



## **Application Notes for Avaya Aura® Communication Manager 8.0, Avaya Aura® Session Manager 8.0 and Avaya Session Border Controller for Enterprise 7.2.2 with CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform – Issue 1.0**

### **Abstract**

These Application Notes describe the procedures for configuring Session Initiation Protocol (SIP) Trunking Service on an enterprise solution consisting of Avaya Aura® Communication Manager 8.0, Avaya Aura® Session Manager 8.0, Avaya Aura® Experience Portal 7.2 and Avaya Session Border Controller for Enterprise 7.2.2, to interoperate with the CenturyLink SIP Trunking service on Oracle/BroadWorks Platform using UDP. These Application Notes update previously published Application Notes with newer versions of Communication Manager, Session Manager, and Avaya Session Border Controller for Enterprise.

The test was performed to verify SIP trunk features including basic calls, call forward (all calls, busy, no answer), call transfer (blind and consult), conference, and voice mail. The calls were placed to and from the PSTN with various Avaya endpoints.

The CenturyLink SIP Trunking service provides customers with PSTN access via a SIP trunk between the enterprise and the CenturyLink network, as an alternative to legacy analog or digital trunks. This approach generally results in lower cost for the enterprise.

Readers should pay attention to **Section 2**, in particular the scope of testing as outlined in **Section 2.1** as well as the observations noted in **Section 2.2**, to ensure that their own use cases are adequately covered by this scope and results.

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.

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# 1. Introduction

These Application Notes describe the procedures for configuring Session Initiation Protocol (SIP) Trunking Service between the CenturyLink network on Oracle/BroadWorks Platform and an Avaya SIP-enabled enterprise solution. The Avaya solution consists of Avaya Aura® Communication Manager 8.0 (Communication Manager), Avaya Aura® Session Manager 8.0 (Session Manager), Avaya Aura® Experience Portal 7.2 (Experience Portal), Avaya Session Border Controller for Enterprise 7.2.2 (Avaya SBCE) and various Avaya endpoints, listed in **Section 4**.

The CenturyLink SIP Trunking service on Oracle/BroadWorks Platform referenced within these Application Notes is designed for business customers. Customers using this service with this Avaya enterprise solution are able to place and receive PSTN calls via a broadband WAN connection and the SIP protocol. This converged network solution is an alternative to traditional PSTN trunks such as analog and/or ISDN-PRI.

The terms “Service Provider” or “CenturyLink” will be used interchangeably throughout these Application Notes.

## 2. General Test Approach and Test Results

A simulated CPE site containing all the equipment for the Avaya SIP-enabled enterprise solution was installed at the Avaya Solution and Interoperability Lab. The enterprise site was configured to connect to the network via a broadband connection to the public Internet.

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.

Avaya recommends our customers implement Avaya solutions using appropriate security and encryption capabilities enabled by our products. The testing referenced in this DevConnect Application Note included the enablement of supported encryption capabilities in the Avaya products only (private network side). Readers should consult the appropriate Avaya product documentation for further information regarding security and encryption capabilities supported by those Avaya products.

Support for these security and encryption capabilities in any non-Avaya solution component is the responsibility of each individual vendor. Readers should consult the appropriate vendor-supplied product documentation for more information regarding those products.

For the testing associated with this Application Note, the interface between Avaya systems and the CenturyLink SIP Trunking service did not include use of any specific encryption features.

Encryption (TLS/SRTP) was used internal to the enterprise between Avaya products wherever possible.

## 2.1. Interoperability Compliance Testing

To verify SIP trunk interoperability, the following features and functionality were covered during the interoperability compliance test:

- SIP Trunk Registration (Dynamic Authentication).
- Response to SIP OPTIONS queries.
- Incoming calls from the PSTN were routed to DID numbers assigned by CenturyLink. Incoming PSTN calls were terminated to the following endpoints: Avaya 96x1 Series IP Deskphones (H.323 and SIP), Avaya J179 IP Deskphones (H.323), Avaya 2420 Digital Deskphones, Avaya one-X® Communicator softphone (H.323 and SIP), Avaya Equinox softphone (SIP) and analog Deskphones.
- Inbound and outbound PSTN calls to/from Remote Workers using Avaya 96x1 Deskphones (SIP).
- Outgoing calls to the PSTN were routed via CenturyLink's network to various PSTN destinations.
- Proper disconnect when the caller abandons the call before the call is answered.
- Proper disconnect via normal call termination by the caller or the called parties.
- Proper disconnect by the network for calls that are not answered (with voicemail off).
- Proper response to busy endpoints.
- Proper response/error treatment when dialing invalid PSTN numbers.
- Proper Codec negotiation and two-way speech-path. Testing was performed with codecs: G.729 and G.711MU.
- No matching codecs.
- DTMF tone transmissions as out-of-band RTP events as per RFC2833:
  - Outbound call to PSTN application requiring DTMF (e.g., an IVR or voice mail system).
  - Inbound call from PSTN to Avaya CPE application requiring DTMF (e.g., Aura® Messaging, Experience Portal, Avaya vector digit collection steps).
- Calling number blocking (Privacy).
- Call Hold/Resume (long and short duration).
- Call Forward (unconditional, busy, no answer).
- Blind Call Transfers.
- Consultative Call Transfers.
- Station Conference.
- EC500 (Extension to Cellular) calls.
- Inbound caller interaction with Experience Portal applications, including prompting, caller DTMF input, wait treatment (e.g., announcements and/or music on hold).
- Experience Portal use of SIP REFER to redirect inbound calls, via the Avaya SBCE, to the appropriate Communication Manager agents and extensions.
- Call and two-way talk path establishment between callers and Communication Manager agents and extensions following redirection from Experience Portal.
- Routing inbound vector call to call center agent queues.

- T.38 fax.
- Simultaneous active calls.
- Long duration calls (over one hour).
- Proper response/error treatment to all trunks busy.
- Proper response/error treatment when disabling SIP connection.

**Note** – Remote Worker was tested as part of this solution. The configuration necessary to support remote workers is beyond the scope of these Application Notes and is not included in these Application Notes. Consult reference [11] in the **References** section for additional information on this topic.

Items that are supported and that were not tested includes the following:

- Inbound toll-free calls and 911 calls (emergency) calls.

Items that are not supported and that were not tested includes the following:

- Network Call Redirection using the “302 Moved Temporarily” method is not supported by CenturyLink.

## 2.2. Test Results

Interoperability testing of the CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform with the Avaya SIP-enabled enterprise solution was completed with successful results for all test cases with the observations/limitations noted below:

- **OPTIONS** – CenturyLink does not send OPTIONS messages to the Avaya enterprise network but it does respond to OPTIONS messages it receives from the Avaya enterprise, this was sufficient to maintain the SIP trunk link up in service.
- **200 Minimal Impact messages** – After a call from the PSTN to the enterprise is successfully transferred back to another PSTN party using the SIP REFER method, CenturyLink accepted the SIP REFER messages sent by Communication Manager with “202 Accepted”, which resulted in the SIP trunk channels being released with BYE messages, as expected. After the SIP trunk channels were released CenturyLink would send a “200 Minimal Impact” in response to a BYE message sent by Communication Manager. This behavior was caused by CenturyLink not sending NOTIFY messages to Communication Manager to update the state of the call transfer. This behaviour had no negative impact on the transferred call and SIP trunk resources were released successfully after the call transfer, as expected. It’s being mentioned here simply as an observation.
- **URI in PAI Header should be set to the Pilot Number** – For EC500 (Extension to Cellular) and for calls that are forwarded to the PSTN CenturyLink SIP trunking specification requires the URI in the PAI header to be the pilot number. This was accomplished by using a Signaling Manipulation script (SigMa) in the Avaya SBCE. Refer to **Sections 8.8** and **13**.
- **T.38 fax version** – A Signaling Manipulation script (SigMa) was created in the Avaya SBCE to change the T.38 fax version from 1 to 0 in the re-INVITE message Communication Manager sends CenturyLink, fax version 0 is the only fax version supported by the CenturyLink’s Oracle/BroadWorks platform. Refer to **Sections 8.8** and **13**.

- **Incorrect Call Display on call transfers to the PSTN Phone** – Call display was not properly updated on PSTN phones involved in call transfers. After successful call transfers to the PSTN, the PSTN phone did not display the actual connected party, instead the DID number assigned to the Communication Manager station that initiated the transfer was displayed.
- **SIP NCR using SIP REFER when Redirected Party is busy** – This was not tested since it requires the service provider to support sending intermediate call states (100 Trying, 180 Ringing, etc.) of the referred call back to the referring party. This is done via NOTIFY messages in response to the REFER request, before the referring party is disconnected. CenturyLink doesn't send NOTIFY messages with SIP REFER during call redirection scenarios.
- **TLS/SRTP used within the enterprise** – When TLS/SRTP is used within the enterprise; the SIP headers include the SIPS URI scheme for Secure SIP. The Avaya SBCE converts these header schemes from SIPS to SIP when it sends the SIP message toward CenturyLink. However, for call forward and EC500 calls, the Avaya SBCE was not changing the Diversion header scheme as expected. This anomaly is currently under investigation by the Avaya SBCE team. A workaround is to include a SigMa script for the Service Provider Server Configuration profile on the Avaya SBCE to convert “sips” to “sip” in the Diversion header. See **Sections 8.8 and 13**.
- **Calls placed ON-HOLD** – Calls made from the PSTN to the enterprise (inbound) and calls made from the enterprise to the PSTN (outbound) that are placed ON-HOLD either at the enterprise or at the PSTN are released/dropped with a BYE sent by CenturyLink after approximately 5 minutes of being placed ON-HOLD. This issue is under investigation by CenturyLink.
- **SIP UPDATE** – The Avaya SBCE was responding with “500 Server Internal Error” to a SIP UPDATE received from Communication Manager. This was caused by the SIP UPDATE being sent by Communication Manager before receiving an ACK for a 200 OK sent to CenturyLink by Communication Manager. This issue was solved with a patch applied to the Avaya SBCE.
- **Calls with Privacy enabled** – Calls made from the enterprise to the PSTN with privacy enabled (Calling Party Number Block) were getting announcement; this issue was solved by CenturyLink.
- **SIP header optimization** – There are multiple SIP headers and parameters used by Communication Manager and Session Manager, some of them Avaya proprietary, that had no significance in the service provider's network. These headers were removed with the purpose of blocking enterprise information from being propagated outside of the enterprise boundaries, to reduce the size of the packets entering the service provider's network and to improve the solution interoperability in general. The following headers were removed from outbound messages using an Adaptation in Session Manager: AV-Global-Session-ID, AV-Correlation-ID, Alert-Info, Endpoint-View, P-AV-Message-id, P-Charging-Vector and P-Location (**Section 7.4**). To help reduce the packet size further, the Avaya SBCE can remove the “gsid” and “epv” parameters that may be included within the Contact header by applying a Sigma script to the CenturyLink's server configuration. See **Section 8.8 and 13**.

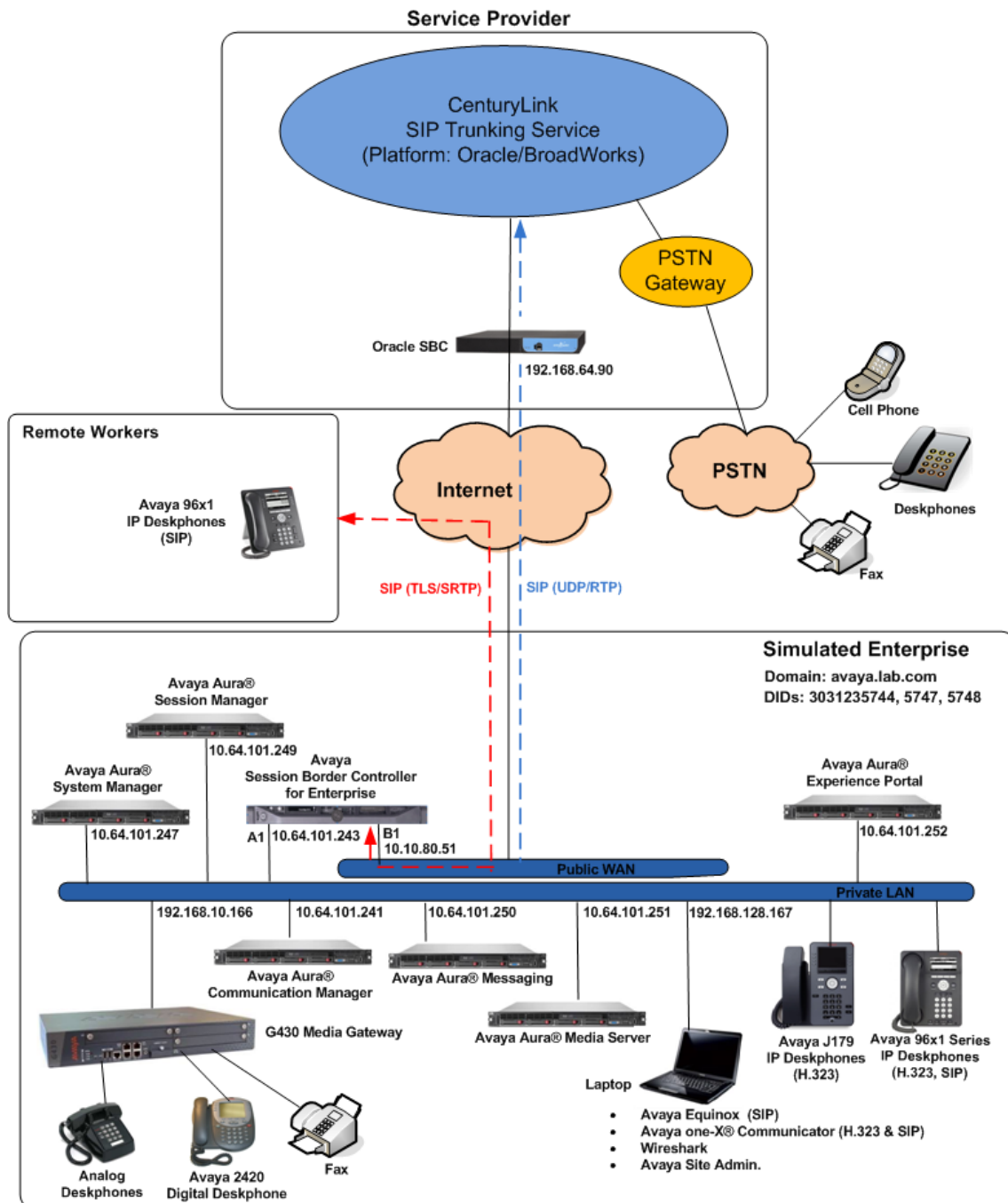
## 2.3. Support

For support of CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform visit the corporate Web page at: <http://www.centurylink.com/business/voice/sip-trunk.html>



### 3. Reference Configuration

**Figure 1** illustrates the sample Avaya SIP-enabled enterprise solution, connected to the CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform through a public Internet WAN connection.



**Figure 1: Avaya SIP Enterprise Solution connected to CenturyLink SIP Trunking Service**

The Avaya components used to create the simulated enterprise customer site included:

- Avaya Aura® Communication Manager.
- Avaya Aura® Session Manager.
- Avaya Aura® System Manager.
- Avaya Session Border Controller for Enterprise.
- Avaya Aura® Messaging.
- Avaya Aura® Media Server.
- Avaya Aura® Experience Portal.
- Avaya G430 Media Gateway.
- Avaya 96x1 Series IP Deskphones (H.323 and SIP).
- Avaya J179 IP Deskphones (H.323).
- Avaya one-X® Communicator softphones (H.323 and SIP).
- Avaya Equinox™ for Windows softphone (SIP).
- Avaya digital and analog telephones.
- Ventafax fax software.

Additionally, the reference configuration included remote worker functionality. A remote worker is a SIP endpoint that resides in the untrusted network, registered to Session Manager at the enterprise via the Avaya SBCE. Remote workers offer the same functionality as any other endpoint at the enterprise. This functionality was successfully tested during the compliance test using only the Avaya 96x1 SIP Deskphones. For signaling, Transport Layer Security (TLS) and for media, Secure Real-time Transport Protocol (SRTP) was used on Avaya 96x1 SIP Deskphones used to test remote worker functionality. Other Avaya SIP endpoints that are supported in a Remote Worker configuration deployment were not tested.

The configuration tasks required to support remote workers are beyond the scope of these Application Notes; hence they are not discussed in this document. Consult reference [11] in the **References** section for additional information on this topic.

The Avaya SBCE was located at the edge of the enterprise. Its public side was connected to the public Internet, while its private side was connected to the enterprise infrastructure. All signaling and media traffic entering or leaving the enterprise flowed through the Avaya SBCE, protecting in this way the enterprise against any SIP-based attacks. The Avaya SBCE also performed network address translation at both the IP and SIP layers.

For inbound calls, the calls flowed from the service provider to the Avaya SBCE then to Session Manager. Session Manager used the configured dial patterns (or regular expressions) and routing policies to determine the recipient (Communication Manager or Experience Portal) and on which link to send the call.

Outbound calls to the PSTN were first processed by Communication Manager for outbound feature treatment such as automatic route selection and class of service restrictions. Once Communication Manager selected the proper SIP trunk, the call was routed to Session Manager.

Session Manager once again used the configured dial patterns (or regular expressions) and routing policies to determine the route to the Avaya SBCE for egress to the CenturyLink network.

A separate SIP trunk was created between Communication Manager and Session Manager to carry the service provider traffic. This was done so that any trunk or codec settings required by the service provider could be applied only to this trunk without affecting other enterprise SIP traffic. This trunk carried both inbound and outbound traffic.

As part of the Avaya Aura® version 8.0 release, Communication Manager incorporates the ability to use the Avaya Aura® Media Server (AAMS) as a media resource. The AAMS is a software-based, high density media server that provides DSP resources for IP-based sessions. Media resources from both the AAMS and a G430 Media Gateway were utilized during the compliance test. The configuration of the AAMS is not discussed in this document. For more information on the installation and administration of the AAMS in Communication Manager refer to the AAMS documentation listed in the **References** section.

The Avaya Aura® Messaging was used during the compliance test to verify voice mail redirection and navigation, as well as the delivery of Message Waiting Indicator (MWI) messages to the enterprise telephones. Since the configuration tasks for Messaging are not directly related to the interoperability tests with the CenturyLink network SIP Trunking service, they are not included in these Application Notes.

The Avaya Aura® Experience Portal was also used during the compliance test to verify various SIP call flow scenarios with CenturyLink SIP trunk service.

## 4. Equipment and Software Validated

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

Equipment/Software	Release/Version
<b>Avaya</b>	
Avaya Aura® Communication Manager	8.0.0.1.2 (00.0.822.0-24826)
Avaya Aura® Session Manager	8.0.0.0 (8.0.0.0.800035)
Avaya Aura® System Manager	8.0.0.0 Build No. 8.0.0.0.931077 Software Update Rev. No. 8.0.0.0.098174
Avaya Session Border Controller for Enterprise	ASBCE 7.2 7.2.2.1-04-16104
Avaya Aura® Messaging	7.1 Patch 1
Avaya Aura® Media Server	8.0.0 SP1 8.0.0.150
Avaya G430 Media Gateway	g430_sw_40_10_0
Avaya Aura® Experience Portal	7.2.0.0.1117
Avaya 96x1 Series IP Deskphones (SIP)	Version 7.1.2.0.13
Avaya 96x1 Series IP Deskphones (H.323)	Version 6.7104
Avaya J179 IP Deskphones (H.323)	Version 6.7104
Avaya one-X® Communicator (H.323, SIP)	6.2.12.22-SP12-Patch12
Avaya Equinox for Windows (SIP)	3.4.10.10.2
Avaya 2420 Series Digital Deskphones	N/A
Avaya 6210 Analog Deskphones	N/A
<b>CenturyLink</b>	
BroadSoft BroadWorks	R21.SP1
Oracle SBC	7.4MIP5

The specific configuration above was used for the compliance testing. Note that this solution will be compatible with other Avaya Servers and Media Gateway platforms running similar versions of Communication Manager and Session Manager.

**Note** – The Avaya Aura® servers and the Avaya SBCE used in the reference configuration and shown on the previous table were deployed on a virtualized environment. These Avaya components ran as virtual machines over VMware® (ESXi 6.0.0) platforms. Consult the installation documentation on the **References** section for more information.

## 5. Configure Avaya Aura® Communication Manager

This section describes the procedure for configuring Communication Manager to work with the CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform. A SIP trunk is established between Communication Manager and Session Manager for use by signaling traffic to and from the service provider. It is assumed that the general installation of Communication Manager, the Avaya G430 Media Gateway and the Avaya Aura® Media Server has been previously completed and is not discussed here.

The Communication Manager configuration was performed using the System Access Terminal (SAT). Some screens in this section have been abridged and highlighted for brevity and clarity in presentation. Some screens captures will show the use of the **change** command instead of the **add** command, since the configuration used for the testing was previously added.

### 5.1. Licensing and Capacity

Use the **display system-parameters customer-options** command to verify that the **Maximum Administered SIP Trunks** value on **Page 2** is sufficient to support the desired number of simultaneous SIP calls across all SIP trunks at the enterprise including any trunks to and from the service provider. The example shows that **30000** licenses are available and **120** are in use. The license file installed on the system controls the maximum values for these attributes. If a required feature is not enabled or there is insufficient capacity, contact an authorized Avaya sales representative.

```
display system-parameters customer-options                               Page 2 of 12
                                OPTIONAL FEATURES

IP PORT CAPACITIES                                                    USED
      Maximum Administered H.323 Trunks: 12000 0
    Maximum Concurrently Registered IP Stations: 18000 2
      Maximum Administered Remote Office Trunks: 12000 0
Maximum Concurrently Registered Remote Office Stations: 18000 0
      Maximum Concurrently Registered IP eCons: 414 0
    Max Concur Registered Unauthenticated H.323 Stations: 100 0
      Maximum Video Capable Stations: 41000 0
      Maximum Video Capable IP Softphones: 18000 6
      Maximum Administered SIP Trunks: 30000 120
Maximum Administered Ad-hoc Video Conferencing Ports: 24000 0
    Maximum Number of DS1 Boards with Echo Cancellation: 688 0

(NOTE: You must logoff & login to effect the permission changes.)
```

## 5.2. System Features

Use the **change system-parameters features** command to set the **Trunk-to-Trunk Transfer** field to **all** to allow incoming calls from the PSTN to be transferred to another PSTN endpoint. If for security reasons incoming calls should not be allowed to transfer back to the PSTN, then leave the field set to **none**.

```
display system-parameters features                                     Page 1 of 19
FEATURE-RELATED SYSTEM PARAMETERS
  Self Station Display Enabled? n
  Trunk-to-Trunk Transfer: all
  Automatic Callback with Called Party Queuing? n
  Automatic Callback - No Answer Timeout Interval (rings): 3
    Call Park Timeout Interval (minutes): 10
  Off-Premises Tone Detect Timeout Interval (seconds): 20
    AAR/ARS Dial Tone Required? y

  Music (or Silence) on Transferred Trunk Calls? all
  DID/Tie/ISDN/SIP Intercept Treatment: attendant
  Internal Auto-Answer of Attd-Extended/Transferred Calls: transferred
    Automatic Circuit Assurance (ACA) Enabled? n

  Abbreviated Dial Programming by Assigned Lists? n
  Auto Abbreviated/Delayed Transition Interval (rings): 2
    Protocol for Caller ID Analog Terminals: Bellcore
  Display Calling Number for Room to Room Caller ID Calls? n
```

On **Page 9** verify that a text string has been defined to replace the Calling Party Number (CPN) for restricted or unavailable calls. This text string is entered in the two fields highlighted below. The compliance test used the value of *restricted* for restricted calls and *unavailable* for unavailable calls.

```
display system-parameters features                                     Page 9 of 19
                                FEATURE-RELATED SYSTEM PARAMETERS

CPN/ANI/ICLID PARAMETERS
  CPN/ANI/ICLID Replacement for Restricted Calls: restricted
  CPN/ANI/ICLID Replacement for Unavailable Calls: unavailable

DISPLAY TEXT
                                Identity When Bridging: principal
                                User Guidance Display? n
  Extension only label for Team button on 96xx H.323 terminals? n

INTERNATIONAL CALL ROUTING PARAMETERS
                                Local Country Code:
                                International Access Code:

SCCAN PARAMETERS
  Enable Enbloc Dialing without ARS FAC? n

CALLER ID ON CALL WAITING PARAMETERS
  Caller ID on Call Waiting Delay Timer (msec): 200
```

### 5.3. IP Node Names

Use the **change node-names ip** command to verify that node names have been previously defined for the IP addresses of Communication Manager (**procr**) and the Session Manager security module (**SM**). These node names will be needed for defining the service provider signaling group in **Section 5.6**.

change node-names ip		Page 1 of 2
IP NODE NAMES		
Name	IP Address	
ASBCE_A1	10.64.101.243	
SM	10.64.101.249	
default	0.0.0.0	
media server	10.64.101.251	
procr	10.64.101.241	
procr6	::	
( 6 of 6 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		



## 5.4. Codecs

Use the **change ip-codec-set** command to define a list of codecs to use for calls between the enterprise and the service provider. For the compliance test, ip-codec-set 2 was used for this purpose. Enter the corresponding codec in the **Audio Codec** column of the table. CenturyLink supports audio codecs *G.729* and *G.711MU*.

change ip-codec-set 2 Page 1 of 2

IP MEDIA PARAMETERS

Codec Set: 2

	Audio Codec	Silence Suppression	Frames Per Pkt	Packet Size (ms)
1:	<u>G.729</u>	<u>n</u>	<u>2</u>	<u>20</u>
2:	<u>G.711MU</u>	<u>n</u>	<u>2</u>	<u>20</u>
3:	<u></u>	<u>-</u>	<u>-</u>	<u>-</u>
4:	<u></u>	<u>-</u>	<u>-</u>	<u>-</u>
5:	<u></u>	<u>-</u>	<u>-</u>	<u>-</u>
6:	<u></u>	<u>-</u>	<u>-</u>	<u>-</u>
7:	<u></u>	<u>-</u>	<u>-</u>	<u>-</u>

Media Encryption

1: 1-srtp-aescm128-hmac80

2: none

3:

4:

5:

Encrypted SRTCP: best-effort

On **Page 2**, set the **Fax Mode** to *t.38-standard* and **ECM** to *y*.

change ip-codec-set 2

Page 2 of 2

IP MEDIA PARAMETERS

Allow Direct-IP Multimedia? n

	Mode	Redun- dancy	Packet Size (ms)
FAX	<u>t.38-standard</u>	<u>0</u>	ECM: <u>y</u>
Modem	<u>off</u>	<u>0</u>	
TDD/TTY	<u>US</u>	<u>3</u>	
H.323 Clear-channel	<u>n</u>	<u>0</u>	
SIP 64K Data	<u>n</u>	<u>0</u>	<u>20</u>

Media Connection IP Address Type Preferences

1: IPv4

2:

## 5.5. IP Network Regions

Create a separate IP network region for the service provider trunk group. This allows for separate codec or quality of service settings to be used (if necessary) for calls between the enterprise and the service provider versus calls within the enterprise or elsewhere. For the compliance test, IP Network Region 2 was chosen for the service provider trunk. Use the **change ip-network-region 2** command to configure region 2 with the following parameters:

- Set the **Authoritative Domain** field to match the SIP domain of the enterprise. In this configuration, the domain name is **avaya.lab.com** as assigned to the shared test environment in the Avaya test lab. This domain name appears in the “From” header of SIP messages originating from this IP region.
- Enter a descriptive name in the **Name** field.
- Leave both **Intra-region** and **Inter-region IP-IP Direct Audio** set to **yes**, the default setting. This will enable **IP-IP Direct Audio** (shuffling), to allow audio traffic to be sent directly between IP endpoints without using media resources in the Avaya Media Gateway and Media Server. Shuffling can be further restricted at the trunk level on the Signaling Group form if needed.
- Set the **Codec Set** field to the IP codec set defined in **Section 5.4**.
- Default values may be used for all other fields.

change ip-network-region 2		Page 1 of 20
IP NETWORK REGION		
Region: 2	NR Group: 2	
Location: 1	Authoritative Domain: avaya.lab.com	
Name: SP Region	Stub Network Region: n	
MEDIA PARAMETERS		Intra-region IP-IP Direct Audio: yes
Codec Set: 2		Inter-region IP-IP Direct Audio: yes
UDP Port Min: 2048		IP Audio Hairpinning? n
UDP Port Max: 3349		
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		
H.323 IP ENDPOINTS		AUDIO RESOURCE RESERVATION PARAMETERS
H.323 Link Bounce Recovery? y		RSVP Enabled? n
Idle Traffic Interval (sec): 20		
Keep-Alive Interval (sec): 5		
Keep-Alive Count: 5		

On **Page 4**, define the IP codec set to be used for traffic between region 2 and region 1 (the rest of the enterprise). Enter the desired IP codec set in the **codec set** column of the row with destination region (**dst rgn**) 1. Default values may be used for all other fields. The following example shows the settings used for the compliance test. It indicates that codec set **2** will be used for calls between region 2 (the service provider region) and region 1 (the rest of the enterprise).

change ip-network-region 2										Page 4 of 20		
Source Region: 2 Inter Network Region Connection Management										I	M	
dst	codec	direct	WAN-BW-limits		Video		Intervening			Dyn	A	G
rgn	set	WAN	Units	Total	Norm	Prio	Shr	Regions	CAC	R	L	
1	<u>2</u>	y	NoLimit						n			
2	2										all	
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

## 5.6. Signaling Group

Use the **add signaling-group** command to create a signaling group between Communication Manager and Session Manager for use by the service provider trunk. This signaling group is used for inbound and outbound calls between the service provider and the enterprise. For the compliance test, signaling group 2 was used and was configured using the parameters highlighted below, shown on the screen on the next page:

- Set the **Group Type** field to *sip*.
- Set the **IMS Enabled** field to *n*. This specifies the Communication Manager will serve as an Evolution Server for the Session Manager.
- Set the **Transport Method** to the transport protocol to be used between Communication Manager and Session Manager. For the compliance test, *tls* was used.
- Set the **Peer Detection Enabled** field to *y*. The **Peer-Server** field will initially be set to *Others* and cannot be changed via administration. Later, the **Peer-Server** field will automatically change to *SM* once Communication Manager detects its peer is a Session Manager.

**Note:** Once the **Peer-Server** field is updated to *SM*, the system changes the default values of the following fields, setting them to display-only:

- Prepend '+' to Outgoing Calling/Alerting/Diverting/Connected Public Numbers? is changed to *y*.
- Remove '+' from Incoming Called/Calling/Alerting/Diverting/Connected Numbers? is changed to *n*.
- Set the **Near-end Node Name** to *procr*. This node name maps to the IP address of the Communication Manager as defined in **Section 5.3**.
- Set the **Far-end Node Name** to *SM*. This node name maps to the IP address of Session Manager, as defined in **Section 5.3**.
- Set the **Near-end Listen Port** and **Far-end Listen Port** to a valid unused port instead of the default well-known port value. (For TLS, the well-known port value is 5061). This is necessary so Session Manager can distinguish this trunk from the trunk used for other enterprise SIP traffic. The compliance test was conducted with the **Near-end Listen Port** and **Far-end Listen Port** set to *5071*.
- Set the **Far-end Network Region** to the IP network region defined for the Service Provider in **Section 5.5**.
- Set the **Far-end Domain** to the domain of the enterprise.
- Set the **DTMF over IP** field to *rtp-payload*. This value enables Communication Manager to send DTMF transmissions using RFC 2833.
- Set **Direct IP-IP Audio Connections** to *y*. This field will enable media shuffling on the SIP trunk allowing Communication Manager to redirect media traffic directly between the Avaya SBCE and the enterprise endpoint. If this value is set to *n*, then the Avaya Media Gateway or Media Server will remain in the media path of all calls between the SIP trunk and the endpoint. Depending on the number of media resources available in the Avaya Media Gateway and Media Server, these resources may be depleted during high call volume preventing additional calls from completing.
- Default values may be used for all other fields.

change signaling-group 2		Page 1 of 2
<b>SIGNALING GROUP</b>		
Group Number: 2	Group Type: sip	
IMS Enabled? <u>n</u>	Transport Method: <u>tls</u>	
Q-SIP? <u>n</u>		
IP Video? <u>n</u>	Enforce SIPS URI for SRTP? <u>y</u>	
Peer Detection Enabled? <u>y</u>	Peer Server: SM	Clustered? <u>n</u>
Prepend '+' to Outgoing Calling/Alerting/Diverting/Connected Public Numbers? <u>y</u>		
Remove '+' from Incoming Called/Calling/Alerting/Diverting/Connected Numbers? <u>n</u>		
Alert Incoming SIP Crisis Calls? <u>n</u>		
Near-end Node Name: <u>procr</u>	Far-end Node Name: <u>SM</u>	
Near-end Listen Port: <u>5071</u>	Far-end Listen Port: <u>5071</u>	
	Far-end Network Region: <u>2</u>	
Far-end Domain: <u>avaya.lab.com</u>		
Bypass If IP Threshold Exceeded? <u>n</u>		
Incoming Dialog Loopbacks: <u>eliminate</u>	RFC 3389 Comfort Noise? <u>n</u>	
DTMF over IP: <u>rtp-payload</u>	Direct IP-IP Audio Connections? <u>y</u>	
Session Establishment Timer(min): <u>3</u>	IP Audio Hairpinning? <u>n</u>	
Enable Layer 3 Test? <u>n</u>	Initial IP-IP Direct Media? <u>n</u>	
H.323 Station Outgoing Direct Media? <u>n</u>	Alternate Route Timer(sec): <u>6</u>	

## 5.7. Trunk Group

Use the **add trunk-group** command to create a trunk group for the signaling group created in **Section 5.6**. For the compliance test, trunk group 2 was configured using the parameters highlighted below.

- Set the **Group Type** field to *sip*.
- Enter a descriptive name for the **Group Name**.
- Enter an available trunk access code (TAC) that is consistent with the existing dial plan in the **TAC** field.
- Set the **Service Type** field to *public-ntwrk*.
- Set the **Signaling Group** to the signaling group shown in **Section 5.6**.
- Set the **Number of Members** field to the number of trunk members in the SIP trunk group. This value determines how many simultaneous SIP calls can be supported by this trunk.
- Default values were used for all other fields.

```
change trunk-group 2                                     Page 1 of 4
                                     TRUNK GROUP
Group Number: 2      Group Type: sip      CDR Reports: y
Group Name: Service Provider      COR: 1      TN: 1      TAC: 602
Direction: two-way      Outgoing Display? n
Dial Access? n      Night Service: _____
Queue Length: 0
Service Type: public-ntwrk      Auth Code? n
                                     Member Assignment Method: auto
                                     Signaling Group: 2
                                     Number of Members: 10
```

On **Page 2**, verify that the **Preferred Minimum Session Refresh Interval** is set to a value acceptable to the service provider. This value defines the interval that re-INVITEs must be sent to keep the active session alive. The default value of **600** seconds was used.

change trunk-group 2		Page 2 of 4
Group Type: sip		
TRUNK PARAMETERS		
Unicode Name: <u>auto</u>		
		Redirect On OPTIM Failure: <u>5000</u>
SCCAN? <u>n</u>	Digital Loss Group: <u>18</u>	
		<b>Preferred Minimum Session Refresh Interval(sec): <u>600</u></b>
Disconnect Supervision - In? <u>y</u> Out? <u>y</u>		
XOIP Treatment: <u>auto</u>		Delay Call Setup When Accessed Via IGAR? <u>n</u>
Caller ID for Service Link Call to H.323 1xC: <u>station-extension</u>		

On Page 3:

- Set the **Numbering Format** field to *private*. This field specifies the format of the calling party number (CPN) sent to the far-end. When *public* format is used, Communication Manager automatically inserts a “+” sign, preceding the numbers in the “From”, “Contact” and “P-Asserted Identity” (PAI) headers. To keep uniformity with the format used by CenturyLink, the **Numbering Format** was set to *private* and the **Numbering Format** in the route pattern was set to *unk-unk* (see **Section 5.10**).
- Set the **Replace Restricted Numbers** and **Replace Unavailable Numbers** fields to y. This will allow the CPN displayed on local endpoints to be replaced with the value set in **Section 5.2**, if the inbound call has enabled CPN block.

change trunk-group 2 Page 3 of 4

TRUNK FEATURES

ACA Assignment? ☒ Measured: none Maintenance Tests? y

Suppress # Outpulsing? ☐ **Numbering Format: private** UI Treatment: service-provider

**Replace Restricted Numbers? y**  
**Replace Unavailable Numbers? y**

Hold/Unhold Notifications? y

Modify Tandem Calling Number: no

Show ANSWERED BY on Display? y



On Page 4:

- Set the **Network Call Redirection** field to **y**. With this setting, Communication Manager will use the SIP REFER method, which is supported by CenturyLink, for the redirection of PSTN calls that are transferred back to the SIP trunk (refer to **Section 2.2**).
- Set the **Send Diversion Header** field to **y** and **Support Request History** to **n**.
- Set the **Telephone Event Payload Type** to **101**, the value preferred by CenturyLink.
- Verify that **Identity for Calling Party Display** is set to **P-Asserted-Identity**.
- Default values were used for all other fields.

change trunk-group 2	Page 4 of 4
PROTOCOL VARIATIONS	
Mark Users as Phone? <u>n</u>	
Prepend '+' to Calling/Alerting/Diverting/Connected Number? <u>n</u>	
Send Transferring Party Information? <u>n</u>	
Network Call Redirection? <u>y</u>	
Build Refer-To URI of REFER From Contact For NCR? <u>n</u>	
Send Diversion Header? <u>y</u>	
Support Request History? <u>n</u>	
Telephone Event Payload Type: <u>101</u>	
Convert 180 to 183 for Early Media? <u>n</u>	
Always Use re-INVITE for Display Updates? <u>n</u>	
Identity for Calling Party Display: <u>P-Asserted-Identity</u>	
Block Sending Calling Party Location in INVITE? <u>n</u>	
Accept Redirect to Blank User Destination? <u>n</u>	
Enable Q-SIP? <u>n</u>	
Interworking of ISDN Clearing with In-Band Tones: <u>keep-channel-active</u>	
Request URI Contents: <u>may-have-extra-digits</u>	

The calling party number is sent in the SIP “From”, “Contact” and “PAI” headers. Since private numbering was selected to define the format of this number (**Section 5.7**), use the **change private-numbering** command to create an entry for each extension which has a DID assigned. DID numbers are provided by the SIP service provider. Each DID number is assigned in this table to one enterprise internal extension or Vector Directory Numbers (VDNs). In the example below, three DID numbers were assigned by the service provider for testing. These DID numbers were used as the outbound calling party information on the service provider trunk when calls were originated from the mapped extensions.

[illegible]

## 5.9. Inbound Routing

In general, the “incoming call handling treatment” form for a trunk group can be used to manipulate the digits received for an incoming call if necessary. Since Session Manager is present, Session Manager can be used to perform digit conversion using an Adaptation, and digit manipulation via the Communication Manager incoming call handling table may not be necessary. If the DID number sent by CenturyLink is left unchanged by Session Manager, then the DID number can be mapped to an extension using the incoming call handling treatment of the receiving trunk group. Use the **change inc-call-handling-trmt** command to create an entry for each DID.

change inc-call-handling-trmt trunk-group 2					Page 1 of 30
INCOMING CALL HANDLING TREATMENT					
Service/ Feature	Number Len	Number Digits	Del	Insert	
public-ntwrk	10	3031235744	10	3042	
public-ntwrk	10	3031235747	10	3044	
public-ntwrk	10	3031235748	10	3050	
public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					
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public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					
public-ntwrk					

## 5.10.Outbound Routing

In these Application Notes, the Automatic Route Selection (ARS) feature is used to route outbound calls via the SIP trunk to the service provider. In the sample configuration, the single digit 9 is used as the ARS access code. Enterprise callers will dial 9 to reach an “outside line”. This common configuration is illustrated below with little elaboration. Use the **change dialplan analysis** command to define a dialed string beginning with **9** of length **1**, as a feature access code (*fac*).

change dialplan analysis			DIAL PLAN ANALYSIS TABLE						Page 1 of 12
			Location: all			Percent Full: 2			
Dialed String	Total Length	Call Type	Dialed String	Total Length	Call Type	Dialed String	Total Length	Call Type	
0	13	udp							
1	4	dac							
2	4	ext							
3	4	ext							
4	4	udp							
5	4	ext							
6	3	dac							
7	4	ext							
8	1	fac							
9	1	fac							
*	3	dac							
#	2	dac							

Use the **change feature-access-codes** command to configure **9** as the **Auto Route Selection (ARS) – Access Code 1**.

change feature-access-codes		Page 1 of 10
FEATURE ACCESS CODE (FAC)		
Abbreviated Dialing List1 Access Code:	_____	
Abbreviated Dialing List2 Access Code:	_____	
Abbreviated Dialing List3 Access Code:	_____	
Abbreviated Dial - Prgm Group List Access Code:	_____	
Announcement Access Code:	#7 _____	
Answer Back Access Code:	_____	
Attendant Access Code:	_____	
Auto Alternate Routing (AAR) Access Code:	8 _____	
Auto Route Selection (ARS) - Access Code 1:	9 _____	Access Code 2: _____
Automatic Callback Activation:	_____	Deactivation: _____
Call Forwarding Activation Busy/DA:	_____ All: _____	Deactivation: _____
Call Forwarding Enhanced Status:	_____ Act: _____	Deactivation: _____
Call Park Access Code:	_____	
Call Pickup Access Code:	_____	
CAS Remote Hold/Answer Hold-Unhold Access Code:	_____	
CDR Account Code Access Code:	_____	
Change COR Access Code:	_____	
Change Coverage Access Code:	_____	
Conditional Call Extend Activation:	_____	Deactivation: _____
Contact Closure Open Code:	_____	Close Code: _____

Use the **change ars analysis** command to configure the routing of dialed digits following the first digit 9. The example below shows a subset of the dialed strings tested as part of the compliance test. See **Section 2.1** for the complete list of call types tested. All dialed strings are mapped to route pattern 2, which contains the SIP trunk group to the service provider.

list ars analysis						Page	8
ARS DIGIT ANALYSIS REPORT							
Location: all							
Dialed String	Total Min	Total Max	Route Pattern	Call Type	Node Number	ANI Req	
178	11	11	deny	fnpa		n	
1786	11	11	2	fnpa		n	
179	11	11	deny	fnpa		n	
180	11	11	deny	fnpa		n	
1800	11	11	2	fnpa		n	
1800555	11	11	deny	fnpa		n	
1809	11	11	2	hnpa		n	
181	11	11	deny	fnpa		n	
182	11	11	deny	fnpa		n	
183	11	11	deny	fnpa		n	
184	11	11	deny	fnpa		n	
185	11	11	deny	fnpa		n	
press CANCEL to quit -- press NEXT PAGE to continue							

The route pattern defines which trunk group will be used for the call and performs any necessary digit manipulation. Use the **change route-pattern** command to configure the parameters for the service provider trunk route pattern in the following manner. The example below shows the values used for route pattern 2 in the compliance test.

- **Pattern Name:** Enter a descriptive name.
- **Grp No:** Enter the outbound trunk group for the SIP service provider.
- **FRL:** Set the Facility Restriction Level (**FRL**) field to a level that allows access to this trunk for all users that require it. The value of **0** is the least restrictive level.
- **Pfx Mrk:** Set to **1** to ensure 1 + 10 digits are sent to the service provider for long distance numbers in the North American Numbering Plan (NANP).
- **Numbering Format:** Set to **unk-unk**. All calls using this route pattern will use the private numbering table. See setting of the **Numbering Format** in the trunk group form for full details in **Section 5.7**.

change route-pattern 2															Page 1 of 3	
Pattern Number: 2															Pattern Name: <u>Serv. Provider</u>	
SCCAN? <u>n</u> Secure SIP? <u>n</u> Used for SIP stations? <u>n</u>																
Grp No	FRL	NPA	Pfx Mrk	Hop Lmt	Toll List	No. Del	Inserted Dgts					DCS/ QSIG Intw	IXC			
1:	<u>2</u>	<u>0</u>		<u>1</u>								<u>n</u>	<u>user</u>			
2:												<u>n</u>	<u>user</u>			
3:												<u>n</u>	<u>user</u>			
4:												<u>n</u>	<u>user</u>			
5:												<u>n</u>	<u>user</u>			
6:												<u>n</u>	<u>user</u>			

BCC	VALUE	TSC	CA-TSC	ITC	BCIE	Service/Feature	PARM	Sub	Numbering	LAR	
0	1	2	M	4	W	Request		Dgts	Format		
1:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>	<u>unk-unk</u>	<u>none</u>
2:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>		<u>none</u>
3:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>		<u>none</u>
4:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>		<u>none</u>
5:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>		<u>none</u>
6:	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>n</u>	<u>n</u>		<u>rest</u>		<u>none</u>

**Note** - Enter the **save translation** command (not shown) to save all the changes made to the Communication Manager configuration in the previous sections.

## 6. Configure Avaya Aura® Experience Portal

These Application Notes assume that the necessary Experience Portal licenses have been installed and basic Experience Portal administration has already been performed. Consult [9] in the **References** section for further details if necessary.

### 6.1. Background

Experience Portal consists of one or more Media Processing Platform (MPP) servers and an Experience Portal Manager (EPM) server. A single “server configuration” was used in the reference configuration. This consisted of a single MPP and EPM, running on a VMware environment, including an Apache Tomcat Application Server (hosting the Voice XML (VXML) and/or Call Control XML (CCXML) application scripts), that provide the directives to Experience Portal for handling the inbound calls.

References to the Voice XML and/or Call Control XML applications are administered on Experience Portal, along with one or more called numbers for each application reference. When an inbound call arrives at Experience Portal, the called party DID number is matched against those administered called numbers. If a match is found, then the corresponding application is accessed to handle the call. If no match is found, Experience Portal informs the caller that the call cannot be handled, and disconnects the call<sup>1</sup>.

For the sample configuration described in these Application Notes, a simple VXML test application was used to exercise various SIP call flow scenarios with the CenturyLink SIP Trunk service. In production, enterprises can develop their own VXML and/or CCXML applications to meet specific customer self-service needs, or consult Avaya Professional Services and/or authorized Avaya Business Partners. The development and deployment of VXML and CCXML applications is beyond the scope of these Application Notes.

---

<sup>1</sup> An application may be configured with “inbound default” as the called number, to process all inbound calls that do not match any other application references.



## 6.2. Logging In and Licensing

This section describes the steps on Experience Portal for administering a SIP connection to the Session Manager.

**Step 1** - Launch a web browser, enter `http://<IP address of the Avaya EPM server>/` in the URL, log in with the appropriate credentials and the following screen is displayed.

**Note** – All page navigation described in the following sections will utilize the menu shown on the left pane of the screenshot below.

**AVAYA**

Welcome, eadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)

Expand All | Collapse All

You are here: Home

### Avaya Aura® Experience Portal Manager

Avaya Aura® Experience Portal Manager (EPM) is the consolidated web-based application for administering Experience Portal. Through the EPM interface you can configure Experience Portal, check the status of an Experience Portal component, and generate reports related to system operation.

#### Installed Components

**Media Processing Platform**  
Media Processing Platform (MPP) is an Avaya media processing server. When an MPP receives a call from a PBX, it invokes a VoiceXML (or CCXML) application on an application server. It then communicates with ASR and TTS servers as necessary to process the call.

**Email Service**  
Email Service is an Experience Portal feature which provides e-mail capabilities.

**HTML Service**  
HTML Service is an Experience Portal feature which supports web applications with HTML5 capabilities. It includes support for browser based services for mobile devices.

**SMS Service**  
SMS Service is an Experience Portal feature which provides SMS capabilities.

#### Legal Notice

AVAYA GLOBAL SOFTWARE LICENSE TERMS  
REVISED: May 1, 2017

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**Step 2** - In the left pane, navigate to **Security**→**Licensing**. On the **Licensing** page, verify that Experience Portal is properly licensed. If required licenses are not enabled, contact an authorized Avaya account representative to obtain the licenses.

**AVAYA**

Welcome, epadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

Press F11 to exit full screen

Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)

Expand All | Collapse All

**▼ User Management**  
Roles  
Users  
Login Options

**▼ Real-time Monitoring**  
System Monitor  
Active Calls  
Port Distribution

**▼ System Maintenance**  
Audit Log Viewer  
Trace Viewer  
Log Viewer  
Alarm Manager

**▼ System Management**  
Application Server  
EPM Manager  
MPP Manager  
Software Upgrade  
System Backup

**▼ System Configuration**  
Applications  
EPM Servers  
MPP Servers  
SNMP  
Speech Servers  
VoIP Connections  
Zones

**▼ Security**  
Certificates  
**Licensing**

**▼ Reports**  
Standard  
Custom  
Scheduled

**▼ Multi-Media Configuration**  
Email  
HTML  
SMS

You are here: [Home](#) > [Security](#) > [Licensing](#)

## Licensing

This page displays the Experience Portal license information that is currently in effect. Experience Portal uses Avaya License Manager (WebLM) to control the number of telephony ports that are used.

**License Server Information**

License Server URL:	https://10.64.101.247:52233/WebLM/LicenseServer
Last Updated:	Dec 4, 2018 3:20:00 PM PST
Last Successful Poll:	Feb 5, 2019 1:34:37 PM PST

**Licensed Products**

Experience Portal	
Announcement Ports:	100
ASR Connections:	100
Email Units:	10
Enable Media Encryption:	1
Enhanced Call Classification:	100
HTML Units:	10
SIP Signaling Connections:	100
SMS Units:	10
Telephony Ports:	100
TTS Connections:	100
Video Server Connections:	100
Zones:	1
Version:	7
Last Successful Poll:	Feb 5, 2019 1:34:37 PM PST
Last Changed:	Dec 4, 2018 3:19:59 PM PST

**Allocations** **Help**

## 6.3. VoIP Connection

This section defines a SIP trunk between Experience Portal and Session Manager (Sections 7.5 and 7.6).

**Step 1** - In the left pane, navigate to **System Configuration** → **VoIP Connections**. On the **VoIP Connections** page, select the **SIP** tab and click **Add** to add a SIP trunk.

**Note** – Only *one* SIP trunk can be active at any given time on Experience Portal.

The screenshot shows the Avaya Aura Experience Portal 7.2.0 (ExperiencePortal) interface. The left navigation pane is expanded, showing the 'System Configuration' section with 'VoIP Connections' selected. The main content area displays the 'VoIP Connections' page, which includes a table of existing connections. The 'SIP' tab is selected, and the 'Add' button is highlighted.

Name	Enable	Proxy Transport	Proxy/DNS Server Address	Proxy Server Port	Listener Port	SIP Domain	Maximum Simultaneous Calls
EP_SIP	Yes	TLS	10.64.101.249	5061	5061	avaya.lab.com	100

**Step 2** - Configure a SIP connection as follows:

- **Name** – Set to a descriptive name (e.g., **EP\_SIP**).
- **Enable** – Set to **Yes**.
- **Proxy Server Transport** – Set to **TLS**.
- Select **Proxy Servers**, and enter:
  - **Proxy Server Address** = **10.64.101.249** (the IP address of the Session Manager signaling interface defined in Section 7.5).
  - **Port** = **5061**
  - **Priority** = **0** (default)
  - **Weight** = **0** (default)
- **Listener Port** – Set to **5061**.
- **SIP Domain** – Set to **avaya.lab.com** (see Section 7.2).
- **Consultative Transfer** – Select **REFER**.
- **SIP Reject Response Code** – Select **ASM (503)**.
- **Maximum Simultaneous Calls** – Set to a number in accordance with licensed capacity. In the reference configuration a value of **100** was used.
- Select **All Calls can be either inbound or outbound**.

- **SRTP Enable = Yes**
- **Encryption Algorithm = AES\_CM\_128**
- **Authentication Algorithm = HMAC\_SHA1\_80**
- **RTCP Encryption Enabled = No**
- **RTP Authentication Enabled = Yes**
- Click on **Add** to add SRTP settings to the **Configured SRTP List**
- Use default values for all other fields.
- Click **Save**.

**AVAYA** Welcome, epadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)

Expand All | Collapse All

- ▼ **User Management**
  - Roles
  - Users
  - Login Options
- ▼ **Real-time Monitoring**
  - System Monitor
  - Active Calls
  - Port Distribution
- ▼ **System Maintenance**
  - Audit Log Viewer
  - Trace Viewer
  - Log Viewer
  - Alarm Manager
- ▼ **System Management**
  - Application Server
  - EPM Manager
  - MPP Manager
  - Software Upgrade
- ▼ **System Configuration**
  - Applications
  - EPM Servers
  - MPP Servers
  - SNMP
  - Speech Servers
  - VoIP Connections
  - Zones
- ▼ **Security**
  - Certificates
  - Licensing
- ▼ **Reports**
  - Standard
  - Custom
  - Scheduled
- ▼ **Multi-Media Configuration**
  - Email
  - HTML
  - SMS

**EP\_SIP**

Enable: ☒ Yes ☐ No

Proxy Transport: TLS

☒ Proxy Servers ☐ DNS SRV Domain

Address	Port	Priority	Weight	
10.64.101.249	5061	0	0	Remove

Additional Proxy Server

Listener Port: 5061

SIP Domain: avaya.lab.com

P-Asserted-Identity:

Maximum Redirection Attempts: 0

Consultative Transfer: ☐ INVITE with REPLACES ☒ REFER

SIP Reject Response Code: ☒ ASM (503) ☐ SES (480) ☐ Custom 503

**SIP Timers**

T1: 250 milliseconds

T2: 2000 milliseconds

B and F: 4000 milliseconds

**Call Capacity**

Maximum Simultaneous Calls: 100

☒ All Calls can be either inbound or outbound

☐ Configure number of inbound and outbound calls allowed

**SRTP**

Enable: ☒ Yes ☐ No

Encryption Algorithm: ☒ AES\_CM\_128 ☐ NONE

Authentication Algorithm: ☒ HMAC\_SHA1\_80 ☐ HMAC\_SHA1\_32

RTCP Encryption Enabled: ☐ Yes ☒ No

RTP Authentication Enabled: ☒ Yes ☐ No

**Add**

**Configured SRTP List**

SRTP-Yes,AES\_CM\_128,HMAC\_SHA1\_80,RTCP Encryption-No,RTP Authentication-Yes

**Remove**

**Save Apply Cancel Help**

## 6.4. Speech Servers

The installation and administration of the ASR and TSR Speech Servers are beyond the scope of this document. Some of the values shown below were defined during the Speech Server installations. Note that in the reference configuration the ASR and TTS servers used the same IP address.

ASR speech server:

**Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)**

Welcome, epadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

You are here: [Home](#) > System Configuration > Speech Servers

### Speech Servers

This page displays the list of Automated Speech Recognition (ASR) and Text-to-Speech (TTS) servers that Experience Portal communicates with.

**ASR** **TTS**

<input type="checkbox"/>	Name	Enable	Network Address	Engine Type	MRCP	Base Port	Total Number of Licensed ASR Resources	Languages
<input type="checkbox"/>	NuanceASR	Yes	10.64.101.154	Nuance	MRCP V1 4900	10	10	English(USA) en-US

**Add** **Delete**  
**Customize** **Help**

TTS speech server:

**Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)**

Welcome, epadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

You are here: [Home](#) > System Configuration > Speech Servers

### Speech Servers

This page displays the list of Automated Speech Recognition (ASR) and Text-to-Speech (TTS) servers that Experience Portal communicates with.

**ASR** **TTS**

<input type="checkbox"/>	Name	Enable	Network Address	Engine Type	MRCP	Base Port	Total Number of Licensed TTS Resources	Voices
<input type="checkbox"/>	Nuance	Yes	10.64.101.154	Nuance	MRCP V1 4900	10	10	English(USA) en-US Jennifer F

**Add** **Delete**  
**Customize** **Help**

## 6.5. Application References

This section describes the steps for administering a reference to the VXML and/or CCXML applications residing on the application server. In the sample configuration, the applications were co-resident on one Experience Portal server, with IP Address 10.64.101.252.

**Step 1** - In the left pane, navigate to **System Configuration** → **Applications**. On the **Applications** page (not shown), click **Add** to add an application and configure as follows:

- **Name** – Set to a descriptive name (e.g., **Test2\_APP**).
- **Enable** – Set to **Yes**. This field determines which application(s) will be executed based on their defined criteria.
- **Type** – Select **VoiceXML**, **CCXML**, or **CCXML/VoiceXML** according to the application type.
- **VoiceXML** and/or **CCXML URL** – Enter the necessary URL(s) to access the VXML and/or CCXML application(s) on the application server. In the sample screen below, the Experience Portal test application on a single server is referenced.

- **Speech Servers ASR and TTS** – Select the appropriate ASR and/or TTS servers as necessary.
- **Application Launch** – Set to **Inbound**.
- **Called Number** – Enter the number to match against an inbound SIP INVITE message, and click **Add**. In the sample configuration illustrated in these Application Notes, the dialed DID number 3031235744 provided by CenturyLink was used. Repeat to define additional called party numbers as needed. Inbound calls with these called party numbers will be handled by the application defined in this section.

**AVAYA** Welcome, epadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

**Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)**

You are here: [Home](#) > [System Configuration](#) > [Applications](#) > [Change Application](#)

### Change Application

Use this page to change the configuration of an application.

Name: Test2\_APP  
 Enable: ☒ Yes ☐ No  
 Type: CCXML  
 Reserved SIP Calls: ☒ None ☐ Minimum ☐ Maximum  
 Requested: 5  
 URI: ☐ Single ☐ Fail Over ☐ Load Balance  
 CCXML URL:  **Verify**

Mutual Certificate Authentication: ☐ Yes ☒ No  
 Basic Authentication: ☐ Yes ☒ No

**Speech Servers**

ASR: Nuance  
 Languages: <None>  
 Selected Languages: English(USA) en-US  
 TTS: Nuance  
 Voices: <None>  
 Selected Voices: English(USA) en-US Jennifer F

**Application Launch**

☒ Inbound ☐ Inbound Default ☐ Outbound  
☒ Number ☐ Number Range ☐ URI  
 Called Number:  **Add**  
 **Remove**

**Speech Parameters** **Reporting Parameters** **Advanced Parameters**

**Save Apply Cancel Help**

## 6.6. MPP Servers and VoIP Settings

This section illustrates the procedure for viewing or changing the MPP Settings. In the sample configuration, the MPP Server is co-resident on a single server with the Experience Portal Management server (EPM).

**Step 1** - In the left pane, navigate to **System Configuration** → **MPP Servers** and the following screen is displayed. Click **Add**.



**AVAYA** Welcome, eadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

**Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)** Home Help Logoff

Expand All | Collapse All

You are here: [Home](#) > System Configuration > MPP Servers

### MPP Servers

This page displays the list of Media Processing Platform (MPP) servers in the Experience Portal system. When an MPP receives a call from a PBX, it invokes a VoiceXML application on an application server and communicates with ASR and TTS servers as necessary to process the call.

<input type="checkbox"/>	Name	Host Address	Network Address (VoIP)	Network Address (MRCP)	Network Address (AppSvr)	Maximum Simultaneous Calls	Trace Level
<input type="checkbox"/>	MPP	10.64.101.252	<Default>	<Default>	<Default>	10	Use MPP Settings

**Add** **Delete**

**MPP Settings** **Browser Settings** **Video Settings** **VoIP Settings** **Help**

**System Configuration**

- Applications
- EPM Servers
- MPP Servers**
- SNMP
- Speech Servers
- VoIP Connections
- Zones

**Step 2** - Enter any descriptive name in the **Name** field (e.g., **MPP**) and the IP address of the MPP server in the **Host Address** field and click **Continue** (not shown). Note that the Host Address used is the same IP address assigned to Experience Portal.

**Step 3** - The certificate page will open. Check the **Trust this certificate** box (not shown). Once complete, click **Save**.

**AVAYA** Welcome, eadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

**Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)** Home Help Logoff

Expand All | Collapse All

You are here: [Home](#) > System Configuration > [MPP Servers](#) > Change MPP Server

### Change MPP Server

Use this page to change the configuration of an MPP. Take care when changing the MPP Trace Logging Thresholds. Do not set Trace Levels to Finest if your Experience Portal system has heavy call traffic. The system might experience performance issues if Trace Levels are set to Finest. Set Trace Levels to Finest only when you are troubleshooting the system.

Name: MPP  
Host Address: 10.64.101.252  
Network Address (VoIP): <Default>  
Network Address (MRCP): <Default>  
Network Address (AppSvr): <Default>  
Maximum Simultaneous Calls: 10  
Restart Automatically: ☒ Yes ☐ No

#### MPP Certificate

Owner: CN=hg-ep-thornton.avaya.lab.com,O=Avaya,OU=EPH  
Issuer: CN=hg-ep-thornton.avaya.lab.com,O=Avaya,OU=EPH  
Serial Number: 8bed8dc7243144  
Signature Algorithm: SHA256withRSA  
Valid from: November 16, 2018 10:24:54 AM PST until November 13, 2028 10:24:54 AM PST  
Certificate Fingerprints  
MD5: c6:38:2d:66:7e:55:fc:e7:a0:bb:69:91:20:60:0b:e4  
SHA: 36:bc:ca:82:1f:a8:9a:d0:37:32:33:89:7f:3d:71:99:a9:10:53:08  
SHA-256: ff:80:8a:07:92:d5:55:cd:0b:a5:7f:fd:d8:d2:52:5e:16:14:da:a1:66:c6:f2:dd:2e:26:8d:88:49:12:ee:f0  
Subject Alternative Names  
DNS Name: hg-ep-thornton  
DNS Name: hg-ep-thornton.avaya.lab.com  
IP Address: 10.64.101.252

**Categories and Trace Levels**

**Save** **Apply** **Cancel** **Help**

**System Configuration**

- Applications
- EPM Servers
- MPP Servers**
- SNMP
- Speech Servers
- VoIP Connections
- Zones
- Security**
- Certificates
- Licensing
- Reports**
- Standard
- Custom
- Scheduled
- Multi-Media Configuration**
- Email
- HTML
- SMS

**Step 4** - Click **VoIP Settings** tab on the screen displayed in **Step 1**, and the following screen is displayed.

- In the Port Ranges section, default ports were used.

**AVAYA** Welcome, eadmin  
Last logged in Jan 29, 2019 at 11:55:28 AM PST

Avaya Aura® Experience Portal 7.2.0 (ExperiencePortal)

You are here: [Home](#) > [System Configuration](#) > [MPP Servers](#) > VoIP Settings

### VoIP Settings

Voice over Internet Protocol (VoIP) is the process of sending voice data through a network using one or more standard protocols such as H.323 and Real-time Transfer Protocol (RTP). Use this page to configure parameters that affect how voice data is transferred through the network. Note that if you make any changes to this page, you must restart all MPPs.

**Port Ranges**

	Low	High
UDP:	11000	30999
TCP:	31000	33499
MRCP:	34000	36499
H.323 Station:	37000	39499

**RTCP Monitor Settings**

Host Address:

Port:

**VoIP Audio Formats**

MPP Native Format:

**Codecs**

**QoS Parameters**

**Out of Service Threshold (% of VoIP Resources)**

**Call Progress**

**Miscellaneous**

**Save** **Apply** **Cancel** **Help**



- In the Codecs section set:
  - Set **Packet Time** to **20**.
  - Verify the **G729 Codec** is enabled.
  - Set the **Offer G729 Discontinuous Transmission** to **No**.
  - Set the **Offer Order** to the preferred codec. In the sample configuration, **G729** is the first codec, followed by **G711ulaw**, then **G711aLaw**.
- Use default values for all other fields.

**Step 5 - Click on Save.**

**AVAYA** Welcome, eadmin  
Last logged in today at 6:18:06 AM PDT

Avaya Aura® Experience Portal 7.2.2 (ExperiencePortal)

You are here: [Home](#) > [System Configuration](#) > [MPP Servers](#) > [VoIP Settings](#)

### VoIP Settings

Voice over Internet Protocol (VoIP) is the process of sending voice data through a network using one or more standard protocols such as H.323 and Real-time Transfer Protocol (RTP). Use this page to configure parameters that affect how voice data is transferred through the network. Note that if you make any changes to this page, you must restart all MPPs.

**Port Ranges**

	Low	High
UDP:	11000	30999
TCP:	31000	33499
MRCP:	34000	36499
H.323 Station:	37000	39499

**RTP Monitor Settings**

Host Address:

Port:

**VoIP Audio Formats**

MPP Native Format:

**Codecs**

**Offer**

Enable	Codec	Order
<input checked="" type="checkbox"/>	G729	1
<input checked="" type="checkbox"/>	G711uLaw	2
<input checked="" type="checkbox"/>	G711aLaw	3

Packet Time:  milliseconds

G729 Discontinuous Transmission: ☐ Yes ☒ No

**Answer**

Enable	Codec	Order
<input checked="" type="checkbox"/>	G711uLaw	1
<input checked="" type="checkbox"/>	G711aLaw	1
<input checked="" type="checkbox"/>	G729	1

G729 Discontinuous Transmission: ☐ Yes ☐ No ☒ Either

G729 Reduced Complexity Encoder: ☒ Yes ☐ No

**QoS Parameters**

Out of Service Threshold (% of VoIP Resources)

Call Progress

Miscellaneous

**Save** **Apply** **Cancel** **Help**

## 6.7. Configuring RFC2833 Event Value Offered by Experience Portal

The configuration change example noted in this section was not required for any of the call flows illustrated in these Application Notes. For incoming calls from CenturyLink to Experience Portal, CenturyLink specifies the value 101 for the RFC2833 telephone-events that signal DTMF digits entered by the user. When Experience Portal answers, the SDP from Experience Portal matches this CenturyLink offered value.

When Experience Portal sends an INVITE with SDP as part of an INVITE-based transfer (e.g., bridged transfer), Experience Portal offers the SDP. By default, Experience Portal specifies the value 127 for the RFC2833 telephone-events. Optionally, the value that is offered by Experience Portal can be changed, and this section outlines the procedure that can be performed by an Avaya authorized representative.

- Access Experience Portal via the command line interface.
- Navigate to the following directory: /opt/Avaya/ ExperiencePortal/MPP/config
- Edit the file mppconfig.xml.
- Search for the parameter “mpp.sip.rfc2833.payload”. If there is no such parameter specified, add a line such as the following to the file, where the value 101 is the value to be used for the RFC2833 events. If the parameter is already specified in the file, simply edit the value assigned to the parameter.  
`<parameter name="mpp.sip.rfc2833.payload">101</parameter>`
- In the verification of these Application Notes, the line was added directly above the line where the sip.session.expires parameter is configured.

After saving the file with the change, restart the MPP server for the change to take effect. As shown below, the MPP may be restarted using the **Restart** button available via the Experience Portal GUI at **System Management → MPP Manager**.

Note that the **State** column shows when the MPP is running after the restart.

The screenshot shows the Avaya Aura Experience Portal 7.2.0 GUI. The top navigation bar includes the Avaya logo, user information (Welcome, epadmin), and a timestamp (Last logged in Jan 29, 2019 at 11:55:28 AM PST). The left sidebar contains a tree view of system management options, with 'System Management' expanded and 'MPP Manager' selected. The main content area is titled 'MPP Manager (Feb 5, 2019 2:34:27 PM PST)' and includes a 'Refresh' button. A message states: 'This page displays the current state of each MPP in the Experience Portal system. To enable the state and mode commands, select one or more MPPs. To enable the mode commands, the selected MPPs must also be stopped.' Below this is a table of MPPs:

Server Name	Mode	State	Config	Auto Restart	Restart Schedule	Active Calls		
					Today	Recurring	In	Out
MPP	Online	Running	OK	Yes	No	None	0	0

Below the table are two sections: 'State Commands' with buttons for Start, Stop, Restart, Reboot, Halt, and Cancel; and 'Mode Commands' with buttons for Offline, Test, and Online. A 'Help' button is also present. To the right of the State Commands is a 'Restart/Reboot Options' section with radio buttons for 'One server at a time' (selected) and 'All servers'.

## 7. Configure Avaya Aura® Session Manager

This section provides the procedures for configuring Session Manager. The procedures include adding the following items:

- SIP domain.
- Logical/physical Locations that can be occupied by SIP Entities.
- Adaptation module to perform header manipulations.
- SIP Entities corresponding to Communication Manager, Session Manager, Experience Portal and the Avaya SBCE.
- Entity Links, which define the SIP trunk parameters used by Session Manager when routing calls to/from SIP Entities.
- Routing Policies, which control call routing between the SIP Entities.
- Dial Patterns, which govern to which SIP Entity a call is routed.

The following sections assume that the initial configuration of Session Manager and System Manager has already been completed, and that network connectivity exists between System Manager and Session Manager.

## 7.1. System Manager Login and Navigation

Session Manager configuration is accomplished by accessing the browser-based GUI of System Manager, using the URL “https://<ip-address>/SMGR”, where “<ip-address>” is the IP address of System Manager. Log in with the appropriate credentials and click on **Log On** (not shown). The screen shown below is then displayed; under **elements** select **Routing** → **Domains**.

The screenshot displays the Avaya Aura System Manager 8.0 interface. The top navigation bar includes 'Users', 'Elements', 'Services', 'Widgets', and 'Shortcuts'. The 'Elements' menu is expanded, showing a list of system components. The 'Routing' option is highlighted, and its sub-menu is visible, with 'Domains' selected. The main dashboard area contains several widgets: 'System Resource Utilization' (a bar chart showing utilization for 'opt', 'var', and 'emdata'), 'Alarms' (empty), 'Notifications' (empty), 'Application State' (showing license status as 'Active'), 'Information' (showing sync status for various elements), and 'Shortcuts' (empty). The 'Current Usage' section shows 6/250000 USERS and 1/50 SIMULTANEOUS ADMINISTRATIVE LOGINS.

Category	Utilization
opt	~10
var	~5
emdata	~15

Elements	GNRL	Sync Status
CM	1	■
Messaging	1	■
Session Manager	1	■
System Manager	1	■
UCM Applications	16	■

Property	Value
License Status	Active
Deployment Type	VMware
Multi-Tenancy	DISABLED
OoBM State	DISABLED
Hardening Mode	Standard

Usage Type	Value
USERS	6/250000
SIMULTANEOUS ADMINISTRATIVE LOGINS	1/50

The navigation tree displayed in the left pane below will be referenced in subsequent sections to navigate to items requiring configuration. Most items discussed in this section will be located under the **Routing** link shown below.

The screenshot displays the Avaya Aura System Manager 8.0 web interface. The top navigation bar includes the Avaya logo, the text "Aura® System Manager 8.0", and several menu items: Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile icon labeled "admin" are also present. Below the top bar, there are tabs for "Home" and "Routing x". The left-hand navigation pane shows a tree structure with "Routing" expanded, revealing sub-items: Domains, Locations, Adaptations, SIP Entities, Entity Links, Time Ranges, Routing Policies, Dial Patterns, Regular Expressions, and Defaults. The "Domains" item is highlighted. The main content area is titled "Domain Management" and features a "Help ?" link. Below the title is a toolbar with buttons for "New", "Edit", "Delete", "Duplicate", and "More Actions". A table below the toolbar shows "1 Item" with a refresh icon and a "Filter: Enable" option. The table has three columns: "Name", "Type", and "Notes". A single row is displayed with the name "avaya.lab.com", type "sip", and notes "HG V-Domain". At the bottom of the table, there is a "Select : All, None" option.

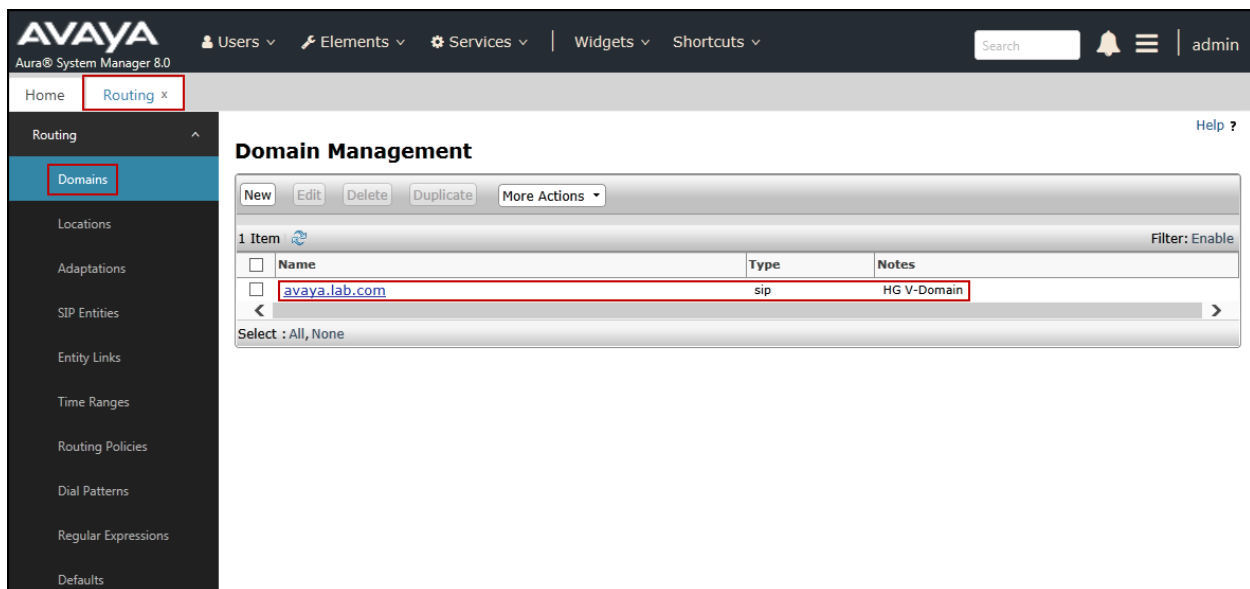
Name	Type	Notes
avaya.lab.com	sip	HG V-Domain

## 7.2. SIP Domain

Create an entry for each SIP domain for which Session Manager will need to be aware in order to route calls. For the compliance test, this was the enterprise domain, **avaya.lab.com**. Navigate to **Routing → Domains** in the left-hand navigation pane and click the **New** button in the right pane (not shown). In the new right pane that appears (shown below), fill in the following:

- **Name:** Enter the domain name.
- **Type:** Select **sip** from the pull-down menu.
- **Notes:** Add a brief description (optional).
- Click **Commit** to save.

The screen below shows the entry for the enterprise domain.



## 7.3. Locations

Locations can be used to identify logical and/or physical locations where SIP Entities reside for purposes of bandwidth management, call admission control and location-based routing. To add a location, navigate to **Routing → Locations** in the left-hand navigation pane and click the **New** button in the right pane (not shown). In the **General** section, enter the following values:

- **Name:** Enter a descriptive name for the location.
- **Notes:** Add a brief description (optional).
- Click **Commit** to save.

The following screen shows the location details for the location named **Session Manager**. Later, this location will be assigned to the SIP Entity corresponding to Session Manager. Other location parameters (not shown) retained the default values.

The screenshot displays the Avaya Aura System Manager 8.0 interface. The top navigation bar includes the Avaya logo, version 8.0, and tabs for Users, Elements, Services, Widgets, and Shortcuts. A search bar and user profile (admin) are on the right. The left sidebar shows a tree view with 'Routing' selected, and 'Locations' highlighted. The main content area is titled 'Location Details' and contains the following sections:

- General**: Includes a red-bordered field for '\* Name: Session Manager' and a 'Notes' field with the value 'VMware Session Manager'. 'Commit' and 'Cancel' buttons are at the top right.
- Dial Plan Transparency in Survivable Mode**: Features an 'Enabled' checkbox (unchecked), a 'Listed Directory Number' field, and an 'Associated CM SIP Entity' field.
- Overall Managed Bandwidth**: Includes a 'Managed Bandwidth Units' dropdown set to 'Kbit/sec', and 'Total Bandwidth' and 'Multimedia Bandwidth' fields.

The following screen shows the location details for the location named **Communication Manager**. Later, this location will be assigned to the SIP Entity corresponding to Communication Manager. Other location parameters (not shown) retained the default values.

This screenshot shows the same Avaya Aura System Manager 8.0 interface as the previous one, but with the 'Name' field set to 'Communication Manager' and the 'Notes' field set to 'VMware Communication Manager'. The rest of the interface, including the navigation sidebar and other form sections, remains identical.

The following screen shows the location details for the location named **Avaya SBCE**. Later, this location will be assigned to the SIP Entity corresponding to the Avaya SBCE. Other location parameters (not shown) retained the default values.

The screenshot displays the Avaya Aura System Manager 8.0 interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.0', and menu items for Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile icon labeled 'admin' are also present. The left sidebar shows a tree view with 'Routing' selected, and 'Locations' highlighted under it. The main content area is titled 'Location Details' and contains three sections: 'General', 'Dial Plan Transparency in Survivable Mode', and 'Overall Managed Bandwidth'. In the 'General' section, the 'Name' field is set to 'Avaya SBCE' and the 'Notes' field contains 'VMware Avaya SBCE'. The 'Dial Plan Transparency in Survivable Mode' section has an 'Enabled' checkbox that is unchecked, and empty fields for 'Listed Directory Number' and 'Associated CM SIP Entity'. The 'Overall Managed Bandwidth' section shows 'Managed Bandwidth Units' set to 'Kbit/sec' and empty fields for 'Total Bandwidth' and 'Multimedia Bandwidth'. 'Commit' and 'Cancel' buttons are located at the top right of the form.

The following screen shows the location details for the location named **Lab Others**. Later, this location will be assigned to the SIP Entity corresponding to the Experience Portal. Other location parameters (not shown) retained the default values.

This screenshot shows the same Avaya Aura System Manager 8.0 interface as the previous one, but with the 'Name' field set to 'Lab Others' and the 'Notes' field set to 'VMware Lab others'. All other fields and the overall layout remain identical to the first screenshot.



## 7.4. Adaptations

In order to improve interoperability with third party elements, Session Manager 8.0 incorporates the ability to use Adaptation modules to remove specific headers that are either Avaya proprietary or deemed excessive/unnecessary for non-Avaya elements.

For the compliance test, an Adaptation named ***CM\_Outbound\_Header\_Removal*** was created to block the following headers from outbound messages, before they were forwarded to the Avaya SBCE: AV-Global-Session-ID, AV-Correlation-ID, Alert-Info, Endpoint-View, P-AV-Message-ID, P-Charging-Vector and P-Location. These headers contain private information from the enterprise, which should not be propagated outside of the enterprise boundaries. They also add unnecessary size to outbound messages, while they have no significance to the service provider.

Navigate to **Routing → Adaptations** in the left-hand navigation pane and click the **New** button in the right pane (not shown). In the new right pane that appears (shown below), fill in the following:

- **Adaptation Name:** Enter an appropriate name.
- **Module Name:** Select the ***DigitConversionAdapter*** option.
- **Module Parameter Type:** Select ***Name-Value Parameter***.

Click **Add** to add the name and value parameters, as follows:

- **Name:** Enter ***eRHdrs***. This parameter will remove the specified headers from messages in the egress direction.
- **Value:** Enter ***“Alert-Info, P-Charging-Vector, AV-Correlation-ID, P-AV-Message-Id, P-Location, Endpoint-View”***
- Click **Commit** to save.

The screen below shows the adaptation created for the compliance test. This adaptation will later be applied to the SIP Entity corresponding to the Avaya SBCE. All other fields were left at their default values.

The screenshot displays the Avaya Aura System Manager 8.0 interface. The left sidebar shows the navigation menu with 'Routing' selected. The main content area is titled 'Adaptation Details' and includes a 'General' tab. The 'Adaptation Name' is 'CM\_Outbound\_Header\_Removal', the 'Module Name' is 'DigitConversionAdapter', and the 'Module Parameter Type' is 'Name-Value Parameter'. Below this, a table lists parameters, with 'eRHdrs' highlighted. The 'Egress URI Parameters' and 'Notes' fields are empty. At the bottom, there are sections for 'Digit Conversion for Incoming Calls to SM' and 'Digit Conversion for Outgoing Calls from SM', both showing 0 items.

**Adaptation Details** [Commit] [Cancel] [Help ?](#)

**General**

\* Adaptation Name: CM\_Outbound\_Header\_Removal

\* Module Name: DigitConversionAdapter

Module Parameter Type: Name-Value Parameter

Name	Value
eRHdrs	"Alert-Info, P-Charging-Vector, AV-Correlation-ID, P-AV-Message-id, P-Location, Endpoint-View"

Select : All, None

Egress URI Parameters:

Notes:

**Digit Conversion for Incoming Calls to SM**

Add Remove

0 Items [Refresh](#) Filter: Enable

Matching Pattern	Min	Max	Phone Context	Delete Digits	Insert Digits	Address to modify	Adaptation Data	Notes
------------------	-----	-----	---------------	---------------	---------------	-------------------	-----------------	-------

**Digit Conversion for Outgoing Calls from SM**

## 7.5. SIP Entities

A SIP Entity must be added for Session Manager and for each SIP telephony system connected to it, which includes Communication Manager, Avaya SBCE and the Experience Portal. Navigate to **Routing** → **SIP Entities** in the left navigation pane and click on the **New** button in the right pane (not shown). In the **General** section, enter the following values. Use default values for all remaining fields:

- **Name:** Enter a descriptive name.
- **FQDN or IP Address:** Enter the FQDN or IP address of the SIP Entity that is used for SIP signaling (see **Figure 1**).
- **Type:** Select *Session Manager* for Session Manager, *CM* for Communication Manager, *SIP Trunk* (or *Other*) for the Avaya SBCE and *Voice Portal* for the Experience Portal.
- **Adaptation:** This field is only present if **Type** is not set to **Session Manager**. If Adaptations were to be created, here is where they would be applied to the entity.
- **Location:** Select the location that applies to the SIP Entity being created, defined in **Section 7.3**.
- **Time Zone:** Select the time zone for the location above.
- Click **Commit** to save.

The following screen shows the addition of the *Session Manager* SIP Entity for Session Manager. The IP address of the Session Manager Security Module is entered in the **FQDN or IP Address** field.

The screenshot displays the Avaya Aura System Manager 8.0 interface. The top navigation bar includes 'Users', 'Elements', 'Services', 'Widgets', and 'Shortcuts'. The left sidebar shows the 'Routing' tab selected, with 'SIP Entities' highlighted. The main content area is titled 'SIP Entity Details' and shows the 'General' section. The form fields are as follows:

- Name:** Session Manager
- IP Address:** 10.64.101.249
- SIP FQDN:**
- Type:** Session Manager
- Notes:** VMware Session Manager
- Location:** Session Manager
- Outbound Proxy:**
- Time Zone:** America/New\_York
- Minimum TLS Version:** Use Global Setting
- Credential name:**
- SIP Link Monitoring:** Use Session Manager Configuration
- CRLF Keep Alive Monitoring:** CRLF Monitoring Disabled

The following screen shows the addition of the *Communication Manager Trunk 2* SIP Entity for Communication Manager. In order for Session Manager to send SIP service provider traffic on a separate entity link to Communication Manager, the creation of a separate SIP entity for Communication Manager is required. This SIP Entity should be different than the one created during the Session Manager installation, used by all other enterprise SIP traffic. The **FQDN or IP Address** field is set to the IP address of the “**procr**” interface in Communication Manager, as seen in **Section 5.3**. Select the location that applies to the SIP Entity being created, defined in **Section 7.3**. Select the **Time Zone**.

The screenshot displays the Avaya Aura System Manager 8.0 web interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.0', and tabs for 'Users', 'Elements', 'Services', 'Widgets', and 'Shortcuts'. A search bar and a user profile 'admin' are also present. The left sidebar shows a tree view with 'Routing' selected, and 'SIP Entities' highlighted under the 'Routing' section. The main content area is titled 'SIP Entity Details' with a 'General' tab. The form contains the following fields: 'Name' (Communication Manager Trunk 2), 'FQDN or IP Address' (10.64.101.241), 'Type' (CM), 'Notes' (Used for SP Testing), 'Adaptation' (empty), 'Location' (Communication Manager), 'Time Zone' (America/New\_York), 'SIP Timer B/F (in seconds)' (4), 'Minimum TLS Version' (Use Global Setting), 'Credential name' (empty), 'Securable' (checkbox), and 'Call Detail Recording' (none). 'Commit' and 'Cancel' buttons are located at the top right of the form area.

* Name:	Communication Manager Trunk 2
* FQDN or IP Address:	10.64.101.241
Type:	CM
Notes:	Used for SP Testing
Adaptation:	
Location:	Communication Manager
Time Zone:	America/New_York
* SIP Timer B/F (in seconds):	4
Minimum TLS Version:	Use Global Setting
Credential name:	
Securable:	<input type="checkbox"/>
Call Detail Recording:	none

The following screen shows the addition of the *Avaya SBCE* SIP Entity for the Avaya SBCE:

- The **FQDN or IP Address** field is set to the IP address of the SBC private network interface (see **Figure 1**).
- On the **Adaptation** field, the adaptation module *CM\_Outbound\_Header\_Removal* previously defined in **Section 7.4** was selected.
- Select the location that applies to the SIP Entity being created, defined in **Section 7.3**.
- Select the **Time Zone**.

The screenshot shows the Avaya Aura System Manager 8.0 interface. The left sidebar has a menu with 'Routing' selected, and 'SIP Entities' is highlighted. The main area displays the 'SIP Entity Details' form for 'Avaya SBCE'. The form includes fields for Name, FQDN or IP Address, Type, Notes, Adaptation, Location, Time Zone, SIP Timer B/F, Minimum TLS Version, Credential name, Securable, and Call Detail Recording. The 'SIP Entities' menu item and the 'SIP Entity Details' form title are highlighted with red boxes.

The following screen shows the addition of the *Avaya Experience Portal* SIP Entity:

- The **FQDN or IP Address** field is set to the IP address of the Experience Portal (see **Figure 1**).
- Select the location that applies to the SIP Entity being created, defined in **Section 7.3**.
- Select the **Time Zone**.

The screenshot shows the Avaya Aura System Manager 8.0 interface. The left sidebar has a menu with 'Routing' selected, and 'SIP Entities' is highlighted. The main area displays the 'SIP Entity Details' form for 'Avaya Experience Portal'. The form includes fields for Name, FQDN or IP Address, Type, Notes, Adaptation, Location, Time Zone, SIP Timer B/F, Minimum TLS Version, Credential name, Securable, and Call Detail Recording. The 'SIP Entities' menu item and the 'SIP Entity Details' form title are highlighted with red boxes.

## 7.6. Entity Links

A SIP trunk between Session Manager and a telephony system is described by an Entity Link. Three Entity Links were created; an entity link to Communication Manager for use only by service provider traffic, an entity link to the Avaya SBCE and an entity link to Experience Portal. To add an Entity Link, navigate to **Routing** → **Entity Links** in the left navigation pane and click on the **New** button in the right pane (not shown). Fill in the following fields in the new row that is displayed:

- **Name:** Enter a descriptive name.
- **SIP Entity 1:** Select the Session Manager from the drop-down menu (**Section 7.5**).
- **Protocol:** Select the transport protocol used for this link (**Section 5.6**).
- **Port:** Port number on which Session Manager will receive SIP requests from the far-end (**Section 5.6**).
- **SIP Entity 2:** Select the name of the other system from the drop-down menu (**Section 7.5**).
- **Port:** Port number on which the other system receives SIP requests from Session Manager (**Section 5.6**).
- **Connection Policy:** Select **Trusted** to allow calls from the associated SIP Entity.
- Click **Commit** to save.

The screen below shows the Entity Link to Communication Manager. The protocol and ports defined here must match the values used on the Communication Manager signaling group form in **Section 5.6**. *TLS* transport and port *5071* were used.

The screenshot shows the Avaya Aura System Manager 8.0 interface. The left navigation pane has 'Entity Links' selected. The main area shows the 'Entity Links' configuration page. At the top, there are 'Commit' and 'Cancel' buttons. Below is a table with one item. The table has columns: Name, SIP Entity 1, Protocol, Port, SIP Entity 2, Port, DNS Override, Connection Policy, Deny New Service, and Notes. The first row is highlighted with a red border. The values are: Name: \*Session\_Manager\_Ch, SIP Entity 1: \*Session Manager, Protocol: TLS, Port: \*5071, SIP Entity 2: \*Communication Manager Trunk 2, Port: \*5071, DNS Override: (unchecked), Connection Policy: trusted, Deny New Service: (unchecked), and Notes: (empty). Below the table, there is a 'Select: All, None' option and another 'Commit' and 'Cancel' button.

Name	SIP Entity 1	Protocol	Port	SIP Entity 2	Port	DNS Override	Connection Policy	Deny New Service	Notes
*Session_Manager_Ch	*Session Manager	TLS	*5071	*Communication Manager Trunk 2	*5071	<input type="checkbox"/>	trusted	<input type="checkbox"/>	

The Entity Link to the Avaya SBCE is shown below; **TLS** transport and port **5061** were used.

The screenshot shows the Avaya Aura System Manager 8.0 interface. The left sidebar has a menu with 'Entity Links' highlighted. The main area is titled 'Entity Links' and contains a table with one item. The table has columns: Name, SIP Entity 1, Protocol, Port, SIP Entity 2, Port, DNS Override, Connection Policy, Deny New Service, and Notes. The row shows a link from '\*Session Manager AS' to '\*Avaya SBCE' using TLS on port 5061, with a 'trusted' connection policy.

Name	SIP Entity 1	Protocol	Port	SIP Entity 2	Port	DNS Override	Connection Policy	Deny New Service	Notes
*Session Manager AS	*Session Manager	TLS	5061	*Avaya SBCE	5061		trusted		

The Entity Link to the Experience Portal is shown below; **TLS** transport and port **5061** were used.

The screenshot shows the Avaya Aura System Manager 8.0 interface. The left sidebar has a menu with 'Entity Links' highlighted. The main area is titled 'Entity Links' and contains a table with one item. The table has columns: Name, SIP Entity 1, Protocol, Port, SIP Entity 2, Port, DNS Override, Connection Policy, Deny New Service, and Notes. The row shows a link from '\*Session Manager AS' to '\*Avaya Experience Portal' using TLS on port 5061, with a 'trusted' connection policy.

Name	SIP Entity 1	Protocol	Port	SIP Entity 2	Port	DNS Override	Connection Policy	Deny New Service	Notes
*Session Manager AS	*Session Manager	TLS	5061	*Avaya Experience Portal	5061		trusted		

## 7.7. Routing Policies

Routing policies describe the conditions under which calls will be routed to the SIP Entities specified in **Section 7.5**. Three routing policies were added; an incoming policy with Communication Manager as the destination, an outbound policy to the Avaya SBCE as the destination, an incoming policy with Experience Portal as the destination. To add a routing policy, navigate to **Routing → Routing Policies** in the left navigation pane and click on the **New** button in the right pane (not shown). The following screen is displayed:

- In the **General** section, enter a descriptive **Name** and add a brief description under **Notes** (optional).
- In the **SIP Entity as Destination** section, click **Select**. The **SIP Entity List** page opens (not shown). Choose the appropriate SIP entity to which this routing policy applies (**Section 7.5**) and click **Select**. The selected SIP Entity displays on the **Routing Policy Details** page as shown below.
- Use default values for remaining fields.
- Click **Commit** to save.

The following screens show the Routing Policies for Communication Manager, the Avaya SBCE and the Experience Portal.

**AVAYA** Aura® System Manager 8.0

Users ▾ Elements ▾ Services ▾ Widgets ▾ Shortcuts ▾ Search 🔍 admin

Home Routing ×

Routing Policy Details Commit Cancel

**General**

\* Name: To CM Trunk 2

Disabled: ☐

\* Retries: 0

Notes: For inbound calls to CM via Trunk

**SIP Entity as Destination**

Select

Name	FQDN or IP Address	Type	Notes
Communication Manager Trunk 2	10.64.101.241	CM	Used for SP Testing

**Time of Day**

Add Remove View Gaps/Overlaps

1 Item

Ranking	Name	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Start Time	End Time	Notes
0	24/7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	00:00	23:59	Time Range 24/7

Select : All, None



**AVAYA**  
Aura® System Manager 8.0

Users ▾ Elements ▾ Services ▾ Widgets ▾ Shortcuts ▾

Search [ ] admin

Home Routing x

**Routing Policy Details** [Commit] [Cancel]

**General**

\* Name: Avaya SBCE

Disabled: ☐

\* Retries: 0

Notes: For outbound calls to SP via ASB

**SIP Entity as Destination**

Select

Name	FQDN or IP Address	Type	Notes
Avaya SBCE	10.64.101.243	SIP Trunk	VMware Avaya SBCE

**Time of Day**

Add Remove View Gaps/Overlaps

1 Item Filter: Enable

Ranking	Name	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Start Time	End Time	Notes
0	24/7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	00:00	23:59	Time Range 24/7

Select : All, None

**AVAYA**  
Aura® System Manager 8.0

Users ▾ Elements ▾ Services ▾ Widgets ▾ Shortcuts ▾

Search [ ] admin

Home Routing x

**Routing Policy Details** [Commit] [Cancel]

**General**

\* Name: To Avaya Experience Portal

Disabled: ☐

\* Retries: 0

Notes: To Avaya Experience Portal

**SIP Entity as Destination**

Select

Name	FQDN or IP Address	Type	Notes
Avaya Experience Portal	10.64.101.252	Voice Portal	SIP Trunk to Avaya Experience Portal

**Time of Day**

Add Remove View Gaps/Overlaps

1 Item Filter: Enable

Ranking	Name	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Start Time	End Time	Notes
0	24/7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	00:00	23:59	Time Range 24/7

Select : All, None

## 7.8. Dial Patterns

Dial Patterns are needed to route specific calls through Session Manager. For the compliance test, dial patterns were needed to route calls from Communication Manager to the service provider and vice versa. Also, a dial pattern was created to route calls from service provider to Experience Portal. Dial Patterns define which route policy will be selected for a particular call based on the dialed digits, destination domain and originating location. To add a dial pattern, navigate to **Routing** → **Dial Patterns** in the left navigation pane and click on the **New** button in the right pane (not shown). Fill in the following, as shown in the screens below:

In the **General** section, enter the following values:

- **Pattern:** Enter a dial string that will be matched against the Request-URI of the call.

- **Min:** Enter a minimum length used in the match criteria.
- **Max:** Enter a maximum length used in the match criteria.
- **SIP Domain:** Enter the destination domain used in the match criteria, or select “**ALL**” to route incoming calls to all SIP domains.
- **Notes:** Add a brief description (optional).
- In the **Originating Locations and Routing Policies** section, click **Add**. From the **Originating Locations and Routing Policy List** that appears (not shown), select the appropriate originating location for use in the match criteria (**Section 7.3**).
- Lastly, select the routing policy from the list that will be used to route all calls that match the specified criteria (**Section 7.7**). Click **Select** (not shown).
- Click **Commit** to save.

The following screen illustrates an example dial pattern used to verify inbound PSTN calls to Communication Manager. In the example, calls to 10-digit numbers starting with **303**, arriving from location **Avaya SBCE**, used route policy **To CM Trunk 2** to Communication Manager. The SIP Domain was set to **avaya.lab.com**.

**AVAYA**  
Aura® System Manager 8.0

Home Routing x

**Dial Pattern Details** [Commit] [Cancel] Help ?

**General**

\* Pattern: 303  
 \* Min: 10  
 \* Max: 10  
 Emergency Call: ☐  
 SIP Domain: avaya.lab.com  
 Notes:

**Originating Locations and Routing Policies**

[Add] [Remove]

1 Item

Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
Avaya SBCE	VMware Avaya SBCE	To CM Trunk 2	0	<input type="checkbox"/>	Communication Manager Trunk 2	For inbound calls to CM via Trunk 2

Select : All, None

The example in this screen shows the 11-digit dialed numbers for outbound calls, beginning with **1**, arriving from the **Communication Manager** location, will use route policy **Avaya SBCE**, which sends the call out to the PSTN via Avaya SBCE and the service provider SIP trunk. The SIP Domain was set to **avaya.lab.com**.

The screenshot shows the 'Dial Pattern Details' page in the Avaya Aura System Manager 8.0 interface. The 'General' tab is active. The 'Pattern' field is set to '1', with 'Min' and 'Max' both set to '11'. The 'SIP Domain' is set to 'avaya.lab.com'. The 'Emergency Call' checkbox is unchecked. Below the 'General' tab, the 'Originating Locations and Routing Policies' section shows a table with one item:

Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
Communication Manager	VMware Communication Manager	Avaya SBCE	0	<input type="checkbox"/>	Avaya SBCE	For outbound calls to SP via ASBCE

The following screen illustrates an example dial pattern used to verify inbound PSTN calls to Experience Portal. In the sample configuration one of the DID numbers provided by CenturyLink was used as a test number to route calls from the PSTN to Experience Portal, arriving from location **Avaya SBCE**, used route policy **To Avaya Experience Portal**. The SIP Domain was set to **avaya.lab.com**.

The screenshot shows the 'Dial Pattern Details' page in the Avaya Aura System Manager 8.0 interface. The 'General' tab is active. The 'Pattern' field is set to '3031235744', with 'Min' set to '10' and 'Max' set to '36'. The 'SIP Domain' is set to 'avaya.lab.com'. The 'Emergency Call' checkbox is unchecked. Below the 'General' tab, the 'Originating Locations and Routing Policies' section shows a table with one item:

Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
Avaya SBCE	VMware Avaya SBCE	To Avaya Experience Portal	0	<input type="checkbox"/>	Avaya Experience Portal	To Avaya Experience Portal

Repeat the above procedures as needed to define additional dial patterns.

## 8. Configure Avaya Session Border Controller for Enterprise

This section describes the configuration of the Avaya SBCE. It is assumed that the initial installation of the Avaya SBCE, the assignment of the management interface IP Address and license installation have already been completed; hence these tasks are not covered in these Application Notes. For more information on the installation and initial provisioning of the Avaya SBCE consult the Avaya SBCE documentation in the **References** section.

**Note** - The configuration tasks required to support TLS transport for signaling and SRTP for media inside of the enterprise (private network side, in between Avaya components) is beyond the scope of these Application Notes; hence they are not discussed in this document. Consult reference [8] in the **References** section for additional information on this topic.

### 8.1. System Access

Access the Session Border Controller web management interface by using a web browser and entering the URL **https://<ip-address>**, where **<ip-address>** is the management IP address configured at installation. Log in using the appropriate credentials.



The screenshot shows the login interface of the Avaya Session Border Controller for Enterprise. On the left, the Avaya logo is displayed in a large, stylized red font. Below it, the text "Session Border Controller for Enterprise" is written in a bold, black, sans-serif font. On the right, the "Log In" section contains a "Username:" label, a text input field, and a "Continue" button. Below the login fields, there is a "WELCOME TO AVAYA SBC" message, followed by a disclaimer: "Unauthorized access to this machine is prohibited. This system is for the use authorized users only. Usage of this system may be monitored and recorded by system personnel." and a consent statement: "Anyone using this system expressly consents to such monitoring and is advised that if such monitoring reveals possible evidence of criminal activity, system personnel may provide the evidence from such monitoring to law enforcement officials." At the bottom, the copyright notice "© 2011 - 2018 Avaya Inc. All rights reserved." is visible.

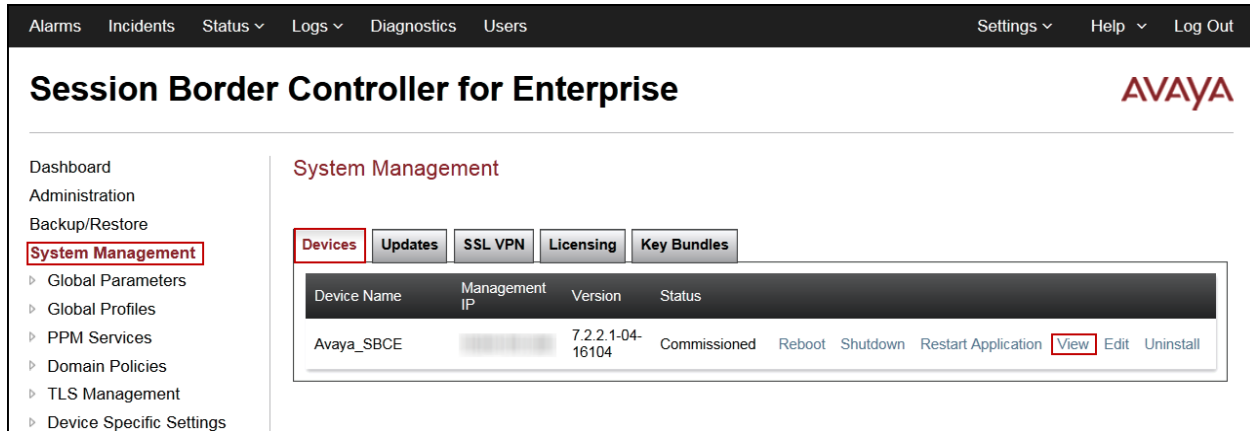
Once logged in, the Dashboard screen is presented. The left navigation pane contains the different available menu items used for the configuration of the Avaya SBCE. Verify that the status of the **License State** field is **OK**, indicating that a valid license is present. Contact an authorized Avaya sales representative if a license is needed.

The screenshot shows the Avaya Session Border Controller for Enterprise (SBCE) Dashboard. The top navigation bar includes links for Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header reads "Session Border Controller for Enterprise" with the AVAYA logo on the right. The left sidebar contains a "Dashboard" menu item, which is highlighted, and a list of other configuration options: Administration, Backup/Restore, System Management, Global Parameters, Global Profiles, PPM Services, Domain Policies, TLS Management, and Device Specific Settings. The main dashboard area displays the following information:

- Information:** System Time (04:59:38 PM EST), Version (7.2.2.1-04-16104), Build Date (Fri Sep 7 06:23:07 UTC 2018), License State (OK), Aggregate Licensing Overages (0), Peak Licensing Overage Count (0), Last Logged in at (01/02/2019 14:46:58 EST), and Failed Login Attempts (0).
- Installed Devices:** EMS, Avaya\_SBCE.
- Active Alarms (past 24 hours):** None found.
- Incidents (past 24 hours):** Avaya\_SBCE: No Subscriber Flow Matched.

## 8.2. System Management

To view current system information, select **System Management** on the left navigation pane. A list of installed devices is shown in the **Devices** tab on the right pane. In the reference configuration, a single device named *Avaya\_SBCE* is shown. The management IP address that was configured during installation is blurred out for security reasons, the current software version is shown. The management IP address needs to be on a subnet separate from the ones used in all other interfaces of the Avaya SBCE, segmented from all VoIP traffic. Verify that the **Status** is *Commissioned*, indicating that the initial installation process of the device has been previously completed, as shown on the screen below.



The screenshot displays the Avaya Session Border Controller for Enterprise (SBCE) management interface. The top navigation bar includes links for Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header reads "Session Border Controller for Enterprise" with the Avaya logo. The left sidebar lists navigation options: Dashboard, Administration, Backup/Restore, System Management (highlighted), Global Parameters, Global Profiles, PPM Services, Domain Policies, TLS Management, and Device Specific Settings. The "System Management" section is active, showing tabs for Devices, Updates, SSL VPN, Licensing, and Key Bundles. The "Devices" tab contains a table with the following data:

Device Name	Management IP	Version	Status						
Avaya_SBCE	[Blurred]	7.2.2.1-04-16104	Commissioned	Reboot	Shutdown	Restart Application	View	Edit	Uninstall

To view the network configuration assigned to the Avaya SBCE, click **View** on the screen above. The **System Information** window is displayed, containing the current device configuration and network settings.

System Information: Avaya\_SBCE

General Configuration

Appliance Name

Avaya\_SBCE

Box Type

SIP

Deployment Mode

Proxy

Device Configuration

HA Mode

No

Two Bypass Mode

No

License Allocation

Standard Sessions

Requested: 2000

1000

Advanced Sessions

Requested: 2000

1000

Scopia Video Sessions

Requested: 500

500

CES Sessions

Requested: 0

0

Transcoding Sessions

Requested: 0

0

CLID

---

Encryption

Available: Yes

☒

Network Configuration

IP	Public IP	Network Prefix or Subnet Mask	Gateway	Interface
10.64.101.243	10.64.101.243	255.255.255.0	10.64.101.1	A1
				A1
				A1
				B1
				B1
10.10.80.51	10.10.80.51	255.255.255.128	10.10.80.1	B1

DNS Configuration

Primary DNS

8.8.8.8

Secondary DNS

7.7.7.7

DNS Location

DMZ

DNS Client IP

10.10.80.51

Management IP(s)

IP #1 (IPv4)

The highlighted IP addresses in the **System Information** screen shown above are the ones used for the SIP trunk to CenturyLink, and are the ones relevant to these Application Notes. Other IP addresses assigned to the Avaya SBCE **A1** and **B1** interfaces are used to support remote workers and other SIP trunks, and they are not discussed in this document. Also note that for security purposes, any public IP addresses used during the compliance test have been masked in this document.

In the reference configuration, the private interface of the Avaya SBCE (10.64.101.243) was used to connect to the enterprise network, while its public interface (10.10.80.51) was used to connect to the public network. See **Figure 1**.

On the **License Allocation** area of the **System Information**, verify that the number of **Standard Sessions** is sufficient to support the desired number of simultaneous SIP calls across all SIP trunks at the enterprise. The number of sessions and encryption features are primarily controlled by the license file installed.

### 8.3. TLS Management

Transport Layer Security (TLS) is a standard protocol that is used extensively to provide a secure channel by encrypting communications over IP networks. It enables clients to authenticate servers or, optionally, servers to authenticate clients. UC-Sec security products utilize TLS primarily to facilitate secure communications with remote servers.

For the compliance testing, the transport protocol that was used between Session Manager and the Avaya SBCE, across the enterprise private IP network (LAN), was SIP over TLS. SIP over UDP was used between the Avaya SBCE and Clearcom, across the public Internet.

It is assumed that generation and installation of certificates and the creation of TLS Profiles on the Avaya SBCE have been previously completed, as it's not discussed in this document. Refer to item [8] in **Section 12**.

### 8.4. Network Management

The network configuration parameters should have been previously specified during installation of the Avaya SBCE. In the event that changes need to be made to the network configuration, they can be entered here.

Select **Network Management** from **Device Specific Settings** on the left-side menu. Under **Devices** in the center pane, select the device being managed, *Avaya\_SBCE* in the sample configuration. On the **Networks** tab, verify or enter the network information as needed.

Note that in the configuration used during the compliance test, the IP addresses assigned to the private (*10.64.101.243*) and public (*10.10.80.51*) sides of the Avaya SBCE are the ones relevant to these Application Notes.



On the **Interfaces** tab, verify the **Administrative Status** is **Enabled** for the **A1** and **B1** interfaces. Click the buttons under the **Status** column if necessary to enable the interfaces.

## 8.5. Media Interfaces

Media Interfaces were created to specify the IP address and port range in which the Avaya SBCE will accept media streams on each interface. Packets leaving the interfaces of the Avaya SBCE will advertise this IP address, and one of the ports in this range as the listening IP address and port in which it will accept media from the Call Server or the trunk server.

To add the Media Interface in the enterprise direction, select **Media Interface** from the **Device Specific Settings** menu on the left-hand side, select the device being managed and click the **Add** button (not shown).

- On the **Add Media Interface** screen, enter an appropriate **Name** for the Media Interface.

- Under **IP Address**, select from the drop-down menus the network and IP address to be associated with this interface.
- The **Port Range** was left at the default values of **35000-40000**.
- Click **Finish**.

The screenshot shows a dialog box titled "Add Media Interface" with a close button (X) in the top right corner. The dialog contains the following fields:

- Name:** A text box containing "Private\_med".
- IP Address:** A section with two dropdown menus. The first dropdown is set to "Network\_A1 (A1, VLAN 0)" and the second dropdown is set to "10.64.101.243".
- Port Range:** Two text boxes containing "35000" and "40000" separated by a hyphen.
- Finish:** A button at the bottom center.

A red rectangular box highlights the Name, IP Address, and Port Range fields.

A Media Interface facing the public side was similarly created with the name **Public\_med**, as shown below.

- Under **IP Address**, the network and IP address to be associated with this interface was selected.
- The **Port Range** was left at the default values.
- Click **Finish**.

The screenshot shows a dialog box titled "Add Media Interface" with a close button (X) in the top right corner. The dialog contains the following fields:

- Name:** A text box containing "Public\_med".
- IP Address:** A section with two dropdown menus. The first dropdown is set to "Network\_B1 (B1, VLAN 0)" and the second dropdown is set to "10.10.80.51".
- Port Range:** Two text boxes containing "35000" and "40000" separated by a hyphen.
- Finish:** A button at the bottom center.

A red rectangular box highlights the Name, IP Address, and Port Range fields.

## 8.6. Signaling Interfaces

Signaling Interfaces are created to specify the IP addresses and ports in which the Avaya SBCE will listen for signaling traffic in the connected networks.

To add the Signaling Interface in the enterprise direction, select **Signaling Interface** from the **Device Specific Settings** menu on the left-hand side, select the device being managed and click the **Add** button (not shown).

- On the **Add Signaling Interface** screen, enter an appropriate **Name** for the interface.
- Under **IP Address**, select from the drop-down menus the network and IP address to be associated with this interface.
- Enter **5061** for **TLS Port**, since TLS port 5061 is used to listen for signaling traffic from Session Manager in the sample configuration, as defined in **Section 7.6**.
- Select a **TLS Profile** (See Note below).
- Click **Finish**.

**Add Signaling Interface** X

Name: Private\_sig

IP Address: Network\_A1 (A1, VLAN 0) 10.64.101.243

TCP Port: Leave blank to disable

UDP Port: Leave blank to disable

TLS Port: 5061 (Leave blank to disable)

TLS Profile: New\_ServiceProvider\_Server\_TLS

Enable Shared Control: ☐

Shared Control Port:

Finish

A second Signaling Interface with the name **Public\_sig** was similarly created in the service provider's direction.

- Under **IP Address**, select from the drop-down menus the network and IP address to be associated with this interface.
- Enter **5060** for **UDP Port**, since UDP port 5060 is used to listen for signaling traffic from CenturyLink.
- Click **Finish**.

**Add Signaling Interface** X

Name	Public_sig
IP Address	Network_B1 (B1, VLAN 0) 10.10.80.51
TCP Port Leave blank to disable	
UDP Port Leave blank to disable	5060
TLS Port Leave blank to disable	
TLS Profile	None
Enable Shared Control	<input type="checkbox"/>
Shared Control Port	

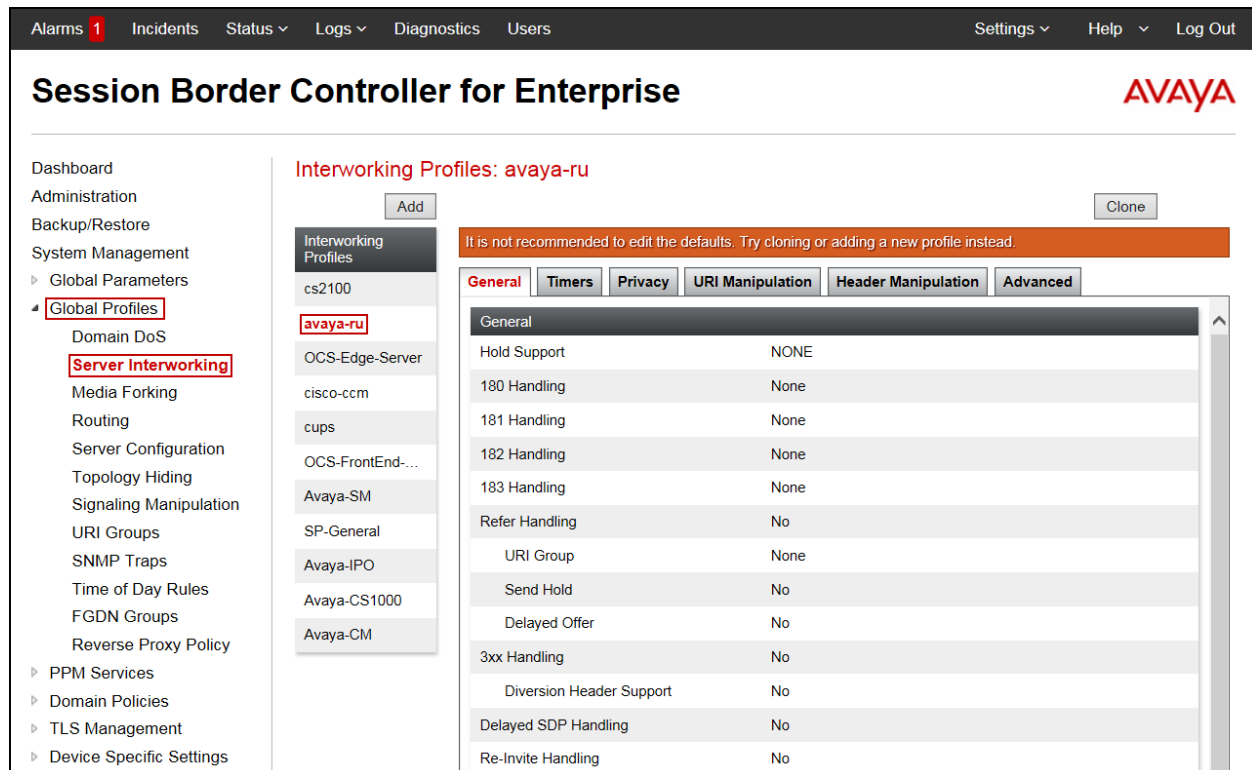
Finish

## 8.7. Server Interworking

Interworking Profile features are configured to facilitate the interoperability between the enterprise SIP-enabled solution (Call Server) and the SIP trunk service provider (Trunk Server).

### 8.7.1. Server Interworking Profile – Enterprise

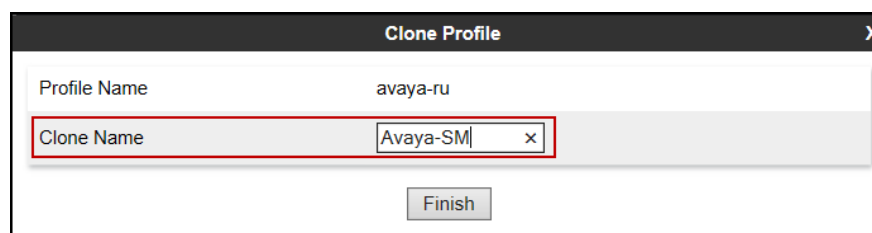
Interworking profiles can be created by cloning one of the pre-defined default profiles, or by adding a new profile. To configure the interworking profile in the enterprise direction, select **Global Profiles → Server Interworking** on the left navigation pane. Under **Interworking Profiles**, select *avaya-ru* from the list of pre-defined profiles. Click **Clone**.



The screenshot displays the Avaya Session Border Controller for Enterprise configuration interface. The left navigation pane shows the 'Global Profiles' section expanded, with 'Server Interworking' highlighted. The main area shows 'Interworking Profiles: avaya-ru' with a list of profiles including 'avaya-ru'. A 'Clone' button is visible. The 'General' tab is selected, showing a table of settings.

Setting	Value
Hold Support	NONE
180 Handling	None
181 Handling	None
182 Handling	None
183 Handling	None
Refer Handling	No
URI Group	None
Send Hold	No
Delayed Offer	No
3xx Handling	No
Diversion Header Support	No
Delayed SDP Handling	No
Re-Invite Handling	No

- Enter a descriptive name for the cloned profile.
- Click **Finish**.



The screenshot shows the 'Clone Profile' dialog box. The 'Profile Name' is 'avaya-ru'. The 'Clone Name' field is highlighted with a red box and contains 'Avaya-SM'. A 'Finish' button is at the bottom.

Click **Edit** on the newly cloned *Avaya-SM* interworking profile:

- On the **General** tab, check *T.38 Support*.
- Leave remaining fields with default values.
- Click **Finish**.

Editing Profile: Avaya-SM

General

Hold Support ☒ None  
☐ RFC2543 - c=0.0.0.0  
☐ RFC3264 - a=sendonly

180 Handling ☒ None ☐ SDP ☐ No SDP

181 Handling ☒ None ☐ SDP ☐ No SDP

182 Handling ☒ None ☐ SDP ☐ No SDP

183 Handling ☒ None ☐ SDP ☐ No SDP

Refer Handling ☐

URI Group None

Send Hold ☐

Delayed Offer ☒

3xx Handling ☐

Diversion Header Support ☐

Delayed SDP Handling ☐

Re-Invite Handling ☐

Prack Handling ☐

Allow 18X SDP ☐

**T.38 Support ☒**

URI Scheme ☒ SIP ☐ TEL ☐ ANY

Via Header Format ☒ RFC3261  
☐ RFC2543

Finish

The **Timers**, **Privacy**, **URI Manipulation** and **Header Manipulation** tabs contain no entries.

The **Advanced** tab settings are shown on the screen below:

The screenshot displays the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes links for Alarms (3), Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header shows the product name and the Avaya logo. A left-hand navigation menu lists various system management options, with 'Global Profiles' expanded and 'Server Interworking' highlighted. The central panel is titled 'Interworking Profiles: Avaya-SM' and features a list of profiles on the left, including 'Avaya-SM' which is selected. On the right, the 'Advanced' tab is active, showing configuration settings for the selected profile. The settings include 'Record Routes' (Both Sides), 'Include End Point IP for Context Lookup' (Yes), 'Extensions' (Avaya), 'Diversion Manipulation' (No), 'Has Remote SBC' (Yes), 'Route Response on Via Port' (No), 'Relay INVITE Replace for SIPREC' (No), 'MOBX Re-INVITE Handling' (No), and 'DTMF Support' (None). Buttons for 'Add', 'Rename', 'Clone', 'Delete', and 'Edit' are visible.

Alarms 3 Incidents Status Logs Diagnostics Users Settings Help Log Out

## Session Border Controller for Enterprise

AVAYA

Dashboard  
Administration  
Backup/Restore  
System Management  
▸ Global Parameters  
▾ Global Profiles  
    Domain DoS  
    Server  
    Interworking  
    Media Forking  
    Routing  
    Server  
    Configuration  
    Topology Hiding  
    Signaling  
    Manipulation  
    URI Groups  
    SNMP Traps  
    Time of Day Rules  
    FGDN Groups  
    Reverse Proxy

### Interworking Profiles: Avaya-SM

Add

cs2100  
avaya-ru  
OCS-Edge-Se...  
cisco-ccm  
cups  
OCS-FrontEn...  
**Avaya-SM**  
SP-General  
Avaya-IPO  
Avaya-CS1000  
Avaya-CM

Rename Clone Delete

Click here to add a description.

General Timers Privacy URI Manipulation Header Manipulation **Advanced**

Record Routes Both Sides

Include End Point IP for Context Lookup Yes

Extensions Avaya

Diversion Manipulation No

Has Remote SBC Yes

Route Response on Via Port No

Relay INVITE Replace for SIPREC No

MOBX Re-INVITE Handling No

DTMF

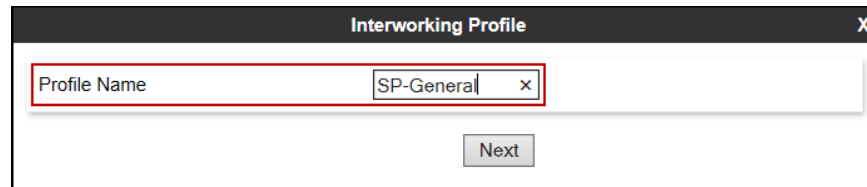
DTMF Support None

Edit

### 8.7.2. Server Interworking Profile – Service Provider

A second interworking profile in the direction of the SIP trunk was created, by adding a new profile in this case. Select **Global Profiles → Server Interworking** on the left navigation pane and click **Add** (not shown).

- Enter a descriptive name for the new profile.
- Click **Next**.

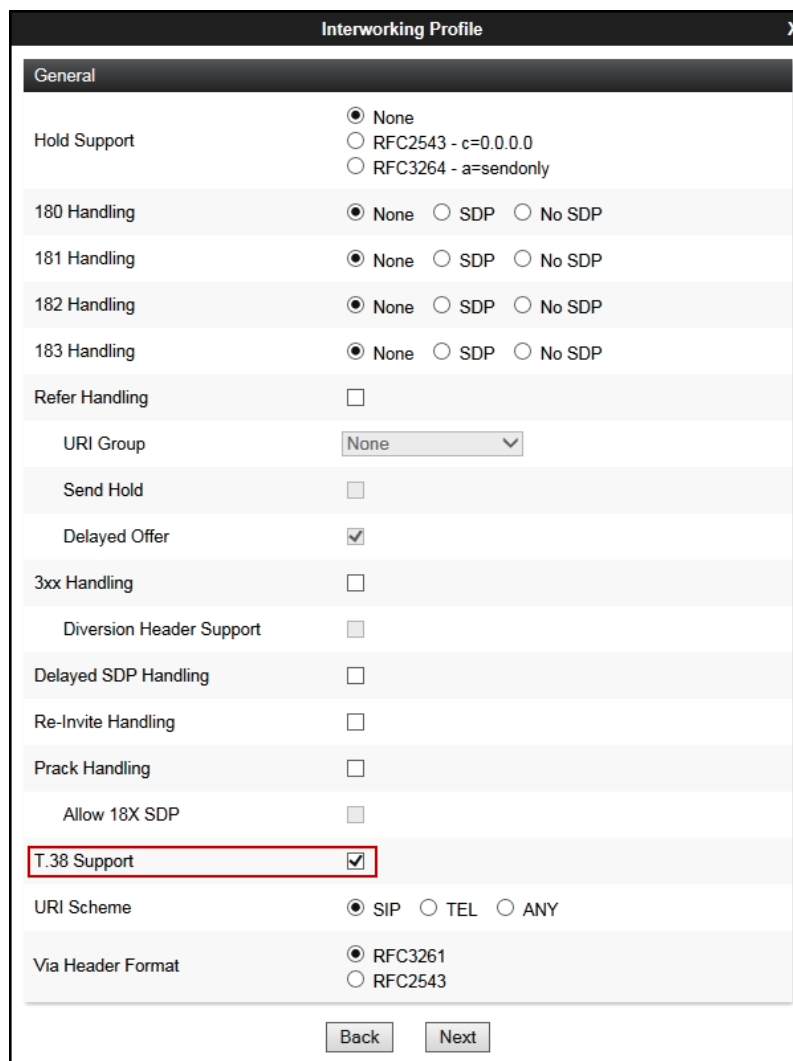


Interworking Profile

Profile Name SP-General x

Next

On the **General** tab, check **T.38 Support**, click **Next** until the last tab is reached then click **Finish** on the last tab leaving remaining fields with default values (not shown).



Interworking Profile

General

Hold Support ☒ None ☐ RFC2543 - c=0.0.0.0 ☐ RFC3264 - a=sendonly

180 Handling ☒ None ☐ SDP ☐ No SDP

181 Handling ☒ None ☐ SDP ☐ No SDP

182 Handling ☒ None ☐ SDP ☐ No SDP

183 Handling ☒ None ☐ SDP ☐ No SDP

Refer Handling ☐

URI Group None v

Send Hold ☐

Delayed Offer ☒

3xx Handling ☐

Diversion Header Support ☐

Delayed SDP Handling ☐

Re-Invite Handling ☐

Prack Handling ☐

Allow 18X SDP ☐

**T.38 Support ☒**

URI Scheme ☒ SIP ☐ TEL ☐ ANY

Via Header Format ☒ RFC3261 ☐ RFC2543

Back Next



## 8.8. Signaling Manipulation

The Signaling Manipulation feature of the Avaya SBCE allows an administrator to perform granular header manipulations on the headers of the SIP messages, which sometimes is not possible by direct configuration on the web interface. This ability to configure header manipulation in such a highly flexible manner is achieved by the use of a proprietary scripting language called SigMa.

The script can be created externally as a regular text file and imported in the Signaling Manipulation screen, or they can be written directly in the page using the embedded Sigma Editor. In the reference configuration, the Editor was used. A detailed description of the structure of the SigMa scripting language and details on its use is beyond the scope of these Application Notes. Consult reference [8] in the **References** section for more information on this topic.

Two Sigma scripts were created during the compliance test to correct the following interoperability issues (refer to **Section 2.2**):

- For EC500 (Extension to Cellular) and for calls that are forwarded to the PSTN the URI in PAI Header should be set to the Pilot Number.
- Remove the gsid and epv parameters from the Contact header.
- Change the Diversion header scheme from SIPS to SIP.
- Change the fax version from 1 to 0.

The scripts will later be applied to the Server Configuration profiles corresponding to the enterprise in **Section 8.9.1** and to the service provider in **Section 8.9.2**.

To create the SigMa script to set the URI in the PAI header to the Pilot number provided by CenturyLink, to remove the gsid and epv parameters from the Contact header and to change the Diversion header scheme from SIPS to SIP, on the left navigation pane, select **Global Profiles** → **Signaling Manipulation**. From the **Signaling Manipulation Scripts** list, select **Add**.

- For **Title** enter a name, the name *CTL-1* was chosen in this example.
- Copy the complete script from **Appendix A**.
- Click **Save**.

```

//This script is to be applied to the CenturyLink/Service Provider Server Configuration.

//For Call Forward and Mobile features CenturyLink requires the PAI to be the pilot number.
within session "All"
{
    act on request where %DIRECTION="OUTBOUND" and %ENTRY_POINT="POST_ROUTING"
    {
        if (%HEADERS["P-Asserted-Identity"][1].URI.USER.regex_match("3031235745")) then
        {
            %var="this does nothing, match for DID number passed";
        }
        else
        {
            %HEADERS["P-Asserted-Identity"][1].URI.USER = "3031235745";
        }
    }
}

//Remove gsid and epv parameters from Contact header.
//Changes the Diversion header scheme from SIPS to SIP.

within session "ALL"
{
    act on message where %DIRECTION="OUTBOUND" and %ENTRY_POINT="POST_ROUTING"
    {
        remove(%HEADERS["Contact"][1].URI.PARAMS["gsid"]);
        remove(%HEADERS["Contact"][1].URI.PARAMS["epv"]);
        %HEADERS["Diversion"][1].regex_replace("sips","sip");
    }
}

```

To create the SigMa script to change the T.38 fax version from 1 to 0, on the left navigation pane, select **Global Profiles → Signaling Manipulation**. From the **Signaling Manipulation Scripts** list, select **Add**.

- For **Title** enter a name, the name *Change fax version 1 to 0* was chosen in this example.
- Copy the complete script from **Appendix A**.
- Click **Save**.

```
//This script changes the T38 Fax version from 1 to 0, on the T38 re-invites sent by
//Communication Manager. Version 0 is the only fax version accepted by the
//CenturyLink-Broadsoft softswitch. Apply the script ONLY to the Session Manager server
//configuration profile of the ASBCE. If applied to the SP server configuration profile,
//as OUTBOUND and POST_ROUTING, the SBC sends the private IP address
//in the Connection Information of the ACK unchanged to the SP and all calls will drop.

within session "ALL"
{
act on request where %DIRECTION="INBOUND" and %ENTRY_POINT="PRE_ROUTING"
    {
        %BODY[1].regex_replace( "a=T38FaxVersion:1","a=T38FaxVersion:0");
    }
}
```

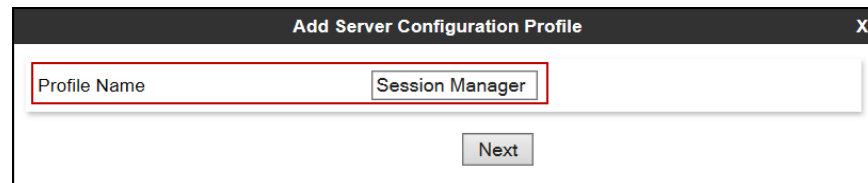
## 8.9. Server Configuration

Server Profiles are created to define the parameters for the Avaya SBCE peers; Session Manager (Call Server) at the enterprise and CenturyLink SIP Proxy (Trunk Server).

### 8.9.1. Server Configuration Profile – Enterprise

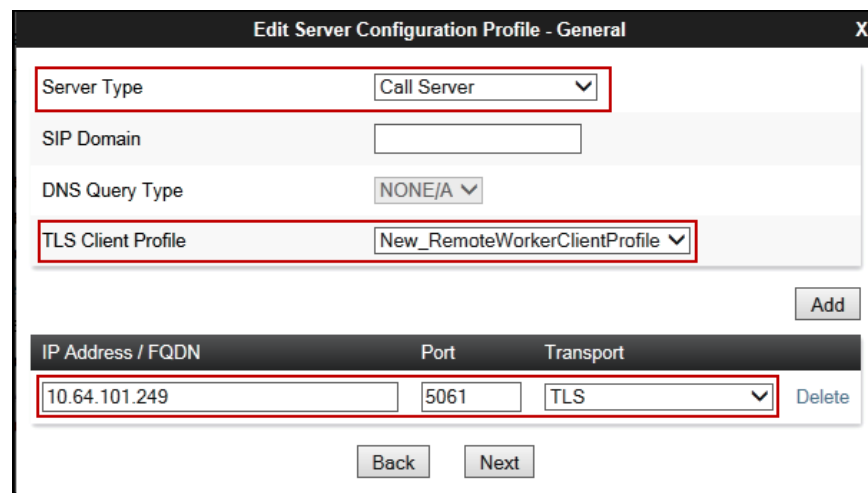
From the **Global Profiles** menu on the left-hand navigation pane, select **Server Configuration** and click the **Add** button (not shown) to add a new profile for the Call Server.

- Enter an appropriate **Profile Name** similar to the screen below.
- Click **Next**.



The screenshot shows a dialog box titled "Add Server Configuration Profile" with a close button (X) in the top right corner. Inside the dialog, there is a text input field labeled "Profile Name" which contains the text "Session Manager". Below this field is a "Next" button.

- On the **Edit Server Configuration Profile – General** tab select **Call Server** from the drop-down menu under the **Server Type**.
- On the **IP Addresses / FQDN** field, enter the IP address of the Session Manager Security Module (**Section 7.5**).
- Enter **5061** under **Port** and select **TLS** for **Transport**. The transport protocol and port selected here must match the values defined for the Entity Link to the Session Manager previously created in **Section 7.6**.
- Select a **TLS Profile**.
- Click **Next**.



The screenshot shows a dialog box titled "Edit Server Configuration Profile - General" with a close button (X) in the top right corner. The dialog contains several configuration fields:

- Server Type:** A dropdown menu set to "Call Server".
- SIP Domain:** An empty text input field.
- DNS Query Type:** A dropdown menu set to "NONE/A".
- TLS Client Profile:** A dropdown menu set to "New\_RemoteWorkerClientProfile".
- Add:** A button located to the right of the TLS Client Profile dropdown.
- IP Address / FQDN, Port, Transport:** A table with three columns. The first row contains the values "10.64.101.249", "5061", and "TLS".
- Delete:** A button located to the right of the Transport dropdown.
- Back, Next:** Buttons located at the bottom center of the dialog.

- Click **Next** until the **Add Server Configuration Profile – Advanced** tab is reached (not shown).
- On the **Add Server Configuration Profile – Advanced** tab check **Enable Grooming**, select **Avaya-SM** from the **Interworking Profile** drop-down menu (Section 8.7.1) and select **Change fax version 1 to 0** from the **Signaling Manipulation Script** drop down menu (Sections 8.8 and 13).
- Click **Finish**.

**Add Server Configuration Profile - Advanced** X

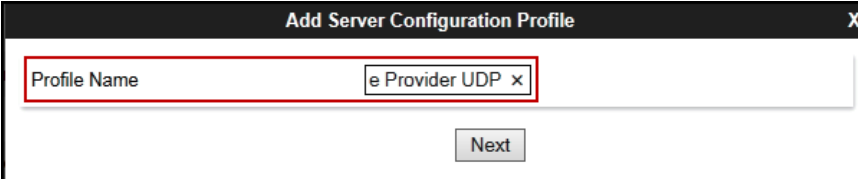
Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input checked="" type="checkbox"/>
Interworking Profile	Avaya-SM ▼
Signaling Manipulation Script	Change fax version 1 to 0 ▼
Securable	<input type="checkbox"/>
Enable FGDN	<input type="checkbox"/>
TCP Failover Port	5060
TLS Failover Port	5061
Tolerant	<input type="checkbox"/>
URI Group	None ▼

Back Finish

### 8.9.2. Server Configuration Profile – Service Provider

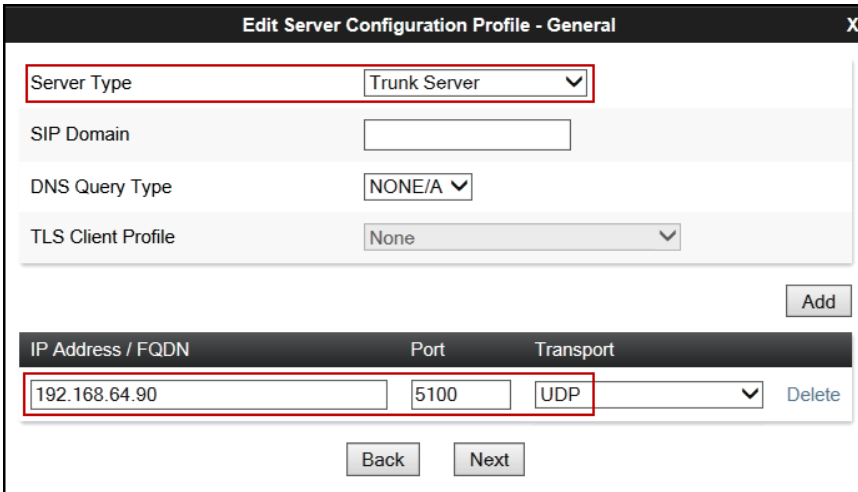
Similarly, to add the profile for the Trunk Server, click the **Add** button on the **Server Configuration** screen (not shown).

- Enter an appropriate **Profile Name** similar to the screen below (*Service Provider UDP* was used).
- Click **Next**.



The screenshot shows a dialog box titled "Add Server Configuration Profile". It has a close button (X) in the top right corner. The main field is labeled "Profile Name" and contains the text "e Provider UDP x". Below this field is a "Next" button.

- On the **Edit Server Configuration Profile - General** Tab select *Trunk Server* from the drop-down menu for the **Server Type**.
- On the **IP Addresses / FQDN** field, *192.168.64.90* (the IP address of the service provider SIP proxy server. This information was provided by CenturyLink).
- Enter *5100* under **Port**, and select **UDP** for **Transport** (The port number was provided by CenturyLink).
- Click **Next**.



The screenshot shows a dialog box titled "Edit Server Configuration Profile - General". It has a close button (X) in the top right corner. The "Server Type" dropdown is set to "Trunk Server". Below it are fields for "SIP Domain", "DNS Query Type" (set to "NONE/A"), and "TLS Client Profile" (set to "None"). An "Add" button is to the right of these fields. Below the "Add" button is a table with three columns: "IP Address / FQDN", "Port", and "Transport". The first row of the table has the values "192.168.64.90", "5100", and "UDP". A "Delete" button is to the right of the "Transport" column. At the bottom are "Back" and "Next" buttons.

On the **Add Server Configuration Profile - Authentication** window:

- Check the **Enable Authentication** box.
- Enter the **User Name** credential provided by the service provider for SIP trunk registration.
- Leave the **Realm** blank.
- Enter **Password** credential provided by the service provider for SIP trunk registration.
- Click **Next**.

The screenshot shows a window titled "Add Server Configuration Profile - Authentication". A red box highlights the following fields:

- Enable Authentication**: ☒
- User Name**:
- Realm**:  (Leave blank to detect from server challenge)
- Password**:
- Confirm Password**:

At the bottom of the window are two buttons: **Back** and **Next**.

Click **Next** on the **Add Server Configuration Profile - Heartbeat** window (not shown).

On the **Add Server Configuration Profile - Registration** window:

- Check the **Register with ALL Servers** box.
- On **Refresh Interval** enter the amount of time (in seconds) between REGISTER messages that will be sent from the enterprise to the Service Provider Proxy Server to refresh the registration binding of the SIP trunk. This value should be chosen in consultation with the service provider, **60** seconds was the value used during the compliance test.
- The **From URI** and **To URI** entries for the REGISTER messages are built using the following:
  - **From URI:** Use the pilot number (3031235745) and CenturyLink's SIP Proxy IP address (192.168.64.90), as shown on the screen below. This information is provided by CenturyLink.
  - **To URI:** Use the pilot number (3031235745) and CenturyLink's SIP Proxy IP address (192.168.64.90) , as shown on the screen below. This information is provided by CenturyLink.
- Click **Next** until the **Add Server Configuration Profile - Advanced** window is reached.

The screenshot shows the 'Add Server Configuration Profile - Registration' window. It contains the following elements:

- Register with All Servers**: ☒
- Register with Priority Server**: ☐
- Refresh Interval**: 60 seconds
- From URI**: 3031235745@192.168.
- To URI**: 35745@192.168.64.90
- Back** and **Next** buttons at the bottom.



On the **Add Server Configuration Profile - Advanced** window:

- Select **SP-General** from the **Interworking Profile** drop-down menu (**Section 8.7.2**).
- Select the **CTL-1** from the **Signaling Manipulation Script** drop down menu (**Sections 8.8** and **Section 13**).
- Click **Finish**.

**Add Server Configuration Profile - Advanced** X

Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input checked="" type="checkbox"/>
Interworking Profile	SP-General ▼
Signaling Manipulation Script	CTL-1 ▼
Securable	<input type="checkbox"/>
Enable FGDN	<input type="checkbox"/>
TCP Failover Port	5060
TLS Failover Port	5061
Tolerant	<input type="checkbox"/>
URI Group	None ▼

Back Finish

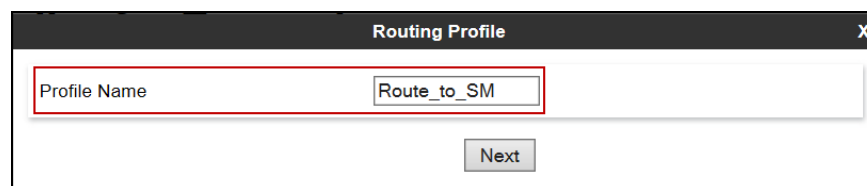
## 8.10.Routing

Routing profiles define a specific set of routing criteria that is used, in addition to other types of domain policies, to determine the path that the SIP traffic will follow as it flows through the Avaya SBCE interfaces. Two Routing Profiles were created in the test configuration, one for inbound calls, with Session Manager as the destination, and the second one for outbound calls, which are routed to the service provider SIP trunk.

### 8.10.1. Routing Profile – Enterprise

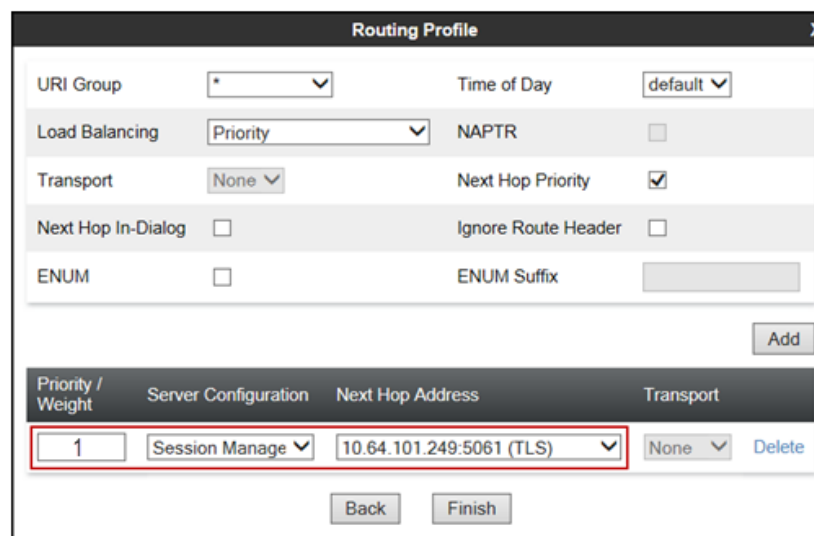
To create the inbound route, select the **Routing** tab from the **Global Profiles** menu on the left-hand side and select **Add** (not shown).

- Enter an appropriate **Profile Name** similar to the example below.
- Click **Next**.



The screenshot shows a dialog box titled "Routing Profile" with a close button (X) in the top right corner. Inside the dialog, there is a text input field labeled "Profile Name" containing the text "Route\_to\_SM". Below the input field is a button labeled "Next".

- On the **Routing Profile** tab, click the **Add** button to enter the next-hop address.
- Under **Priority/Weight** enter **1**.
- Under **Server Configuration**, select **Session Manager**. The **Next Hop Address** field will be populated with the IP address, port and protocol defined for the Session Manager Server Configuration Profile in **Section 8.9.1**.
- Defaults were used for all other parameters.
- Click **Finish**.



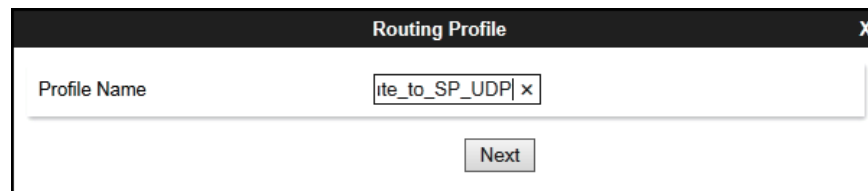
The screenshot shows the "Routing Profile" dialog box with various configuration options. The "URI Group" is set to "\*", "Time of Day" is "default", "Load Balancing" is "Priority", "NAPTR" is unchecked, "Transport" is "None", "Next Hop Priority" is checked, "Next Hop In-Dialog" is unchecked, "Ignore Route Header" is unchecked, "ENUM" is unchecked, and "ENUM Suffix" is empty. There is an "Add" button. Below this is a table with four columns: "Priority / Weight", "Server Configuration", "Next Hop Address", and "Transport". The first row in the table has "1" in the "Priority / Weight" column, "Session Manage" in the "Server Configuration" column, "10.64.101.249:5061 (TLS)" in the "Next Hop Address" column, and "None" in the "Transport" column. There is a "Delete" button next to the "Transport" column. At the bottom are "Back" and "Finish" buttons.

Priority / Weight	Server Configuration	Next Hop Address	Transport
1	Session Manage	10.64.101.249:5061 (TLS)	None

### 8.10.2. Routing Profile – Service Provider

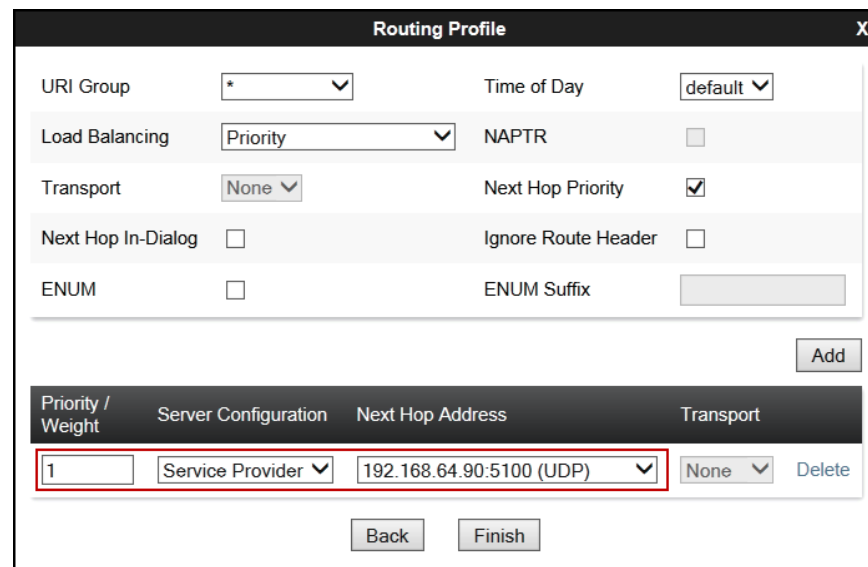
Back at the **Routing** tab, select **Add** (not shown) to repeat the process in order to create the outbound route.

- Enter an appropriate **Profile Name** similar to the example below (*Route\_to\_SP\_UDP* was used).
- Click **Next**.



The image shows a 'Routing Profile' dialog box. It has a title bar with 'Routing Profile' and a close button 'X'. Inside, there is a text input field for 'Profile Name' containing 'ite\_to\_SP\_UDP' with a small 'x' icon to its right. Below the input field is a 'Next' button.

- On the **Routing Profile** tab, click the **Add** button to enter the next-hop address.
- Under **Priority/Weight** enter *1*.
- **Server Configuration:** Select *Service Provider UDP*.
- The **Next Hop Address** is populated automatically with *192.168.64.90:5100 (UDP)* CenturyLink's SIP Proxy IP address, Port and Transport, Server Configuration Profile defined in **Section 8.9.2**.
- Click **Finish**.



The image shows a 'Routing Profile' dialog box with various configuration options and a table of entries. The configuration options include: URI Group (dropdown with '\*'), Time of Day (dropdown with 'default'), Load Balancing (dropdown with 'Priority'), NAPTR (checkbox), Transport (dropdown with 'None'), Next Hop Priority (checkbox checked), Next Hop In-Dialog (checkbox), Ignore Route Header (checkbox), ENUM (checkbox), and ENUM Suffix (text input). There is an 'Add' button. Below these options is a table with the following columns: Priority / Weight, Server Configuration, Next Hop Address, and Transport. The table has one row with the following values: 1, Service Provider, 192.168.64.90:5100 (UDP), and None. There is a 'Delete' button next to the 'Transport' column. At the bottom are 'Back' and 'Finish' buttons.

Priority / Weight	Server Configuration	Next Hop Address	Transport
1	Service Provider	192.168.64.90:5100 (UDP)	None

## 8.11. Topology Hiding

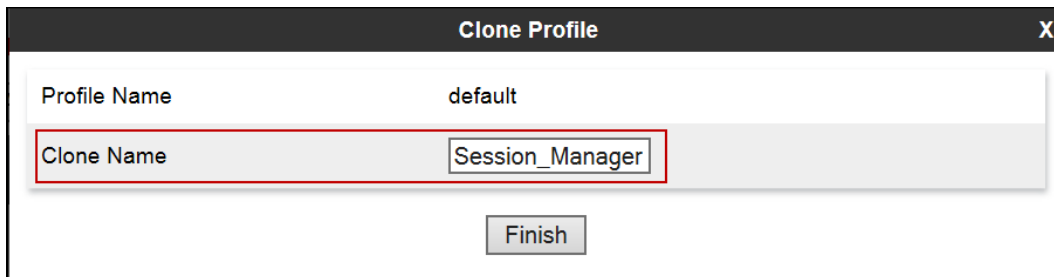
Topology Hiding is a security feature that allows the modification of several SIP headers, preventing private enterprise network information from being propagated to the untrusted public network.

Topology Hiding can also be used as an interoperability tool to adapt the host portion in the SIP headers to the IP addresses or domains expected on the service provider and the enterprise networks. For the compliance test, the default Topology Hiding Profile was cloned and modified accordingly. Only the minimum configuration required to achieve interoperability on the SIP trunk was performed. Additional steps can be taken in this section to further mask the information that is sent from the enterprise to the public network.

### 8.11.1. Topology Hiding Profile – Enterprise

To add the Topology Hiding Profile in the enterprise direction, select **Topology Hiding** from the **Global Profiles** menu on the left-hand side, select *default* from the list of pre-defined profiles and click the **Clone** button (not shown).

- Enter a **Clone Name** such as the one shown below.
- Click **Finish**.



The screenshot shows a 'Clone Profile' dialog box. It has a title bar with 'Clone Profile' and a close button 'X'. Inside, there are two input fields: 'Profile Name' with the value 'default' and 'Clone Name' with the value 'Session\_Manager'. The 'Clone Name' field is highlighted with a red border. Below the fields is a 'Finish' button.

On the newly cloned *Session\_Manager* profile screen, click the **Edit** button (not shown).

- For the, **From**, **To** and **Request-Line** headers, select **Overwrite** in the **Replace Action** column and enter the enterprise SIP domain **avaya.lab.com**, in the **Overwrite Value** column of these headers, as shown below. This is the domain known by Session Manager, defined in **Section 7.2**.
- Default values were used for all other fields.
- Click **Finish**.

Header	Criteria	Replace Action	Overwrite Value	
SDP	IP/Domain	Auto		Delete
To	IP/Domain	Overwrite	avaya.lab.com	Delete
From	IP/Domain	Overwrite	avaya.lab.com	Delete
Refer-To	IP/Domain	Auto		Delete
Via	IP/Domain	Auto		Delete
Record-Route	IP/Domain	Auto		Delete
Request-Line	IP/Domain	Overwrite	avaya.lab.com	Delete
Referred-By	IP/Domain	Auto		Delete

Finish

### 8.11.2. Topology Hiding Profile – Service Provider

To add the Topology Hiding Profile in the service provider direction, select **Topology Hiding** from the **Global Profiles** menu on the left-hand side, select **default** from the list of pre-defined profiles and click the **Clone** button (not shown).

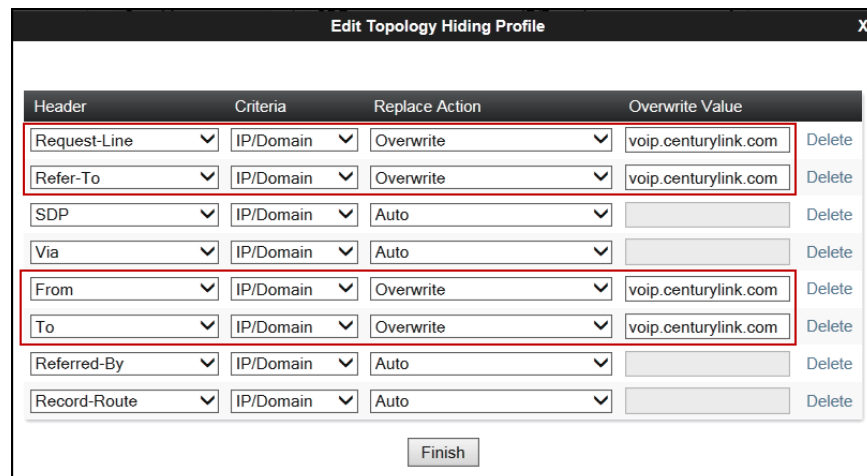
- Enter a **Clone Name** such as the one shown below.
- Click **Finish**.



The screenshot shows a 'Clone Profile' dialog box. It has a title bar with 'Clone Profile' and a close button 'X'. Inside, there's a 'Profile Name' field with the value 'default'. Below it is a 'Clone Name' field with the value 'Service\_Provider'. At the bottom is a 'Finish' button.

On the newly cloned **Service\_Provider** profile screen, click the **Edit** button (not shown).

- For the, **From**, **To**, **Request-Line** and **Refer-To** headers, select **Overwrite** in the **Replace Action** column and enter CenturyLink's SIP domain **voip.centurylink.com** in the **Overwrite Value** column of these headers, as shown below.
- Default values were used for all other fields.
- Click **Finish**.



The screenshot shows an 'Edit Topology Hiding Profile' dialog box. It contains a table with the following columns: Header, Criteria, Replace Action, Overwrite Value, and a Delete button. The table has 10 rows. The first four rows are highlighted with a red box. The 'Request-Line' and 'Refer-To' rows have 'Overwrite' as the action and 'voip.centurylink.com' as the value. The 'From' and 'To' rows also have 'Overwrite' as the action and 'voip.centurylink.com' as the value. The other rows have 'Auto' as the action and an empty 'Overwrite Value' field. A 'Finish' button is at the bottom.

Header	Criteria	Replace Action	Overwrite Value	Delete
Request-Line	IP/Domain	Overwrite	voip.centurylink.com	Delete
Refer-To	IP/Domain	Overwrite	voip.centurylink.com	Delete
SDP	IP/Domain	Auto		Delete
Via	IP/Domain	Auto		Delete
From	IP/Domain	Overwrite	voip.centurylink.com	Delete
To	IP/Domain	Overwrite	voip.centurylink.com	Delete
Referred-By	IP/Domain	Auto		Delete
Record-Route	IP/Domain	Auto		Delete

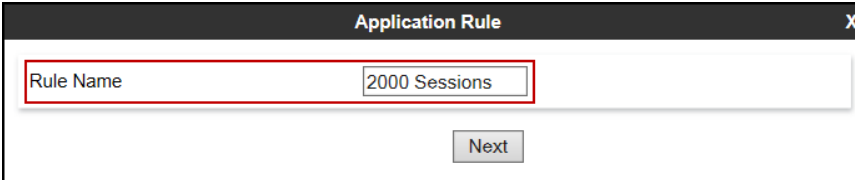
## 8.12.Domain Policies

Domain Policies allow the configuration of sets of rules designed to control and normalize the behavior of call flows, based upon various criteria of communication sessions originating from or terminating in the enterprise. Domain Policies include rules for Application, Media, Signaling, Security, etc.

### 8.12.1.Application Rules

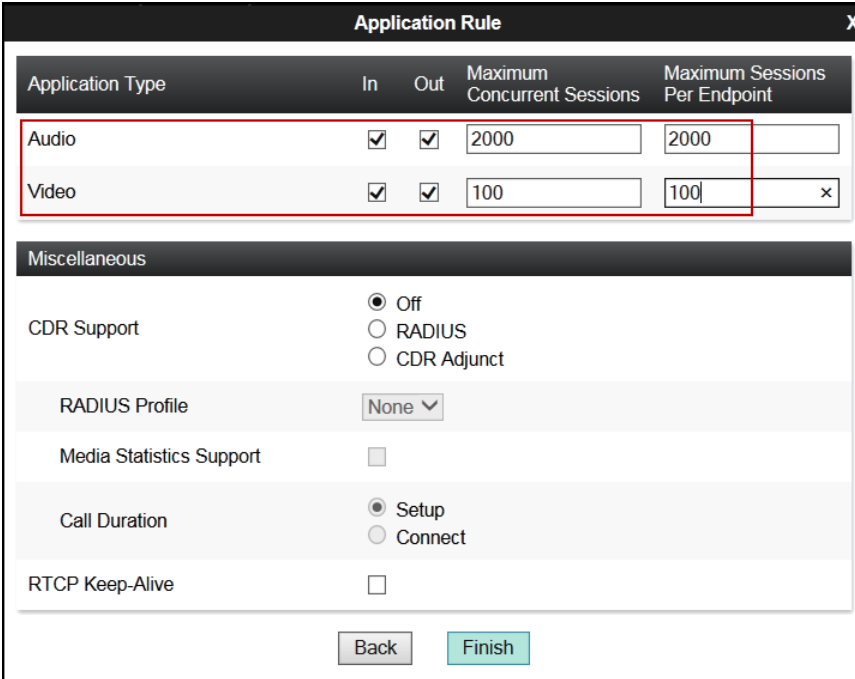
Application Rules define which types of SIP-based Unified Communications (UC) applications the UC-Sec security device will protect: voice, video, and/or Instant Messaging (IM). In addition, Application Rules define the maximum number of concurrent voice and video sessions the network will process in order to prevent resource exhaustion. From the menu on the left-hand side, select **Domain Policies** → **Application Rules**, click on the **Add** button to add a new rule.

- Under **Rule Name** enter the name of the profile, e.g., *2000 Sessions*.
- Click **Next**.



The screenshot shows a window titled "Application Rule" with a close button (X) in the top right corner. Inside the window, there is a text input field labeled "Rule Name" which contains the text "2000 Sessions". This field is highlighted with a red rectangular box. Below the input field, there is a "Next" button.

- Under **Audio** check *In* and *Out* and set the **Maximum Concurrent Sessions** and **Maximum Sessions Per Endpoint** to recommended values, the values of *2000* for Audio and *100* for Video were used in the sample configuration.
- Click **Finish**.



The screenshot shows a window titled "Application Rule" with a close button (X) in the top right corner. The window contains a table with the following data:

Application Type	In	Out	Maximum Concurrent Sessions	Maximum Sessions Per Endpoint
Audio	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2000	2000
Video	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100	100

The 'Audio' and 'Video' rows are highlighted with a red rectangular box. Below the table, there is a "Miscellaneous" section with the following options:

- CDR Support: ☒ Off, ☐ RADIUS, ☐ CDR Adjunct
- RADIUS Profile: None (dropdown menu)
- Media Statistics Support: ☐
- Call Duration: ☒ Setup, ☐ Connect
- RTCP Keep-Alive: ☐

At the bottom of the window, there are "Back" and "Finish" buttons.

### 8.12.2. Media Rules

Media Rules allow one to define RTP media packet parameters such as prioritizing encryption techniques and packet encryption techniques. Together these media-related parameters define a strict profile that is associated with other SIP-specific policies to determine how media packets matching these criteria will be handled by the Avaya SBCE security product. For the compliance test, one media rule (shown below) was created toward Session Manager and a default media rule was used toward the Service Provider.

To add a media rule in the Session Manager direction, from the menu on the left-hand side, select **Domain Policies → Media Rules**.

- Click on the **Add** button to add a new media rule (not shown).
- Under **Rule Name** enter **SM\_SRTP**.
- Click **Next** (not shown).
- Under Audio Encryption, **Preferred Format #1**, select **SRTP\_AES\_CM\_128\_HMAC\_SHA1\_80**.
- Under Audio Encryption, **Preferred Format #2**, select **RTP**.
- Under Audio Encryption, uncheck **Encrypted RTCP**.
- Under Audio Encryption, check **Interworking**.
- Repeat the above steps under Video Encryption.
- Under Miscellaneous verify that **Capability Negotiation** is checked.
- Click **Next**.



Media Encryption
X

Audio Encryption

Preferred Format #1
SRTP\_AES\_CM\_128\_HMAC\_SHA1\_80

Preferred Format #2
RTP

Preferred Format #3
NONE

Encrypted RTCP
☐

MKI
☐

Lifetime
Leave blank to match any value.
2^

Interworking
☒

Video Encryption

Preferred Format #1
SRTP\_AES\_CM\_128\_HMAC\_SHA1\_80

Preferred Format #2
RTP

Preferred Format #3
NONE

Encrypted RTCP
☐

MKI
☐

Lifetime
Leave blank to match any value.
2^

Interworking
☒

Miscellaneous

Capability Negotiation
☒

Finish

- Accept default values in the remaining sections by clicking **Next** (not shown), and then click **Finish** (not shown).

For the compliance test, the **default-low-med** Media Rule was used in the Service Provider direction.

The screenshot displays the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes links for Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header shows the product name and the Avaya logo. On the left, a sidebar menu lists various configuration areas, with 'Domain Policies' and 'Media Rules' highlighted. The main content area is titled 'Media Rules: default-low-med' and features a list of media rules on the left and a configuration panel on the right. The configuration panel includes tabs for Encryption, Codec Prioritization, Advanced, and QoS. The Encryption tab is active, showing settings for Audio and Video Encryption, including Preferred Formats (RTP) and Interworking (checked). A warning message at the top of the configuration panel states: 'It is not recommended to edit the defaults. Try cloning or adding a new rule instead.'

Alarms Incidents Status Logs Diagnostics Users Settings Help Log Out

## Session Border Controller for Enterprise

AVAYA

Dashboard  
Administration  
Backup/Restore  
System Management  
Global Parameters  
Global Profiles  
PPM Services  
Domain Policies  
Application Rules  
Border Rules  
Media Rules  
Security Rules  
Signaling Rules  
End Point Policy Groups  
Session Policies  
TLS Management  
Device Specific Settings

### Media Rules: default-low-med

Add Filter By Device... Clone

Media Rules  
default-low-med  
default-low-med-enc  
default-high  
default-high-enc  
avaya-low-med-enc  
Rem\_Workers\_SRTP  
IPO\_SRTP  
ServiceProvider\_SR...  
SM\_SRTP

It is not recommended to edit the defaults. Try cloning or adding a new rule instead.

Encryption Codec Prioritization Advanced QoS

**Audio Encryption**  
Preferred Formats RTP  
Interworking ☒

**Video Encryption**  
Preferred Formats RTP  
Interworking ☒

**Miscellaneous**  
Capability Negotiation ☐

Edit

### 8.12.3. Signaling Rules

For the compliance test, the **default** signaling rule was used.

The screenshot displays the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes links for Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header shows the product name and the Avaya logo. A left-hand navigation menu lists various system management options, with 'Domain Policies' and 'Signaling Rules' highlighted. The main content area is titled 'Signaling Rules: default' and features an 'Add' button, a 'Filter By Device...' dropdown, and a 'Clone' button. A warning message states: 'It is not recommended to edit the defaults. Try cloning or adding a new rule instead.' Below this, there are tabs for 'General', 'Requests', 'Responses', 'Request Headers', 'Response Headers', 'Signaling QoS', and 'UCID'. The 'General' tab is active, showing sections for 'Inbound' and 'Outbound' rules, and a 'Content-Type Policy' section. The 'Inbound' and 'Outbound' sections each have a table with columns for 'Requests', 'Non-2XX Final Responses', 'Optional Request Headers', and 'Optional Response Headers', all set to 'Allow'. The 'Content-Type Policy' section has a checkbox for 'Enable Content-Type Checks' which is checked, and a table for 'Action' with columns for 'Allow', 'Multipart Action', and 'Allow'. An 'Exception List' section is also present. An 'Edit' button is located at the bottom right of the configuration area.

Alarms Incidents Status Logs Diagnostics Users Settings Help Log Out

## Session Border Controller for Enterprise

AVAYA

Dashboard  
Administration  
Backup/Restore  
System Management  
‣ Global Parameters  
‣ Global Profiles  
‣ PPM Services  
‣ **Domain Policies**  
  Application Rules  
  Border Rules  
  Media Rules  
  Security Rules  
  **Signaling Rules**  
  End Point Policy Groups  
  Session Policies  
‣ TLS Management  
‣ Device Specific Settings

### Signaling Rules: default

Add Filter By Device... Clone

Signaling Rules  
**default**  
No-Content-Typ...  
SessMgr\_CM\_S...  
OPTIONS  
Remote Workers  
Remove\_Update  
Contact  
Remove PAI  
Remove PAI\_1  
Remove\_headers  
Remove Record...  
Test

It is not recommended to edit the defaults. Try cloning or adding a new rule instead.

General Requests Responses Request Headers Response Headers Signaling QoS UCID

#### Inbound

Requests	Allow
Non-2XX Final Responses	Allow
Optional Request Headers	Allow
Optional Response Headers	Allow

#### Outbound

Requests	Allow
Non-2XX Final Responses	Allow
Optional Request Headers	Allow
Optional Response Headers	Allow

#### Content-Type Policy

Enable Content-Type Checks ☒

Action	Allow	Multipart Action	Allow
--------	-------	------------------	-------

Exception List Exception List

Edit

## 8.13.End Point Policy Groups

End Point Policy Groups associate the different sets of rules under Domain Policies (Media, Signaling, Security, etc.) to be applied to specific SIP messages traversing through the Avaya SBCE. Please note that changes should not be made to any of the default rules used in these End Point Policy Groups.

### 8.13.1. End Point Policy Group – Enterprise

To create an End Point Policy Group for the enterprise, select **End Point Policy Groups** under the **Domain Policies** menu and select **Add** (not shown).

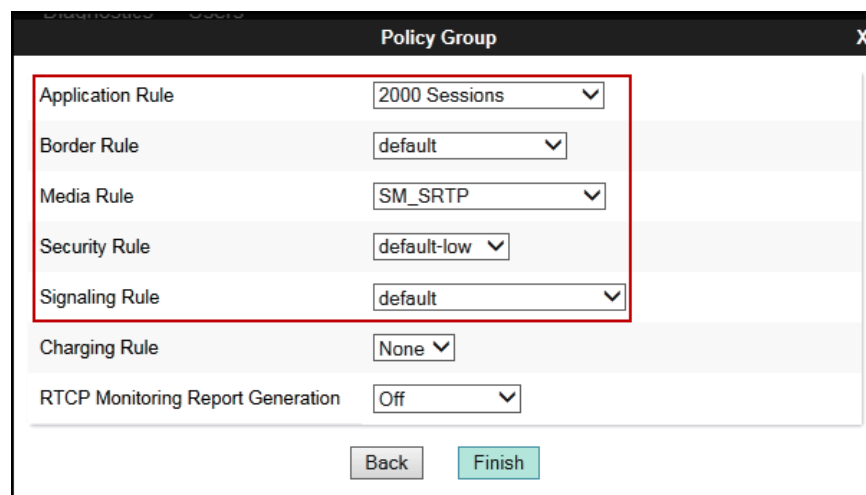
- Enter an appropriate name in the **Group Name** field.
- Click **Next**.



The screenshot shows a dialog box titled "Policy Group" with a close button (X) in the top right corner. Inside the dialog, there is a text input field labeled "Group Name" which contains the text "Enterprise". This field is highlighted with a red rectangular box. Below the input field, there is a "Next" button.

Under the **Policy Group** tab enter the following:

- **Application Rule:** *2000 Sessions* (Section 8.12.1).
- **Border Rule:** *default*.
- **Media Rule:** *SM\_SRTP* (Section 8.12.2).
- **Security Rule:** *default-low*.
- **Signaling Rule:** *default* (Section 8.12.3).
- Click **Finish**.

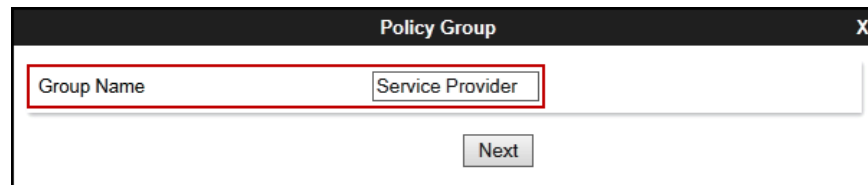


The screenshot shows the "Policy Group" dialog box with several dropdown menus. A red rectangular box highlights the first five rules: "Application Rule" (2000 Sessions), "Border Rule" (default), "Media Rule" (SM\_SRTP), "Security Rule" (default-low), and "Signaling Rule" (default). Below these, "Charging Rule" is set to "None" and "RTCP Monitoring Report Generation" is set to "Off". At the bottom, there are "Back" and "Finish" buttons.

### 8.13.2. End Point Policy Group – Service Provider

To create an End Point Policy Group for the Service Provider, select **End Point Policy Groups** under the **Domain Policies** menu and select **Add** (not shown).

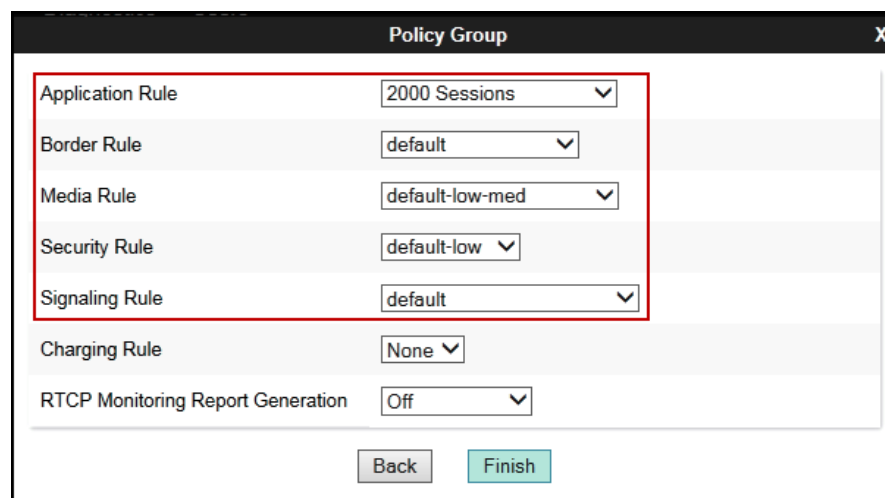
- Enter an appropriate name in the **Group Name** field (*Service Provider* was used).
- Click **Next**.



The screenshot shows a dialog box titled "Policy Group" with a close button (X) in the top right corner. Inside the dialog, there is a text input field labeled "Group Name" which contains the text "Service Provider". Below the input field is a button labeled "Next".

Under the **Policy Group** tab enter the following:

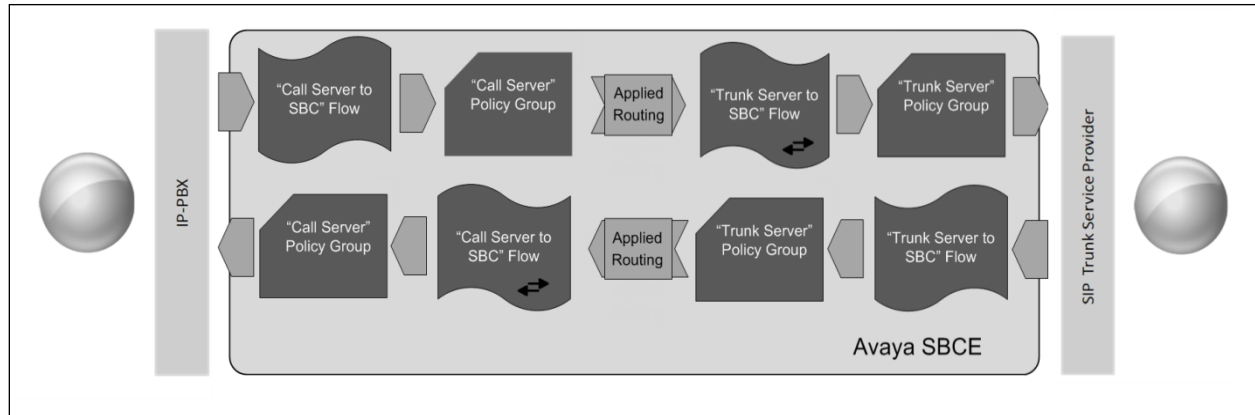
- **Application Rule:** *2000 Sessions* (Section 8.12.1).
- **Border Rule:** *default*.
- **Media Rule:** *default-low-med* (Section 8.12.2).
- **Security Rule:** *default-low*.
- **Signaling Rule:** *default* (Section 8.12.3).
- Click **Finish**.



The screenshot shows the "Policy Group" dialog box with various configuration options. The "Application Rule" is set to "2000 Sessions", "Border Rule" is "default", "Media Rule" is "default-low-med", "Security Rule" is "default-low", and "Signaling Rule" is "default". These five rules are grouped together in a red box. Below these, "Charging Rule" is set to "None" and "RTPC Monitoring Report Generation" is set to "Off". At the bottom, there are "Back" and "Finish" buttons.

## 8.14.End Point Flows

When a packet is received by Avaya SBCE, the content of the packet (IP addresses, URIs, etc.) is used to determine which flow it matches. Once the flow is determined, the flow points to a policy group which contains several rules concerning processing, privileges, authentication, routing, etc. Once routing is applied and the destination endpoint is determined, the policies for this destination endpoint are applied. The context is maintained, so as to be applied to future packets in the same flow. The following screen illustrates the flow through the Avaya SBCE to secure a SIP trunk call.



The **End-Point Flows** defines certain parameters that pertain to the signaling and media portions of a call, whether it originates from within the enterprise or outside of the enterprise.

### 8.14.1. End Point Flow – Enterprise

To create the call flow toward the enterprise, from the **Device Specific** menu, select **End Point Flows**, then select the **Server Flows** tab. Click **Add** (not shown). The screen below shows the flow named *Session\_Manager\_Flow* created in the sample configuration. The flow uses the interfaces, policies, and profiles defined in previous sections. Note that the **Routing Profile** selection is the profile created for the Service Provider in **Section 8.10.2**, which is the reverse route of the flow. Click **Finish**.

Edit Flow: Session_Manager_Flow	
Flow Name	Session_Manager_Flow
Server Configuration	Session Manager
URI Group	*
Transport	*
Remote Subnet	*
Received Interface	Public_sig
Signaling Interface	Private_sig
Media Interface	Private_med
Secondary Media Interface	None
End Point Policy Group	Enterprise
Routing Profile	Route_to_SP_UDP
Topology Hiding Profile	Session_Manager
Signaling Manipulation Script	None
Remote Branch Office	Any

Finish

### 8.14.2. End Point Flow – Service Provider

A second Server Flow with the name *SIP\_Trunk\_Flow\_UDP* was similarly created in the Service Provider direction. The flow uses the interfaces, policies, and profiles defined in previous sections. Note that the **Routing Profile** selection is the profile created for Session Manager in **Section 8.10.1**, which is the reverse route of the flow. Also note that there is no selection under the **Signaling Manipulation Script** field. Click **Finish**.

Edit Flow: SIP_Trunk_Flow_UDP	
Flow Name	SIP_Trunk_Flow_UDP
Server Configuration	Service Provider UDP
URI Group	*
Transport	*
Remote Subnet	*
Received Interface	Private_siq
Signaling Interface	Public_siq
Media Interface	Public_med
Secondary Media Interface	None
End Point Policy Group	Service Provider
Routing Profile	Route_to_SM
Topology Hiding Profile	Service_Provider
Signaling Manipulation Script	None
Remote Branch Office	Any

Finish



## 9. CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform Configuration

To use CenturyLink SIP Trunking Service on Oracle/BroadWorks Platform, a customer must request the service from CenturyLink using the established sales processes. The process can be started by contacting CenturyLink via the corporate web site at:

<http://www.centurylink.com/business/voice/sip-trunk.html>

During the signup process, CenturyLink and the customer will discuss details about the preferred method to be used to connect the customer's enterprise network to CenturyLink's network.

CenturyLink will provide the following information:

- CenturyLink SIP proxy server IP address, SIP signaling transport (UDP was used) and port number (5100 was used).
- SIP trunk registration credentials.
- DID and pilot numbers.
- Supported codecs and order of preference.
- Etc.

## 10. Verification and Troubleshooting

This section provides verification steps that may be performed in the field to verify that the solution is configured properly. This section also provides a list of commands that can be used to troubleshoot the solution.

### 10.1.General Verification Steps

- Verify that endpoints at the enterprise site can place calls to the PSTN and that the call remains active for more than 35 seconds. This time period is included to verify that proper routing of the SIP messaging has satisfied SIP protocol timers.
- Verify that endpoints at the enterprise site can receive calls from the PSTN and that the call can remain active for more than 35 seconds.
- Verify that the user on the PSTN can end an active call by hanging up.
- Verify that an endpoint at the enterprise site can end an active call by hanging up.

### 10.2.Communication Manager Verification

The following commands can be entered in the Communication Manager SAT terminal to verify the SIP trunk functionality:

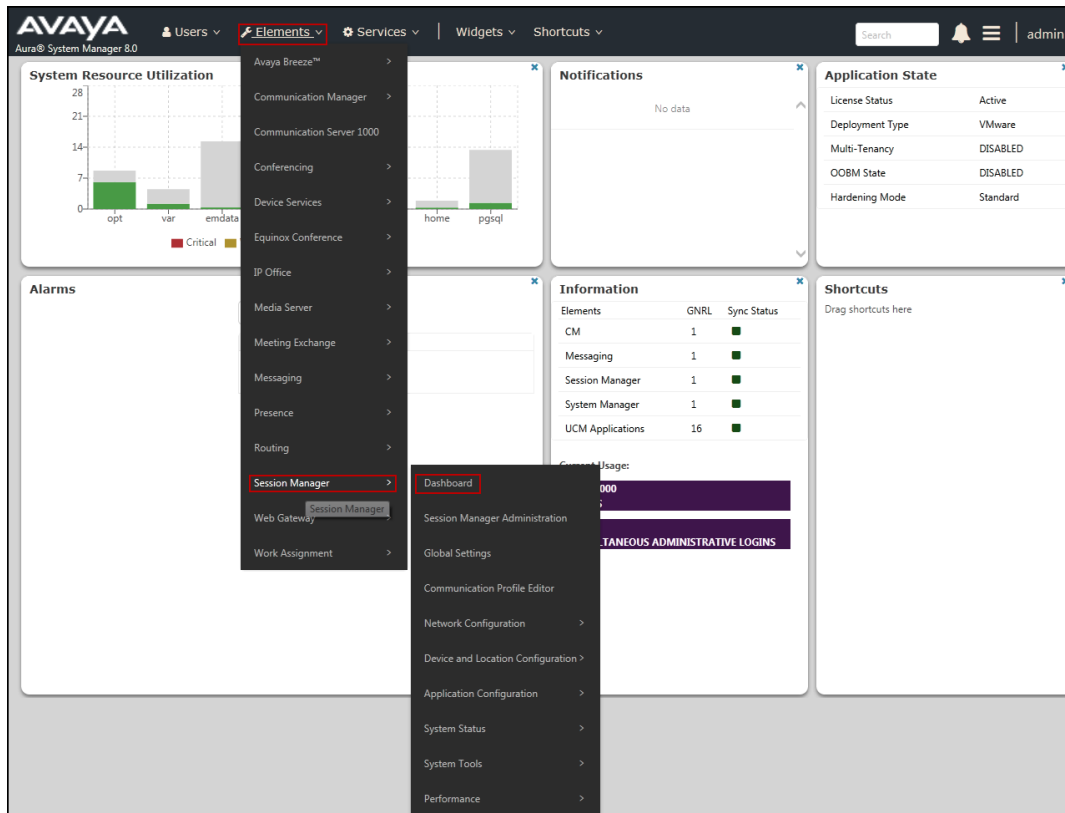
- **list trace station** <extension number>  
Traces calls to and from a specific station.
- **list trace tac** <trunk access code number>  
Trace calls over a specific trunk group.
- **status signaling-group** <signaling group number>  
Displays signaling group service state.
- **status trunk** <trunk group number>  
Displays trunk group service state.

- **status station** <extension number>  
Displays signaling and media information for an active call on a specific station.

### 10.3.Session Manager Verification

The Session Manager configuration may be verified via System Manager.

**Step 1** - Using the procedures described in **Section 7**, access the System Manager GUI. From the **Home** screen, under the **Elements** heading, select **Session Manager**, then select **Dashboard**.



**Step 2** - The Session Manager Dashboard is displayed. Note that the **Test Passed**, **Alarms**, **Service State**, and **Data Replication** columns all show good status.

In the **Entity Monitoring** column, Session Manager shows that there is **1** alarm out of the **14** Entities defined.

<div> <div>Session Manager</div> <div>Dashboard</div> <div>Session Manager Admin...</div> <div>Global Settings</div> <div>Communication Profile ...</div> <div>Network Configuration ...</div> <div>Device and Location ...</div> <div>Application Configur...</div> <div>System Status</div> </div> <div> <div>Session Manager Dashboard</div> <div>This page provides the overall status and health summary of each administered Session Manager.</div> <div> <div>Session Manager Instances</div> <div> <div>Service State</div> <div>Shutdown System</div> <div>EASG</div> <div>As of 10:43 AM</div> </div> <div> <div>1 Item</div> <div>Show</div> <div>All</div> </div> <div>Filter: Enable</div> <table> <tr> <th></th> <th>Session Manager</th> <th>Type</th> <th>Tests Pass</th> <th>Alarms</th> <th>Security Module</th> <th>Service State</th> <th>Entity Monitoring</th> <th>Active Call Count</th> <th>Registrations</th> <th>Data Replication</th> <th>User Data Storage Status</th> <th>License Mode</th> <th>EASG</th> <th>Version</th> </tr> <tr> <td><input type="checkbox"/></td> <td><a href="#">Session Manager</a></td> <td>Core</td> <td>✓</td> <td>0/0/0</td> <td>Up</td> <td>Accept New Service</td> <td>1/14</td> <td>0</td> <td>7/7</td> <td>⚠</td> <td>✓</td> <td>Normal</td> <td>Enabled</td> <td>8.0.0.0.800035</td> </tr> </table> <div>Select : All, None</div> </div> </div>																Session Manager	Type	Tests Pass	Alarms	Security Module	Service State	Entity Monitoring	Active Call Count	Registrations	Data Replication	User Data Storage Status	License Mode	EASG	Version	<input type="checkbox"/>	<a href="#">Session Manager</a>	Core	✓	0/0/0	Up	Accept New Service	1/14	0	7/7	⚠	✓	Normal	Enabled	8.0.0.0.800035
	Session Manager	Type	Tests Pass	Alarms	Security Module	Service State	Entity Monitoring	Active Call Count	Registrations	Data Replication	User Data Storage Status	License Mode	EASG	Version																														
<input type="checkbox"/>	<a href="#">Session Manager</a>	Core	✓	0/0/0	Up	Accept New Service	1/14	0	7/7	⚠	✓	Normal	Enabled	8.0.0.0.800035																														

Other Session Manager useful verification and troubleshooting tools include:

- **traceSM** – Session Manager command line tool for traffic analysis. Login to the Session Manager command line management interface to run this command.
- **Call Routing Test** – The Call Routing Test verifies the routing for a particular source and destination. To run the routing test, from the System Manager Home screen navigate to **Elements** → **Session Manager** → **System Tools** → **Call Routing Test**. Enter the requested data to run the test.

## 10.4.Ayaya SBCE Verification

There are several links and menus located on the taskbar at the top of the screen of the web interface that can provide useful diagnostic or troubleshooting information.

**Alarms:** This screen provides information about the health of the SBC.

The screenshot shows the 'Session Border Controller for Enterprise' dashboard. The top navigation bar includes 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', and 'Users'. The main content area is divided into several sections:

- Information:** A table showing system details.

System Time	02:03:53 PM EST	Refresh
Version	7.2.2.1-04-16104	
Build Date	Fri Sep 7 06:23:07 UTC 2018	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	01/03/2019 13:39:22 EST	
Failed Login Attempts	0	
- Installed Devices:** A list showing 'EMS' and 'Avaya\_SBCE'.
- Active Alarms (past 24 hours):** A section stating 'None found.'
- Incidents (past 24 hours):** A section stating 'Avaya\_SBCE: No Subscriber Flow Matched'.

The following screen shows the **Alarm Viewer** page.

The screenshot shows the 'Alarm Viewer' page. The top navigation bar includes 'Help'. The main content area is divided into two sections:

- Devices:** A list showing 'EMS' and 'Avaya\_SBCE' (highlighted with a red box).
- Alarms:** A table showing alarm details. The table has columns for 'ID', 'Details', 'State', 'Time', and 'Device'. The table is currently empty, displaying 'No alarms found for this device.' Below the table are buttons for 'Clear Selected' and 'Clear All'.

**Incidents** : Provides detailed reports of anomalies, errors, policies violations, etc.

**Session Border Controller for Enterprise**

**Dashboard**

**Information**

System Time	02:03:53 PM EST	<a href="#">Refresh</a>
Version	7.2.2.1-04-16104	
Build Date	Fri Sep 7 06:23:07 UTC 2018	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	01/03/2019 13:39:22 EST	
Failed Login Attempts	0	

**Installed Devices**

EMS
Avaya_SBCE

**Active Alarms (past 24 hours)**

None found.

**Incidents (past 24 hours)**

Avaya\_SBCE: No Subscriber Flow Matched

The following screen shows the Incident Viewer page.

**Incident Viewer**

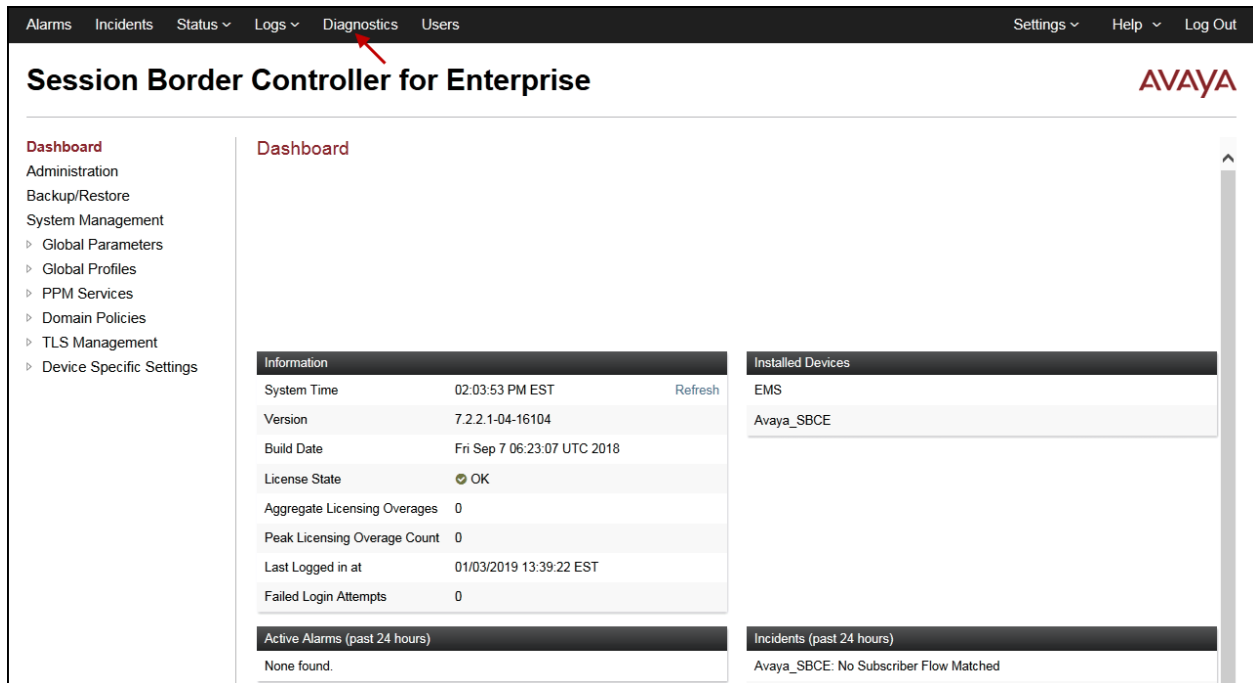
Device:  Category:  [Clear Filters](#) [Refresh](#) [Generate Report](#)

Displaying results 0 to 0 out of 0.

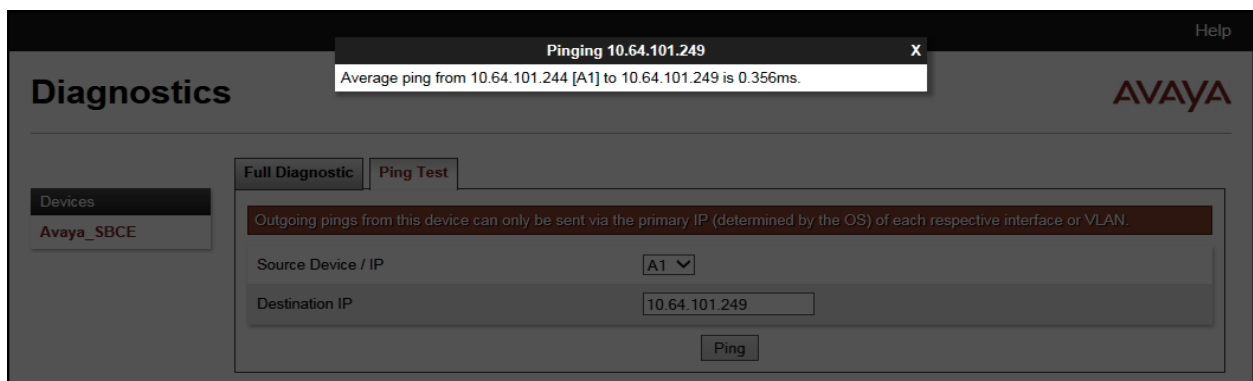
ID	Device	Date & Time	Category	Type	Cause
No incidents found.					

<< < 1 > >>

**Diagnostics:** This screen provides a variety of tools to test and troubleshoot the Avaya SBCE network connectivity.



The following screen shows the Diagnostics page with the results of a ping test.



Additionally, the Avaya SBCE contains an internal packet capture tool that allows the capture of packets on any of its interfaces, saving them as *pcap* files. Navigate to **Device Specific Settings** → **Troubleshooting** → **Trace**. Select the **Packet Capture** tab, set the desired configuration for the trace and click **Start Capture**.

The screenshot displays the Avaya SBCE web interface. The top navigation bar includes 'Alarms 1', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The main header reads 'Session Border Controller for Enterprise' with the 'AVAYA' logo on the right. A left-hand sidebar lists various system management options, with 'Device Specific Settings' expanded to show 'Troubleshooting' and 'Trace'. The 'Trace' option is selected, leading to the 'Trace: Avaya\_SBCE' page. This page has two tabs: 'Packet Capture' (active) and 'Captures'. The 'Packet Capture Configuration' form includes fields for Status (Ready), Interface (Any), Local Address (All), Remote Address (\*), Protocol (All), Maximum Number of Packets to Capture (10000), and Capture Filename (Test.pcap). 'Start Capture' and 'Clear' buttons are at the bottom of the form.

Once the capture is stopped, click the **Captures** tab and select the proper *pcap* file. Note that the date and time is appended to the filename specified previously. The file can now be saved to the local PC, where it can be opened with an application such as Wireshark.

Alarms Incidents Status ▾ Logs ▾ Diagnostics Users Settings ▾ Help ▾ Log Out

## Session Border Controller for Enterprise

AVAYA

Dashboard  
Administration  
Backup/Restore  
System Management  
▸ Global Parameters  
▸ Global Profiles  
▸ PPM Services  
▸ Domain Policies  
▸ TLS Management  
▾ Device Specific Settings  
    Network Management  
    Media Interface  
    Signaling Interface  
    End Point Flows  
    Session Flows  
    ▸ DMZ Services  
    TURN/STUN Service  
    SNMP  
    Syslog Management  
    Advanced Options  
    ▾ Troubleshooting  
        Debugging  
        Trace  
        DoS Learning  
        Logs Collection

Trace: Avaya\_SBCE

Devices Avaya\_SBCE

Packet Capture Captures

Refresh

File Name	File Size (bytes)	Last Modified	
CenturyLink_20180510180559.pcap	1,040,384	May 10, 2018 6:06:35 PM EDT	Delete

Also the **traceSBC** tool can be used to monitor the SIP signaling messages between the Service provider and the Avaya SBCE.



## 11. Conclusion

These Application Notes describe the procedures required to configure Avaya Aura® Communication Manager 8.0, Avaya Aura® Session Manager 8.0, Avaya Aura® Experience Portal 7.2, and Avaya Session Border Controller for Enterprise 7.2.2, to connect to the CenturyLink SIP Trunking service on Oracle/BroadWorks Platform using UDP, as shown in **Figure 1**.

Interoperability testing of the sample configuration was completed with successful results for all test cases with the observations/limitations described in **Sections 2.1** and **2.2**.

## 12. References

This section references the documentation relevant to these Application Notes. Additional Avaya product documentation is available at <http://support.avaya.com>.

- [1] *Deploying Avaya Aura® Communication Manager in a Virtualized Environment*, Release 8.0.1, Issue 5, December 2018.
- [2] *Administering Avaya Aura® Communication Manager*, Release 8.0.1, Issue 3, December 2018.
- [3] *Administering Avaya Aura® System Manager* for Release 8.0.1, Issue 5, December 2018.
- [4] *Deploying Avaya Aura® System Manager in a Virtualized Environment*, Release 8.0.1, Issue 3, December 2018.
- [5] *Deploying Avaya Aura® Session Manager and Avaya Aura® Branch Session Manager in a Virtualized Environment*, Release 8.0.1, Issue 3, December 2018.
- [6] *Administering Avaya Aura® Session Manager*, Release 8.0.1, Issue 3, December 2018.
- [7] *Deploying Avaya Session Border Controller for Enterprise in a Virtualized Environment*, Release 7.2.2, Issue 9, October 2018.
- [8] *Administering Avaya Session Border Controller for Enterprise*, Release 7.2.2, Issue 11, November 2018.
- [9] *Administering Avaya Aura® Experience Portal*, Release 7.2.1, Issue 1, March 2018
- [10] *Implementing Avaya Aura® Experience Portal on a single server*, Release 7.2, Issue 1, July 2017
- [11] *Configuring Remote Workers with Avaya Session Border Controller for Enterprise Rel. 7.0, Avaya Aura® Communication Manager Rel. 7.0 and Avaya Aura® Session Managers Rel. 7.0 - Issue 1.0*.
- [12] *Deploying and Updating Avaya Aura® Media Server Appliance*, Release 8.0, Issue 3, December 2018.
- [13] *Implementing and Administering Avaya Aura® Media Server*. Release 8.0, Issue 3, November 2018.
- [14] *Planning for and Administering Avaya Equinox for Android, iOS, Mac, and Windows*. Release 3.4.8, Issue 3, November 2018.
- [15] *Administering Avaya one-X® Communicator*. Release 6.2, Feature Pack 10, November 2015.
- [16] *RFC 3261 SIP: Session Initiation Protocol*, <http://www.ietf.org/>
- [17] *RFC 2833 RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*, <http://www.ietf.org/>

## 13. Appendix A: SigMa Scripts

Following are the Signaling Manipulation scripts that were used in the configuration of the Avaya SBCE, **Section 8.8**. When adding these scripts as instructed in **Sections 8.9** enter a name for the script in the Title (e.g., *CTL-1*) and copy/paste the entire scripts shown below.

The following SigMa scripts will:

Set the URI in PAI Header to the Pilot Number provided by CenturyLink.  
Remove gsid and epv parameters from Contact header.  
Changes the Diversion header scheme from SIPS to SIP.

Note that the Pilot number shown below as “3031235745” will need to be changed with the correct Pilot number provided by CenturyLink.

---

### Title: CTL-1

//This script is to be applied to the CenturyLink/Service Provider Server Configuration.

//For Call Forward and Mobile features CenturyLink requires the PAI to be the pilot number.  
within session "All"

```
{
  act on request where %DIRECTION="OUTBOUND" and
  %ENTRY_POINT="POST_ROUTING"
  {
    if (%HEADERS["P-Asserted-Identity"][1].URI.USER.regex_match("3031235745")) then
    {
      %var="this does nothing, match for DID number passed";
    }
    else
    {
      %HEADERS["P-Asserted-Identity"][1].URI.USER = "3031235745";
    }
  }
}
```

//Remove gsid and epv parameters from Contact header.  
//Changes the Diversion header scheme from SIPS to SIP.

within session "ALL"

```
{
  act on message where %DIRECTION="OUTBOUND" and
  %ENTRY_POINT="POST_ROUTING"
  {
```

```
remove(%HEADERS["Contact"][1].URI.PARAMS["gsid"]);
remove(%HEADERS["Contact"][1].URI.PARAMS["epv"]);
%HEADERS["Diversion"][1].regex_replace("sips","sip");

}
}
```

---

The following SigMa script will change the T.38 fax version from 1 to 0.

---

**Title: Change fax version 1 to 0**

```
//This script changes the T38 Fax version from 1 to 0, on the T38 re-invites sent by
//Communication Manager. Version 0 is the only fax version accepted by the
//CenturyLink-Broadsoft softswitch. Apply the script ONLY to the Session Manager server
//configuration profile of the ASBCE. If applied to the SP server configuration profile,
//as OUTBOUND and POST_ROUTING, the SBC sends the private IP address
//in the Connection Information of the ACK unchanged to the SP and all calls will drop.
```

```
within session "ALL"
```

```
{
act on request where %DIRECTION="INBOUND" and %ENTRY_POINT="PRE_ROUTING"
{
    %BODY[1].regex_replace( "a=T38FaxVersion:1","a=T38FaxVersion:0");
}
}
```

## 14. Appendix A – Avaya Session Border Controller for Enterprise – Refer Handling

One of the capabilities important to the Experience Portal environment is the Avaya SBCE Refer Handling option. Experience Portal inbound call processing may include call redirection to Communication Manager agents, or other CPE destinations. This redirection is accomplished by having Experience Portal send SIP REFER messaging to the Avaya SBCE. Enabling the Refer Handling option causes the Avaya SBCE to intercept and process the REFER and generate a new SIP INVITE messages back to the CPE (e.g., Communication Manager).

As an additional option, the Refer Handling feature can also specify *URI Group* criteria as a discriminator, whereby SIP REFER messages matching the URI Group criteria are processed by the Avaya SBCE, while SIP REFER messages that do not match the URI Group criteria, are passed through to the Service Provider.

Create a URI Group for numbers intended for Communication Manager.

**Step 1** - Select **Global Profiles → URI Groups** from the left-hand menu.

**Step 2** - Select **Add** and enter a descriptive **Group Name**, e.g., **internal-extension**, and select **Next** (not shown).

**Step 3** - Enter the following:

- **Scheme:** **sip:/sips:**
- **Type:** **Regular Expression**
- **URI:** **304[0-9]{1}@.\*** This will match 4-digit local extensions starting with 304, e.g., 3041 or 3042.
- Select **Finish**.

URI Group

Each entry should match a valid SIP URI.

**WARNING:** Invalid or incorrectly entered regular expressions may cause unexpected results.

Note: This regular expression is case-insensitive.

Ex: [0-9]{3,5}\user@domain\.com, (simple|advanced)\-user[A-Z]{3}@.\*

Scheme: ☒ sip:/sips: ☐ tel:

Type: ☐ Plain ☐ Dial Plan ☒ Regular Expression

URI: 304[0-9]{1}@.\*

Back Finish

**Step 4** - For additional entries, select **Add** on the right-hand side of the URI Group tab and repeat **Step 3**.

Alarms 3IncidentsStatus ▾Logs ▾DiagnosticsUsersSettings ▾Help ▾Log Out

Session Border Controller for Enterprise

AVAYA

DashboardAdministrationBackup/RestoreSystem Management

▸ Global Parameters

▾ Global Profiles

Domain DoS

Server Interworking

Media Forking

Routing

Server Configuration

Topology Hiding

Signaling Manipulation

URI Groups

SNMP Traps

URI Groups: internal-extensions

Add

URI Groups

Emergency

internal-extensions

RenameDelete

Click here to add a description.

URI Group

Add

URI Listing

304[0-9](1)@.\*

EditDelete

HG; Reviewed:  
SPOC 4/3/2019

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110 of 113  
CCMSM80SBC72UDP

Edit the existing **SP-General** Server Interworking Profile to enable Refer Handling and assign the newly created URI Group.

**Step 1** - Select **Global Profiles** → **Server Interworking** from the left-hand menu (not shown).

**Step 2** - Select the **SP-General** Server Interworking Profile created in **Section 8.7.2** and click **Edit**

- Check **Refer Handling**.
- **URI Group: internal-extensions**
- Select **Finish**.

Editing Profile: SP-General

General

Hold Support ☒ None  
☐ RFC2543 - c=0.0.0.0  
☐ RFC3264 - a=sendonly

180 Handling ☒ None ☐ SDP ☐ No SDP

181 Handling ☒ None ☐ SDP ☐ No SDP

182 Handling ☒ None ☐ SDP ☐ No SDP

183 Handling ☒ None ☐ SDP ☐ No SDP

Refer Handling ☒

URI Group internal-extensions ▼

Send Hold ☐

Delayed Offer ☒

3xx Handling ☐

Diversion Header Support ☐

Delayed SDP Handling ☐

Re-Invite Handling ☐

Prack Handling ☐

Allow 18X SDP ☐

T.38 Support ☒

URI Scheme ☒ SIP ☐ TEL ☐ ANY

Via Header Format ☒ RFC3261  
☐ RFC2543

Finish

Following is the SP-General Server Interworking profile after editing.

The screenshot displays the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes links for Alarms (3), Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header shows the product name and the Avaya logo. A left-hand navigation menu lists various configuration areas, with 'Global Profiles' and 'Server Interworking' highlighted. The main content area is titled 'Interworking Profiles: SP-General' and features an 'Add' button and action buttons (Rename, Clone, Delete). Below this is a list of interworking profiles, with 'SP-General' selected. The 'General' tab is active, showing a table of configuration parameters.

General	
Hold Support	NONE
180 Handling	None
181 Handling	None
182 Handling	None
183 Handling	None
Refer Handling	Yes
URI Group	internal-extensions
Send Hold	No
Delayed Offer	Yes



---

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