



Avaya Solution & Interoperability Test Lab

Application Notes for Empirix Hammer FX-IP with Avaya Communication Manager using H.323 Endpoints – Issue 1.0

Abstract

These Application Notes describe the configuration steps required for Empirix Hammer FX-IP H.323 endpoints to interoperate with Avaya 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.

1. Introduction

Empirix FX-IP Hammer (FX-IP) is an integrated IP telephony test system with Ethernet interfaces. The system generates real voice streams to simulate real-world loads, and performs real time voice quality measurements. The FX-IP has a fully programmable state machine-based signaling emulation engine that offers users the control over the behavior of all emulated endpoints, as well as scripting flexibility.

These Application Notes focus on FX-IP emulating H.323 endpoint stations that originate and terminate calls that are made through Avaya Communication Manager. To accomplish H.323 endpoint station emulation, the following conditions must occur:

- The FX-IP must successfully register both the sending and receiving endpoint(s) with Avaya Communication Manager.
- The calls are generated from the FX-IP (Sending) and are terminated at the FX-IP (Receiving).

The **Figure 1** illustrates the configuration tested with FX-IP. Avaya Communication Manager provides gatekeeper functionality by redirecting registered H.323 incoming station calls to an off-switch H.323 registered station. In this case, the FX-IP is performing both the “calling” and “answering” function of the call.

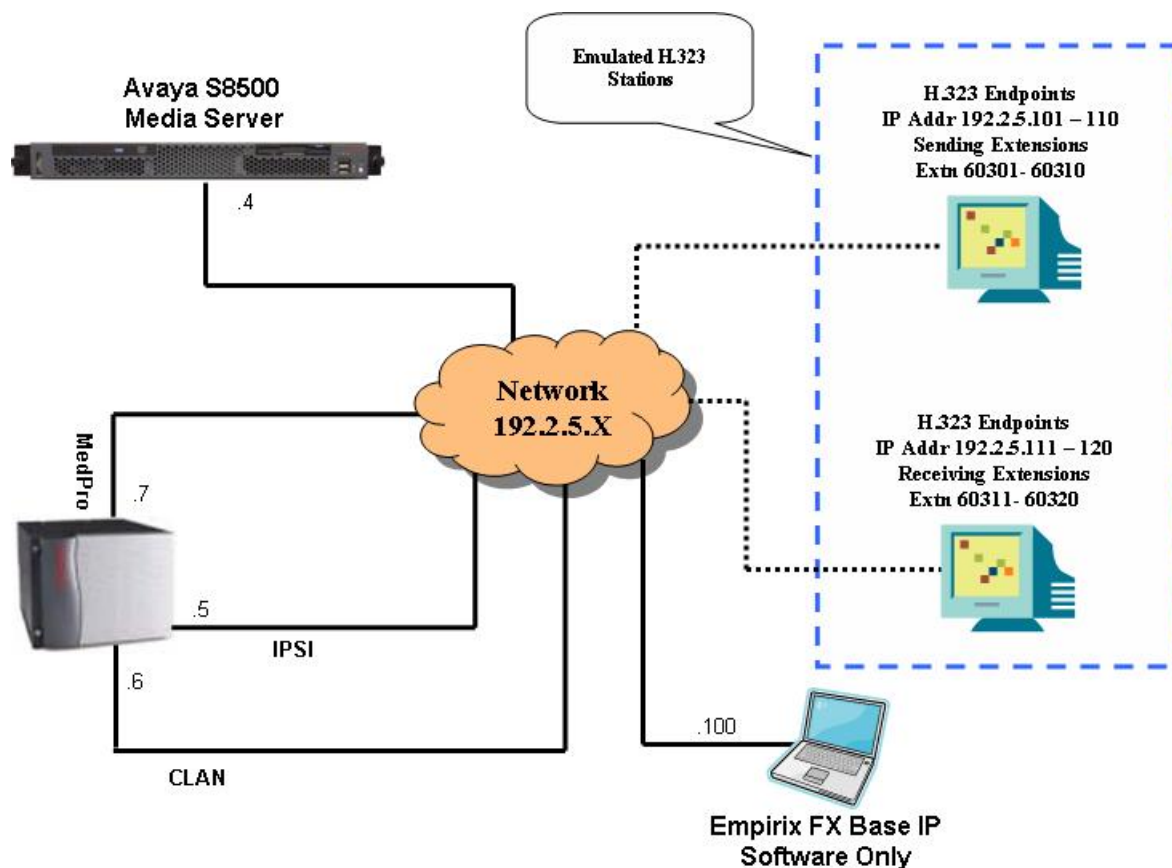


Figure 1

H.323 station endpoint calls with **Direct IP-IP Audio Connections** disabled within the station form, will utilize the Media Processor resources. In contrast, when **Direct IP-IP Audio Connections** is enabled (a.k.a. shuffling), data streams will communicate directly between the sending and receiving H.323 endpoints on the FX-IP system.

1.1. FX-IP Capacity

For the compliance testing, ten simultaneous H.323 endpoints originated calls while ten H.323 endpoints answered and terminated the calls on the same FX-IP. All twenty origination and termination endpoints are assigned separate IP addresses and telephone numbers.

2. Equipment and Software Validated

The following equipment and software were used for the configurations that were tested:

Equipment	Software
Avaya S8500 Media Server	Avaya Communication Manager 4.0.1 (R014x.00.1.731.2)
Avaya G650 Media Gateway <ul style="list-style-type: none">TN799DP C-LAN Circuit PackTN2302AP IP Media Processor Circuit Pack	HW01 FW015 HW13 FW095
Avaya C364T-PWR Converged Stackable Switch	4.5.14
Empirix FX-Base-IP Software Only (Laptop)	2.4.1

3. Configure Avaya Communication Manager

The procedures for configuring H.323 endpoints on Avaya Communication Manager include the following areas:

- Administer IP codec set
- Administer network region
- Administer H.323 station configuration

3.1. Administer IP Codec Set

The following configuration of Avaya Communication Manager was performed using the System Access Terminal (SAT).

Use the **change ip-codec-set n** command, where **n** is a codec set number that will be used for integration with FX-IP. Select audio codec types in the **Audio Codec** field, in this case **G.711MU**, **G.729AB**, and **G.723-6.3k**. The codec type will vary with different FX-IP test scenarios.

Note: G.711MU is initially used by FX-IP.

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	2	30			

3.2. Administer Network Region

Use the **change ip-network-region n** command, where **n** is a network region number that will be used for integration with FX-IP. Enter the audio codec set number from the **Codec Set** screen above into the **Codec Set** field in **Figure 2**. Set the following fields to allow audio shuffling: **Intra-region IP-IP Direct Audio** to **yes**, **Inter-region IP-IP Direct Audio** to **yes**, and **IP Audio Hairpinning** to **y**. Retain the default values for the remaining fields, and submit these changes. Note that the **Direct IP-IP Audio** feature enables the originating and terminating endpoints to exchange audio streams directly while minimizing media resource usage on the Avaya IP Media Gateway. This setting should be enabled on both or disabled on both Avaya Communication Manager and FX-IP.

change ip-network-region 1		Page 1 of 19
IP NETWORK REGION		
Region: 2		
Location:	Authoritative Domain:	
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		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		

Change IP Network Region – Page 1

3.3. Administer H.323 Stations

Each H.323 endpoint requires a configured station assignment on Avaya Communication Manager. When adding H.323 endpoints, the **add station** command requires a telephone number assignment, as in this case **add station 60301**. Configure **Type: H.323**, **Name: FXIP-60301** (in this case), and **an assigned Security Code**: A total of twenty consecutively numbered and named stations were configured using the **duplicate station SAT** command for the compliance test. In addition to the station configuration, FX-IP's programmable state machine associates an IP address with each station's telephone number. All the IP addresses are consecutive and are associated with the same subnet as illustrated in **Figure 1**. The 5 digit dial plan used in this documentation is predefined, and locally in-use on this Avaya Communication Manager system, also defined in **Figure 1**.

add station 60301		Page 1 of 4
STATION		
Extension: 60321	Lock Messages? n	BCC: 0
Type: H.323	Security Code: xxxx	TN: 1
Port: IP	Coverage Path 1:	COR: 1
Name: FXIP-60301	Coverage Path 2:	COS: 1
	Hunt-to Station:	Tests? y
STATION OPTIONS		
Loss Group: 19	Time of Day Lock Table:	
	Message Waiting Indicator: none	
Survivable COR: internal		
Survivable Trunk Dest? y		
DTMF over IP: in-band		
	IP Video? n	

Add Station – Page 1

Changing the audio shuffling status was performed on **Page 2** by changing the **Direct IP-IP Audio Connections** value to **y** to enable.

Add / change station 60301		Page 2 of 4
STATION		
FEATURE OPTIONS		
LWC Reception: spe		
LWC Activation? y	Coverage Msg Retrieval? y	
LWC Log External Calls? n		
CDR Privacy? n	Data Restriction? n	
Redirect Notification? y	Call Waiting Indication: y	
Per Button Ring Control? n	Att. Call Waiting Indication: y	
Bridged Call Alerting? n		
Switchhook Flash? y		
H.320 Conversion? n	Per Station CPN - Send Calling Number?	
MWI Served User Type:		
AUDIX Name:		
	Coverage After Forwarding? s	
	Multimedia Early Answer? n	
	Direct IP-IP Audio Connections? y	
Emergency Location Ext: 60321	IP Audio Hairpinning? n	





Add Station – Page 2

4. Configure Empirix FX-IP

The Empirix FX-IP is configured through a graphical user interface residing on the FX-IP server. The following sections focus on describing the settings applicable to the configuration with Avaya Communication Manager. The user is expected to be familiar with the FX-IP interface. For additional detail in configuring the FX-IP, refer to the Empirix FX-IP online Help manual.

4.1. Setup of Hammer Server

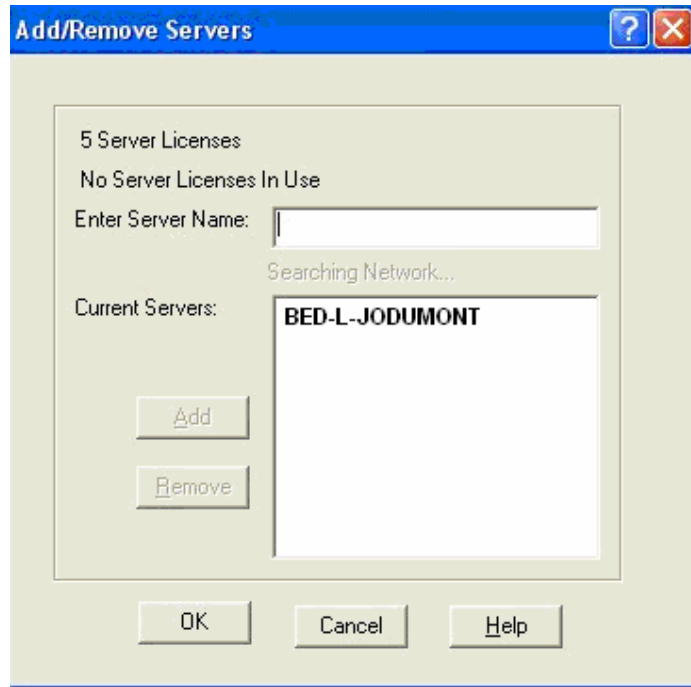
The Hammer Configurator is the application used to configure and manage Hammer systems. The Hammer Configurator can also be used to view the status of a server, and to view license and version information.

1. Log in to the FX-IP laptop console by entering the appropriate logon and password credentials.
2. On the desktop of the Empirix Server, double-click Hammer Configurator . The Hammer Configurator window appears, displaying a list of server types in the left panel as shown in **Figure 5**. Hammer Configurator can also be started from the **Start Men** by selecting **Programs → Hammer → Hammer Configurator**.
3. The FX-IP must be in **Master Controller mode**. Verify the FX-IP is in Master Controller mode by clicking the  button. If no  button exists, the FX-IP is most likely already in Master Controller mode.
4. In the left panel, click **Hammer FX Servers** as shown below, then click **Edit** from the pull-down menu and select **Add/Remove Servers** from the menu (not shown). The  icon provides an alternate means for the same functionality.



Adding an FX Server

5. The **Add/Remove Servers** screen is displayed below. Any servers that are currently attached to the system appear in the **Current Servers** list box. The top of the **Add/Remove Servers** window shows how many total server licenses are available and how many are being used.



Current Server Used

6. In the **Enter Server Name** field, enter the name of the server to be connected.
 - Click the **Add** button.
 - Repeat steps 5 and 6 for each server to be connected.
 - To remove a server from the **Current Servers** list, highlight the server, and click the **Remove** button.

7. When finished, click **OK**. Each server entered is added to the **Current Servers** list and then appears in the list of servers in the Hammer Configurator window as shown below. In this case there is only one FX-IP Server created, called **BED-L-JODUMONT**.

When the **BED-L-JODUMONT** server is created as above, the **IP Channels Configuration** and **TestBuilder Configuration** sub directories are also created, along with **System Status** and **Version and License Information** files.



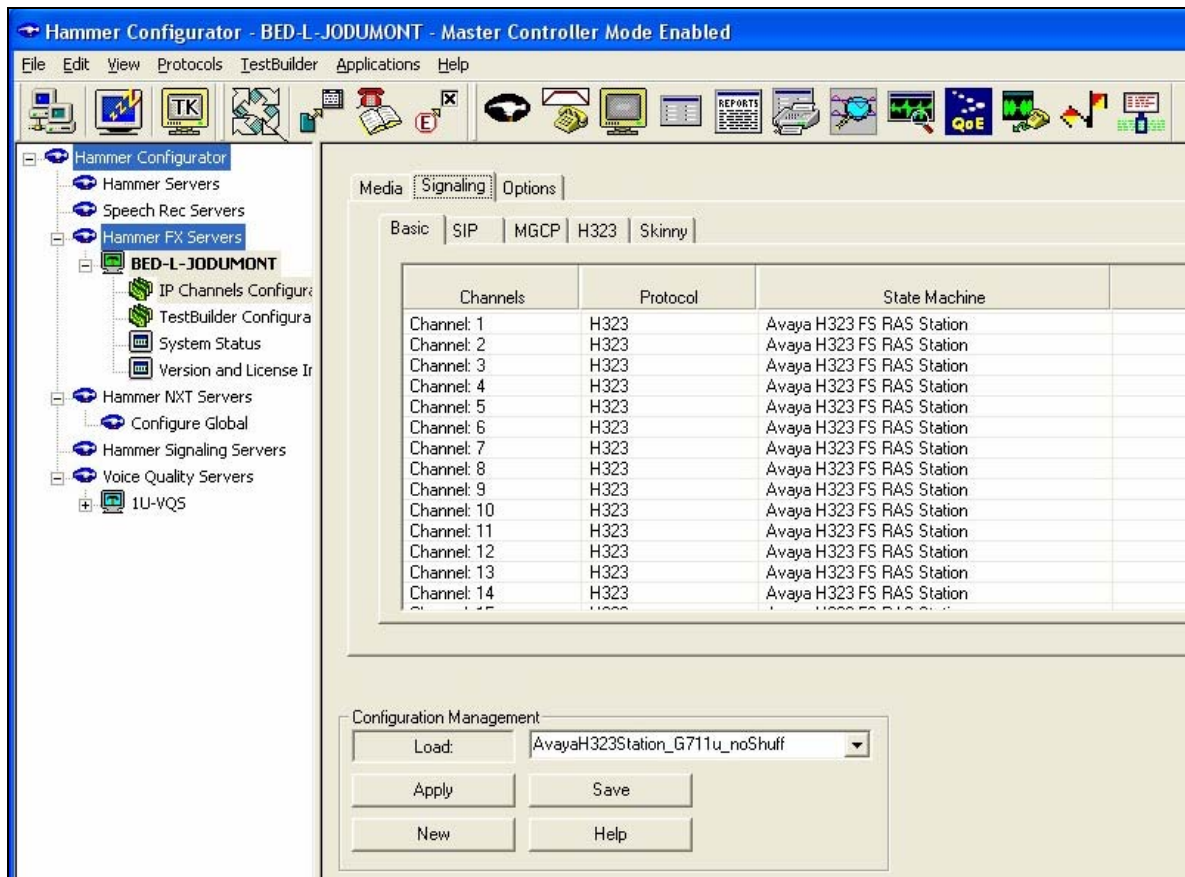
Servers in Hammer Configurator

4.2. Configure Empirix FX-IP Signaling

For the purposes of Avaya interoperability, the H323 emulated endpoint state machine was modified to support Avaya media shuffling, and is displayed under **State Machine** as **Avaya H323 FS RAS Station**. To obtain a copy of this state machine or to obtain information on state machine programmability, contact Empirix support.

1. Configure the FX-IP by selecting **IP Channels Configuration** from the Left Panel.
2. Select **Signaling → Basic**. Select all available channels by selecting **channel 1** in the **Channels** column, holding the *shift* key, and depressing the *end* key.
3. Right click in the **Protocol** column and select **H.323**.

4. Right click in the **State Machine** column and select the **Avaya H323 FS RAS Station** state machine as shown below.



Signaling Basic Tab Configuration

5. Use the **H323** tab shown below to configure the H.323 endpoint parameters. Unless otherwise indicated, each parameter is defined on a per channel basis. The values set for these parameters are used by the system to populate fields in H.323 messages. The following four figures (**Part 1** through **Part 4**) are one continuous screen showing the fields to be configured on the **H323** tab. The values shown were used in the tested configuration.

Media | Signaling | Options |

Basic | SIP | MGCP | H323 | Skinny |

Channels	Endpoint ID	Phone IP	Phone Port	Register with Gatekeeper?	Requested Expiration [s]	Auto re-Register?	Registration Stagger [ms]	H.225 Identifier	H.245 Identifier	Local H.245 IP
Channel: 1	60301	192.2.5.101	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.101
Channel: 2	60302	192.2.5.102	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.102
Channel: 3	60303	192.2.5.103	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.103
Channel: 4	60304	192.2.5.104	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.104
Channel: 5	60305	192.2.5.105	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.105
Channel: 6	60306	192.2.5.106	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.106
Channel: 7	60307	192.2.5.107	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.107
Channel: 8	60308	192.2.5.108	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.108
Channel: 9	60309	192.2.5.109	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.109
Channel: 10	60310	192.2.5.110	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.110
Channel: 11	60311	192.2.5.111	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.111
Channel: 12	60312	192.2.5.112	1720	No	0	No	0	0.0.8.2250.0.5	0.0.8.245.0.10	192.2.5.112

Configuration Management

Load: AvayaH323Station_G711u_noShuff

Apply Save

New Help

Signaling H323 Endpoint Basic Tab Configuration Part 1

Media | Signaling | Options |

Basic | SIP | MGCP | H323 | Skinny |

Gatekeeper IP	Gatekeeper Port	Destination IP address (e.g. Gateway)	Destination Port	QSIG Calling Name	QSIG Test Type	QSIG User Diversion Type	QSIG Diversion Number	RAS IP	RAS Port	Local T.3 Country Co
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.101	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.102	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.103	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.104	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.105	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.106	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.107	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.108	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.109	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.110	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.111	15000	
192.2.5.6	1719	192.2.5.6	1720		Basic Call	Busy		192.2.5.112	15000	

Configuration Management

Load: AvayaH323Station_G711u_Shuff

Apply Save

New Help

Signaling H323 Endpoint Basic Tab Configuration Part 2

[illegible]

Signaling H323 Endpoint Basic Tab Configuration Part 3

Media
Signaling
Options

Basic
SIP
MGCP
H323
Skinny

	GRQ Timeout Value (ms)	GRQ Retry Count	RRQ Timeout Value (ms)	RRQ Retry Count	Keepalive RRQ Timeout Value (ms)	Keepalive RRQ Retry Count	Admission Required?	ARQ Timeout Value (ms)	ARQ Retry Count	URQ Timeout Value (ms)	URQ Retry Count	DRQ Timeout Value (ms)
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	
5000	2	3000	2	3000	2	No	3000	2	3000	1	3000	

Configuration Management

Load:
AvayaH323Station_G711u_Shuff

Apply
Save

New
Help

Signaling H323 Endpoint Basic Tab Configuration Part 4

Figure 13 shows the parameters and values used for the RTP and RTCP media. From the **Hammer Configurator**, select **IP Channels Configuration** on the left panel, then select the **Media** tab. The screen below shows the values used during the compliance tests. A detailed description of the fields is available in the Reference [2].

[illegible]

Media Tab Configuration

4.3.1. Administering Codec

The **Media Profile** provides the ability to configure the codec negotiation and dynamic payload of all supported codecs. A **Media Profile** needs to be selected to determine the properties a span uses when establishing a media session. The **default.sdp** can be selected to use the default settings or the user can create a customized profile. **Note:** Media Profiles have a .SDP extension. The **Media Tab Codec Configuration Part 2** screen displays the media configuration. In **Media Tab Codec Configuration Part 1** and **Part 2** screens below, the G.729 codec is being changed to G.729-6.3k by a right-click to the column header and selecting the codec from the codec list displayed. The values displayed in these figures were used during the compliance tests.

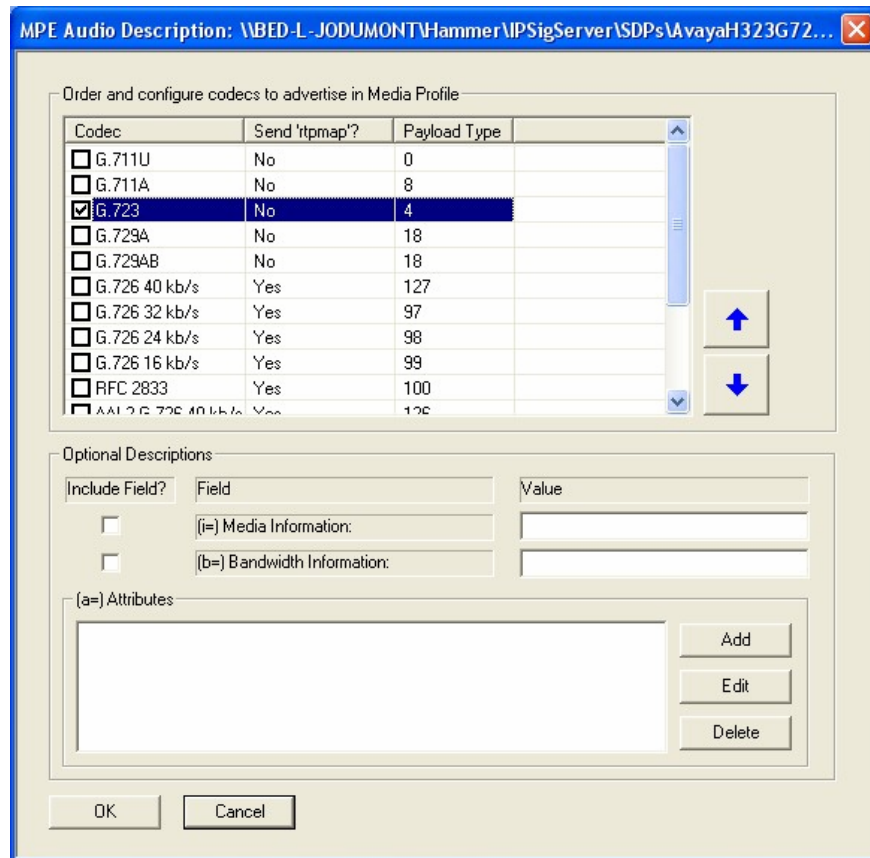
The screenshot shows the 'Media Profile Editor' window with the title bar path: \BED-L-JODUMONT\Hammer\VPs\SigServer\SDPs\AvayaH323G729AB.sdp. The window is divided into several sections:

- Session Description:** A table with columns 'Include Field?' and 'Value'.

Include Field?	Field	Value
<input type="checkbox"/>	(o=) Owner:	HammerFXIP
<input type="checkbox"/>	(s=) Session Name:	
<input type="checkbox"/>	(i=) 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:** A large empty text area with 'Add', 'Edit', and 'Delete' buttons to its right.
- Media Descriptions:** Three buttons: 'Audio Description' (checked), 'Image (T.38) Description', and 'Video Description'.
- Buttons:** 'New', 'Save', 'Load', 'Delete', 'Preview', 'OK', 'Cancel', and 'Help' are located at the bottom of the window.

Media Tab Codec Configuration Part 3

To change the settings, click on the **Audio Description** button. The screen will display the available codecs, their priority order (listed top-down), **Send 'rtpmap'?**, and a **Payload Type** number for all codecs. Select the codec to us by checking the box. For dynamic payloads (such as Request For Comments (RFC) 2833) the payload number can be changed. **Media Tab Codec Configuration Part 4** displays the **Audio Description** window. In this case, check G.723 and click the **OK** button. Click **OK** again to return to the main screen.



Media Tab Codec Configuration Part 4

The **Media Profile Files** and the codec they represent are in the table below and were use during the compliance test.

Codec	Media Profile Files
G711mu	AvayaH323G711u.sdp
G723-6.3k	AvayaH323G723u.sdp
G729AB	AvayaH323G729AB.sdp

4.3.2. Toggling Media Shuffling

The functionality of **Toggling Media Shuffling** below (Direct IP-IP Media Connections) is performed on the **Hammer FX Server → IP Channels Configuration → Signaling → H.323** configuration screen. In the custom State Machine, select the channels and right-click the **Media Shuffling** column. Select **Enabled** or **Disabled** from the list.

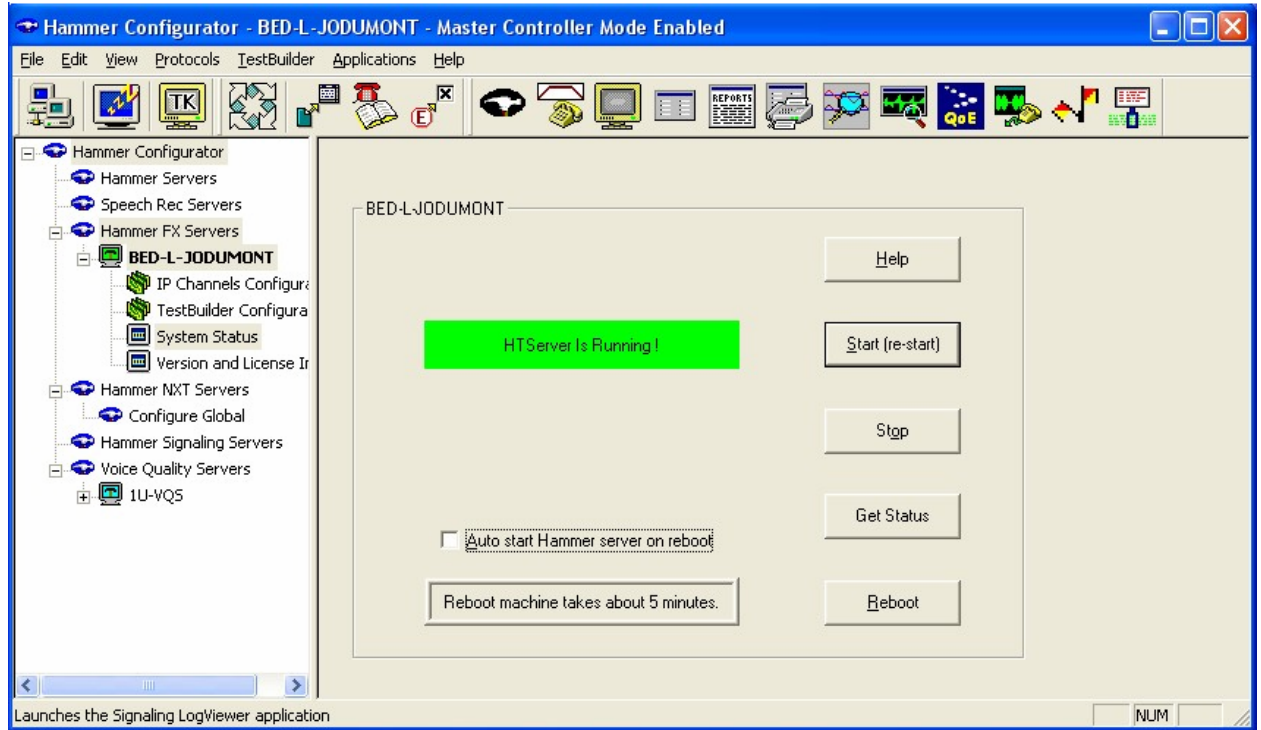
Local Mfg Country Code	Local Product ID	Local Version ID	Local Terminal Type	Media Negotiation Type	Media Shuffling	Ignore H.225 Info Msgs?	Gatekeeper Security Algorithm Type	Gatekeeper Password	GRQ Stagger (ms)	GRQ Timeout Value (ms)	GRQ Retry Count
			50 - Terminal ...	Dynamic	Enabled	Yes	Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Enabled	Yes	Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Enabled	Yes	Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Select an action:		Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Enabled		Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Set Field		Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic			Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Clear Field		Standard Security R9	1234	1000	5000	2
			50 - Terminal ...	Dynamic	Enabled	Yes	Standard Security R9	1234	1000	5000	2

Toggling Media Shuffling

4.3.3. Applying the Configuration and Starting the HTServer Process

In the Hammer Configurator, click the **Apply** button to update the FX-IP with the new configuration.

1. From the left panel, click on **System Status** as shown below



System Status Screen

Note: The HT Server has three different status states and colors. They are: Running depicted in green as above, Initializing depicted in blue (not illustrated here), and Not Running depicted in red (not illustrated here). If the HT Server is not running, click the **Start (re-start)** button.

4.3.4. Creating a Dial Plan Using the Phonebook

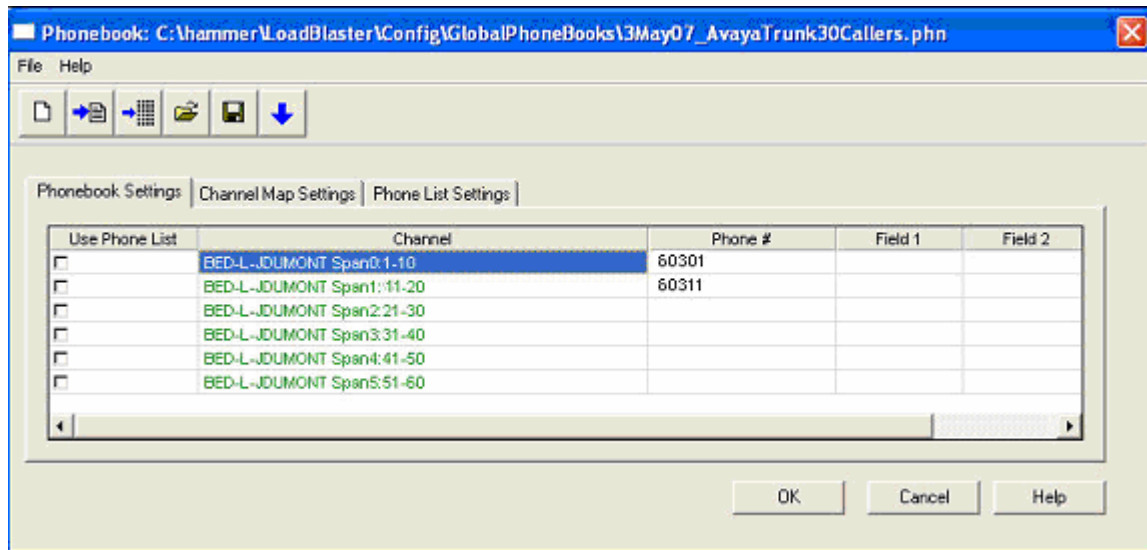
Before building and executing a test, a Phone Book needs to be created to place calls. To create a Phone Book:

1. Launch the Hammer Configurator.



2. From the Hammer Configurator, select the **PhoneBook** icon. The last saved Phone Book opens. If the last saved Phone Book cannot be found, a new blank Phone Book opens. To open a different saved Phone Book, select **File → Open**, and then select a PhoneBook (.phn) file. To open a new blank Phone Book, select **File → New**.
3. Select the **Phonebook Settings** tab, as shown in **Figure 20**.

Using one or more of the following methods, enter dialing information for each channel that will be used. Enter phone numbers or destination addresses in the **Phone #** column. Optionally, enter dialing digits in the **Field 1**, **Field 2**, and **Field 3** columns. In this case, **BED-L-JDUMOPNT Span0:1-10** are sequentially numbered endpoints starting at 60301 to 60310, will dial **BED-L-JDUMOPNT Span1:11-20** endpoint numbers starting at 60311 to 60320. This means, endpoint extension 60301 will call endpoint extension 60311, 60302 calls 60312, etc. For more information see Reference [2]



Phone Book

4. When finished entering values, select **File → Save**. The **Save PhoneBook** dialog box appears.
5. Enter a file name and click **Save**. If prompted to overwrite an existing Phone Book, click **Yes**. Phone Book files (including .phn, .map, and .lst) are saved in the...\LoadBlaster\Config\GlobalPhoneBooks directory.
6. When asked if the user wants to replace the Test Builder default Phone Book with the latest saved Phone Book, click **Yes**. Otherwise, click **No**.
 - If **Yes** is selected, the system copies the PhoneBook files to every Hammer server connected to the system. These files become the default PhoneBook. If tests are running, the new default PhoneBook files will take effect after all tests have stopped.
 - If **No** is selected, the user can replace TestBuilder with the latest saved PhoneBook files later by opening the saved PhoneBook and selecting **Update** on the Hammer Configurator TestBuilder menu.
7. Select **File → Exit** to close the PhoneBook Suite window.

4.3.5. Empirix Test Builder

TestBuilder is a telephony testing software package that allows a user to easily create and run load tests using a simple graphical interface. TestBuilder provides two interfaces for creating tests: Test Builder Ladder Diagrams (TB) and Hammer Visual Basic (HVB). Assemble test action icons in a TB, or write a test script using HVB in the HVB editor. HVB test scripts were developed and executed to validate the interoperability of the emulated Hammer FX-IP station endpoints against the Avaya Communication Manager.

The test scripts are scheduled either directly from the TB/HVB Graphical User Interface (GUI) or from the Test Profiler. Either scheduling option gives the user the ability to run multiple tests simultaneously. The Test Profiler includes predefined calling patterns that enable simulation of real world operating conditions. The Test Profiler also provides scheduling tests on a group of channels and allows the FX-IP to control when each channel starts in order to create the calling pattern selected.

The FX-IP includes three test monitors that show test statistics and channel status in real-time as tests are running: The System Monitor, The Call Summary Monitor, and the Quality of Experience (QoE) Monitor.

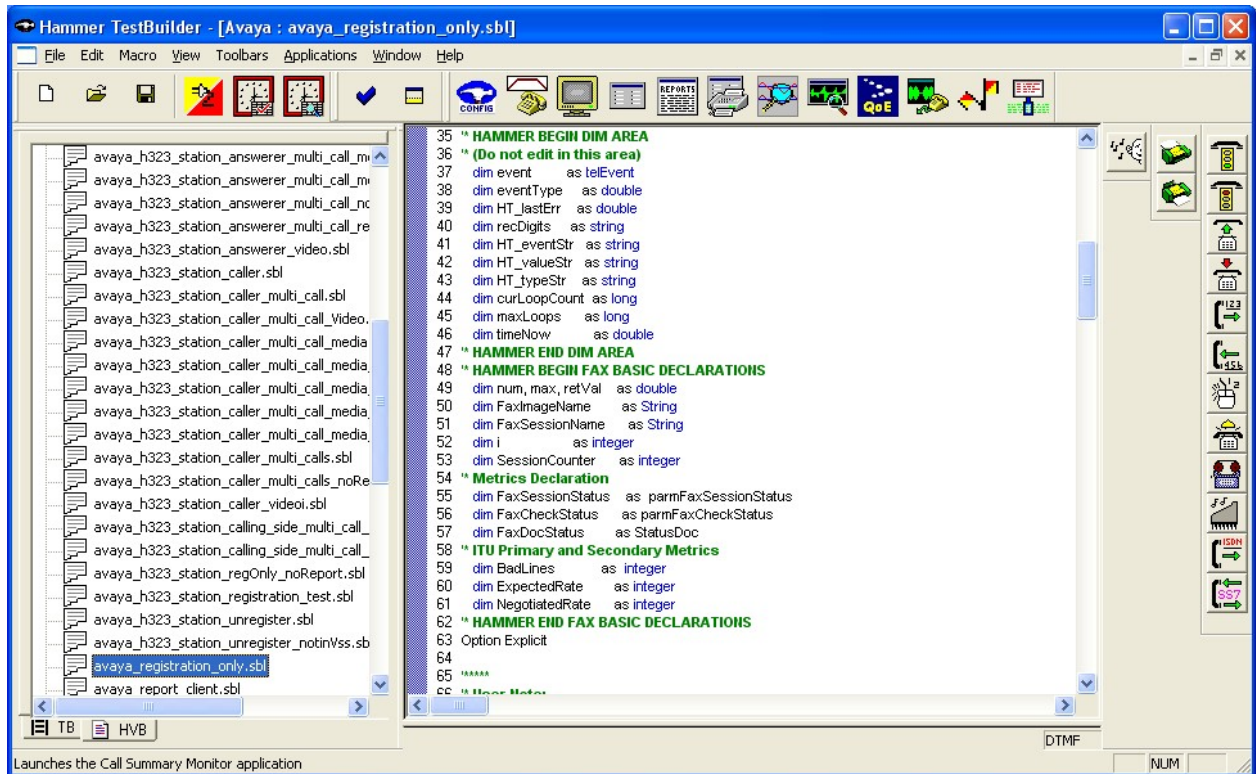
Once a test completes execution, a series of reports are automatically generated to provide detail for an entire test and for individual channels.

4.3.6. Executing a TestBuilder Test

To schedule a test follow these steps:

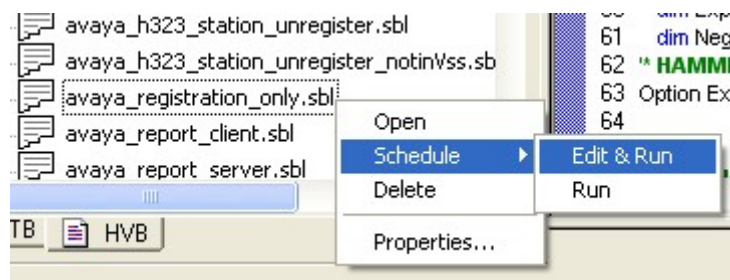
1. Launch TestBuilder by clicking the  icon and then select the HVB tab at the bottom left-hand corner of the GUI.

2. Open a customized HVB script like **avaya_registration_only.sbl** as shown below.




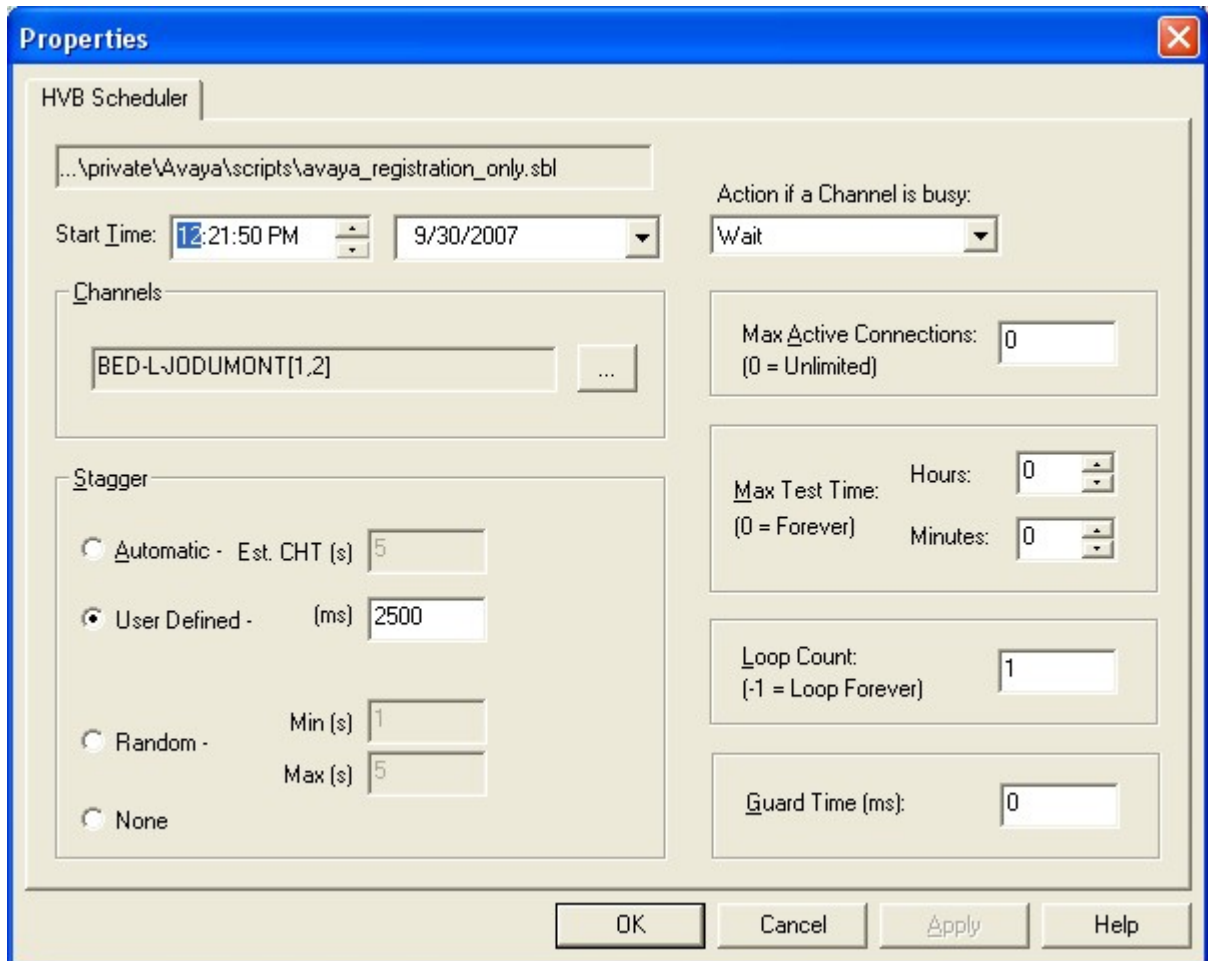
Test Script

3. Right-click on the test name and select **Schedule** followed by **Edit and Run** as displayed below



Running Tests

4. Select the **Channels** to use to execute the test for the A-Side and B-Side side by clicking  shown below. Click **OK** to start the test. Test execution will begin at the scheduled time.



Properties

HVB Scheduler

...\private\Avaya\scripts\avaya_registration_only.sbl

Start Time: 12:21:50 PM 9/30/2007

Action if a Channel is busy: Wait

Channels

BED-L-JODUMONT[1,2] ...

Stagger

☐ Automatic - Est. CHT (s) 5

☒ User Defined - (ms) 2500

☐ Random - Min (s) 1 Max (s) 5

☐ None

Max Active Connections: 0 (0 = Unlimited)

Max Test Time: Hours: 0 Minutes: 0 (0 = Forever)

Loop Count: 1 (-1 = Loop Forever)

Guard Time (ms): 0

OK Cancel Apply Help

Scheduler Properties

5. Interoperability Compliance Testing

The Interoperability compliance testing focused on the following areas in FX-IP:

1. Registration of the sending and receiving H323 endpoints
2. Support of various audio codecs with Avaya Communication Manager.
3. Support for direct and non-direct audio with media shuffling.
4. Recovery from adverse conditions during the load test.
5. Voice quality as measured by Perceptual Evaluation of Speech Quality (PESQ) scores with path confirmation.

5.1. General Test Approach

The feature test cases were conducted by using FX-IP to originating H.323 endpoint calls to Avaya Communication Manager and terminate H.323 calls received from Avaya Communication Manager. The FX-IP test calls were held active for 60 seconds. The serviceability test cases were performed by disconnecting, then reconnecting the LAN cables on the FX-IP as tests were in progress.

The verification included monitoring the various reports from FX-IP during and after the traffic runs, and checking the status of various H.323 stations on Avaya Communication Manager.

5.2. Test Results

All test cases were executed and passed.

The following was observed during the introduction of failures: when the Ethernet cable was disconnected from the FX-IP, the test stopped and all H.323 stations were placed in an out-of-service state in Avaya Communication Manager. The FX-IP did not release and stop the data stream after the cable was disconnected. The condition was cleared by manually re-establishing connectivity to the FX-IP's HT Server, and restarting the FX-IP (**Section 4.3.3**).

- PESQ Mean Opinion Score (MOS) scoring along with sending and receiving data over twenty channels created a large demand for system resources on the FX-IP laptop. Therefore PESQ MOS scoring was performed for a one minute periods only.
- FX-IP customization is required to support emulating H.323 endpoint for both direct and non-direct media and can be available through Empirix.

6. Verification Steps

This section provides screen shots verifying proper interoperability of H.323 endpoints between Avaya Communication Manager and FX-IP.

6.1. Verify Avaya Communication Manager

Verify proper H.323 endpoint registration and audio connection type by using the **list trace ras ip-stations n**, and **status station n** commands respectively, where **n** is the station extension number administered in **Section 3.3**.

1. Verify proper registration of the H.323 sending side as displayed below. The sending station's RAS sequence is displayed. In the traces below, the Gatekeeper Confirm (**GCF**) and Registration Confirm (**RCF**) messages are essential and must be observed by the user to progress further.

list trace ras ip-address 192.2.5.101		Page 1
LIST TRACE		
time	data	
04:17:08	rcv GRQ endpt 192.2.5.101 :15000 switch 192.2.5.6:1719 ext 60301	
04:17:08	snd GCF endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:17:08	rcv RRQ endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:17:08	snd RCF endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:17:08	endpt 192.2.5.101 MAC addr: 00:00:00:00:00:00 ext 60301	
04:17:58	rcv KARRQ endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:17:58	snd KARCF endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:18:48	rcv KARRQ endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:18:48	snd KARCF endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:18:53	rcv DRQ endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	
04:18:53	UNKNOWN MESSAGE endpt 192.2.5.101:15000 switch 192.2.5.6:1719 ext 60301	

Registration Sending Side

2. Verify proper registration of the H.323 receiving side as in displayed below. The receiving station's RAS sequence is displayed.

list trace ras ip-stations 60311		Page 1
LIST TRACE		
time	data	
09:08:53	rcv GRQ endpt 192.2.5.111 :15000 switch 192.2.5.6:1719 ext 60311	
09:08:53	snd GCF endpt 192.2.5.111:15000 switch 192.2.5.6:1719 ext 60311	
09:08:53	rcv RRQ endpt 192.2.5.111:15000 switch 192.2.5.6:1719 ext 60311	
09:08:53	snd RCF endpt 192.2.5.111:15000 switch 192.2.5.6:1719 ext 60311	
09:08:53	endpt 192.2.5.111 MAC addr: 00:00:00:00:00:00 ext 60311	
09:09:44	rcv KARRQ endpt 192.2.5.111:15000 switch 192.2.5.6:1719 ext 60311	
09:09:44	snd KARCF endpt 192.2.5.111:15000 switch 192.2.5.6:1719 ext 60311	

Registration Received Side

3. Verify proper **Audio Connection Type** when Direct IP-IP Audio Connections is disabled, displayed in the status pages below. Only G.711MU is displayed.

status station 60301		Page 1 of 8	
GENERAL STATUS			
Administered Type: H.323	Service State: in-service/off-hook		
Connected Type: N/A	TCP Signal Status: connected		
Extension: 60301			
Port: S00003	Parameter Download: not-applicable		
Call Parked? no	SAC Activated? no		
Ring Cut Off Act? no			
Active Coverage Option: 1			
EC500 Status: N/A	Off-PBX Service State: N/A		
Message Waiting:			
Connected Ports: S00018			
Limit Incoming Calls? no			
User Cntrl Restr: none	HOSPITALITY STATUS		
Group Cntrl Restr: none	Awaken at:		
	User DND: not activated		
	Group DND: not activated		
	Room Status: non-guest roo		

Status Station - Page 1

status station 60301				Page 3 of 8	
CALL CONTROL SIGNALING					
Port: S00003		Switch-End IP Signaling Loc: 01A0317		H.245 Port:	
IP Address		Port	Node Name		Rgn
Switch-End: 192. 2. 5. 6		1720	Clan-1		1
Set End: 192. 2. 5.101		2234			1
H.245 Near:					
H.245 Set:					

Status Station - Page3

status station 60301			Page 4 of 8	
AUDIO CHANNEL Port: S00003				
G.711MU		Switch-End Audio Location: 01A0201		
IP Address		Port	Node Name	Rgn
Other-End: 192. 2. 5. 7		40112	Prowler-1	1
Set-End: 192. 2. 5.101		7000		1
Audio Connection Type: ip-tdm				

Status Station - Page 4

4. Verify proper **Audio Connection Type** when Direct IP-IP Audio Connections is enabled, as displayed in the **status station** pages below.

status station 60301				Page	3 of	7
CALL CONTROL SIGNALING						
Port: S00003		Switch-End IP Signaling Loc: 01A0317		H.245 Port:		
IP Address		Port	Node Name		Rgn	
Switch-End: 192. 2. 5. 6		1720	Clan-1		1	
Set End: 192. 2. 5.101		2468	1			
H.245 Near:						
H.245 Set:						

Status Station - Page 3

status station 60301				Page	4 of	7
AUDIO CHANNEL Port: S00003						
G.711MU Switch-End Audio Location:						
IP Address		Port	Node Name		Rgn	
Other-End: 192. 2. 5.111		7000			1	
Set-End: 192. 2. 5.101		7000			1	
Audio Connection Type: ip-direct						

Status Station - Page 4

status station 60301			Page	5 of	7
IP ENDPOINT DATA					
Port: S00003					
Product ID-Release:		0. 0	H.245 Tunneled? yes		
Registration Status:		registered-authenticated	MAC Address: unavailable		
Authentication Type:		DES-56	Dependency Mode: main		
Native NAT Address: not applicable					
ALG NAT WAN Address: not applicable					

Status Station - Page 5

status station 60301				Page	6 of	7
SRC PORT TO DEST PORT TALKPATH						
src port: S00003						
S00003:TX:192.2.5.101:7000/g711u/20ms						
S00018:RX:192.2.5.111:7000/g711u/20ms						

Status Station - Page 6

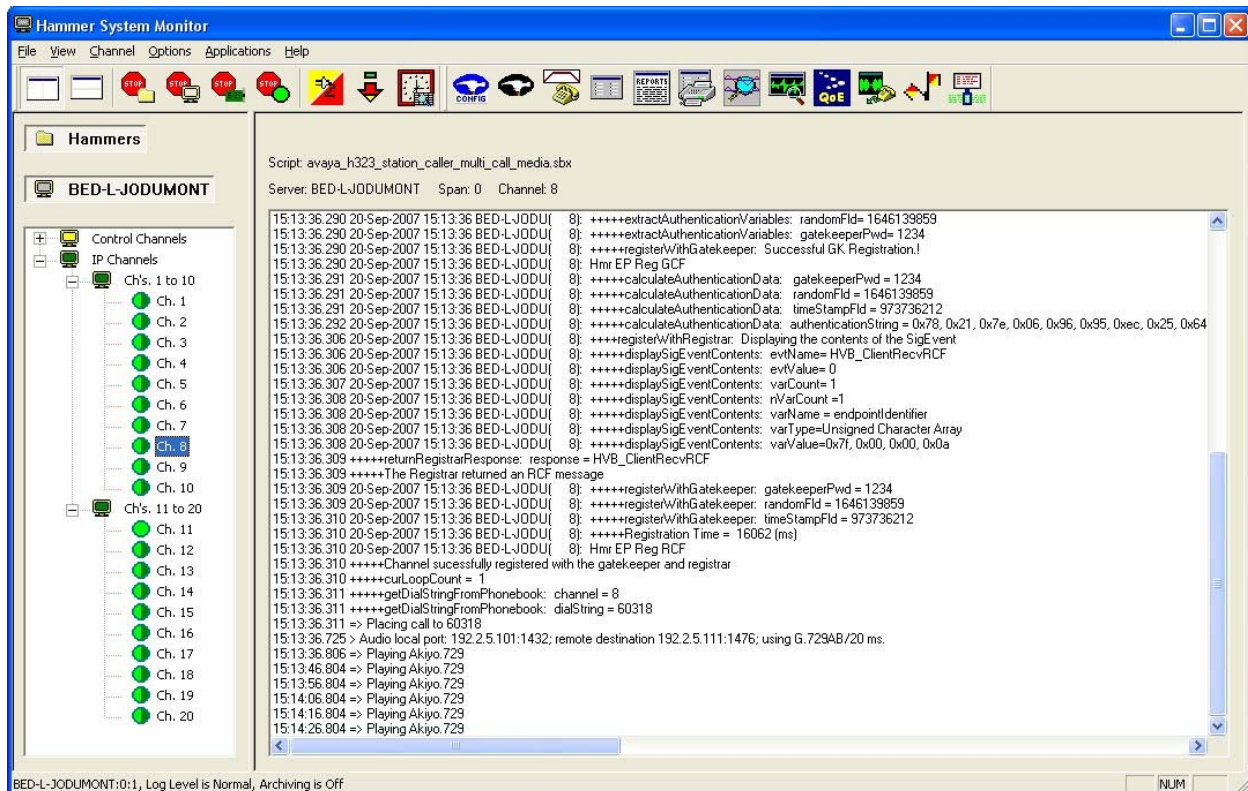
6.2. Verify Empirix Hammer FX-IP

The Hammer System Monitor is an application that displays the current status of each channel and displays the log messages each channel generates. The System Monitor also provides the user with the ability to stop specific channels, spans, or the entire server. A user can choose to stop channels immediately, or can select the gradual stop option that causes channels to complete their current test iteration before stopping. This section describes how to use the System Monitor along with the type of information that can be gathered during running tests.

6.2.1. Empirix Hammer FX-IP Monitor

If there are speakers connected to the Hammer FX-IP system, a user can listen to the media sent and received on the currently selected channel. One speaker will play transmitted audio; the other will play received audio. No audio is played for Request For Comments (RFC) 2833 DTMF digits. **Section 6.2.1** and **6.2.2** display various captures of the H.323 verification of the FX-IP process.

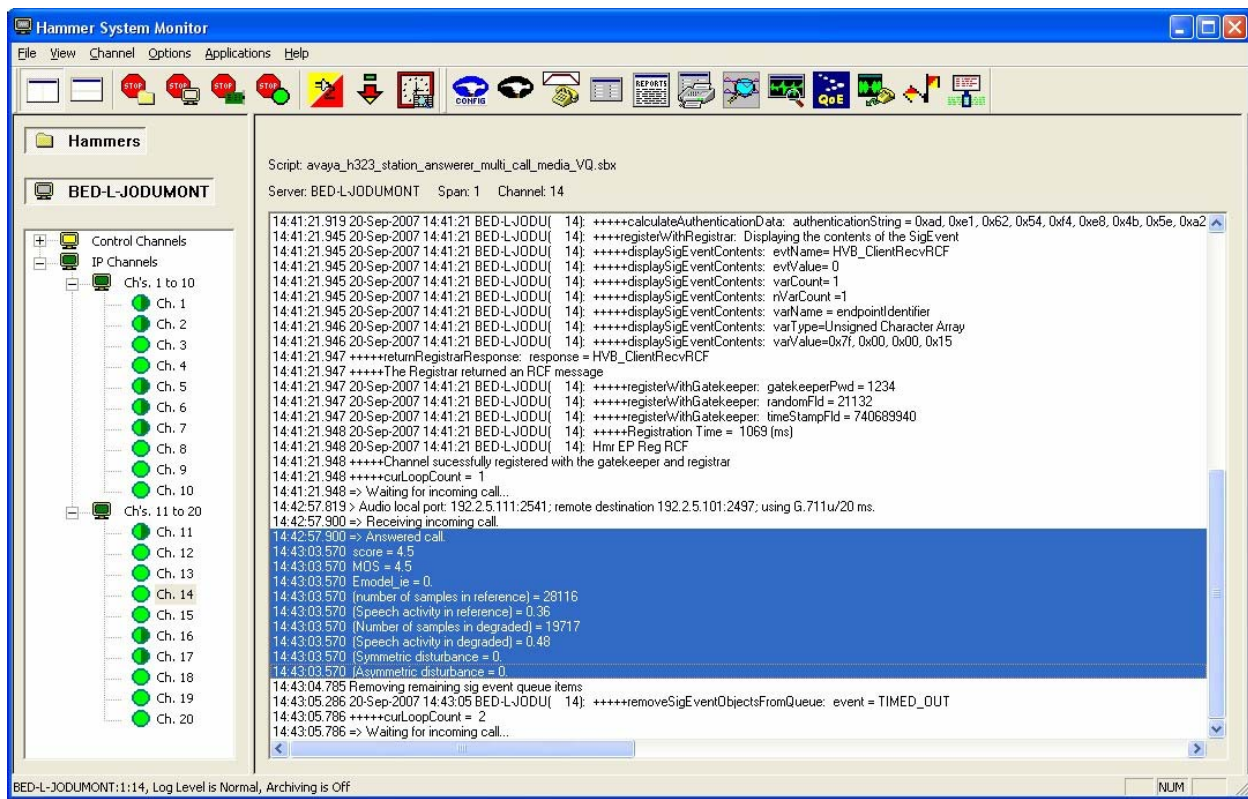
The screen below displays the registration flow between FX-IP and Avaya Communication Manager completing with the Registrar received an RCF message.



Registration Flow

6.2.2. Verify Empirix Hammer FX-IP MOS

When the Hammer System Monitor is executing, the FX-IP verification process is displayed along with the selected channel information. The next two screens display the PESQ MOS score for G.711 Mu and G.729AB respectively. G.723-6.3k had a PESQ MOS score of 3.2 (not displayed). All PESQ MOS scores are in the high acceptable range for the codec being tested.



G.711Mu MOS score

```

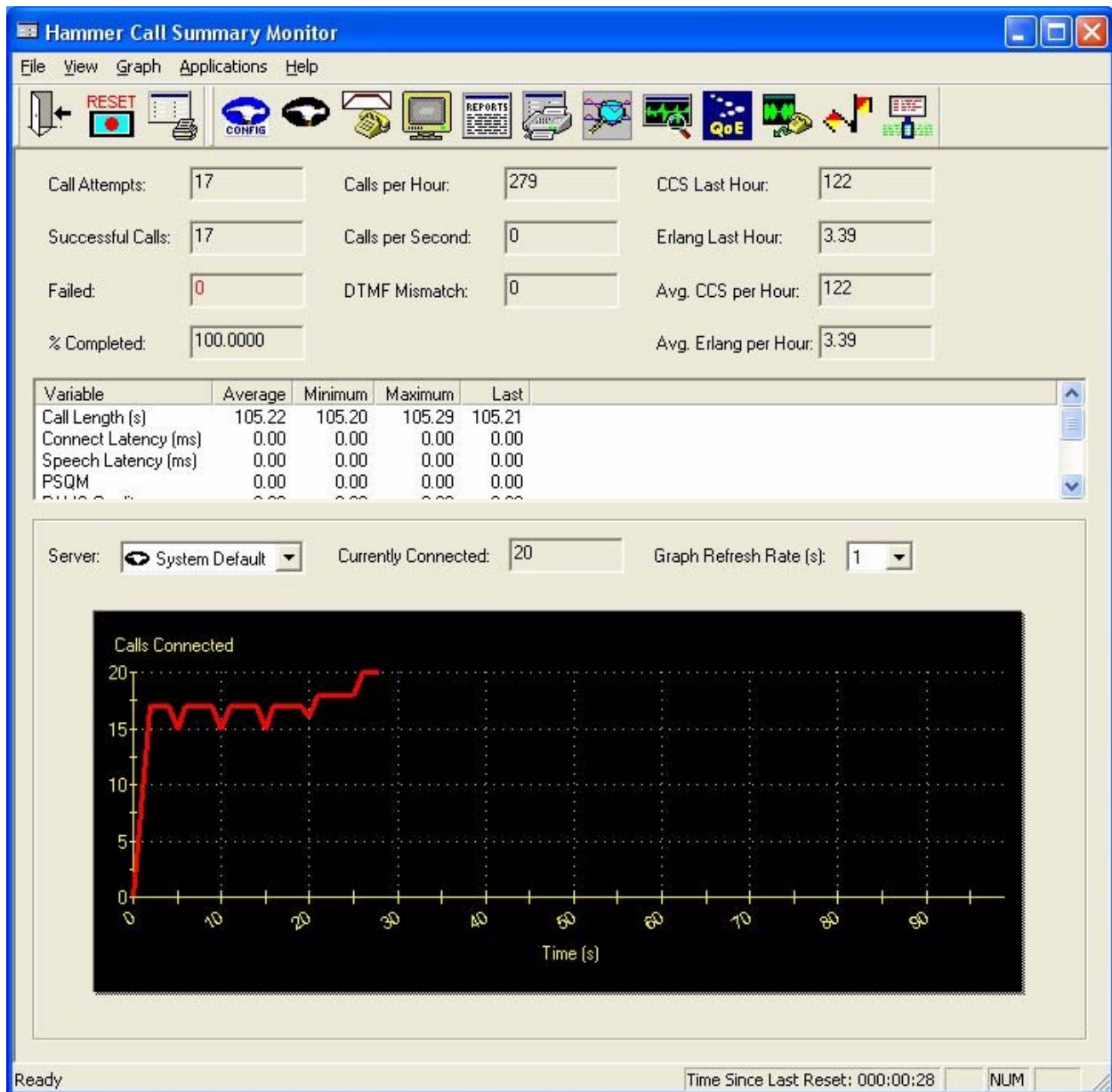
14:54:16.387 => Waiting for incoming call...
14:55:57.156 > Audio local port: 192.2.5.111:1177; remote destination 192.2.5.101:1133; using G.729AB/20 ms.
14:55:57.237 => Receiving incoming call.
14:55:57.237 => Answered call.
14:56:03.249 score = 3.39
14:56:03.249 MOS = 3.34
14:56:03.249 Emodel_ie = 26.24
14:56:03.249 (number of samples in reference) = 28116
14:56:03.249 (Speech activity in reference) = 0.36
14:56:03.249 (Number of samples in degraded) = 19659
14:56:03.249 (Speech activity in degraded) = 0.48
14:56:03.249 (Symmetric disturbance) = 5.31
14:56:03.249 (Asymmetric disturbance) = 18.86
14:56:04.520 Removing remaining sig event queue items

```

G.729AB MOS score


6.2.3. Verify Empirix Hammer FX-IP Call Summary

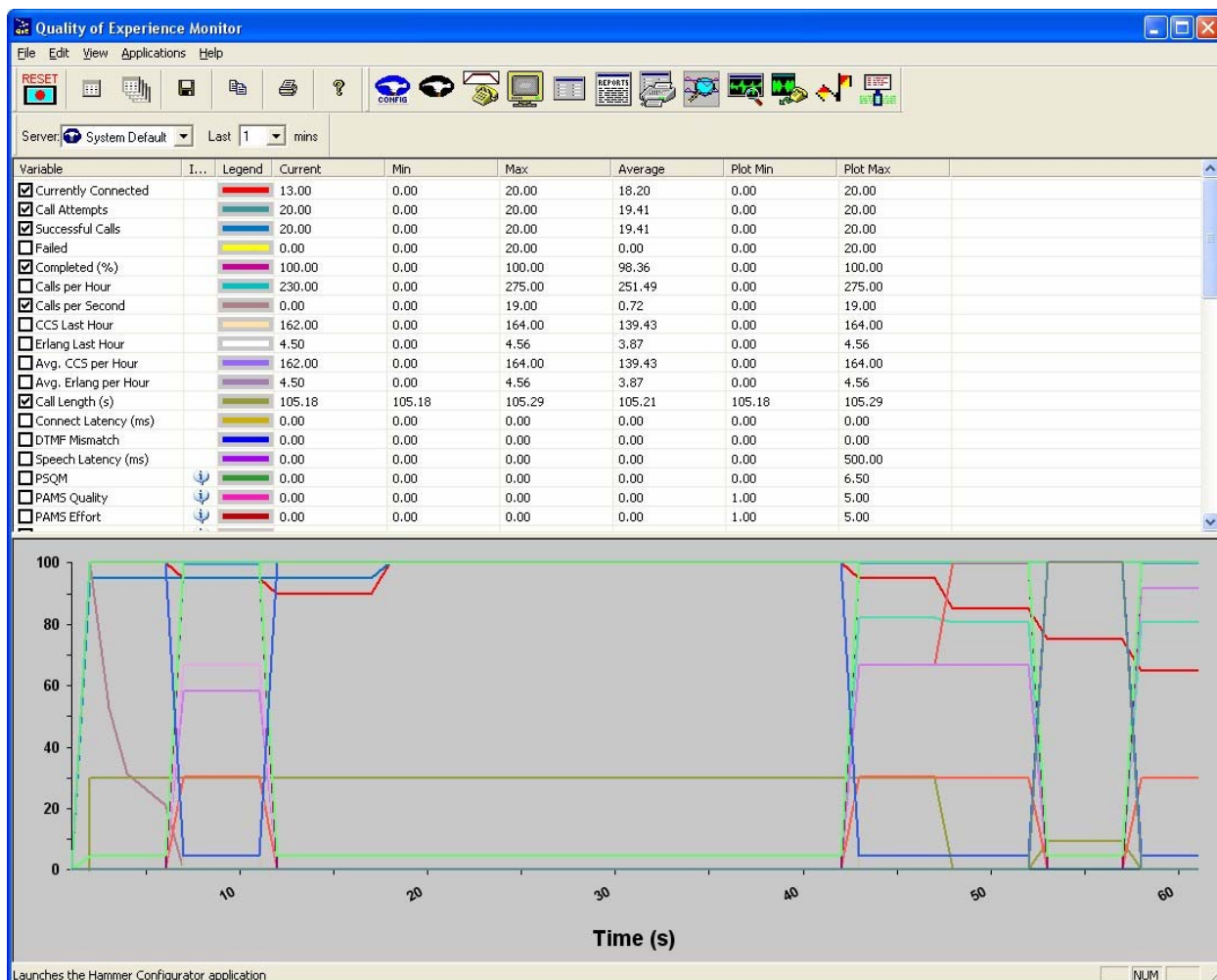
Clicking the Test Builder  Icon as the FX-IP is executing brings up the call status of the current test in progress. The screen below displays a call summary in progress.



Summary Monitor

6.2.4. Verify Empirix Hammer FX-IP Quality of Experience

Click the Quality of Experience  Icon (previous screen) as FX-IP is executing. The screen below displays a graphical color representation of test data between FX-IP and Avaya Communication Manager.




Quality of Experience Monitor

6.2.5. Generating a Report with Hammer Reports

After test execution has concluded, test results including a call detail report, call summary report, and RTP Metrics report can be generated.



1. Launch the reports tool by clicking the  icon. See **Figure 32**.
2. From the drop-down list in the top left-hand corner of the window, select the type of report to be generated.
3. A new dialog box will display. From the dialog box select the test named, for example, **Confirm Path**, and the appropriate time and date stamp for the test.

A report similar to the screen below will be displayed.

Hammer Reports - [RTP Metrics Report]

File View DataFile Applications Help

RTP Metrics

1 of 2

Total: 41 100% 41 of 41

RTP METRICS REPORT
May/8/2007 10:00:50AM

Test Name: ConfirmPath_A.sbx
Start Time: 2007-05-02 18:48:00
Stop Time: 2007-05-02 18:52:59
4 minutes and 59 seconds

TimeStamp	Server	Chan#	Call ID	Media	Transmit		Receive		PktIn	Seq	Lost	Dups
					BytesOut	PktsOut	BytesIn	PktsIn				
5/2/2007 6:48:14PM	H4911	6	000000020100006	G.711u	143,372	839	593,400	3,450	0	0	0	
5/2/2007 6:48:14PM	H4911	2	000000020100002	G.711u	143,372	839	594,432	3,456	0	1	0	
5/2/2007 6:48:15PM	H4911	1	000000020100001	G.711u	143,372	839	596,840	3,470	0	1	0	
5/2/2007 6:48:15PM	H4911	9	000000020100009	G.711u	143,372	839	593,228	3,449	0	0	0	
5/2/2007 6:48:16PM	H4911	7	000000020100007	G.711u	143,372	839	593,400	3,450	0	0	0	
5/2/2007 6:48:16PM	H4911	5	000000020100005	G.711u	143,372	839	593,744	3,452	0	0	0	
5/2/2007 6:48:16PM	H4911	3	000000020100003	G.711u	143,372	839	594,088	3,454	0	0	0	
5/2/2007 6:48:16PM	H4911	8	000000020100008	G.711u	143,372	839	594,432	3,456	0	0	0	
5/2/2007 6:48:16PM	H4911	4	000000020100004	G.711u	143,372	839	594,604	3,457	0	0	0	
5/2/2007 6:48:16PM	H4911	10	000000020100010	G.711u	143,372	839	595,292	3,461	0	0	0	
5/2/2007 6:48:17PM	H4911	6	000000020100006	G.711u	143,372	839	594,432	3,456	0	0	0	

Launches the VQScope application

NUM

Sample Report

7. Support

Technical support on Empirix Hammer FX-IP can be obtained through the following:

- Email the Empirix support center via support@empirix.com.
- Call the Empirix support center at 1-800-Empirix.

8. Conclusion

These Application Notes describe the configuration steps required for Empirix Hammer FX-IP Release 2.4.1 to successfully interoperate with Avaya Communication Manager 4.0.1. All feature and serviceability test cases were completed successfully and the exceptions are noted in Section 5.

9. Additional References

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

- [1] Administrator Guide for Avaya Communication Manager, Document 03-300509, Issue 1, June 2005, available at <http://support.avaya.com>
- [2] Empirix Hammer FX-IP User Manual is installed with FX-IP and is access by clicking **Help**

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