



Application Notes for Avaya Aura® Communication Manager 8.1, Avaya Aura® Session Manager 8.1 and Avaya Session Border Controller for Enterprise 8.1 with Destiny SIP Trunking Service – 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 8.1, Avaya Aura® Session Manager 8.1 and Avaya Session Border Controller for Enterprise 8.1 to interoperate with Destiny SIP Trunking service. 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 Destiny SIP Trunking service provides customers with PSTN access via a SIP trunk between the enterprise and the Destiny 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 Destiny network and an Avaya SIP-enabled enterprise solution. The Avaya solution consists of Avaya Aura® Communication Manager 8.1 (Communication Manager), Avaya Aura® Session Manager 8.1 (Session Manager), Avaya Session Border Controller for Enterprise 8.1 (Avaya SBCE) and various Avaya endpoints, listed in **Section 4**.

The Destiny SIP Trunking service 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 “Destiny” 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 Destiny SIP Trunking service did not include the 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:

- Public DNS “SRV” record queries to establish the SIP trunk connections across multiple servers.
- SIP Trunk Registration (Dynamic Authentication).
- Response to SIP OPTIONS queries.
- Incoming PSTN calls to various Avaya endpoints, including SIP, H.323, digital, and analog telephones at the enterprise. All incoming calls from the PSTN were routed to the simulated enterprise across the SIP Trunk from the service provider’s network.
- Outgoing PSTN calls from Avaya endpoints including SIP, H.323, digital and analog telephones at the enterprise. All outgoing calls to the PSTN were routed from the simulated enterprise across the SIP trunk to the service provider’s network.
- Inbound and outbound PSTN calls to/from Remote Workers using the Avaya Workplace Client for Windows SIP softphone.
- Outgoing calls to the PSTN were routed via the service provider’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.711A, G.711MU and G.729.
- 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, 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.
- Routing inbound vector call to call center agent queues.
- 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 [9] 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 were not tested.
- 0, 0+10 digits, 411 Directory Assistance, 911 Emergency and international calls were not tested.

2.2. Test Results

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

- **Caller ID on transferred calls** – On calls from the PSTN to the enterprise that were transferred back out to the PSTN, the caller ID number displayed at the PSTN endpoints was always of the transferring party instead of the originating PSTN number.
- **Caller ID on call-forward and EC500 calls** – On calls from the PSTN to the enterprise that were forwarded back out to the PSTN, the caller ID number displayed at the PSTN endpoint always showed “Restricted”. This included calls to “twinned” mobile phones (EC500).
- **OPTIONS** – Destiny 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.
- **Fax support** – Fax call attempts using T.38 were rejected with a “488 Not Acceptable Here” response from Destiny. G.711 fax was also tested, but it behaved unreliably. The issue related to G.711 fax being unreliable during the compliance test may be related to the unpredictability of G.711 techniques, which only works well on networks with very few hops and with limited end-to-end delay.
- **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 Destiny. 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 (**Sections 7.8 and 12**).
- **SIP REFER method** – Calls from the PSTN to the enterprise that were transferred back out to the PSTN network using the SIP REFER method did not work properly. On blind transfers, the REFER message was accepted by Destiny with a “202 Accepted message”, but the SIP trunk resources were not released after the call transfer was completed. Testing was done with REFER enabled in Communication Manager (**Network Call Redirection** set to “y” under the **trunk-group**, refer to **Section 5.7**). With REFER

enabled, blind and attended call transfers to the PSTN completed successfully, with the caveat that Communication Manager trunk channels were not released from the call path after the call was transferred; two trunks channels remained busy/connected for the entire duration of the call. There was no impact to the user, it's being mentioned here simply as an observation.

- **Removal of unwanted xml element information from the SDP in SIP messages sent to Destiny** – A Signaling Manipulation script (SigMa) was added to the Avaya SBCE to remove unwanted xml element information from the SDP in SIP messages sent to Destiny. (**Sections 7.8** and **12**).
- **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-Correlation-ID, Alert-Info, Endpoint-View, P-AV-Message-id, P-Charging-Vector, AV-Global-Session-ID and P-Location (Refer to **Section 6.4**). 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 Destiny server configuration. Refer to **Section 7.8** and **12**.

2.3. Support

For support of Destiny SIP Trunking Service visit the corporate Web page at:
<http://www.destiny.nl>

For technical support on the Avaya products described in these Application Notes visit
<http://support.avaya.com>

3. Reference Configuration

Figure 1 illustrates the sample Avaya SIP-enabled enterprise solution, connected to the Destiny SIP Trunking Service through a public Internet WAN connection.

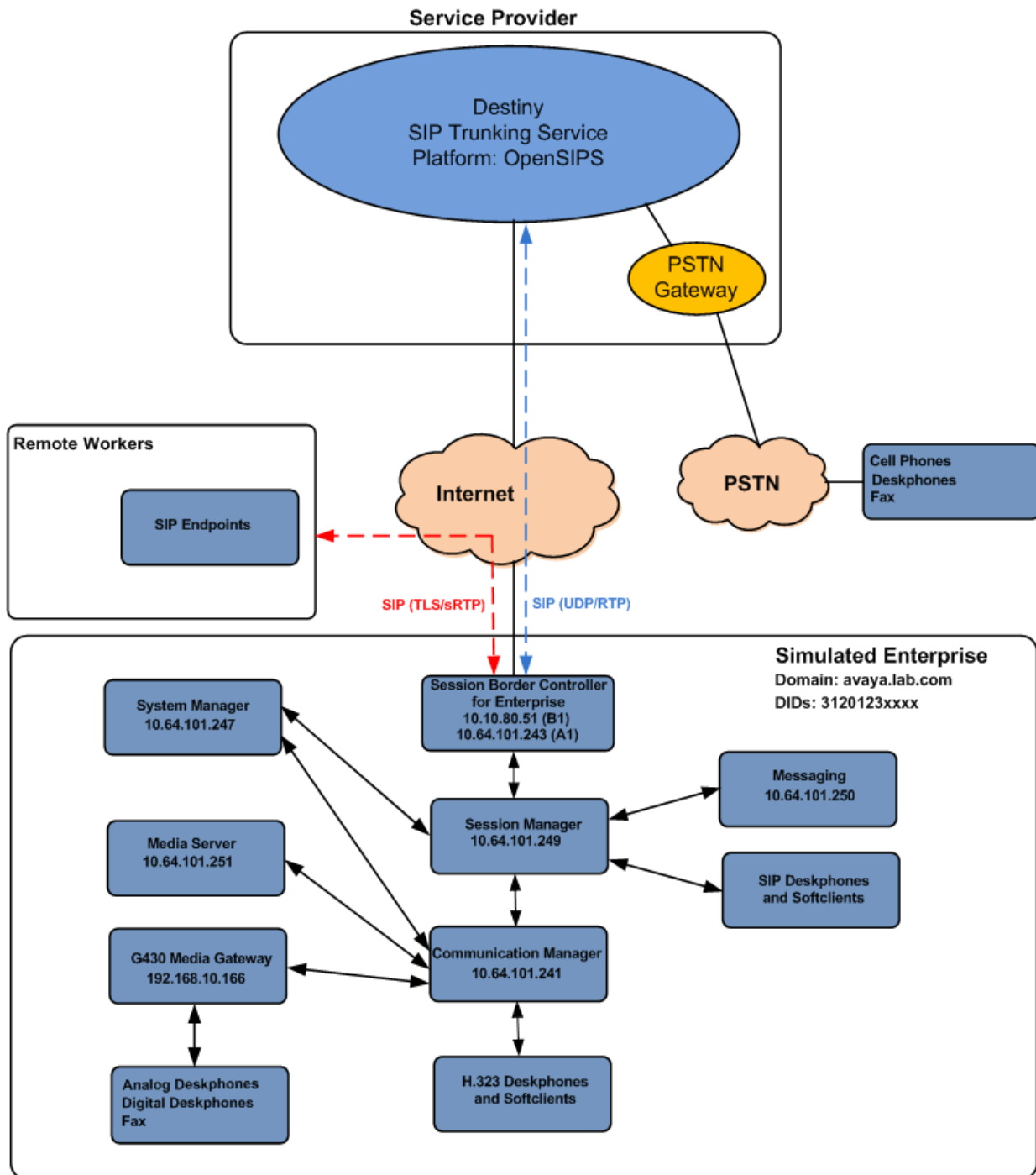


Figure 1: Avaya SIP Enterprise Solution connected to Destiny SIP Trunking Service

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 G430 Media Gateway.
- Avaya 96x1 Series IP Deskphones (H.323).
- Avaya J179 IP Deskphones (H.323).
- Avaya J129 IP Deskphones (SIP).
- Avaya one-X® Communicator softphones (H.323 and SIP).
- Avaya Workplace Client for Windows (SIP).
- Avaya digital and analog telephones.

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 Avaya Workplace Client for Windows (SIP). For signaling, Transport Layer Security (TLS) and for media, Secure Real-time Transport Protocol (SRTP) was used on the Avaya Workplace Client for Windows (SIP). 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 [9] 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) 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 Destiny 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 8.1 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 Destiny network SIP Trunking service, they are not included in these Application Notes.

4. Equipment and Software Validated

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

Equipment/Software	Release/Version
Avaya	
Avaya Aura® Communication Manager	8.1.2.1.0 (01.0.890.0-26095)
Avaya Aura® Session Manager	8.1.2.0 (8.1.2.0.812039)
Avaya Aura® System Manager	8.1.2.0 Build No. 8.1.0.0.733078 Software Update Rev. No. 8.1.2.0.0611240
Avaya Session Border Controller for Enterprise	ASBCE 8.1.0 8.1.0.0-14-18490
Avaya Session Border Controller for Enterprise patch	sbce-8.1.0.0-14-19116-hotfix-06242020.tar.gz
Avaya Aura® Messaging	7.1 Service Pack 2 (MSG-01.0.532.0-002_0204)
Avaya Aura® Media Server	8.0.2.43 Service Pack 2
Avaya G430 Media Gateway	g430_sw_41_24_0
Avaya 96x1 Series IP Deskphones (H.323)	Version 6.8304
Avaya J179 IP Deskphones (H.323)	Version 6.8304
Avaya J129 IP Deskphones (SIP)	4.0.5.0.10
Avaya one-X® Communicator (H.323, SIP)	6.2.14.6-SP14
Avaya Workplace Client for Windows (SIP)	3.8.4.10.2
Avaya 2420 Series Digital Deskphones	N/A
Avaya 6210 Analog Deskphones	N/A
Destiny	
OpenSIPS	2.2.1 (x86_64/linux)
Asterisk	11.14.0-Destiny3

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 Destiny SIP Trunking Service. 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 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 capture 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 **40000** 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	
Max Concurrently Registered Remote Office Stations:		18000	0	
Maximum Concurrently Registered IP eCons:		414	0	
Max Concur Reg Unauthenticated H.323 Stations:		100	0	
Maximum Video Capable Stations:		41000	0	
Maximum Video Capable IP Softphones:		18000	6	
Maximum Administered SIP Trunks:		40000	120	
Max Administered Ad-hoc Video Conferencing Ports:		24000	0	
Max Number of DS1 Boards with Echo Cancellation:		999	0	

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**.

```
change 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.

```
change 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. Destiny supports audio codecs **G.711A**, **G.711MU** and **G.729**.

change ip-codec-set 2

Page1 of 2

IP MEDIA PARAMETERS

Codec Set: 2

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

Media Encryption

Encrypted SRTCP: best-effort

1: 1-srtp-aescml28-hmac80

2: none

3:

4:

5:

On **Page 2**, set the **Fax Mode** to *off*.

Destiny SIP Trunk supports G.711 for transmission of fax. As this is in-band and requires no interaction from Communication Manager, there is no specific configuration required (refer to **Section 2.2**).

IP MEDIA PARAMETERS

Allow Direct-IP Multimedia? n

	Mode	Redun- dancy	Packet Size (ms)
FAX	off	0	
Modem	off	0	
TDD/TTY	US	3	
H.323 Clear-channel	n	0	
SIP 64K Data	n	0	20

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
                      IP Audio Hairpinning? n
UDP Port Min: 2048
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
										G	A		t
dst	codec	direct	WAN-BW-limits		Video		Intervening			Dyn	A	G	c
rgn	set	WAN	Units	Total	Norm	Prio	Shr	Regions		CAC	R	L	e
1	2	y	NoLimit							n			t
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

SIGNALING GROUP

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

	Audio	Silence	Frames	Packet
	Codec	Suppression	Per Pkt	Size(ms)
1:	G.722-64K		2	20

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	Night Service:	
Dial Access? n			
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: auto

                                         Redirect On OPTIM Failure: 5000

  SCCAN? n                                         Digital Loss Group: 18
    Preferred Minimum Session Refresh Interval(sec): 600

Disconnect Supervision - In? y Out? y

  XOIP Treatment: auto    Delay Call Setup When Accessed Via IGAR? n

Caller ID for Service Link Call to H.323 1xC: station-extension
```

On Page 3:

- Set the **Numbering Format** field to *public*. 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. The **Numbering Format** was set to *public* and the **Numbering Format** in the route pattern was set to *pub-unk* (see **Section 5.10**). Note that in the case of Destiny the + sign was removed from SIP messages with a SigMa script added to the Avaya SBCE before sending the SIP messages to Destiny (refer to **Section 7.8** and **12**).
- 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? n	Measured: none	Maintenance Tests? y
Suppress # Outpulsing? n	Numbering Format: public	UII 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 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 Destiny.
- 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? n	
Prepend '+' to Calling/Alerting/Diverting/Connected Number? n	
Send Transferring Party Information? n	
Network Call Redirection? y	
Build Refer-To URI of REFER From Contact For NCR? n	
Send Diversion Header? y	
Support Request History? n	
Telephone Event Payload Type: 101	
Convert 180 to 183 for Early Media? n	
Always Use re-INVITE for Display Updates? n	
Identity for Calling Party Display: P-Asserted-Identity	
Block Sending Calling Party Location in INVITE? n	
Accept Redirect to Blank User Destination? n	
Enable Q-SIP? n	
Interworking of ISDN Clearing with In-Band Tones: keep-channel-active	
Request URI Contents: may-have-extra-digits	

5.8. Calling Party Information

The calling party number is sent in the SIP “From”, “Contact” and “PAI” headers. Since public numbering was selected to define the format of this number (**Section 5.7**), use the **change public-unknown-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, four DID numbers assigned by the service provider are shown. These DID numbers were used as the outbound calling party information on the service provider trunk when calls were originated from the mapped extensions.

change public-unknown-numbering 1					Page 1 of 2
NUMBERING - PUBLIC/UNKNOWN FORMAT					
Ext Len	Ext Code	Trk Grp(s)	CPN Prefix	Total CPN Len	
4	3			4	Total Administered: 5
4	5			4	Maximum Entries: 9999
4	3041	2	31201231111	11	Note: If an entry applies to a SIP connection to Avaya Aura(R) Session Manager, the resulting number must be a complete E.164 number.
4	3042	2	31201232222	11	
4	5015	2	31201233333	11	
					Communication Manager automatically inserts a '+' digit in this case.

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 Destiny 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	11	31201231111	11	3041		
public-ntwrk	11	31201232222	11	3042		
public-ntwrk	11	31201233333	11	5015		
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
public-ntwrk						
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 11
                                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.

For international call to the U.S. (e.g., dialing: 90017863311234):

change ars analysis 001						
ARS DIGIT ANALYSIS TABLE						
Location: all						
Percent Full: 1						
	Dialed String	Total Min	Total Max	Route Pattern	Call Type	Node ANI Req
001		13	18	2	intl	n
	01	12	12	2	natl	n
	011	10	18	2	intl	n
	040	3	3	2	svcl	n
	045	13	13	2	natl	n
	101xxxx0	8	8	deny	op	n
	101xxxx0	18	18	deny	op	n
	101xxxx01	16	24	deny	iop	n
	101xxxx011	17	25	deny	intl	n
	101xxxx1	18	18	deny	fnpa	n
	10xxx0	6	6	deny	op	n
	10xxx0	16	16	deny	op	n
	10xxx01	14	22	deny	iop	n
	10xxx011	15	23	deny	intl	n
	10xxx1	16	16	deny	fnpa	n

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.
- **Numbering Format:** Set to **pub-unk**. All calls using this route pattern will use the public 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 4

Pattern Number: 2
Pattern Name: **Serv. Provider**

SCCAN? n
Secure SIP? n
Used for SIP stations? n

Grp	FRL	NPA	Pfx	Hop	Toll	No.	Inserted	DCS/	IXC
No	Mrk	Lmt	List	Del	Digits	Dgts	Intw	QSIG	
1: 2		0						n	user
2:								n	user
3:								n	user
4:								n	user
5:								n	user
6:								n	user

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

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® 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 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.

6.1. 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 8.1 web interface. The top navigation bar includes tabs for Users, Elements, Services, Widgets, and Shortcuts, along with a search bar and a user profile icon labeled 'admin'. The main content area is divided into several sections: System Resource Utilization (a bar chart showing utilization for opt, var, emdata, tmp, and per), Alarms, Notifications (No data), Application State (License Status: Active, Deployment Type: VMware, Multi-Tenancy: DISABLED, OOBM State: DISABLED, Hardening Mode: Standard), Information (a table of elements and their sync status), and Shortcuts. A dark navigation menu is open on the left, listing various system components. The 'Routing' item is highlighted with a red box, and a sub-menu is visible for it, with 'Domains' also highlighted with a red box. Other items in the sub-menu include Locations, Conditions, Adaptations, SIP Entities, Entity Links, Time Ranges, Routing Policies, and Dial Patterns.

Category	Utilization
opt	~10
var	~10
emdata	~15
tmp	~10
per	~10

Elements	Count	Sync Status
CM	1	Green
Messaging	1	Green
Session Manager	1	Green
System Manager	1	Green
UCM Applications	16	Green

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

Item	Status
Domains	Highlighted
Locations	
Conditions	
Adaptations	
SIP Entities	
Entity Links	
Time Ranges	
Routing Policies	
Dial Patterns	

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 8.1 web interface. The top navigation bar includes the Avaya logo, version information, and links for Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile (admin) are also present. The main navigation pane on the left shows a tree structure under the 'Routing' tab, with 'Domains' highlighted. The main content area is titled 'Domain Management' and features a table with one item: 'avaya.lab.com' of type 'sip' with the note 'HG V-Domain'. The table has columns for Name, Type, and Notes. Above the table are buttons for New, Edit, Delete, Duplicate, and More Actions. A filter button labeled 'Filter: Enable' is also visible.

AVAYA
Aura® System Manager 8.1

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

Home Routing

Routing

Domains

Locations

Conditions

Adaptations ▾

SIP Entities

Entity Links

Time Ranges

Routing Policies

Dial Patterns ▾

Regular Expressions

Defaults

Domain Management

New Edit Delete Duplicate More Actions ▾

1 Item Filter: Enable

<input type="checkbox"/>	Name	Type	Notes
<input type="checkbox"/>	avaya.lab.com	sip	HG V-Domain

Select : All, None

6.2. 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.

The screenshot displays the Avaya Aura System Manager 8.1 web interface. The top navigation bar includes the Avaya logo, version information, and user roles (Users, Elements, Services, Widgets, Shortcuts). A search bar and a user profile (admin) are also present. The left-hand navigation pane is expanded to the 'Routing' section, with 'Domains' selected. The main content area is titled 'Domain Management' and features a table with one entry. The table has columns for Name, Type, and Notes. The entry is 'avaya.lab.com' with Type 'sip' and Notes 'HG V-Domain'. Below the table, there is a 'Select : All, None' option.

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

6.3. 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 8.1 web interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.1', and tabs for Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile 'admin' are also present. The left-hand navigation pane shows a tree structure with 'Routing' selected, and 'Locations' highlighted under the 'Routing' category. 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 'Session Manager' and the 'Notes' field is set to 'VMware Session Manager'. The 'Dial Plan Transparency in Survivable Mode' section has an 'Enabled' checkbox that is unchecked, and fields for 'Listed Directory Number' and 'Associated CM SIP Entity'. The 'Overall Managed Bandwidth' section includes a 'Managed Bandwidth Units' dropdown set to 'Kbit/sec', and input fields for 'Total Bandwidth' and 'Multimedia Bandwidth'. A checkbox for 'Audio Calls Can Take Multimedia Bandwidth' is checked.

AVAYA
Aura® System Manager 8.1

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

Home Routing **Routing**

Routing
Domains
Locations
Conditions
Adaptations ▾
SIP Entities
Entity Links
Time Ranges
Routing Policies
Dial Patterns ▾
Regular Expressions
Defaults

Location Details Commit Cancel Help ?

General

* **Name:** Session Manager

Notes: VMware Session Manager

Dial Plan Transparency in Survivable Mode

Enabled: ☐

Listed Directory Number:

Associated CM SIP Entity:

Overall Managed Bandwidth

Managed Bandwidth Units: Kbit/sec ▾

Total Bandwidth:

Multimedia Bandwidth:

Audio Calls Can Take Multimedia Bandwidth: ☒

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.

The screenshot displays the Avaya Aura System Manager 8.1 web interface. The top navigation bar includes the Avaya logo, version information, and a menu with options like Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile (admin) are also present. The left sidebar shows a tree view of the system configuration, with 'Locations' selected under the 'Routing' section. 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' is set to 'Communication Manager' and the 'Notes' are 'VMware Communication Manager'. The 'Dial Plan Transparency in Survivable Mode' section has an 'Enabled' checkbox that is unchecked, and fields for 'Listed Directory Number' and 'Associated CM SIP Entity'. The 'Overall Managed Bandwidth' section includes a 'Managed Bandwidth Units' dropdown set to 'Kbit/sec', and input fields for 'Total Bandwidth' and 'Multimedia Bandwidth'. A checkbox for 'Audio Calls Can Take Multimedia Bandwidth' is checked.

AVAYA
Aura® System Manager 8.1

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

Home Routing **Routing**

Routing
Domains
Locations
Conditions
Adaptations ▾
SIP Entities
Entity Links
Time Ranges
Routing Policies
Dial Patterns ▾
Regular Expressions
Defaults

Location Details Commit Cancel Help ?

General

* Name: Communication Manager

Notes: VMware Communication Manager

Dial Plan Transparency in Survivable Mode

Enabled: ☐

Listed Directory Number:

Associated CM SIP Entity:

Overall Managed Bandwidth

Managed Bandwidth Units: Kbit/sec ▾

Total Bandwidth:

Multimedia Bandwidth:

Audio Calls Can Take Multimedia Bandwidth: ☒

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 8.1 web interface. The top navigation bar includes the Avaya logo, version information, 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 navigation tree with 'Routing' selected, and sub-items like Domains, Locations (highlighted), Conditions, Adaptations, SIP Entities, Entity Links, Time Ranges, Routing Policies, Dial Patterns, Regular Expressions, and Defaults. The main content area is titled 'Location Details' and features a 'Commit' button and a 'Cancel' button. The 'General' section contains fields for 'Name' (Avaya SBCE) and 'Notes' (VMware Avaya SBCE). The 'Dial Plan Transparency in Survivable Mode' section has an 'Enabled' checkbox and fields for 'Listed Directory Number' and 'Associated CM SIP Entity'. The 'Overall Managed Bandwidth' section includes a 'Managed Bandwidth Units' dropdown (set to Kbit/sec), fields for 'Total Bandwidth' and 'Multimedia Bandwidth', and a checked checkbox for 'Audio Calls Can Take Multimedia Bandwidth'.

AVAYA
Aura® System Manager 8.1

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

Home Routing **Routing**

Routing
Domains
Locations
Conditions
Adaptations ▾
SIP Entities
Entity Links
Time Ranges
Routing Policies
Dial Patterns ▾
Regular Expressions
Defaults

Location Details Commit Cancel Help ?

General

* Name: Avaya SBCE
Notes: VMware Avaya SBCE

Dial Plan Transparency in Survivable Mode

Enabled: ☐

Listed Directory Number:

Associated CM SIP Entity:

Overall Managed Bandwidth

Managed Bandwidth Units: Kbit/sec ▾
Total Bandwidth:
Multimedia Bandwidth:
Audio Calls Can Take Multimedia Bandwidth: ☒

6.4. Adaptations

In order to improve interoperability with third party elements, Session Manager 8.1 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-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-Global-Session-ID, 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 8.1 interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.1', and various menu items: Users, Elements, Services, Widgets, Shortcuts, a search bar, a notification bell, and a user profile labeled 'admin'. The left sidebar shows a tree view with categories like Routing, Domains, Locations, Conditions, Adaptations, Regular Expressions, Device Mappings, SIP Entities, Entity Links, Time Ranges, Routing Policies, Dial Patterns, Regular Expressions, and Defaults. The 'Routing' category is expanded, and 'Adaptations' is selected.

The main content area is titled 'Adaptation Details' and includes 'Commit' and 'Cancel' buttons. Under the 'General' tab, the following fields are visible:

- * Adaptation Name:** CM_Outbound_Header_Removal
- Notes:** (empty text area)
- * Module Name:** DigitConversionAdapter (dropdown menu)
- Type:** digit
- State:** enabled (dropdown menu)
- Module Parameter Type:** Name-Value Parameter (dropdown menu)

Below these fields is a table for parameters with 'Add' and 'Remove' buttons. The table has columns for 'Name' and 'Value'.

Name	Value
eRHdrs	"Alert-Info, P-Charging-Vector, AV-Global-Session-ID, AV-Correlation-ID, P-AV-Message-Id, P-Location, Endpoint-

Below the table is a 'Select' dropdown menu with options 'All' and 'None'.

Below the table is a text field for 'Egress URI Parameters'.

Below the 'Egress URI Parameters' field is a section titled 'Digit Conversion for Incoming Calls to SM' with 'Add' and 'Remove' buttons. Below this section is a table with columns: Matching Pattern, Min, Max, Phone Context, Delete Digits, Insert Digits, Address to modify, Adaptation Data, and Notes. The table is currently empty, showing '0 Items'.

Below the 'Digit Conversion for Incoming Calls to SM' section is a section titled 'Digit Conversion for Outgoing Calls from SM'.

6.5. SIP Entities

A SIP Entity must be added for Session Manager and for each SIP telephony system connected to it, which includes Communication Manager and the Avaya SBCE. 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 and *SIP Trunk* (or *Other*) for the Avaya SBCE.
- **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 6.3**.
- **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 8.1 web interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.1', and various menu items: Users, Elements, Services, Widgets, Shortcuts, a search bar, a notification bell, and a user profile labeled 'admin'. The left sidebar shows a navigation tree with 'Routing' selected, and 'SIP Entities' highlighted under the 'Routing' section. The main content area is titled 'SIP Entity Details' and is divided into two sections: 'General' and 'Monitoring'. In the 'General' section, the following fields are visible: 'Name' (Session Manager), 'IP Address' (10.64.101.249), 'SIP FQDN' (empty), 'Type' (Session Manager), 'Notes' (VMware Session Manager), 'Location' (Session Manager), 'Outbound Proxy' (empty), 'Time Zone' (America/New_York), 'Minimum TLS Version' (Use Global Setting), and 'Credential name' (empty). In the 'Monitoring' section, 'SIP Link Monitoring' is set to 'Use Session Manager Configuration' and 'CRLF Keep Alive Monitoring' is set to 'CRLF Monitoring Disabled'. 'Commit' and 'Cancel' buttons are located at the top right of the form.

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 6.3**. Select the **Time Zone**.

The screenshot displays the Avaya Aura System Manager 8.1 web interface. The top navigation bar includes the Avaya logo, 'Aura® System Manager 8.1', and various menu items: 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 categories like Routing, Domains, Locations, Conditions, Adaptations, and SIP Entities (which is currently selected). The main content area is titled 'SIP Entity Details' and contains several sections: 'General' with 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; 'Loop Detection' with a Loop Detection Mode field; and 'Monitoring' with SIP Link Monitoring and CRLF Keep Alive Monitoring fields. 'Commit' and 'Cancel' buttons are located at the top right of the form area.

Field	Value
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
Loop Detection Mode	Off
SIP Link Monitoring	Use Session Manager Configuration
CRLF Keep Alive Monitoring	Use Session Manager Configuration

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 6.4** was selected.
- Select the location that applies to the SIP Entity being created, defined in **Section 6.3**.
- Select the **Time Zone**.

Awaya

Aura® System Manager 8.1

Users ▾

Elements ▾

Services ▾

|

Widgets ▾

Shortcuts ▾

Search

admin

HomeRoutingRouting

Routing

Domains

Locations

Conditions

Adaptations

Adaptations

Regular Expressions

Device Mappings

SIP Entities

Entity Links

Time Ranges

Routing Policies

Dial Patterns

Regular Expressions

SIP Entity Details

CommitCancel

Help ?

General

* Name: Avaya SBCE

* FQDN or IP Address: 10.64.101.243

Type: SIP Trunk

Notes: VMware Avaya SBCE

Adaptation: CM_Outbound_Header_Removal

Location: Avaya SBCE

Time Zone: America/New_York

* SIP Timer B/F (in seconds): 4

Minimum TLS Version: Use Global Setting

Credential name:

Securable: ☐

Call Detail Recording: none

Loop Detection

Loop Detection Mode: Off

Monitoring

SIP Link Monitoring: Use Session Manager Configuration

CRLF Keep Alive Monitoring: Use Session Manager Configuration

6.6. Entity Links

A SIP trunk between Session Manager and a telephony system is described by an Entity Link. Two Entity Links were created; an entity link to Communication Manager for use only by service provider traffic and an entity link to the Avaya SBCE. 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 6.5**).
- **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 6.5**).
- **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.

Name	SIP Entity 1	Protocol	Port	SIP Entity 2	Port	DNS Override	Connection Policy	Deny New Service
Session_Manager_CM_Ti	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 8.1 interface. The top navigation bar includes the Avaya logo, version information, and various menu items like Users, Elements, Services, Widgets, and Shortcuts. A search bar and a user profile (admin) are also present. The left sidebar shows a navigation tree with options like Routing, Domains, Locations, Conditions, Adaptations, SIP Entities, Entity Links (selected), Time Ranges, Routing Policies, Dial Patterns, Regular Expressions, and Defaults. The main content area is titled 'Entity Links' and features a table with one item. The table columns are Name, SIP Entity 1, Protocol, Port, SIP Entity 2, Port, DNS Override, Connection Policy, and Deny New Service. The single entry shows a link from Session Manager to Avaya SBCE using TLS on port 5061. Below the table, there are 'Commit' and 'Cancel' buttons.

Name	SIP Entity 1	Protocol	Port	SIP Entity 2	Port	DNS Override	Connection Policy	Deny New Service
* Session_Manager_ASBC	* Session Manager	TLS	* 5061	* Avaya SBCE	* 5061	<input type="checkbox"/>	trusted	<input type="checkbox"/>

Routing policies describe the conditions under which calls will be routed to the SIP Entities specified in **Section 6.5**. Two routing policies were added; an incoming policy with Communication Manager as the destination and an outbound policy with the Avaya SBCE 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:

- The following screens show the Routing Policies for Communication Manager and the Avaya SBCE.

HG; Reviewed:
SPOC 10/7/2020

AVAYA
 Aura® System Manager 8.1

Users ▾
 Elements ▾
 Services ▾
 Widgets ▾
 Shortcuts ▾
 Search

 admin

Home
 Routing

Routing
 Domains
 Locations
 Conditions
 Adaptations ▾
 SIP Entities
 Entity Links
 Time Ranges
 Routing Policies
 Dial Patterns ▾
 Regular Expressions
 Defaults

Routing Policy Details
 Commit
 Cancel
 Help ?

General

* Name: Avaya SBCE
 Disabled: ☐
 * Retries: 0
 Notes: For outbound calls to SP via ASBCE

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
<input type="checkbox"/>	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

6.8. 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. 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 6.3**).
- Lastly, select the routing policy from the list that will be used to route all calls that match the specified criteria (**Section 6.7**). 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 11-digit numbers starting with **31**, 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 8.1

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

Home Routing

Routing

Domains

Locations

Conditions

Adaptations ▾

SIP Entities

Entity Links

Time Ranges

Routing Policies

Dial Patterns ▾

Dial Patterns

Origination Dial ...

Regular Expressions

Dial Pattern Details Commit Cancel Help ?

General

* Pattern: 31

* Min: 2

* Max: 11

Emergency Call: ☐

SIP Domain: avaya.lab.com ▾

Notes:

Originating Locations, Origination Dial Pattern Sets, and Routing Policies

Add Remove

1 Item Filter: Enable

	Originating Location Name	Originating Location Notes	Origination Dial Pattern Set Name	Origination Dial Pattern Set Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
<input type="checkbox"/>	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 13-digit dialed numbers for outbound calls, beginning with **001**, 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**.

AVAYA
Aura® System Manager 8.1

Users ▾ Elements ▾ Services ▾ Widgets ▾ Shortcuts ▾ Search [] admin

Home Routing

Routing
Domains
Locations
Conditions
Adaptations ▾
SIP Entities
Entity Links
Time Ranges
Routing Policies
Dial Patterns ▾
Regular Expressions
Defaults

Dial Pattern Details [Commit] [Cancel] Help ?

General

* Pattern: 001

* Min: 13

* Max: 13

Emergency Call: ☐

SIP Domain: avaya.lab.com ▾

Notes: []

Originating Locations, Origination Dial Pattern Sets, and Routing Policies

[Add] [Remove]

1 Item [Refresh] Filter: Enable

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

Select : All, None

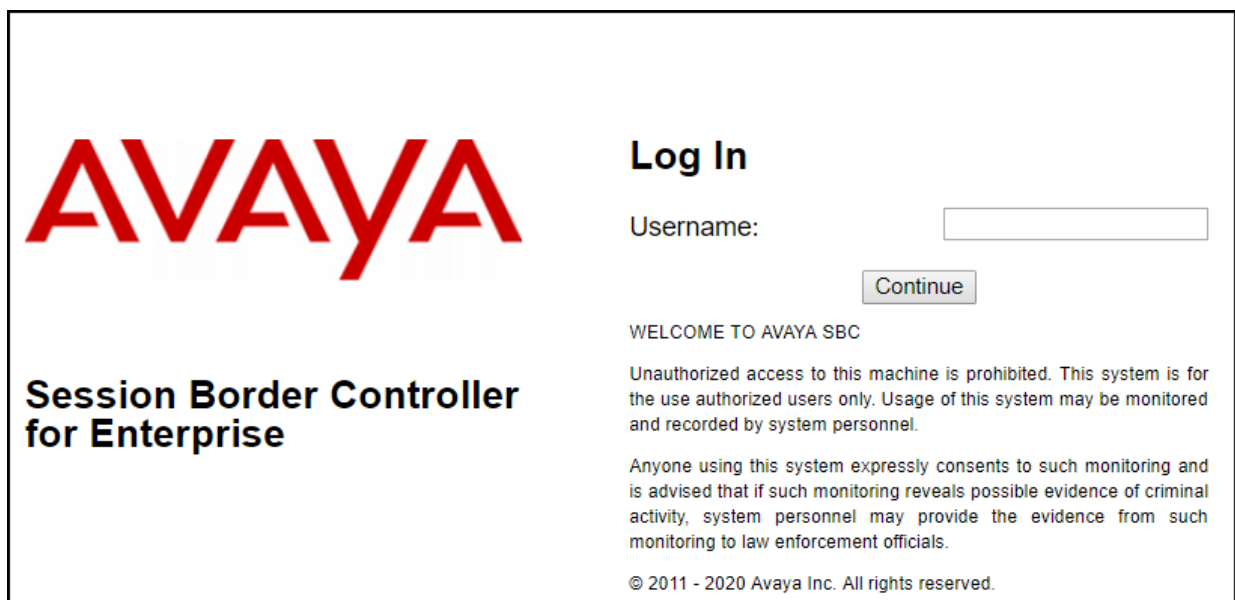
Repeat the above procedures as needed to define additional dial patterns.

7. 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.

7.1. 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 image shows the login page of the Avaya Session Border Controller for Enterprise. On the left, there is a large red 'AVAYA' logo and the text 'Session Border Controller for Enterprise' in bold black font. On the right, under the heading 'Log In', there is a 'Username:' label followed by a text input field. Below the input field is a 'Continue' button. Further down, the text 'WELCOME TO AVAYA SBC' is displayed. Below that, a warning message states: '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.' This is followed by 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 - 2020 Avaya Inc. All rights reserved.' is shown.

Once logged in, on the top left of the screen, under **Device:** select the device being managed, *Avaya_SBCE* in the sample configuration.

Device: EMS ▾AlarmsIncidentsStatus ▾Logs ▾DiagnosticsUsersSettings ▾Help ▾Log Out

EMS

Avaya_SBCE

er Controller for EnterpriseAVAYA

EMS Dashboard

Device Management

- System Administration
- Backup/Restore
- Monitoring & Logging

Dashboard

Information

System Time	10:03:00 AM EDT	Refresh
Version	8.1.0.0-14-18490	
GUI Version	8.1.0.0-18490	
Build Date	Mon Feb 03 17:23:09 UTC 2020	
License State	✔ OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	07/24/2020 09:03:43 EDT	
Failed Login Attempts	0	

Active Alarms (past 24 hours)

None found.

Installed Devices

EMS

Avaya_SBCE

Incidents (past 24 hours)

None found.

Notes

No notes found.

Add

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.

Device: Avaya_SBCE ▾AlarmsIncidentsStatus ▾Logs ▾DiagnosticsUsersSettings ▾Help ▾Log Out

Session Border Controller for Enterprise

AVAYA

EMS Dashboard

Device Management

Backup/Restore

▸ System Parameters

▸ Configuration Profiles

▸ Services

▸ Domain Policies

▸ TLS Management

▸ Network & Flows

▸ DMZ Services

▸ Monitoring & Logging

Dashboard

Information

System Time	10:05:18 AM EDT	Refresh
Version	8.1.0.0-14-18490	
GUI Version	8.1.0.0-18490	
Build Date	Mon Feb 03 17:23:09 UTC 2020	
License State	✔ OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	07/24/2020 09:03:43 EDT	
Failed Login Attempts	0	

Active Alarms (past 24 hours)

None found.

Incidents (past 24 hours)

None found.

Notes

No notes found.

Installed Devices

EMS

Avaya_SBCE

Add

7.2. Device Management

To view current system information, select **Device Management** on the left navigation pane. In the reference configuration, the 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) web interface. The top navigation bar includes 'Device: Avaya_SBCE', 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The main heading is 'Session Border Controller for Enterprise' with the Avaya logo. The left sidebar lists navigation options: EMS Dashboard, Device Management (highlighted), Backup/Restore, System Parameters, Configuration Profiles, Services, Domain Policies, TLS Management, Network & Flows, DMZ Services, and Monitoring & Logging. The 'Device Management' section is active, showing a sub-header 'Device Management' and tabs for 'Devices', 'Updates', 'SSL VPN', 'Licensing', and 'Key Bundles'. The 'Devices' tab is selected, displaying a table with the following data:

Device Name	Management IP	Version	Status	
Avaya_SBCE	[Blurred]	8.1.0.0-14-18490	Commissioned	Reboot Shutdown Restart Application View Edit Uninstall

To view the network configuration assigned to the Avaya SBCE, click **View** on the screen shown above. The **System Information** window is displayed, containing the current device configuration and network settings. Note that **DNS configuration** is required for this solution. The DNS information can be added by clicking on **Edit** shown on the previous screen.

The highlighted IP addresses in the **System Information** screen shown below are the ones used for the SIP trunk to Destiny 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.

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: 1000	1000
Advanced Sessions Requested: 1000	1000
Scopio Video Sessions Requested: 500	500
CES Sessions Requested: 0	0
Transcoding Sessions Requested: 0	0
CLID	---
Encryption Available: Yes	<input checked="" type="checkbox"/>

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	75.75.75.75
Secondary DNS	75.75.76.76
DNS Location	DMZ
DNS Client IP	10.10.80.51

Management IP(s)

IP #1 (IPv4)	
--------------	--

7.3. 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.

In the reference configuration, TLS transport is used for the communication between Session Manager and Avaya SBCE. The following procedures show how to create the client and server profiles to support the TLS connection.

Note – Testing was done with System Manager signed identity certificates. The procedure to create and obtain these certificates is outside the scope of these Application Notes.

7.3.1. Verify TLS Certificates – Avaya Session Border Controller for Enterprise

Once logged in, on the top left of the screen, under **Device:** select the device being managed, *Avaya_SBCE* in the sample configuration.



Step 1 - Select **TLS Management** → **Certificates** from the left-hand menu. Verify the following:

- System Manager CA certificate is present in the **Installed CA Certificates** area.
- System Manager CA signed identity certificate is present in the **Installed Certificates** area.
- Private key associated with the identity certificate is present in the **Installed Keys** area.

The screenshot displays the Avaya Session Border Controller for Enterprise (SBCE) web interface. The top navigation bar includes links for Device: Avaya_SBCE, Alarms, Incidents, Status, Logs, Diagnostics, Settings, Help, and Log Out. The main header shows "Session Border Controller for Enterprise" and the Avaya logo. The left sidebar contains a menu with "EMS Dashboard", "Device Management", "Backup/Restore", "System Parameters", "Configuration Profiles", "Services", "Domain Policies", "TLS Management" (expanded), "Certificates" (selected), "Client Profiles", "Server Profiles", "SNI Group", "Network & Flows", "DMZ Services", and "Monitoring & Logging". The main content area is titled "Certificates" and features two buttons: "Install" and "Generate CSR". Below these are five sections: "Installed Certificates" (listing sbce_inside.pem with View and Delete links), "Installed CA Certificates" (listing default.pem with View and Delete links), "Installed Certificate Revocation Lists" (stating no lists are installed), "Installed Certificate Signing Requests" (listing sbceExternal.req with a Delete link), and "Installed Keys" (listing sbce_inside.key with a Delete link).

7.3.2. Server Profiles

Step 1 - Select **TLS Management** → **Server Profiles** and click on **Add**. Enter the following:

- **Profile Name:** enter descriptive name.
- **Certificate:** select the identity certificate, e.g., **sbce_inside.pem**, from pull down menu.
- **Peer Verification** = **None**.
- Click **Next**.

Step 2 - Accept default values for the next screen (not shown) and click **Finish**.

Edit Profile X

WARNING: Due to the way OpenSSL handles cipher checking, Cipher Suite validation will pass even if one or more of the ciphers are invalid as long as at least one cipher is valid. Make sure to carefully check your entry as invalid or incorrectly entered Cipher Suite custom values may cause catastrophic problems.

Changing the certificate in a TLS Profile which has SNI enabled may cause existing Reverse Proxy entries which utilize this TLS Profile to become invalid.

TLS Profile

Profile Name: Inside_Server

Certificate: sbce_inside.pem

SNI Options: None

SNI Group: None

Certificate Verification

Peer Verification: None

Peer Certificate Authorities: Avaya_EP_CA_cert.pem, DigiCertGlobalRootCA.cer, GeoTrust_Global_CA_Trust.cer, default.pem

Peer Certificate Revocation Lists:

Verification Depth: 0

Next

The following screen shows the completed TLS **Server Profile** form:

Device: Avaya_SBCE ▾AlarmsIncidentsStatus ▾Logs ▾DiagnosticsUsersSettings ▾Help ▾Log Out

Session Border Controller for EnterpriseAVAYA

EMS DashboardDevice ManagementBackup/Restore

- System Parameters
- Configuration Profiles
- Services
- Domain Policies
- TLS Management
 - Certificates
 - Client Profiles
 - Server Profiles**
 - SNI Group
- Network & Flows
- DMZ Services
- Monitoring & Logging

Server Profiles: Inside_Server

AddDelete

Server ProfilesRemote_Work...Outside_Server**Inside_Server**

Click here to add a description.

Server Profile

TLS Profile

Profile Name	Inside_Server
Certificate	sbce_inside.pem
SNI Options	None

Certificate Verification

Peer Verification	None
Extended Hostname Verification	<input type="checkbox"/>

Renegotiation Parameters

Renegotiation Time	0
Renegotiation Byte Count	0

Handshake Options

Version	<input checked="" type="checkbox"/> TLS 1.2 <input type="checkbox"/> TLS 1.1 <input type="checkbox"/> TLS 1.0
Ciphers	<input checked="" type="radio"/> Default <input type="radio"/> FIPS <input type="radio"/> Custom
Value	HIGH:IDH:IADH:IMD5:1aNULL:1eNULL:@STRENGTH

Edit

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SPOC 10/7/2020

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DestinyAura81

7.3.3. Client Profiles

Step 1 - Select **TLS Management** → **Client Profiles** and click on **Add**. Enter the following:

- **Profile Name:** enter descriptive name.
- **Certificate:** select the identity certificate, e.g., **sbce_inside.pem**, from pull down menu.
- **Peer Verification = Required.**
- **Peer Certificate Authorities:** select the CA certificate used to verify the certificate received from Session Manager, e.g., **default.pem**.
- **Verification Depth:** enter **1**.
- Click **Next**.

Step 2 - Accept default values for the next screen (not shown) and click **Finish**.

Edit Profile X

WARNING: Due to the way OpenSSL handles cipher checking, Cipher Suite validation will pass even if one or more of the ciphers are invalid as long as at least one cipher is valid. Make sure to carefully check your entry as invalid or incorrectly entered Cipher Suite custom values may cause catastrophic problems.

Changing the certificate in a TLS Profile which has SNI enabled may cause existing Reverse Proxy entries which utilize this TLS Profile to become invalid.

TLS Profile

Profile Name:

Certificate:

SNI: ☐ Enabled

Certificate Verification

Peer Verification: Required

Peer Certificate Authorities:
DigiCertGlobalRootCA.cer
GeoTrust_Global_CA_Trust.cer
default.pem

Peer Certificate Revocation Lists:

Verification Depth:

Extended Hostname Verification: ☐

Server Hostname:

The following screen shows the completed TLS **Client Profile** form:

The screenshot displays the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes 'Device: Avaya_SBCE', 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The main header shows 'Session Border Controller for Enterprise' and the 'AVAYA' logo.

On the left, a sidebar menu lists various management options, with 'Client Profiles' highlighted under 'TLS Management'. The main content area is titled 'Client Profiles: Inside_Client' and features an 'Add' button and a 'Delete' button.

The 'Client Profile' configuration form is shown, containing the following sections:

- TLS Profile**
 - Profile Name: Inside_Client
 - Certificate: sbce_inside.pem
 - SNI: ☐ Enabled
- Certificate Verification**
 - Peer Verification: Required
 - Peer Certificate Authorities: default.pem
 - Peer Certificate Revocation Lists: ---
 - Verification Depth: 1
 - Extended Hostname Verification: ☐
- Renegotiation Parameters**
 - Renegotiation Time: 0
 - Renegotiation Byte Count: 0
- Handshake Options**
 - Version: ☒ TLS 1.2 ☐ TLS 1.1 ☐ TLS 1.0
 - Ciphers: ☒ Default ☐ FIPS ☐ Custom
 - Value: HIGH:IDH:IDH:IMD5:1aNULL:1eNULL:@STRENGTH

An 'Edit' button is located at the bottom of the form.

7.4. 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.

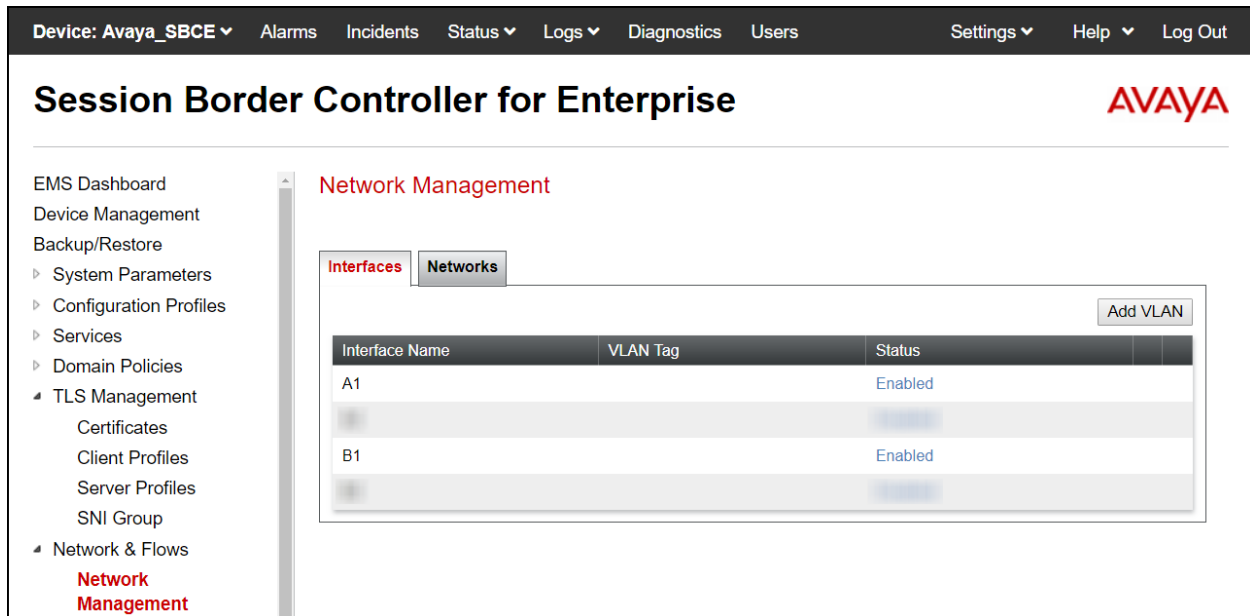
Select **Network Management** from the **Network & Flows** on the left-side menu. On the **Networks** tab, verify or enter the network information as needed.

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.

The screenshot shows the Avaya Session Border Controller for Enterprise web interface. The top navigation bar includes 'Device: Avaya_SBCE', 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The main header displays 'Session Border Controller for Enterprise' and the Avaya logo. The left sidebar contains a menu with categories like 'EMS Dashboard', 'Device Management', 'Backup/Restore', 'System Parameters', 'Configuration Profiles', 'Services', 'Domain Policies', 'TLS Management', and 'Network & Flows'. Under 'Network & Flows', 'Network Management' is highlighted. The main content area is titled 'Network Management' and features two tabs: 'Interfaces' and 'Networks'. The 'Networks' tab is active, showing a table with two entries: 'Network_A1' and 'Network_B1'. Each entry lists its Gateway, Subnet Mask / Prefix Length, Interface, and IP Address, with 'Edit' and 'Delete' links for each. An 'Add' button is located in the top right corner of the table area.

Name	Gateway	Subnet Mask / Prefix Length	Interface	IP Address		
Network_A1	10.64.101.1	255.255.255.0	A1	10.64.101.243	Edit	Delete
Network_B1	10.10.80.1	255.255.255.128	B1	10.10.80.51	Edit	Delete

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.



7.5. 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.

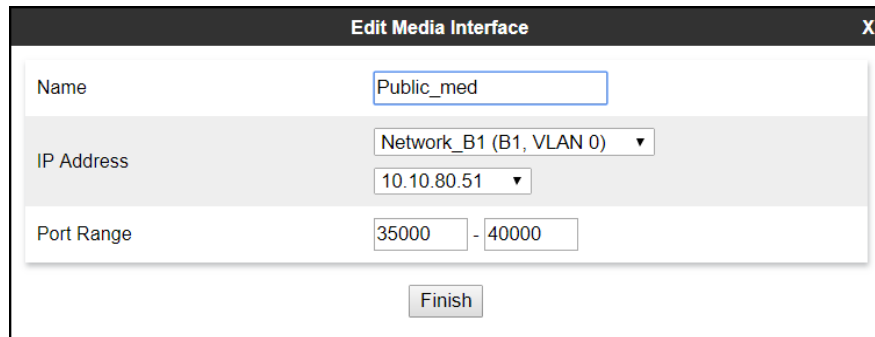
To add the Media Interface in the enterprise direction, select **Media Interface** from the **Network & Flows** menu on the left-hand side, click the **Add** button (not shown).

- On the **Add Media Interface** screen, enter an appropriate **Name** for the Media Interface, in the example *Private_med* was used.
- 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 the 'Edit Media Interface' dialog box. It has a title bar with 'Edit Media Interface' and a close button 'X'. The form contains three main sections: 'Name' with a text input field containing 'Private_med'; 'IP Address' with a dropdown menu showing 'Network_A1 (A1, VLAN 0)' and a text input field containing '10.64.101.243'; and 'Port Range' with two text input fields containing '35000' and '40000' separated by a hyphen. At the bottom is a 'Finish' button.

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**.



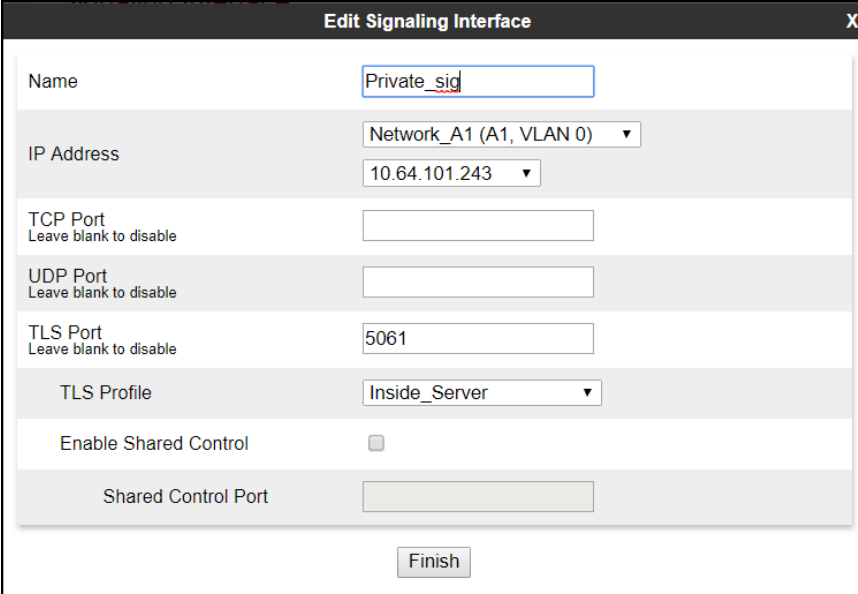
The screenshot shows a dialog box titled "Edit Media Interface" with a close button (X) in the top right corner. The dialog contains three main sections: "Name" with a text input field containing "Public_med"; "IP Address" with a dropdown menu showing "Network_B1 (B1, VLAN 0)" and a sub-dropdown showing "10.10.80.51"; and "Port Range" with two input fields containing "35000" and "40000" separated by a hyphen. A "Finish" button is located at the bottom center of the dialog.

7.6. 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 **Network & Flows** menu on the left-hand side, click the **Add** button (not shown).

- On the **Add Signaling Interface** screen, enter an appropriate **Name** for the interface, in the example *Private_sig* was used.
- 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 6.6**.
- Select a **TLS Profile** defined in **Section 7.3.2**.
- Click **Finish**.



The screenshot shows the 'Edit Signaling Interface' window with the following fields and values:

Field	Value
Name	Private_sig
IP Address	Network_A1 (A1, VLAN 0) / 10.64.101.243
TCP Port	
UDP Port	
TLS Port	5061
TLS Profile	Inside_Server
Enable Shared Control	<input type="checkbox"/>
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 Destiny in the sample configuration.
- Click **Finish**.

Edit 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

7.7. 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).

7.7.1. 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 **Configuration Profiles → Server Interworking** on the left navigation pane. Under **Interworking Profiles**, select *avaya-ru* from the list of pre-defined profiles. Click **Clone** (not shown).

The screenshot displays the configuration interface for a Session Border Controller for Enterprise. The top navigation bar includes links for Device: Avaya_SBCE, Alarms, Incidents, Status, Logs, Diagnostics, Users, and Settings. The main title is "Session Border Controller for Enterprise".

On the left, the navigation pane shows the following structure:

- EMS Dashboard
- Device Management
- Backup/Restore
- System Parameters
- Configuration Profiles
 - Domain DoS
 - Server Interworking**
 - Media Forking
 - Routing
 - Topology Hiding
 - Signaling Manipulation
 - URI Groups
 - SNMP Traps
 - Time of Day Rules
 - FGDN Groups
 - Reverse Proxy Policy
 - URN Profile
 - Recording Profile
- Services
- Domain Policies
- TLS Management
- Network & Flows
- DMZ Services
- Monitoring & Logging

The main content area is titled "Interworking Profiles: avaya-ru". It features an "Add" button and a list of interworking profiles:

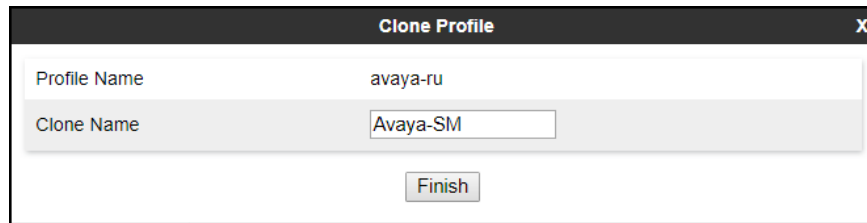
- cs2100
- avaya-ru**
- OCS-Edge-Server
- cisco-ccm
- cups
- OCS-FrontEnd-S...
- Avaya-SM
- Avaya-IPO
- Avaya-CS1000
- Avaya-CM
- SP-General

A warning message states: "It is not recommended to edit the defaults. Try cloning or adding a new profile instead." Below this, there are tabs for General, Timers, Privacy, URI Manipulation, Header Manipulation, and Advanced. The "General" tab is selected, showing the following configuration table:

General	
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	Yes
3xx Handling	No
Diversion Header Support	No
Delayed SDP Handling	No
Re-Invite Handling	No
Prack Handling	No
Allow 18X SDP	No
T.38 Support	No
URI Scheme	SIP
Via Header Format	RFC3261

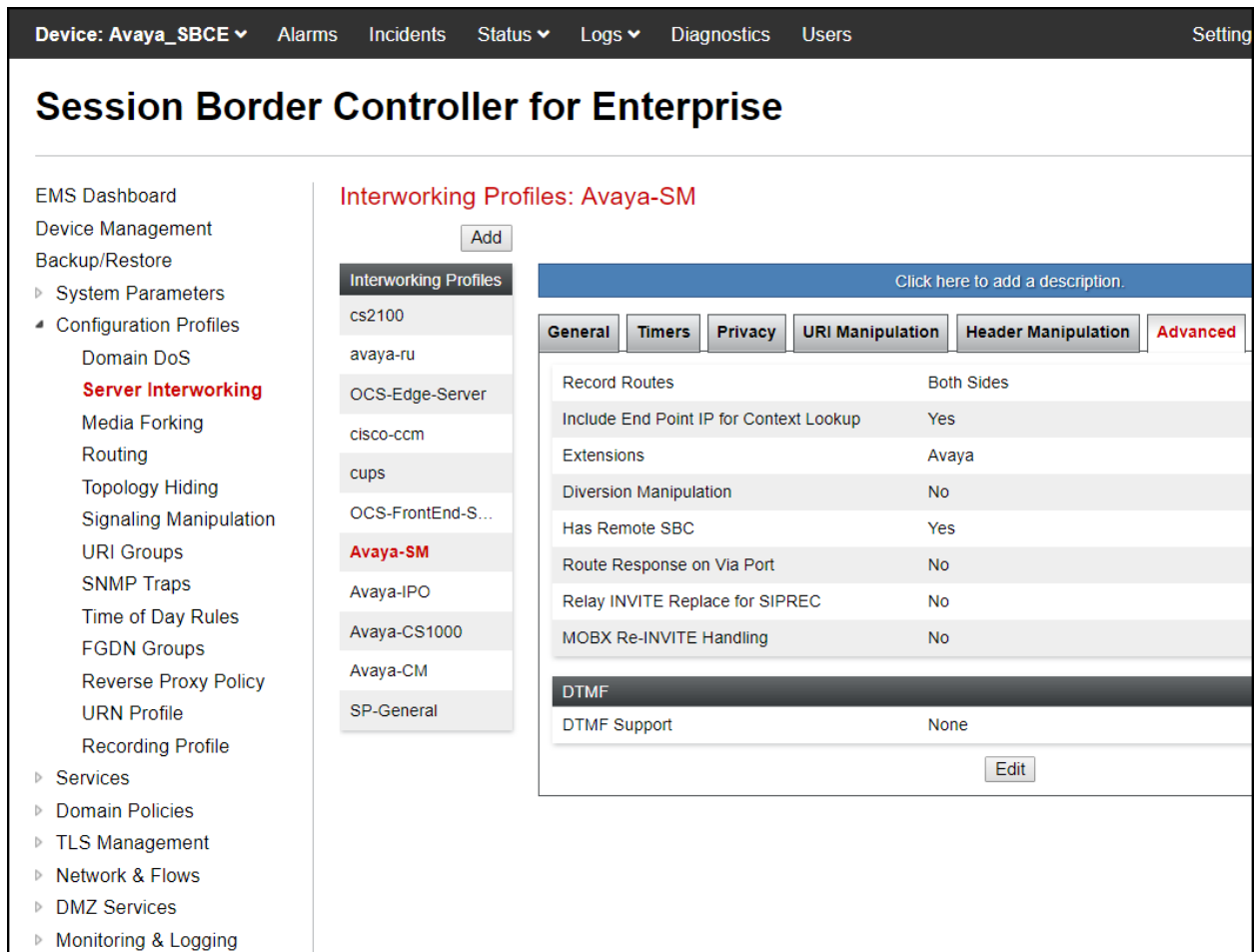
An "Edit" button is located at the bottom right of the configuration table.

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



A dialog box titled "Clone Profile" with a close button (X) in the top right corner. It contains two input fields: "Profile Name" with the value "avaya-ru" and "Clone Name" with the value "Avaya-SM". Below the fields is a "Finish" button.

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



The screenshot shows the "Session Border Controller for Enterprise" web interface. The top navigation bar includes "Device: Avaya_SBCE", "Alarms", "Incidents", "Status", "Logs", "Diagnostics", "Users", and "Setting". The main heading is "Session Border Controller for Enterprise".

On the left is a sidebar menu with categories like "EMS Dashboard", "Device Management", "Backup/Restore", "System Parameters", "Configuration Profiles", "Services", "Domain Policies", "TLS Management", "Network & Flows", "DMZ Services", and "Monitoring & Logging". Under "Configuration Profiles", "Server Interworking" is highlighted.

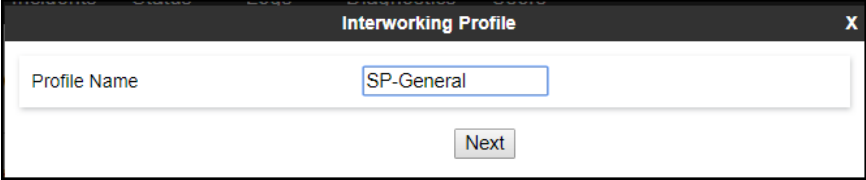
The main content area is titled "Interworking Profiles: Avaya-SM" and includes an "Add" button. Below this is a list of profiles: "cs2100", "avaya-ru", "OCS-Edge-Server", "cisco-ccm", "cups", "OCS-FrontEnd-S...", "Avaya-SM" (highlighted), "Avaya-IPO", "Avaya-CS1000", "Avaya-CM", and "SP-General".

To the right of the profile list is a configuration panel for "Avaya-SM". It has tabs for "General", "Timers", "Privacy", "URI Manipulation", "Header Manipulation", and "Advanced" (which is selected). The "Advanced" tab shows settings for "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), and "MOBX Re-INVITE Handling" (No). Below these is a "DTMF" section with "DTMF Support" set to "None". An "Edit" button is at the bottom right of the configuration panel.

7.7.2. 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 **Configuration Profiles → Server Interworking** on the left navigation pane and click **Add** (not shown).

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



The screenshot shows a dialog box titled "Interworking 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 "SP-General". Below the input field, there is a "Next" button.

- 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

X

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

Back

Next

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

Device: Avaya_SBCE ▾

Alarms

Incidents

Status ▾

Logs ▾

Diagnostics

Users

Settings

Session Border Controller for Enterprise

EMS Dashboard

Device Management

Backup/Restore

▸ System Parameters

▾ Configuration Profiles

Domain DoS

Server Interworking

Media Forking

Routing

Topology Hiding

Signaling Manipulation

URI Groups

SNMP Traps

Time of Day Rules

FGDN Groups

Reverse Proxy Policy

URN Profile

Recording Profile

▸ Services

▸ Domain Policies

▸ TLS Management

▸ Network & Flows

▸ DMZ Services

▸ Monitoring & Logging

Interworking Profiles: SP-General

Add

Interworking Profiles

cs2100

avaya-ru

OCS-Edge-Server

cisco-ccm

cups

OCS-FrontEnd-S...

Avaya-SM

Avaya-IPO

Avaya-CS1000

Avaya-CM

SP-General

Click here to add a description.

GeneralTimersPrivacyURI ManipulationHeader Manipulation**Advanced**

Record Routes	Both Sides
Include End Point IP for Context Lookup	No
Extensions	None
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

7.8. 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.

A single Sigma script was created during the compliance test to correct the following interoperability issues (refer to **Section 2.2**):

- Remove + sign from SIP messages before sending to Destiny.
- Remove unwanted “gsid” and “epv” parameter from being sent to the Service Provider in the Contact header.
- Remove the P-Location parameter from being sent to the Service Provider.
- Change the Diversion header scheme from SIPS to SIP.
- Remove unwanted xml element information from the SDP in SIP messages sent to the Service Provider.

The scripts will later be applied to the Server Configuration profile corresponding to the Service Provider (toward Destiny) in **Section 7.9.2**.

To create the SigMa script to be applied to the Server Configuration Profile corresponding to the Service Provider, on the left navigation pane, select **Configuration Profiles → Signaling Manipulation**. From the **Signaling Manipulation Scripts** list, select **Add**.

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

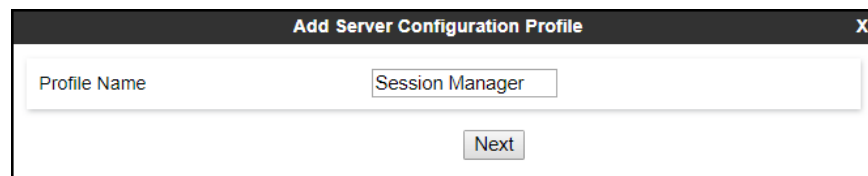
7.9. Server Configuration

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

7.9.1. Server Configuration Profile – Enterprise

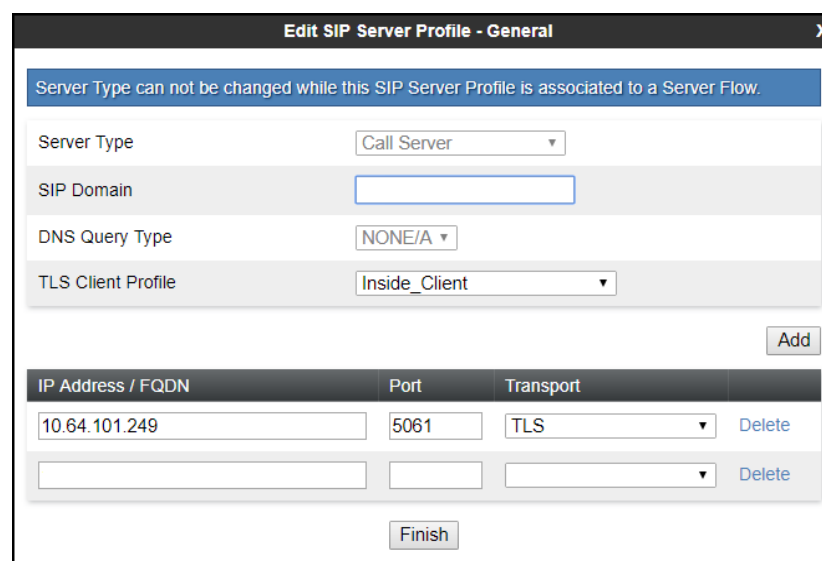
From the **Services** menu on the left-hand navigation pane, select **SIP Servers** and click the **Add** button (not shown) to add a new profile for the Call Server.

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



The screenshot shows a dialog box titled "Add Server Configuration Profile". It has 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 SIP Server 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 6.5**).
- 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 6.6**.
- Select a **TLS Profile** defined in **Section 7.3.3**.
- Click **Next**.



The screenshot shows a dialog box titled "Edit SIP Server Profile - General". It has a close button (X) in the top right corner. At the top, there is a blue warning bar that says "Server Type can not be changed while this SIP Server Profile is associated to a Server Flow." Below this, there are several fields: "Server Type" (a dropdown menu showing "Call Server"), "SIP Domain" (an empty text box), "DNS Query Type" (a dropdown menu showing "NONE/A"), and "TLS Client Profile" (a dropdown menu showing "Inside_Client"). To the right of these fields is an "Add" button. Below these fields is a table with three columns: "IP Address / FQDN", "Port", and "Transport". The first row of the table contains the values "10.64.101.249", "5061", and "TLS". There is a "Delete" button to the right of each row. Below the table is a "Finish" button.

- 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 7.7.1**).
- Click **Finish**.

The screenshot shows a window titled "Edit SIP Server Profile - Advanced" with a close button (X) in the top right corner. The window contains a list of configuration options, each with a label and a control element (checkbox or dropdown menu). The options are: "Enable DoS Protection" (checkbox, unchecked), "Enable Grooming" (checkbox, checked), "Interworking Profile" (dropdown menu, set to "Avaya-SM"), "Signaling Manipulation Script" (dropdown menu, set to "None"), "Securable" (checkbox, unchecked), "Enable FGDN" (checkbox, unchecked), "TCP Failover Port" (text input field, empty), "TLS Failover Port" (text input field, empty), "Tolerant" (checkbox, unchecked), and "URI Group" (dropdown menu, set to "None"). At the bottom right of the window is a "Finish" button.

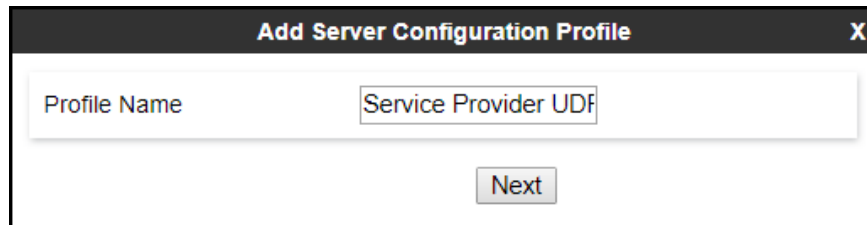
Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input checked="" type="checkbox"/>
Interworking Profile	Avaya-SM ▼
Signaling Manipulation Script	None ▼
Securable	<input type="checkbox"/>
Enable FGDN	<input type="checkbox"/>
TCP Failover Port	<input type="text"/>
TLS Failover Port	<input type="text"/>
Tolerant	<input type="checkbox"/>
URI Group	None ▼

Finish

7.9.2. Server Configuration Profile – Service Provider

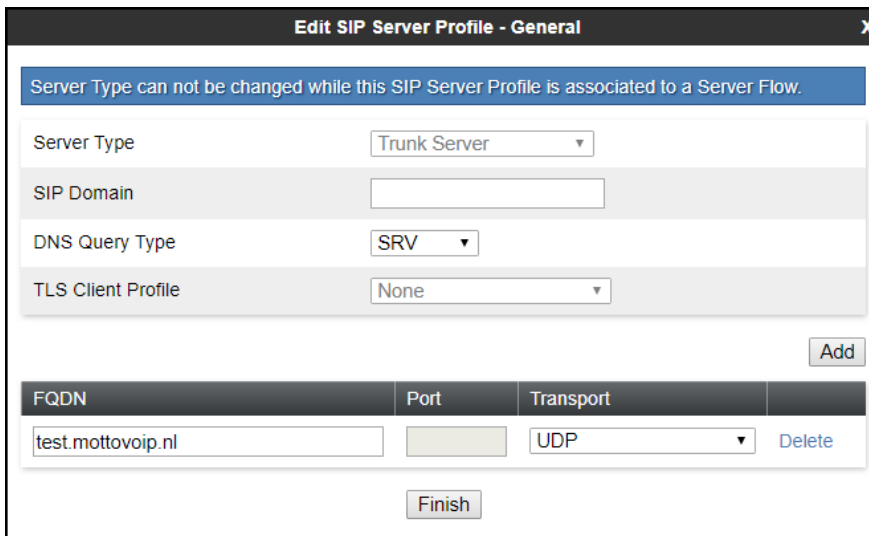
Similarly, to add the profile for the Trunk Server, click the **Add** button on the **Server Configuration** screen (not shown).

- 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" 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 "Service Provider UDP". Below the input field is a button labeled "Next".

- On the **Edit Server Configuration Profile - General** Tab select *Trunk Server* from the drop-down menu for the **Server Type**.
- Select *SRV* from the drop-down menu for **DNS Query Type**.
- On the **IP Addresses / FQDN** field, enter *test.mottovoip.nl* (Destiny SIP proxy server FQDN). This information was provided by Destiny.
- Select *UDP* for **Transport** (note the port cannot be enter since SRV was selected for **DNS Query Type**, the port being used will be collected from the DNS response).
- Click **Next**.



The screenshot shows a dialog box titled "Edit SIP Server Profile - General" with a close button (X) in the top right corner. A blue message bar at the top states: "Server Type can not be changed while this SIP Server Profile is associated to a Server Flow." Below this, there are four rows of configuration options, each with a label and a dropdown menu:

- Server Type: Trunk Server
- SIP Domain: (empty)
- DNS Query Type: SRV
- TLS Client Profile: None

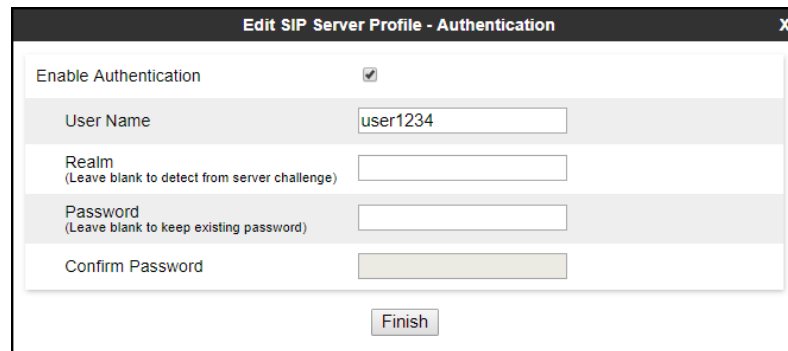
Below these options is an "Add" button. Underneath is a table with four columns: FQDN, Port, Transport, and an action column. The table contains one row with the following values:

FQDN	Port	Transport	
test.mottovoip.nl	(empty)	UDP	Delete

At the bottom of the dialog is a "Finish" button.

On the **Add SIP Server Profile - Authentication** tab:

- 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 web-based configuration window titled "Edit SIP Server Profile - Authentication". The window contains the following elements:

- Enable Authentication:** A checkbox that is checked.
- User Name:** A text input field containing the value "user1234".
- Realm:** A text input field that is empty. Below the field is the text "(Leave blank to detect from server challenge)".
- Password:** A text input field that is empty. Below the field is the text "(Leave blank to keep existing password)".
- Confirm Password:** A text input field that is empty.
- Finish:** A button located at the bottom right of the form area.

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

On the **Add SIP Server Profile - Registration** tab:

- Check the **Register with All Servers** box.
- **Frequency:** 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 **User Name** entered above in the **Authentication** screen (user1234) and the Service Provider's SIP proxy server FQDN (**test.mottovoip.nl**), as shown on the screen below.
 - **To URI:** Use the **User Name** entered above in the **Authentication** screen (user1234) and the Service Provider's SIP proxy server FQDN (**test.mottovoip.nl**), as shown on the screen below.
 - Click **Next**.

Edit SIP Server Profile - Registration	
Register with All Servers	<input checked="" type="checkbox"/>
Register with Priority Server	<input type="checkbox"/>
Refresh Interval	60 seconds
From URI	user1234@test.mottovoip.
To URI	user1234@test.mottovoip.
Finish	

Click **Next** on the **Add SIP Server Profile - Ping** window (not shown).

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

- Uncheck **Enable Grooming**.
- Select **SP-General** from the **Interworking Profile** drop-down menu (Section 7.7.2).
- Select the **Destiny_Sigma** from the **Signaling Manipulation Script** drop down menu (Sections 7.8 and 12).
- Click **Finish**.

Edit SIP Server Profile - Advanced X

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

Finish

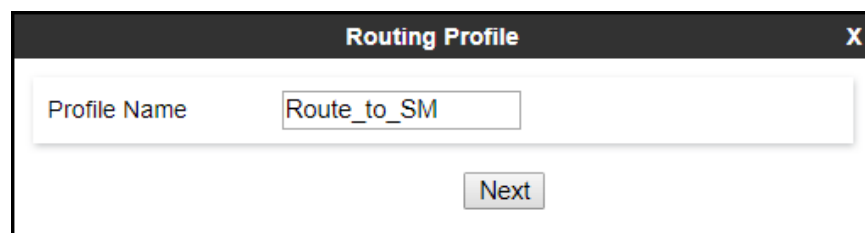
7.10.Routing

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.

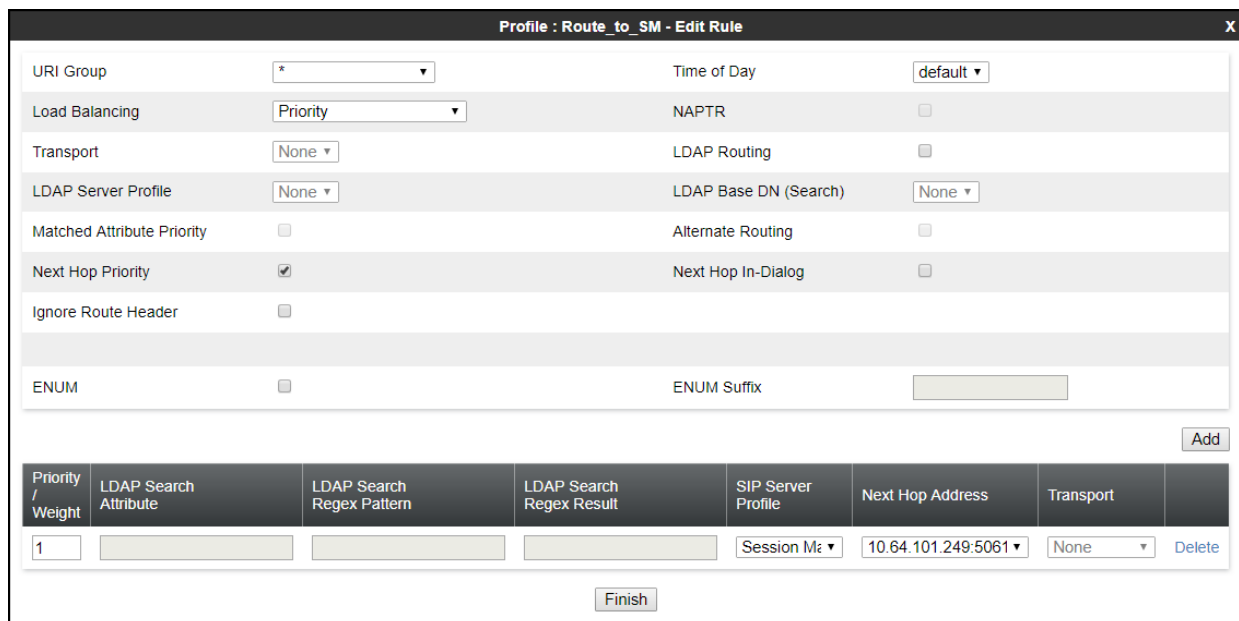
7.10.1. Routing Profile – Enterprise

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

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



- On the **Routing Profile** tab, click the **Add** button to enter the next-hop address.
- Under **Priority/Weight** enter **1**.
- Under **SIP Server Profile**, 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 7.9.1**.
- Defaults were used for all other parameters.
- Click **Finish**.

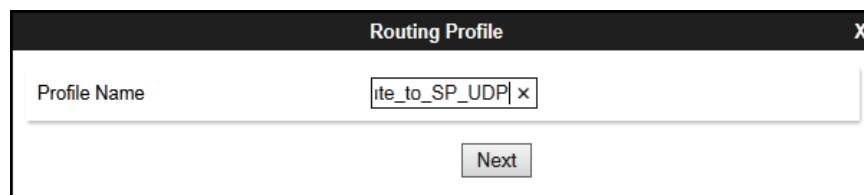


Priority / Weight	LDAP Search Attribute	LDAP Search Regex Pattern	LDAP Search Regex Result	SIP Server Profile	Next Hop Address	Transport	
1				Session Manager	10.64.101.249:5061	None	Delete

7.10.2. Routing Profile – Service Provider

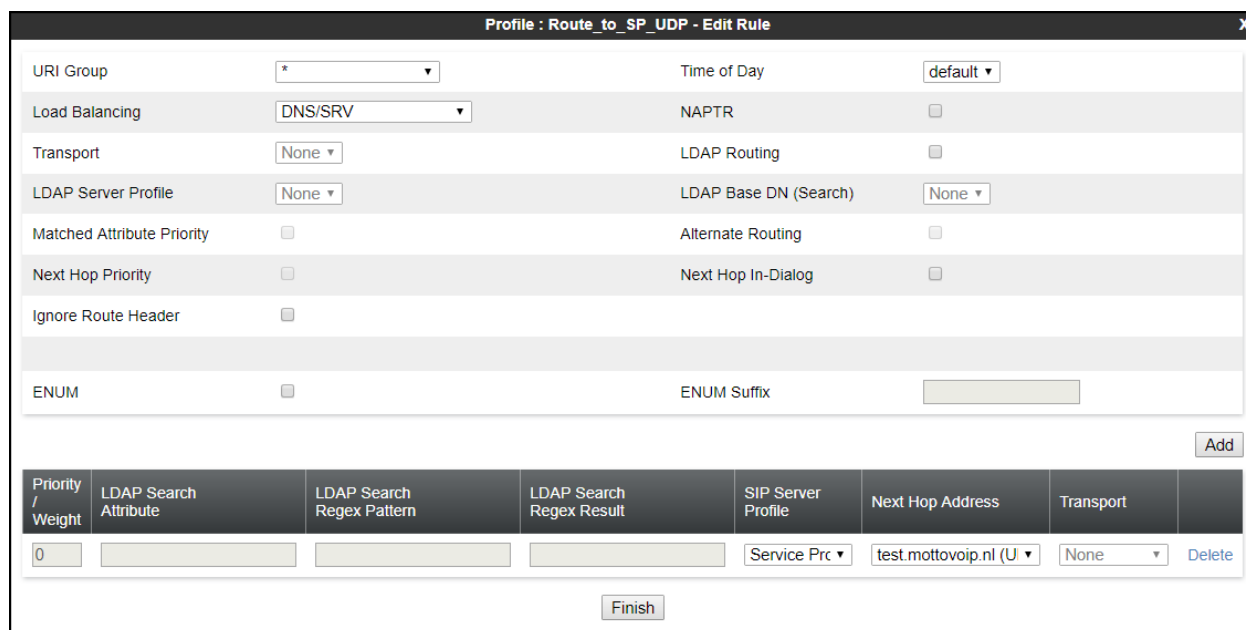
Back at the **Routing** tab, select **Add** (not shown) to repeat the process in order to create the outbound route.

- 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 'Profile Name' label followed by a text input field containing 'ite_to_SP_UDP' and a small 'x' icon. Below the input field is a 'Next' button.

- Under **Load Balancing** select *DNS/SRV*.
- Click the **Add** button to enter the next-hop address.
- Under **SIP Server Profile**, select *Service Provider UDP*. The **Next Hop Address** is populated automatically with *test.mottovoip.nl:5060 (UDP)*. Destiny SIP Proxy FQDN, Port and Transport, Server Configuration Profile defined in **Section 7.9.2**.
- Defaults were used for all other parameters.
- Click **Finish**



The image shows a 'Profile: Route_to_SP_UDP - Edit Rule' dialog box. It has a title bar with the profile name and a close button 'X'. The main area contains various configuration options:

- URI Group: * (dropdown)
- Time of Day: default (dropdown)
- Load Balancing: DNS/SRV (dropdown)
- NAPTR: ☐
- Transport: None (dropdown)
- LDAP Routing: ☐
- LDAP Server Profile: None (dropdown)
- LDAP Base DN (Search): None (dropdown)
- Matched Attribute Priority: ☐
- Alternate Routing: ☐
- Next Hop Priority: ☐
- Next Hop In-Dialog: ☐
- Ignore Route Header: ☐
- ENUM: ☐
- ENUM Suffix: (text input)

At the bottom right is an 'Add' button. Below the configuration options is a table with 8 columns: Priority / Weight, LDAP Search Attribute, LDAP Search Regex Pattern, LDAP Search Regex Result, SIP Server Profile, Next Hop Address, Transport, and an empty column. The first row has the following values: 0, (text input), (text input), (text input), Service Prc (dropdown), test.mottovoip.nl (U) (dropdown), None (dropdown), and a 'Delete' button. At the bottom center is a 'Finish' button.

7.11.Topology Hiding

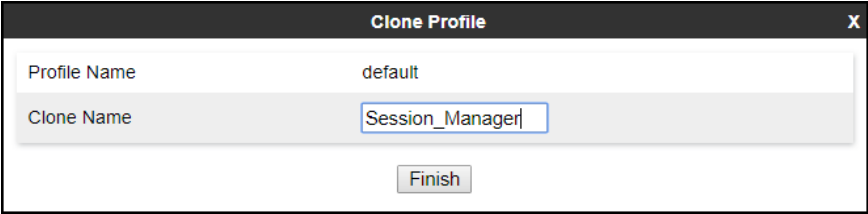
Topology Hiding is a security feature that allows the modification of several SIP headers, preventing private enterprise network information from being propagated to the untrusted public network.

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.

7.11.1. Topology Hiding Profile – Enterprise

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

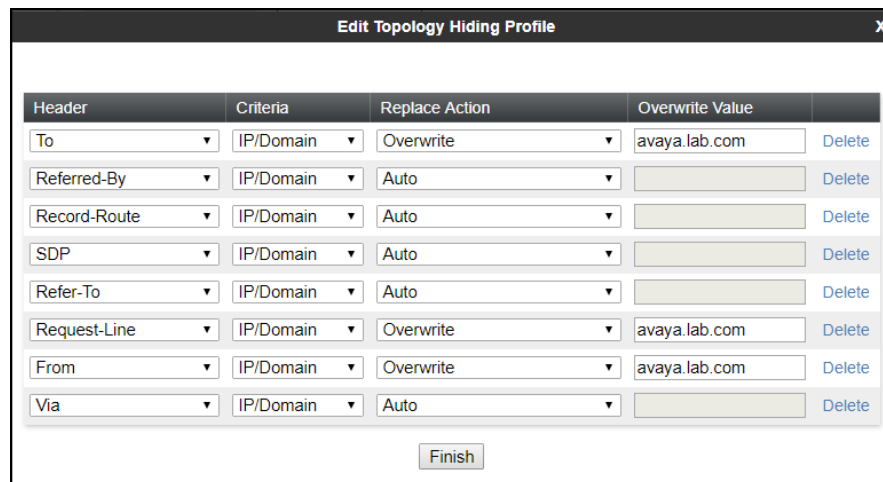
- Enter a **Clone Name** such as the one shown below.
- Click **Finish**.



Clone Profile	
Profile Name	default
Clone Name	Session_Manager
<button>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 6.2**.
- Default values were used for all other fields.
- Click **Finish**.



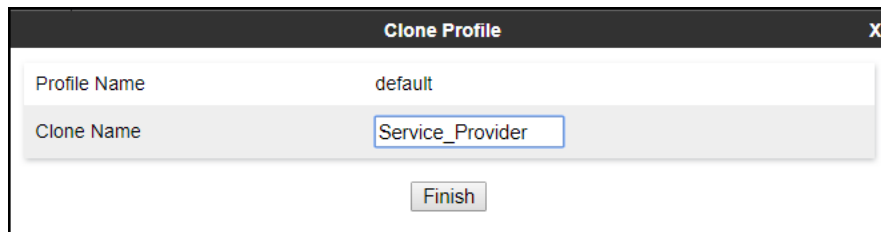
Header	Criteria	Replace Action	Overwrite Value	
To	IP/Domain	Overwrite	avaya.lab.com	Delete
Referred-By	IP/Domain	Auto		Delete
Record-Route	IP/Domain	Auto		Delete
SDP	IP/Domain	Auto		Delete
Refer-To	IP/Domain	Auto		Delete
Request-Line	IP/Domain	Overwrite	avaya.lab.com	Delete
From	IP/Domain	Overwrite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

Finish

7.11.2. 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 with a dark header bar containing the title 'Clone Profile' and a close button 'X'. The dialog has two input fields: 'Profile Name' with the value 'default' and 'Clone Name' with the value 'Service_Provider'. The 'Clone Name' field is highlighted with a blue border. At the bottom center is a 'Finish' button.

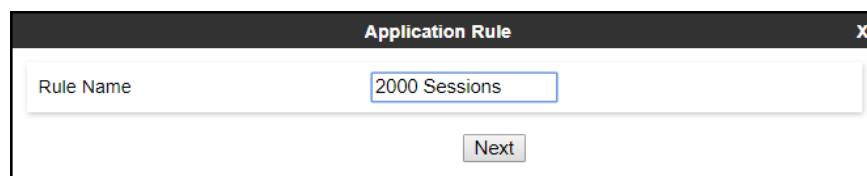
7.12.Domain Policies

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.

7.12.1.Application Rules

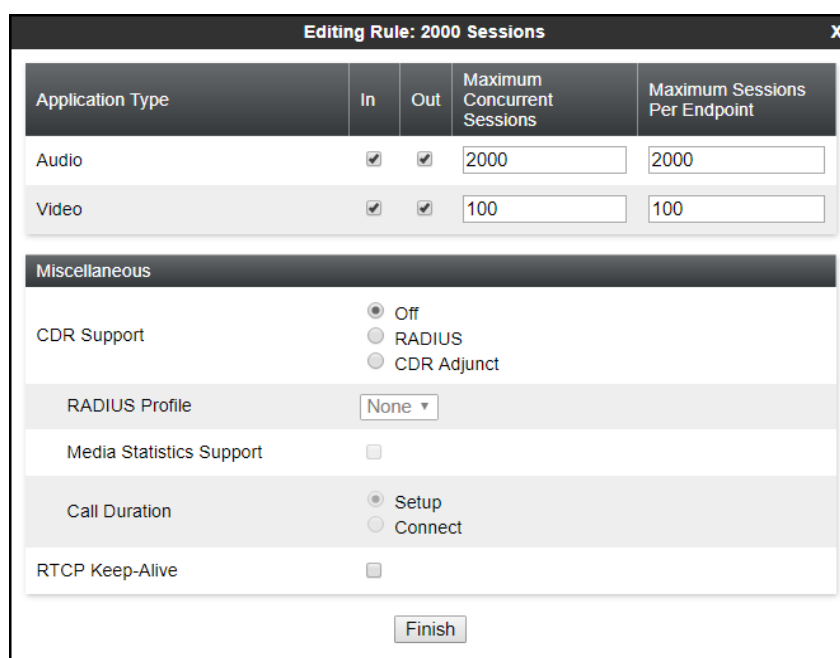
Application Rules define which types of SIP-based Unified Communications (UC) applications the UC-Sec security device will protect voice, video, and/or Instant Messaging (IM). In addition, Application Rules define the maximum number of concurrent voice sessions the network will process in order to prevent 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**.



Application Rule	
Rule Name	2000 Sessions
<div>Next</div>	

- Under **Audio** check **In** and **Out** and set the **Maximum Concurrent Sessions** and **Maximum Sessions Per Endpoint** to recommended values, the value of **2000** for Audio. Repeat for video if needed, the value of **100** for Video was used for the test.
- Click **Finish**.



Editing Rule: 2000 Sessions				
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

Miscellaneous

CDR Support

☒ Off
☐ RADIUS
☐ CDR Adjunct

RADIUS Profile

None ▾

Media Statistics Support

☐

Call Duration

☒ Setup
☐ Connect

RTCP Keep-Alive

☐

Finish

7.12.2. 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, if needed.
- Under Miscellaneous verify that **Capability Negotiation** is checked.
- Accept default values in the remaining sections by clicking **Next** (not shown), and then click **Finish**

Media Encryption

Audio Encryption

Preferred Format #1

SRTP_AES_CM_128_HMAC_SHA1_80

Preferred Format #2

RTP

Preferred Format #3

NONE

SRTP Context Reset on SSRC Change

☐

Encrypted RTCP

☐

MKI

☐

Lifetime

2^

Leave blank to match any value.

Interworking

☒

Video Encryption

Preferred Format #1

SRTP_AES_CM_128_HMAC_SHA1_80

Preferred Format #2

RTP

Preferred Format #3

NONE

SRTP Context Reset on SSRC Change

☐

Encrypted RTCP

☐

MKI

☐

Lifetime

2^

Leave blank to match any value.

Interworking

☒

Miscellaneous

Capability Negotiation

☒

Finish

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

Media Encryption

Audio Encryption

Preferred Format #1

RTP

Preferred Format #2

NONE

Preferred Format #3

NONE

SRTP Context Reset on SSRC Change

☐

Encrypted RTCP

☐

MKI

☐

Lifetime

2^

Leave blank to match any value.

Interworking

☒

Video Encryption

Preferred Format #1

RTP

Preferred Format #2

NONE

Preferred Format #3

NONE

SRTP Context Reset on SSRC Change

☐

Encrypted RTCP

☐

MKI

☐

Lifetime

2^

Leave blank to match any value.

Interworking

☒

Miscellaneous

Capability Negotiation

☐

Finish

7.12.3. 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 Device: Avaya_SBCE, Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header shows the title "Session Border Controller for Enterprise" and the Avaya logo.

On the left, a sidebar menu lists various configuration options under "Domain Policies", including Signaling Rules, which is currently selected and highlighted in red.

The main content area is titled "Signaling Rules: default" and features an "Add" 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 the "Inbound" and "Outbound" sections. The "Inbound" section includes a table with the following data:

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

The "Outbound" section includes a table with the following data:

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

Below these sections is the "Content-Type Policy" section, which includes a checkbox for "Enable Content-Type Checks" (checked), a table for "Action" (Allow, Multipart Action, Allow), and an "Exception List" section.

The interface also includes a "Clone" button and an "Edit" button at the bottom right of the configuration area.

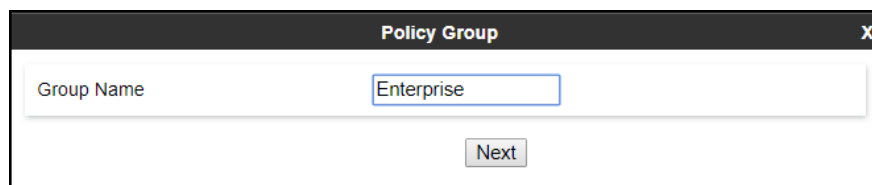
7.13.End Point Policy Groups

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.

7.13.1. 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).

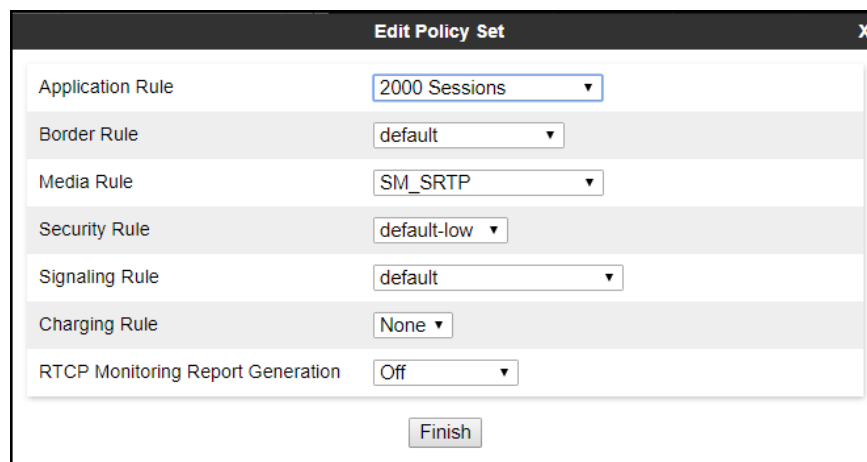
- Enter an appropriate name in the **Group Name** field.
- Click **Next**.



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". Below the input field is a button labeled "Next".

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

- **Application Rule:** *2000 Sessions* (Section 7.12.1).
- **Border Rule:** *default*.
- **Media Rule:** *SM_SRTP* (Section 7.12.2).
- **Security Rule:** *default-low*.
- **Signaling Rule:** *default* (Section 7.12.3).
- Click **Finish**.



The screenshot shows a dialog box titled "Edit Policy Set" with a close button (X) in the top right corner. The dialog contains several rows, each with a label and a dropdown menu:

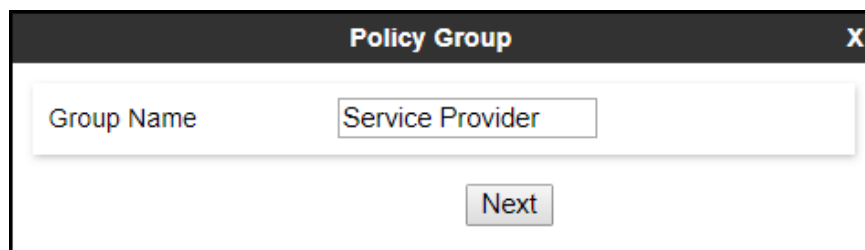
Label	Value
Application Rule	2000 Sessions
Border Rule	default
Media Rule	SM_SRTP
Security Rule	default-low
Signaling Rule	default
Charging Rule	None
RTCP Monitoring Report Generation	Off

At the bottom of the dialog is a button labeled "Finish".

7.13.2. 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).

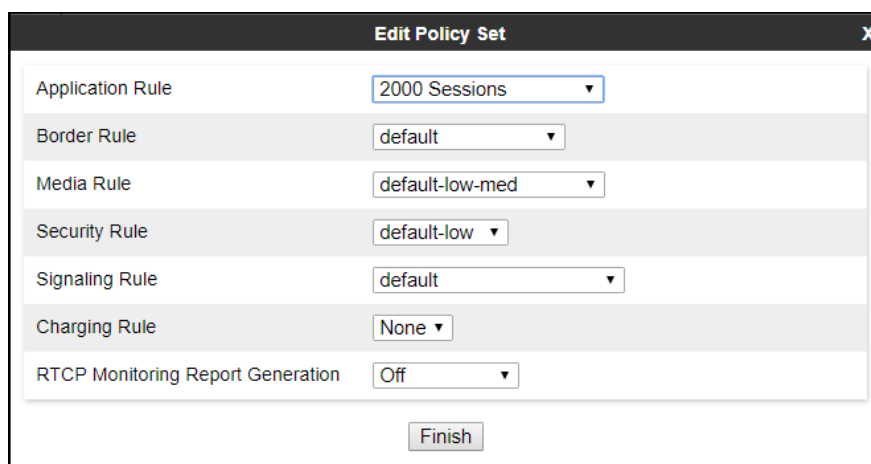
- Enter an appropriate name in the **Group Name** field (*Service Provider* was used).
- Click **Next**.



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, there is a button labeled "Next".

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

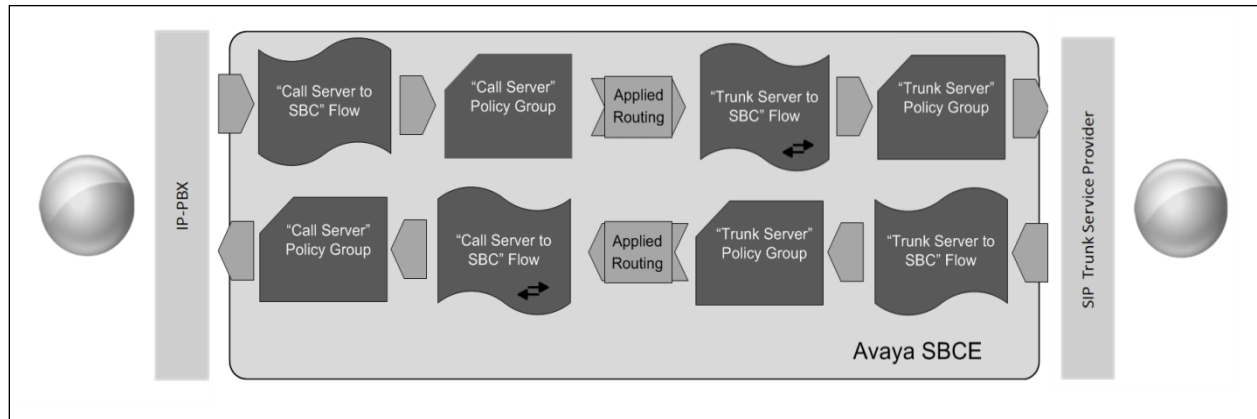
- **Application Rule:** *2000 Sessions* (Section 7.12.1).
- **Border Rule:** *default*.
- **Media Rule:** *default-low-med* (Section 7.12.2).
- **Security Rule:** *default-low*.
- **Signaling Rule:** *default* (Section 7.12.3).
- Click **Finish**.



The screenshot shows a dialog box titled "Edit Policy Set" with a close button (X) in the top right corner. Inside the dialog, there are several rows, each with a label and a dropdown menu. The labels are: "Application Rule", "Border Rule", "Media Rule", "Security Rule", "Signaling Rule", "Charging Rule", and "RTCP Monitoring Report Generation". The corresponding dropdown values are: "2000 Sessions", "default", "default-low-med", "default-low", "default", "None", and "Off". At the bottom right of the dialog, there is a button labeled "Finish".

7.14.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.

7.14.1. 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 7.10.2**, which is the reverse route of the flow. Click **Finish**.

Edit Flow: Session_Manager_Flow	
Flow Name	Session_Manager_Flow
SIP Server Profile	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
Link Monitoring from Peer	<input type="checkbox"/>
<div>Finish</div>	

7.14.2. 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 7.10.1**, 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
SIP Server Profile	Service Provider UDP ▼
URI Group	* ▼
Transport	* ▼
Remote Subnet	*
Received Interface	Private_sig ▼
Signaling Interface	Public_sig ▼
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 ▼
Link Monitoring from Peer	<input type="checkbox"/>
<div>Finish</div>	

8. Destiny SIP Trunking Service Configuration

To use Destiny SIP Trunking Service, a customer must request the service from Destiny using the established sales processes. The process can be started by contacting Destiny via the corporate web site at: <http://www.destiny.nl>

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

Destiny will provide the following information:

- Destiny's SIP Proxy FQDN to be used for public DNS SRV record queries.
- SIP Trunk registration credentials (User Name, Password, etc.).
- DID numbers.
- Public DNS IP addresses.
- Etc.

9. 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.

9.1. 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.

9.2. Communication Manager Verification

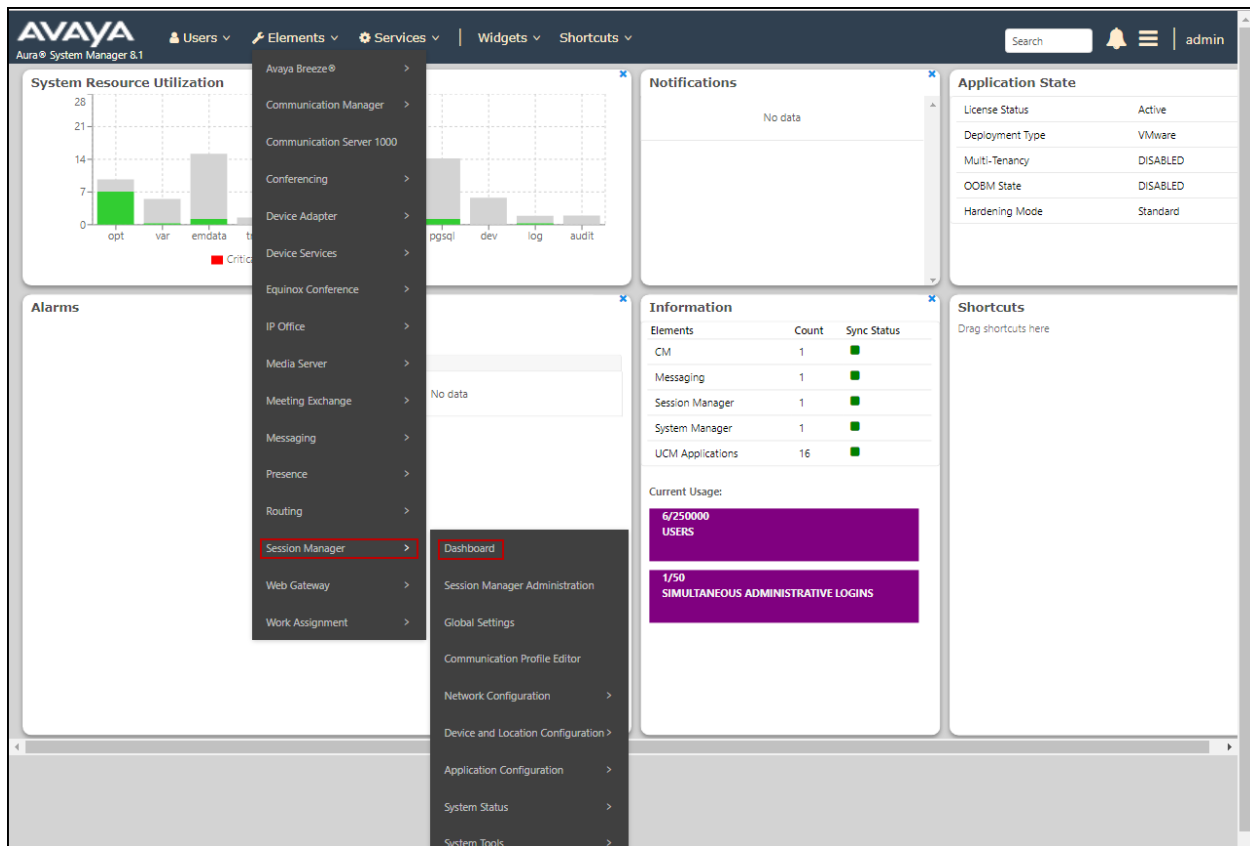
The following commands can be entered in the Communication Manager SAT terminal to verify the SIP trunk functionality:

- **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.

9.3. Session Manager Verification

The Session Manager configuration may be verified via System Manager.

Step 1 - Using the procedures described in **Section 6**, 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 are **1** alarm out of the **7** Entities defined.

Session Manager Dashboard
This page provides the overall status and health summary of each administered Session Manager.

Session Manager Instances

Service State: Shutdown System: EASG: Clear Logs: As of 3:17 PM

1 Item Show All Filter: Enable

	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"/>	Session Manager	Core	✓	0/0/0	Up	Accept New Service	1/7	0	0/0	✓	✓	Normal	Disabled	8.1.2.0.812039

Select: All, None

Verify that the state of the Session Manager links under the **Conn. Status** and **Link Status** columns are **UP**, like shown on the screen below

Session Manager Entity Link Connection Status
This page displays detailed connection status for all entity links from a Session Manager.

Status Details for the selected Session Manager:

All Entity Links for Session Manager: Session Manager

Summary View

7 Items Filter: Enable

	SIP Entity Name	Session Manager IP Address Family	SIP Entity Resolved IP	Port	Proto.	Deny	Conn. Status	Reason Code	Link Status
<input type="radio"/>	CS1K7.6	IPv4	172.16.5.60	5085	UDP	FALSE	DOWN	408 Request Timeout	DOWN
<input type="radio"/>	Avaya Experience Portal	IPv4	10.64.101.252	5061	TLS	FALSE	UP	200 OK	UP
<input type="radio"/>	Avaya SBCE	IPv4	10.64.101.243	5061	TLS	FALSE	UP	200 Keepalive	UP
<input type="radio"/>	Communication Manager Trunk 1	IPv4	10.64.101.241	5061	TLS	FALSE	UP	200 OK	UP
<input type="radio"/>	AA-Messaging	IPv4	10.64.101.250	5060	TCP	FALSE	UP	200 OK	UP
<input type="radio"/>	Communication Manager Trunk 2	IPv4	10.64.101.241	5071	TLS	FALSE	UP	200 OK	UP
<input type="radio"/>	Communication Manager Trunk 98	IPv4	10.64.101.241	5065	TLS	FALSE	UP	200 OK	UP

Select: None

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.

9.4. Avaya 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.

Device: Avaya_SBCE ▾ Alarms Incidents Status ▾ Logs ▾ Diagnostics Users Settings ▾ Help ▾ Log Out

Session Border Controller for Enterprise

AVAYA

EMS Dashboard

- Device Management
- Backup/Restore
 - System Parameters
 - Configuration Profiles
- Services
 - Domain Policies
 - TLS Management
 - Network & Flows
 - DMZ Services
 - Monitoring & Logging

Dashboard

Information

System Time	11:08:24 AM EDT	Refresh
Version	8.1.0.0-14-18490	
GUI Version	8.1.0.0-18490	
Build Date	Mon Feb 03 17:23:09 UTC 2020	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	07/24/2020 10:39:59 EDT	
Failed Login Attempts	0	

Installed Devices

EMS
Avaya_SBCE

Active Alarms (past 24 hours)

None found.

Incidents (past 24 hours)

None found.

[Add](#)

Notes


No notes found.

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

Device: EMS ▾

Help

Alarm Viewer



Alarms

<input checked="" type="checkbox"/>	ID	Details	State	Time	Device
No alarms found for this device.					

Clear Selected

Clear All

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

Device: Avaya_SBCE ▾ **Alarms** **Incidents** ▾ **Status** ▾ **Logs** ▾ **Diagnostics** **Users** **Settings** ▾ **Help** ▾ **Log Out**

Session Border Controller for Enterprise

AVAYA

EMS Dashboard

- Device Management
- Backup/Restore
 - System Parameters
 - Configuration Profiles
- Services
 - Domain Policies
 - TLS Management
 - Network & Flows
 - DMZ Services
 - Monitoring & Logging

Dashboard

Information

System Time	11:08:24 AM EDT	Refresh
Version	8.1.0.0-14-18490	
GUI Version	8.1.0.0-18490	
Build Date	Mon Feb 03 17:23:09 UTC 2020	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	07/24/2020 10:39:59 EDT	
Failed Login Attempts	0	

Installed Devices

EMS
Avaya_SBCE

Active Alarms (past 24 hours)

None found.

Incidents (past 24 hours)

None found.

[Add](#)

Notes

No notes found.

The following screen shows the Incident Viewer page.

Help

Incident Viewer

AVAYA

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

Displaying results 1 to 15 out of 2000.

ID	Device	Date & Time	Category	Type	Cause
795649056596610	Avaya_SBCE	Jun 4, 2020, 3:15:13 PM	Policy	Server Registration	Registration Successful, Server is UP
795648650574360	Avaya_SBCE	Jun 4, 2020, 3:01:41 PM	Policy	Server Registration	Registration Successful, Server is UP
795648649788533	Avaya_SBCE	Jun 4, 2020, 3:01:39 PM	Policy	Server Registration	Registration Successful, Server is UP
795602006652158	Avaya_SBCE	Jun 3, 2020, 1:06:53 PM	Policy	Server Registration	Registration Successful, Server is UP

<< < 1 2 3 4 5 > >>

Status : Provides the status for each server resolved during DNS SRV queries handling calls to/from the PSTN. Note that Server FQDN and Server IP were blurred out for security reasons.

Device: Avaya_SBCE ▾ Alarms Incidents **Status ▾** Logs ▾ Diagnostics Users Settings ▾ Help ▾ Log Out

Session Border Controller for Enterprise

EMS Dashboard

- Device Management
- Backup/Restore
 - System Parameters
 - Configuration Profiles
 - Services
 - Domain Policies
 - TLS Management
 - Network & Flows
 - DMZ Services
 - Monitoring & Logging

Dashboard

Information

System Time	11:08:24 AM EDT	Refresh
Version	8.1.0.0-14-18490	
GUI Version	8.1.0.0-18490	
Build Date	Mon Feb 03 17:23:09 UTC 2020	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	07/24/2020 10:39:59 EDT	
Failed Login Attempts	0	

Installed Devices

EMS
Avaya_SBCE

Active Alarms (past 24 hours)

None found.

Incidents (past 24 hours)

None found.

[Add](#)

Notes

No notes found.

Device: Avaya_SBCE ▾ Help

Status

Server Status

Server Profile	Server FQDN	Server IP	Server Port	Server Transport	Heartbeat Status	Registration Status	TimeStamp
Service Provider UDP	.mottovoip.nl	.215.228	5060	UDP	UNKNOWN	REGISTERED	08/28/2020 09:09:06 EDT
Service Provider UDP	mottovoip.nl	.192.231	5060	UDP	UNKNOWN	REGISTERED	08/28/2020 09:09:06 EDT

Diagnostics: This screen provides a variety of tools to test and troubleshoot the Avaya SBCE network connectivity. Note that public Server IPs were blurred out for security reasons.

Task Description	Status
✓ EMS Link Check	M1 is operating within normal parameters with a full duplex connection at 1Gb/s.
✓ SBC Link Check: A1	A1 is operating within normal parameters with a full duplex connection at 1Gb/s.
✓ SBC Link Check: B1	B1 is operating within normal parameters with a full duplex connection at 1Gb/s.
✓ Ping: SBC (A1) to Gateway (10.64.101.1)	Average ping from 10.64.101.243 [A1] to 10.64.101.1 is 0.221ms.
✓ Ping: SBC (A1) to Primary DNS (75.75.75.75)	Average ping from 10.64.101.243 [A1] to 75.75.75.75 is 1.817ms.
✓ Ping: SBC (A1) to Secondary DNS (75.75.76.76)	Average ping from 10.64.101.243 [A1] to 75.75.76.76 is 3.687ms.
✓ Ping: SBC (B1) to Gateway (.80.1)	Average ping from .80.23 [B1] to .80.1 is 0.310ms.
✓ Ping: SBC (B1) to Primary DNS (75.75.75.75)	Average ping from .80.23 [B1] to 75.75.75.75 is 2.009ms.
✓ Ping: SBC (B1) to Secondary DNS (75.75.76.76)	Average ping from .80.23 [B1] to 75.75.76.76 is 3.365ms.

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

The screenshot shows the 'Diagnostics' page for the device 'Avaya_SBCE'. A notification box at the top states 'Pinging 10.64.101.247' and 'Average ping from 10.64.101.243 [A1] to 10.64.101.247 is 0.745ms.' Below this, there are two tabs: 'Full Diagnostic' and 'Ping Test'. A message indicates that outgoing pings can only be sent via the primary IP of each interface or VLAN. The 'Ping Test' tab is active, showing a 'Source Device / IP' dropdown set to 'A1' and a 'Destination IP' text field containing '10.64.101.247'. A 'Ping' button is located at the bottom of the form.

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 **Monitor & Logging** → **Trace**. Select the **Packet Capture** tab, set the desired configuration for the trace and click **Start Capture**.

The screenshot shows the 'Session Border Controller for Enterprise' interface. The top navigation bar includes 'Device: Avaya_SBCE', 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The left sidebar lists various management options, with 'Monitoring & Logging' expanded to show 'Trace'. The main content area is titled 'Trace: Avaya_SBCE' and contains two tabs: 'Packet Capture' and 'Captures'. The 'Packet Capture' tab is active, displaying a 'Packet Capture Configuration' form. The 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' (Destiny_Capture.pcap). 'Start Capture' and 'Clear' buttons are at the bottom.

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.

The screenshot displays the Avaya Session Border Controller for Enterprise (SBCE) web interface. The top navigation bar includes 'Device: Avaya_SBCE', 'Alarms', 'Incidents', 'Status', 'Logs', 'Diagnostics', 'Users', 'Settings', 'Help', and 'Log Out'. The main header reads 'Session Border Controller for Enterprise' with the Avaya logo. A left sidebar lists various management options, with 'Trace' highlighted under 'Monitoring & Logging'. The main content area is titled 'Trace: Avaya_SBCE' and features two tabs: 'Packet Capture' and 'Captures'. The 'Captures' tab is active, showing a table of captured files. The table has columns for 'File Name', 'File Size (bytes)', and 'Last Modified'. A single entry is listed: 'Destiny_Capture_20200828091956.pcap' with a size of 512,000 bytes and a timestamp of August 28, 2020 at 9:20:11 AM EDT. A 'Delete' link is present next to the file name. A 'Refresh' button is located in the top right corner of the table area.

File Name	File Size (bytes)	Last Modified
Destiny_Capture_20200828091956.pcap	512,000	August 28, 2020 at 9:20:11 AM EDT

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

10. Conclusion

These Application Notes describe the procedures required to configure Avaya Aura® Communication Manager 8.1, Avaya Aura® Session Manager 8.1 and Avaya Session Border Controller for Enterprise 8.1, to interoperate with the Destiny SIP Trunking service, 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**.

11. 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 8.1.x, Issue 4, March 2020.
- [2] *Administering Avaya Aura® Communication Manager*, Release 8.1.x, Issue 6, March 2020.
- [3] *Administering Avaya Aura® System Manager* for Release 8.1.x, Issue 6, April 2020.
- [4] *Deploying Avaya Aura® System Manager in a Virtualized Environment*, Release 8.1.x, Issue 5, May 2020.
- [5] *Deploying Avaya Aura® Session Manager and Avaya Aura® Branch Session Manager in a Virtualized Environment*, Release 8.1., Issue 3, March 2020.
- [6] *Administering Avaya Aura® Session Manager*, Release 8.1.x, Issue 4, May 2020.
- [7] *Deploying Avaya Session Border Controller for Enterprise*, Release 8.1, Issue 3, June 2020.
- [8] *Administering Avaya Session Border Controller for Enterprise*, Release 8.1, Issue 2, April 2020.
- [9] *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*.
- [10] *Deploying and Updating Avaya Aura® Media Server Appliance*, Release 8.0.x, Issue 9, April 2020.
- [11] *Implementing and Administering Avaya Aura® Media Server*. Release 8.0.x, Issue 9, April 2020.
- [12] *Planning for and Administering Avaya IX™ Workplace Client for Android, iOS, Mac, and Windows*. Release 3.8, Issue 1, March 2020.
- [13] *Administering Avaya one-X® Communicator*. Release 6.2, Feature Pack 10, November 2015.
- [14] *RFC 3261 SIP: Session Initiation Protocol*, <http://www.ietf.org/>
- [15] *RFC 2833 RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*, <http://www.ietf.org/>

12. Appendix A – SigMa Scripts

Following are the Signaling Manipulation scripts that were used in the configuration of the Avaya SBCE. Add the scripts as instructed in **Sections 7.8**, enter a name for the script in the Title and copy/paste the entire scripts shown below.

To create the SigMa script on the left navigation pane, select **Configuration Profiles** → **Signaling Manipulation**. From the **Signaling Manipulation Scripts** list, select **Add**.

- For **Title** enter a name, the name *Destiny_Sigma* was chosen in this example.
- Copy and paste the entire script shown below.
- Click **Save**.

within session "ALL"

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

//Removes + signs from headers
%HEADERS["To"][1].URI.USER.regex_replace("\+", "");
%HEADERS["From"][1].URI.USER.regex_replace("\+", "");
%HEADERS["Contact"][1].URI.USER.regex_replace("\+", "");
%HEADERS["Diversion"][1].URI.USER.regex_replace("\+", "");
%HEADERS["P-Asserted-Identity"][1].URI.USER.regex_replace("\+", "");

//Remove gsid and epv parameters from Contact header.
remove(%HEADERS["Contact"][1].URI.PARAMS["gsid"]);
remove(%HEADERS["Contact"][1].URI.PARAMS["epv"]);

//Remove P-Location parameter.
remove(%HEADERS["P-Location"][1]);

//Changes the Diversion header scheme from SIPS to SIP.
%HEADERS["Diversion"][1].regex_replace("sips", "sip");

//Remove unwanted xml element information from the SDP in SIP messages sent to the Service
Provider.
remove(%BODY[1]);

}
}
```

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