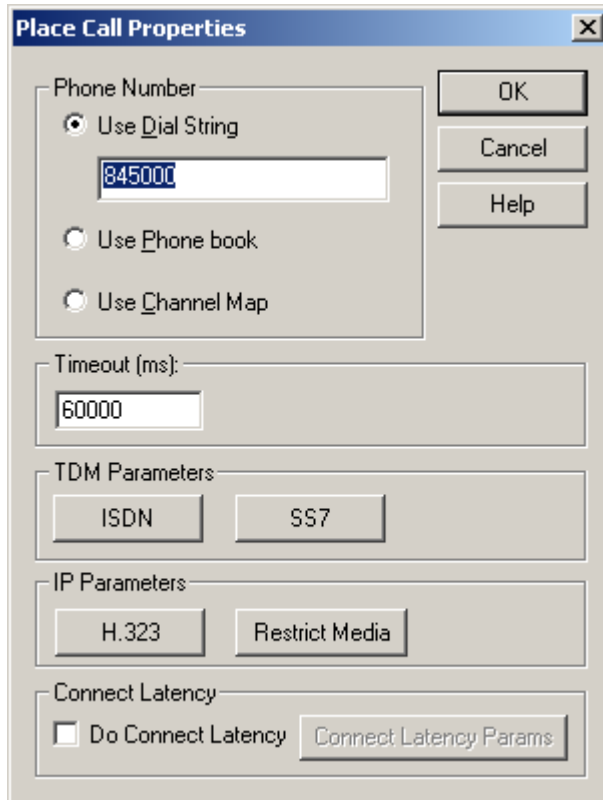
- a_calls_b_dtmf.hld to verify DTMF
- Voice Quality Test.hld to verify voice quality

The sample test script, Voice Quality Test.hld, 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 can be displayed in a ladder diagram as shown below by double-clicking on the test script name.

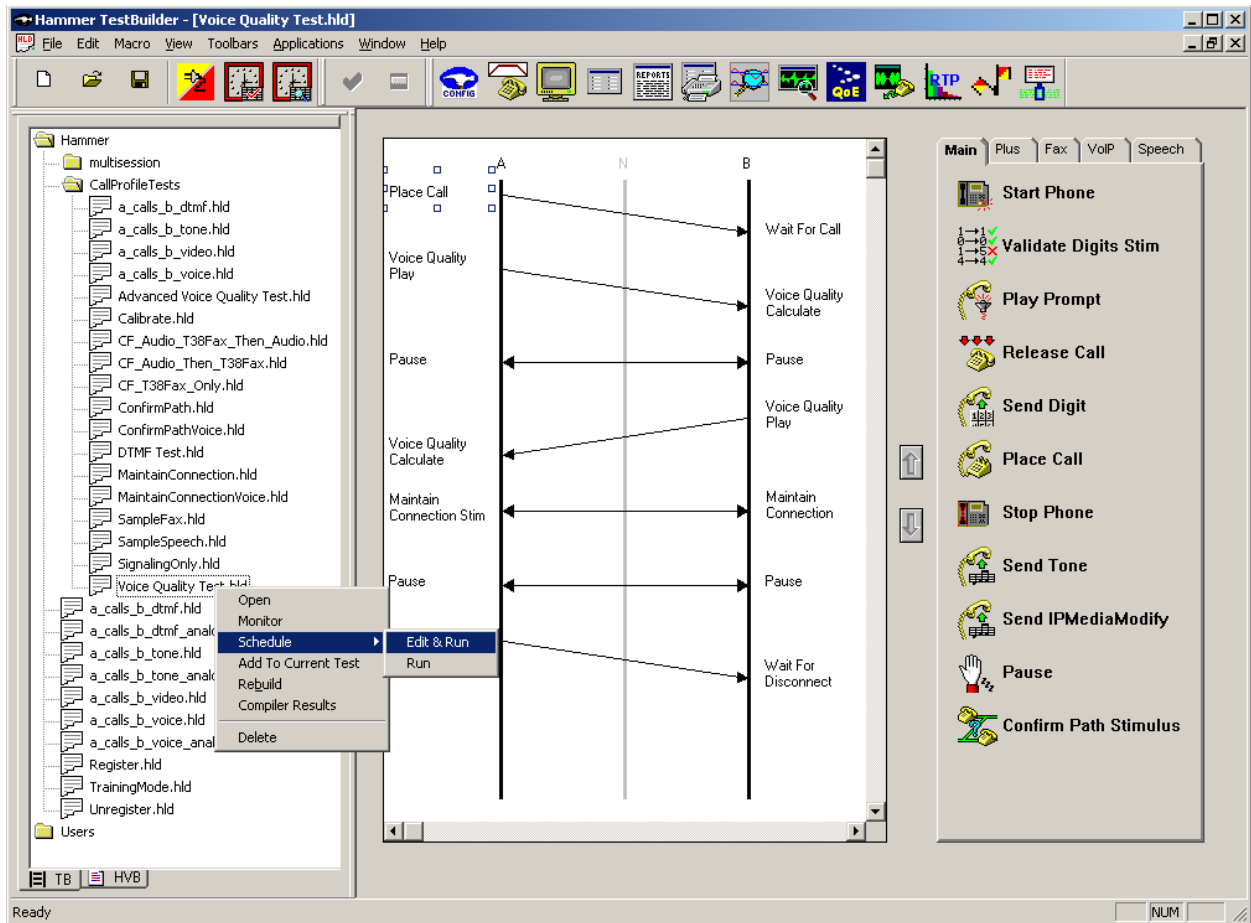


In the sample test script configured above, the A-side (originating H.323 trunk) places a call to the B-side (terminating H.323 trunk) using the **Place Call** action. The **Place Call** properties can be configured by double-clicking on the action in the ladder diagram. The **Place Call Properties** is configured to dial the same digits for every call. In this example, the Hammer G5 dials the AAR access code '8' followed by "45000".

Note: Disable **Do Connect Latency** option in the **Place Call Properties** window.

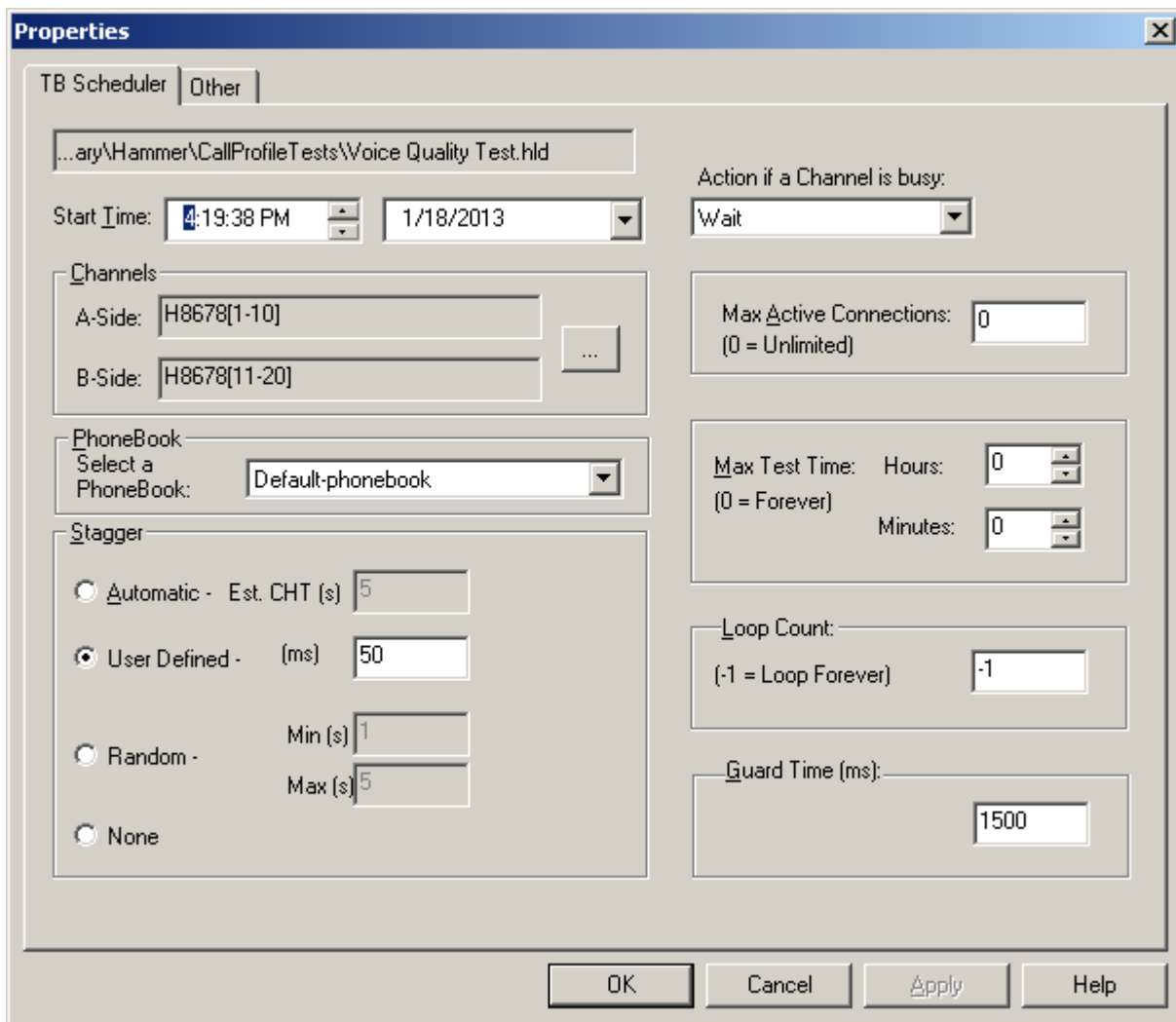


To run the test, right-mouse click on the test script in the left pane of the **Hammer TestBuilder** window and navigate to **Schedule**→**Edit & Run**. To re-run the test, the user can simply select **Schedule**→**Run**, if no changes are required.



In the **Properties** window, click on the ellipses button (...) in the **Channels** section and assign channels to the **A-Side** and **B-Side**. Set the **Loop Count** to the appropriate value to control the number of iterations 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 minimum setting should be *1500*. The **Stagger** section allows the user to specify how long to wait before the test is run on the next channel. Click **OK**.

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.



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

Verify that the H.323 signaling channels are *in-service* using the **status signaling-group** command as shown below. Repeat for both signaling groups.

```
status signaling-group 70
                        STATUS SIGNALING GROUP

      Group ID: 70                Active NCA-TSC Count: 0
      Group Type: h.323           Active CA-TSC Count: 0

Group State: in-service
```

Verify that the H.323 trunks to the Hammer G5 are in *in-service/idle* using the **status trunk** command as shown below. This command only requires the trunk group number.

```
status trunk 70

                        TRUNK GROUP STATUS

Member   Port      Service State      Mtce Connected Ports
                          Busy

0070/001 T00054   in-service/idle    no
0070/002 T00055   in-service/idle    no
0070/003 T00056   in-service/idle    no
0070/004 T00057   in-service/idle    no
0070/005 T00058   in-service/idle    no
0070/006 T00059   in-service/idle    no
0070/007 T00060   in-service/idle    no
0070/008 T00061   in-service/idle    no
0070/009 T00062   in-service/idle    no
0070/010 T00063   in-service/idle    no
```

While 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 70/1                                     Page 1 of 3
                                     TRUNK STATUS

Trunk Group/Member: 0070/001                Service State: in-service/active
      Port: T00054                          Maintenance Busy? no
Signaling Group ID: 70                      CA-TSC state: none

IGAR Connection? no

Connected Ports: T00065
```

Page 2 of the **status trunk** command indicates the codec being used for the call and whether the call is shuffled. When the call is shuffled, **Audio Connection Type** would be set to *ip-direct* as shown below,

```
status trunk 70/1                                     Page 2 of 3
                                     CALL CONTROL SIGNALING

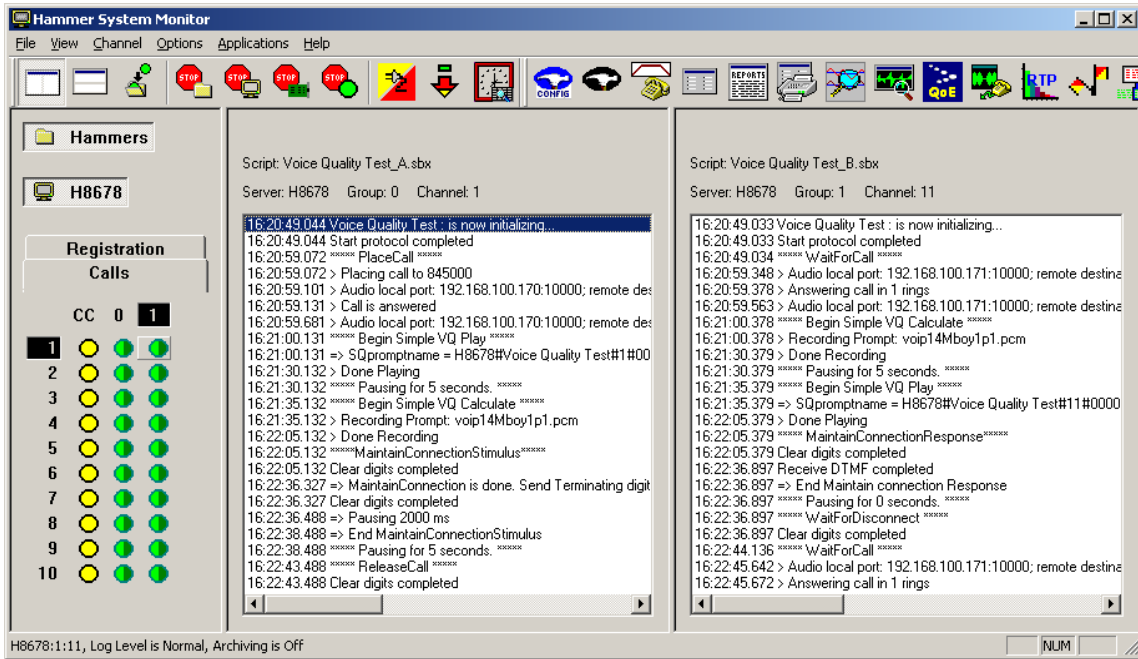
Near-end Signaling Loc: PROCR
  Signaling  IP Address      Port
  Near-end:  192.168.100.10   : 1720
  Far-end:   192.168.100.170  : 21891
H.245 Near:
H.245 Far:
H.245 Signaling Loc:          H.245 Tunneled in Q.931? no

Audio Connection Type: ip-direct      Authentication Type: None
Near-end Audio Loc:                Codec Type: G.711MU
Audio      IP Address      Port
Near-end:  192.168.100.171   : 10004
Far-end:   192.168.100.170   : 10000

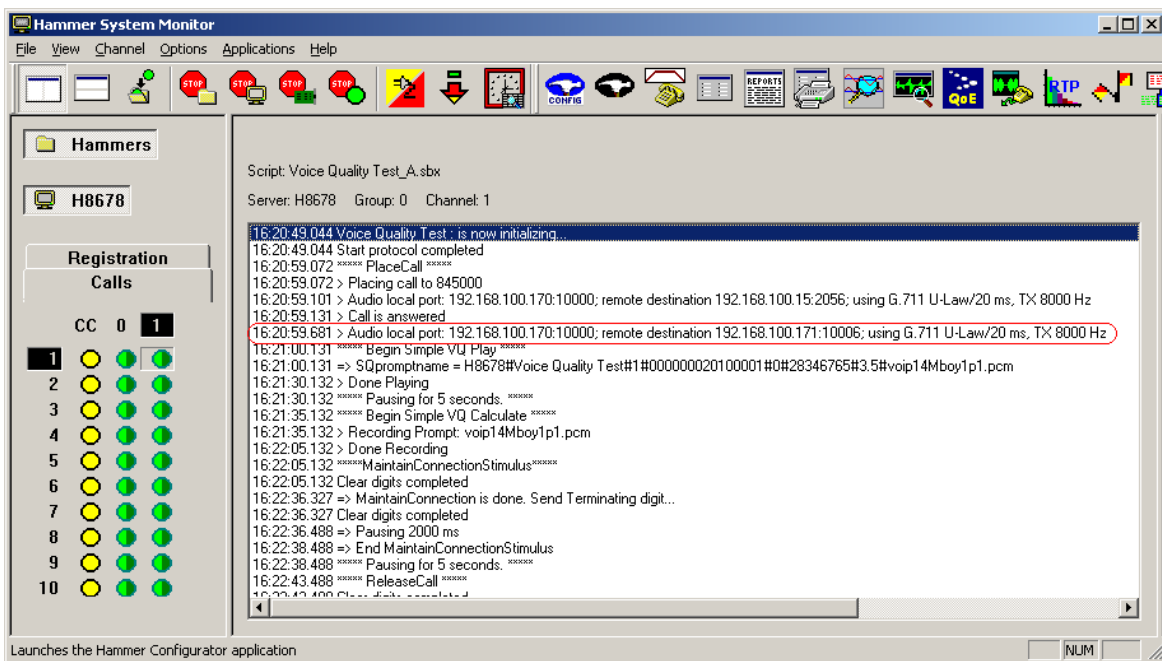
Video Near:
Video Far:
Video Port:
Video Near-end Codec:             Video Far-end Codec:
```


7.2 Verify Empirix Hammer G5

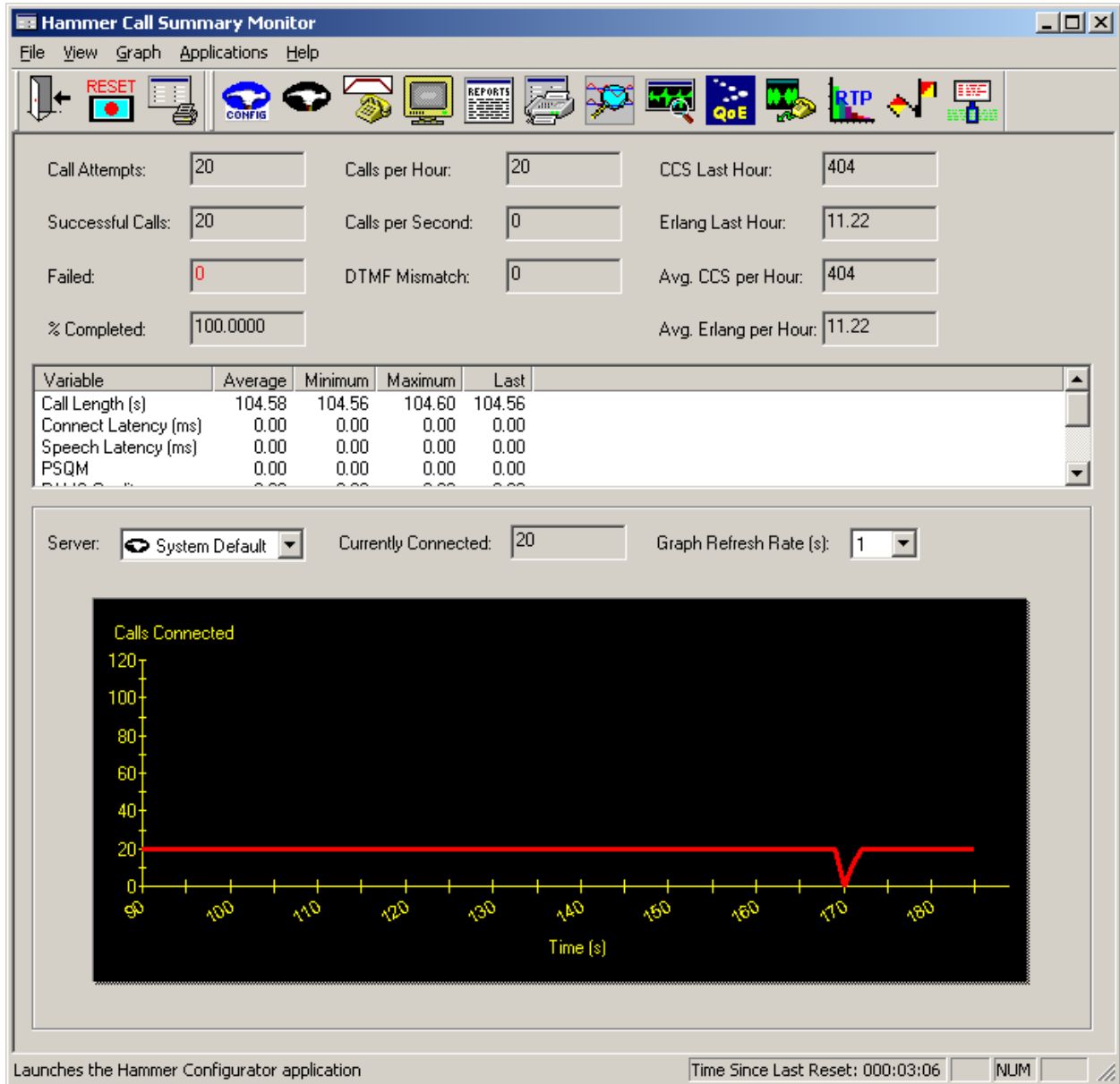
Call progress can be seen in the **Hammer System Monitor**. The call log for an originating channel may be logged to the left window and the call log for a terminating channel may be logged to the right window.



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.



8 Conclusion

These Application Notes describe the configuration steps required to integrate the Empirix Hammer G5 with Avaya Aura® Communication Manager 6.2 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® Communication Manager*, Document 03-300509, Issue 7.0, Release 6.2, December 2012, 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] *Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using SIP Trunk Emulation*, Issue 1.0, available at <http://www.avaya.com>.
- [4] *Application Notes for Empirix Hammer G5 with Avaya Aura® Communication Manager and Avaya Aura® Session Manager using SIP Endpoint Emulation*, Issue 1.0, available at <http://www.avaya.com>.
- [5] *Empirix Hammer G5 1.7 Installation Guide*, Revision A, April 2012, available from Empirix.

APPENDIX A: Configure Media Profile on Empirix Hammer G5

The following windows show the configuration of the **Media Profile** used in the **Media** tab for the originating and terminating channel groups. To access this window, click on the ellipses button (...) by the **Media Profile** field in the **Media** tab. Click on the **Audio Description** button to view the codecs that will be advertised by the Hammer G5 when placing a call.

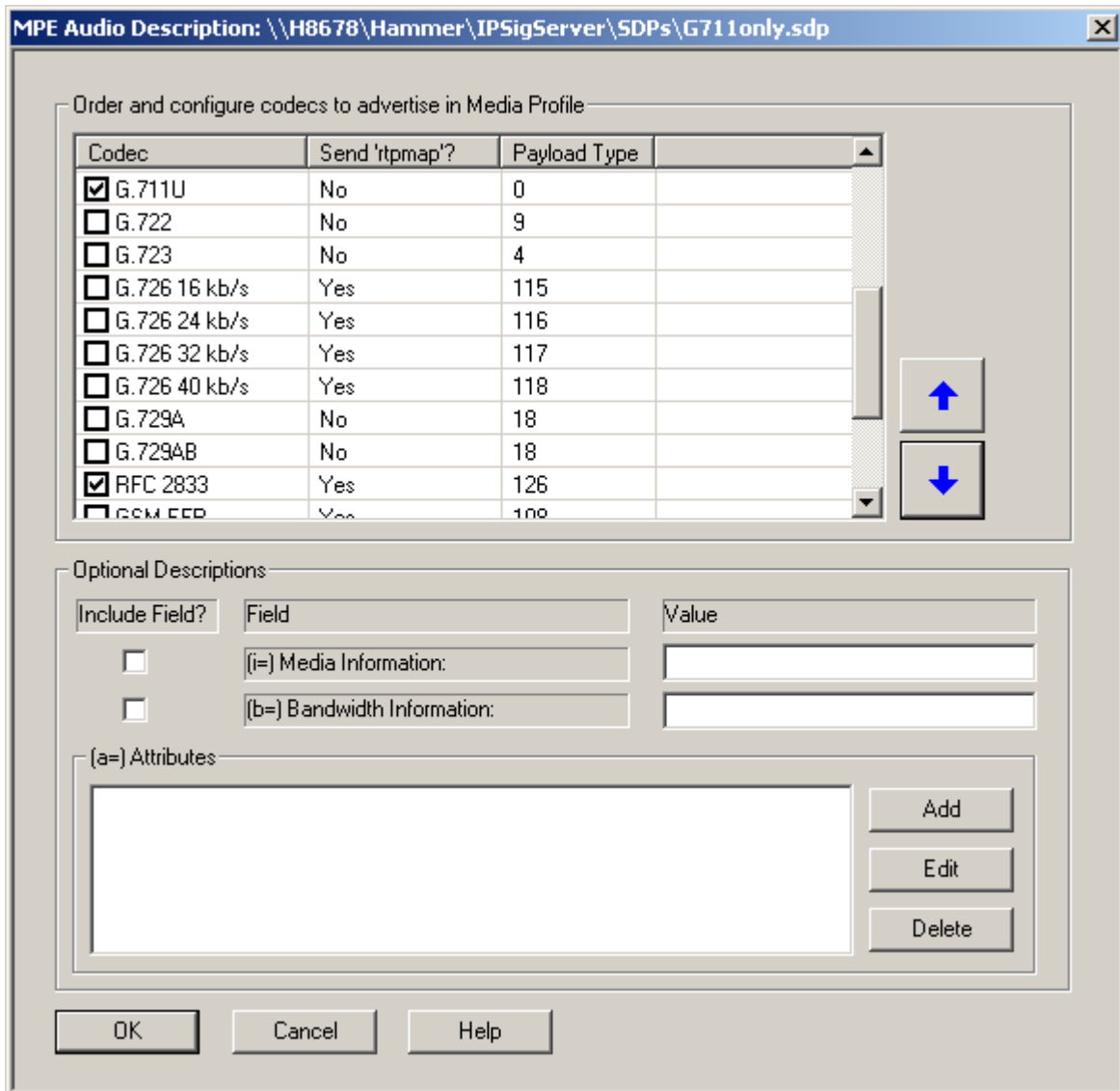
The screenshot shows the 'Media Profile Editor' window with the following configuration:

- Session Description:**
 - Include Field?

Field	Value
(o=) Owner:	Hammer
(s=) Session Name:	
<input type="checkbox"/> (j=) Session Information:	
<input type="checkbox"/> (u=) URI of Description:	
<input type="checkbox"/> (e=) Email Address:	
<input type="checkbox"/> (p=) Phone Number:	
<input type="checkbox"/> (b=) Bandwidth Information:	
- (a=) Attributes:** An empty list box with 'Add', 'Edit', and 'Delete' buttons.
- Media Descriptions:**
 - Audio Description
 - Image (T.38) Description
 - Video Description

Buttons at the bottom: New, Save, Load, Delete, Preview, OK, Cancel, Help.

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.



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