



Avaya Solution & Interoperability Test Lab

Application Notes for BT Wholesale Hosted SIP Trunking service with Avaya Communication Server 1000 Release 7.6 SP8, Avaya Aura® Session Manager Release 7.0.1 SP2 and Avaya Session Border Controller for Enterprise Release 7.1 SP2 - Issue 1.0

Abstract

These Application Notes illustrate a sample configuration of Avaya Communication Server 1000 Release 7.6 SP8 and Avaya Aura® Session Manager Release 7.0.1 SP2 with SIP Trunks to Avaya Session Border Controller for Enterprise (Avaya SBCE) Release 7.1 SP2 when used to connect BT Wholesale Hosted SIP Trunking Service.

BT Wholesale Hosted SIP Trunking Service provides PSTN access via a SIP trunk between the enterprise and BT Wholesale 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 any observations noted in **Section 2.2**, to ensure that their own use cases are adequately covered by this scope and results.

BT Wholesale is a member of the Avaya DevConnect Service Provider program. Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at Avaya lab.

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1. Introduction

These Application Notes illustrate a sample configuration for Avaya Communication Server 1000 Release 7.6 SP8 (Avaya CS1000) and Avaya Aura® Session Manager Release 7.0.1 SP2 with SIP Trunks to Avaya Session Border Controller for Enterprise (Avaya SBCE) Release 7.1 SP2 when used to connect to the BT Wholesale Hosted SIP Trunking Service.

Avaya Aura® Session Manager is a core SIP routing and integration engine that connects disparate SIP devices and applications within an enterprise. Avaya CS1000 is a telephony application server and is the point of connection between the enterprise endpoints and Avaya Aura® Session Manager. Avaya SBCE is the point of connection between Avaya Aura® Session Manager and BT Wholesale Hosted SIP Trunking Service and is used to not only secure the SIP trunk, but also to make adjustments to VoIP traffic for interoperability.

The Hosted SIP Trunking Service available from BT Wholesale is the SIP-based Voice over IP (VoIP) service offered to enterprises for a variety of voice communications needs. The BT Wholesale Hosted SIP Trunking Service allows enterprises to place outbound local and long distance calls, receive inbound Direct Inward Dialing (DID) calls from the PSTN, and place calls between an enterprise's sites.

2. General Test Approach and Test Results

The general test approach was to make calls from/to Avaya CS1000 through Avaya Aura® Session Manager and Avaya SBCE using BT Wholesale Hosted SIP Trunking Service. The configuration (shown in **Figure 1**) was used to exercise the features and functionality tests listed in **Section 2.1**.

DevConnect Compliance Testing is conducted jointly by Avaya and DevConnect members. The jointly-defined test plan focuses on exercising 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.

2.1 Interoperability Compliance Testing

The interoperability compliance testing focused on verifying inbound and outbound call flows between Avaya CS1000, Avaya Aura® Session Manager, Avaya SBCE, and the BT Wholesale Hosted SIP Trunking Service.

The compliance testing was based on the Avaya DevConnect CS1000 Generic SIP Trunk test plan. The testing covered functionality required for compliance as a solution supported on the BT Wholesale Hosted SIP Trunking Service. Calls were made to and from the PSTN across the BT Wholesale Hosted SIP Trunking Service. The following standard features were tested as part of this effort:

- Inbound PSTN calls to telephones at the enterprise. All inbound calls from PSTN are routed to the enterprise across the SIP trunk from the service provider.
- Outbound PSTN calls from telephones at the enterprise. All outbound calls to PSTN are routed from the enterprise across the SIP trunk to the service provider.
- Inbound and outbound Avaya CS1000 calls from/to BT Wholesale IP Telephony.
- Dialing plan: local call.
- Calling Party Name presentation and Calling Party Name restriction.
- Codecs G.711A, G.711MU and G.729A.
- Inbound and outbound fax using T.38.
- DTMF tone transmissions as out-of-band RTP events as per RFC2833.
- Voicemail navigation for inbound and outbound calls.
- User features such as hold and resume, transfer, forward and conference.
- Off-net call forward with History-info.
- Avaya CS1000 MobileX feature.
- Response to incomplete call attempts and trunk errors.

2.2 Test Results

Interoperability testing of BT Wholesale Hosted SIP Trunking Service was completed with successful results for all test cases with the exception of the observations/limitations described below.

Please refer to the test case document for a complete list of solution issues found when tested.

- **BT Wholesale SIP Trunk Resilience** – BT Wholesale supports SIP Trunk Resilience using DNS/SRV record. The DNS/SRV record is configured with a list of two FQDNs of BT Wholesale SBC servers which are working in active-active primary-secondary model. BT Wholesale requires only one SIP trunk registration to the platform at a time, hence, only one FQDN of BT Wholesale SBC server is configured in Server Configuration of Avaya SBCE because Avaya SBCE does not support DNS/SRV in Server Configuration. As a result, Avaya SBCE is not working properly with BT Wholesale SIP Trunk Resilience.
- **SIP Options sent to BT Wholesale** – It was observed that BT Wholesale responded back with **403 Forbidden-Source Endpoint Lookup Failed** for the SIP Options sent from Avaya. This is normal treatment of BT Wholesale.
- **Avaya CS1000 MobileX** – When a PSTN phone called to an Avaya phone which had MobileX enabled, Avaya CS1000 forked the call to the twinned mobile phone. However, BT Wholesale could not route the call to the twinned mobile phone, hence, only Avaya phone ringed. This is because BT Wholesale requires either proper History-info header or Diversion header in the forking INVITE sent to BT Wholesale but Avaya CS1000 MobileX does not support those kinds of headers. Therefore, MobileX feature should not be enabled.

- **Outgoing trunk to Outgoing trunk Call Transfer** - When an Avaya phone called to a PSTN phone, then the Avaya phone performed a blinded transfer or a consultative transfer to another PSTN endpoint, the expected behavior was that the Avaya phone should transfer the call successfully. But in this case, the Avaya phone could not complete the transfer. In order to overcome this issue, plug-in 201 must be enabled on Avaya CS1000.
- **If the Avaya CS1000 phone holds/resumes an outbound call, the dialed digits were no longer displayed** - This is a known limitation on Avaya CS1000.
- **Calling Line Identification Display (CLID) was not correctly displayed** - After call redirection, namely blind/consultative transfers, was completed with 2-way audio, the CLID on the transferee's phone was not updated accordingly. This is a known Avaya CS1000 limitation.

2.3 Support

- **Avaya:** Avaya customers may obtain documentation and support for Avaya products by visiting <http://support.avaya.com>.
- **BT Wholesale:** Customers should contact their BT Wholesale Business representative or follow the support links available on <https://www.btwholesale.com/pages/static/products-services/wholesale-SIP-trunking.htm>.

3. Reference Configuration

The reference configuration used in these Application Notes is shown in the diagram below and consists of several components.

- Avaya Aura® Session Manager running on VMware ESXi 5.5.
- Avaya Aura® System Manager running on VMware ESXi 5.5.
- Avaya CS1000 CPPM co-resident.
- Avaya CallPilot 201i.
- Avaya IP phones are represented with Avaya 1100 Series IP Telephones running SIP software and Avaya i2004p2 IP Telephones running Unistim software.
- Avaya 3904 digital phone.
- Avaya i2050 softphone.
- The Avaya SBCE provided Session Border Controller functionality, including, SIP header manipulation, and topology hiding between the BT Wholesale Hosted SIP Trunking Service and the enterprise network.
- BT Wholesale Hosted SIP Trunking Service provided one trunk group with a DNS/SRV record for resilience. DID range assigned by BT Wholesale for this testing is +445600653xxx (12 digits).

Because of security reasons, real DNS A-records and SRV record of BT Wholesale Hosted SIP Trunking Service are replaced with:

- ipcomms-sipt-core2.bt.com
- ipcomms-sipt-metro2.bt.com
- _sip._udp.ipcomms-sipt-metrocore2.bt.com

Avaya SBCE does not support DNS/SRV in Server Configuration so only one DNS A-record is chosen to configure in Server Configuration of Avaya SBCE (**refer to BT Wholesale SIP Trunk Resilience in section 2.2**).

- All IP addresses shown below are private IP addresses except for B1 interface of Avaya SBCE.

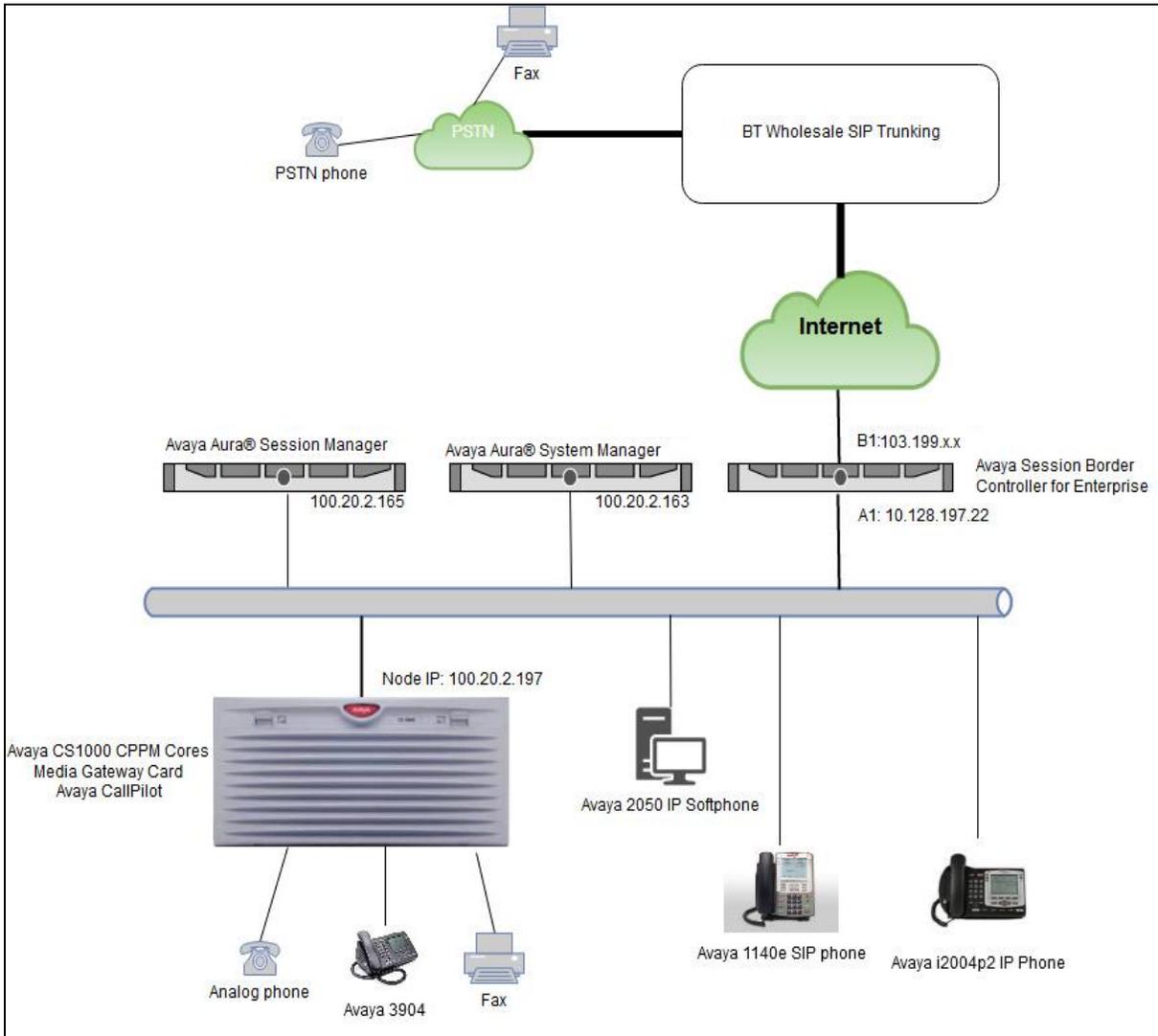


Figure 1: Network Components as Tested

4. Equipment and Software Validated

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

Component	Version
Avaya	
Avaya Aura® System Manager 7.0.1 SP2	7.0.1.2.086007
Avaya Aura® Session Manager 7.0.1 SP2	7.0.1.2.701230
Avaya Session Border Controller for Enterprise 7.1 SP2	7.1.0.2-01-13249
Avaya Communication Server 1000 7.6 SP8	Call Server 7.65 Service Pack 8 Signaling Server 7.65 Service Pack 8
Avaya CallPilot	5.1 SU4
Avaya i2004p2 Unistim phone	0604DCO
Avaya 1100 Series SIP phone	4.4.5
Avaya i2050 PC	4.4 SP7
Avaya 3904 Digital phone	9.3
Analog phone	N/A
Service Provider	
BT Wholesale Hosted SIP Trunking Service	SBC Genband Q20 9.1.13, Software Release of BroadWorks R20 SP1

Table 1: Software version

5. Configure Avaya CS1000

The configuration of the Avaya CS1000 outlined in these Application Notes uses the Incoming Digit Translation feature to receive calls, and the Trunk Steering Code (TSC) feature to route calls from the Avaya CS1000 to the PSTN via SIP trunks to the BT Wholesale Hosted SIP Trunking Service.

These Application Notes assume that the basic Avaya CS1000 configuration has already been administered. For further information on Avaya CS1000, please consult the references in **Section 10**. The procedures below describe the configuration details for configuring the Avaya CS1000.

5.1 Access to Avaya CS1000 System

Changes to Avaya CS1000 can be made using Element Manager, which is accessible from Unified Communications Management (UCM) and offers the user a Web GUI for making changes. Changes to Avaya CS1000 can also be made using the Command Line Interface (CLI) offered using PuTTY to make an SSH connection.

5.1.1 Access to Avaya CS1000 Element Manager

Open an instance of a web browser and connect to UCM using the following address: <https://<UCM IP address>/network-login/>. Log in using an appropriate User ID and Password (not shown). The UCM screen is displayed.

The screenshot shows the Avaya Unified Communications Management (UCM) interface. The top navigation bar includes the Avaya logo, the title "Avaya Unified Communications Management", and links for "Help" and "Logout". Below the navigation bar, the user's session information is displayed: "Host Name: 100.20.2.196", "Software Version: 02.30.0099.00(6718)", and "User Name admin". The main content area is titled "Elements" and contains a search bar with "Search" and "Reset" buttons. Below the search bar is a table of elements with columns for "Element Name", "Element Type", "Release", "Address", and "Description". The table contains four entries:

	Element Name	Element Type	Release	Address	Description
1	<input type="checkbox"/> EM on cs1k	CS1000	7.6	100.20.2.136	New element.
2	<input type="checkbox"/> cs1k.sipinterop.com (primary)	Linux Base	7.6	100.20.2.196	Base OS element.
3	<input type="checkbox"/> CallPilot	Non CS1000 Manual Device	7.6	100.20.2.137	
4	<input type="checkbox"/> 100.20.2.135	Media Gateway Controller	7.6	100.20.2.135	New element.

Click on the **Element Name** of the Avaya CS1000 Element: “**EM on cs1k**”. The Avaya CS1000 Element Manager **System Overview** page is displayed as shown below:

The screenshot shows the Avaya CS1000 Element Manager System Overview page. The top navigation bar includes the Avaya logo, the title "CS1000 Element Manager", and links for "Help" and "Logout". Below the navigation bar, the user's session information is displayed: "Managing: 100.20.2.136", "Username: admin", and "System Overview". The main content area is titled "System Overview" and contains a large empty box with the following information:

IP Address: 100.20.2.136
Type: Avaya Communication Server 1000E CPPM Linux
Version: 4121
Release: 765 P +

5.1.2 Access Avaya CS1000 Call Server by using CLI

Using Putty to open an SSH session to the IP address of Avaya CS1000 Signaling Server then log in with administrator credentials. Run the command **cslogin** and log in with the appropriate user account and password. Sample output is shown below.

```
login as: admin
```

```
Avaya Inc. Linux Base 7.65
```

```
The software and data stored on this system are the property of, or licensed to, Avaya Inc. and are lawfully available only to authorized users for approved purposes. Unauthorized access to any software or data on this system is strictly prohibited and punishable under appropriate laws. If you are not an authorized user then do not try to login. This system may be monitored for operational purposes at any time.
```

```
admin@100.20.2.196's password:
```

```
Last login: Tue Sep 20 16:57:20 2016 from 100.20.2.189
```

```
[admin@cs1k ~]$
```

```
[admin@cs1k ~]$
```

```
[admin@cs1k ~]$
```

```
[admin@cs1k ~]$ cslogin
```

```
SEC054 A device has connected to, or disconnected from, a pseudo tty without authenticating
```

```
TTY 07 SCH MTC BUG OSN 10:46
```

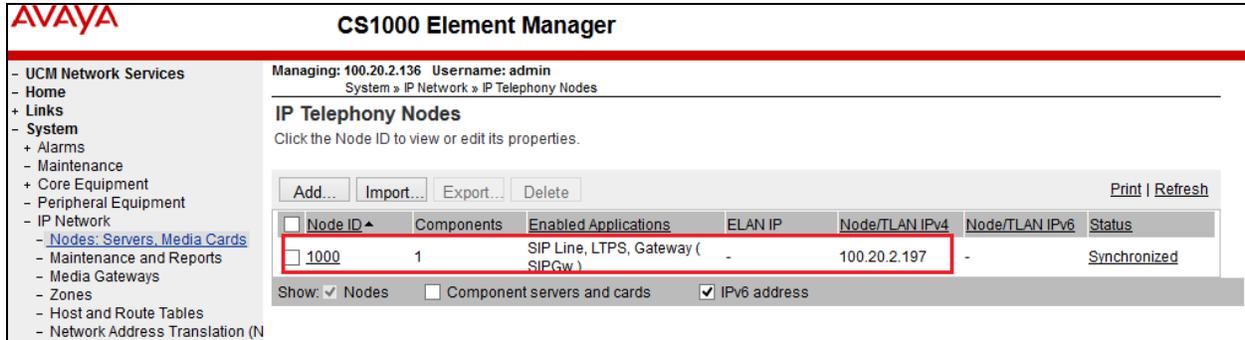
```
OVL111 IDLE 0
```

```
>
```

5.2 Administer IP Telephony Node

5.2.1 Obtain Node IP address

These Application Notes assume that the basic Avaya CS1000 configuration has already been administered and that a Node has already been created. This section describes the steps for configuring a Node (**Node ID 1000**) in Avaya CS1000 IP network to work with BT Wholesale Hosted SIP Trunking Service. Access Element Manager as per **Section 5.1.1**. Select **System > IP Network > Nodes: Servers, Media Cards** and then click on the **Node ID** as shown below:



The screenshot shows the Avaya CS1000 Element Manager interface. The top navigation bar includes the Avaya logo and the title "CS1000 Element Manager". Below the navigation bar, there is a breadcrumb trail: "System > IP Network > IP Telephony Nodes". The main content area is titled "IP Telephony Nodes" and contains a table of nodes. The table has the following columns: Node ID, Components, Enabled Applications, ELAN IP, Node/TLAN IPv4, Node/TLAN IPv6, and Status. The node with ID 1000 is highlighted, showing 1 component and a status of Synchronized. The table also includes a "Show:" section with checkboxes for "Nodes", "Component servers and cards", and "IPv6 address".

Node ID	Components	Enabled Applications	ELAN IP	Node/TLAN IPv4	Node/TLAN IPv6	Status
1000	1	SIP Line, LTPS, Gateway (SIPGw)	-	100.20.2.197	-	Synchronized

The **Node Details** screen is displayed with the IP address of the Avaya CS1000 node: **Call server IP address: 100.20.2.136**. The **Node IPv4 address 100.20.2.197** for **Telephony LAN (TLAN)** is a virtual address which corresponds to the **TLAN IPv4 address 100.20.2.196** of the Signaling Server/SIP Signaling Gateway. The SIP Signaling Gateway uses this Node IP address to communicate with other components to process SIP calls.

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details

Node Details (ID: 1000 - SIP Line, LTPS, Gateway (SIPGw))

Node ID: 1000 * (0-9999)

Call server IP address: 100.20.2.136 *

TLAN address type: IPv4 only
 IPv4 and IPv6

Embedded LAN (ELAN)
Gateway IP address: 100.20.2.129 *
Subnet mask: 255.255.255.224 *

Telephony LAN (TLAN)
Node IPv4 address: 100.20.2.197 *
Subnet mask: 255.255.255.224 *

Node IPv6 address:

IP Telephony Node Properties

- Voice Gateway (VGW) and Codecs
- Quality of Service (QoS)
- LAN
- SNTP
- Numbering Zones
- MCDN Alternative Routing Treatment (MALT) Causes

Applications (click to edit configuration)

- SIP Line
- Terminal Proxy Server (TPS)
- Gateway (SIPGw)
- Personal Directories (PD)
- Presence Publisher
- IP Media Services

* Required Value. Save Cancel

Associated Signaling Servers & Cards

Select to add Print | Refresh

Hostname ^	Type	Deployed Applications	ELAN IP	TLAN IPv4	Role
<input type="checkbox"/> cs1k	Signaling_Server	SIP Line, LTPS, Gateway (SIP/H323), PD, Presence Publisher, IP Media Services	100.20.2.136	100.20.2.196	Leader

Show: IPv6 address

5.2.2 Administer Terminal Proxy Server (TPS)

Continuing from **Section 5.2.1**, on the **Node Details** page, select the **Terminal Proxy Server (TPS)** link then check the **UNISlim Line Terminal Proxy Server** box to enable proxy service on this node and click on **Save** button:

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » UNISlim Line Terminal Proxy Server (LTPS) Configuration

Node ID: 1000 - UNISlim Line Terminal Proxy Server (LTPS) Configuration Details

UNISlim Line Terminal Proxy Server: Enable proxy service on this node

Firmware

IP address: 0.0.0.0
Full file path: download/firmwa
Server Account/User ID: admin
Password:

DTLS

DTLS policy: Off

Options: Client authentication
 Periodic re-keying

Network Connect Server

Primary network connect server (TI AN) IP address: 0.0.0.0

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved. **Save** Cancel

5.2.3 Administer Voice Codecs

On the **Node Details** page shown in **Section 5.2.1**, click on **Voice Gateway (VGW) and Codecs**. Make sure **T.38 FAX**, **G.711** and **G.729** are configured as shown below then click on **Save** button:

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » VGW and Codecs

Node ID: 1000 - Voice Gateway (VGW) and Codecs

General | **Voice Codecs** | Fax

General

Echo cancellation: Use canceller, with tail delay: 128
 Dynamic attenuation

Voice activity detection threshold: -17 (-20 - +10 DBM)
Idle noise level: -65 (-327 - +327 DBM)

Signaling options: DTMF tone detection
 Low latency mode
 Remove DTMF delay (squelch DTMF from TDM to IP)
 Modem/Fax pass-through
 V.21 Fax tone detection
 R factor calculation

Voice Codecs

Codec G711: Enabled (required)
Voice payload size: 20 (milliseconds per frame)
Voice playout (jitter buffer) delay: 40 (Nominal) 80 (Maximum) (milliseconds)

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved. Save Cancel

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » VGW and Codecs

Node ID: 1000 - Voice Gateway (VGW) and Codecs

General | **Voice Codecs** | Fax

Codec G729: Enabled
Voice payload size: 20 (milliseconds per frame)
Voice playout (jitter buffer) delay: 40 (Nominal) 80 (Maximum) (milliseconds)
Nominal Maximum
Maximum delay may be automatically adjusted based on nominal settings.
 Voice Activity Detection (VAD)

Codec G723.1: Enabled
Voice payload size: 30 (milliseconds per frame)
Voice playout (jitter buffer) delay: 60 (Nominal) 120 (Maximum) (milliseconds)
Nominal Maximum
Maximum delay may be automatically adjusted based on nominal settings.

Coding rate: 5.3 (kbps)

Fax

Codec name: T.38 FAX
Maximum rate: 44400 (bps)

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved. Save Cancel

The screenshot shows the AVAYA CS1000 Element Manager interface. The main title is "CS1000 Element Manager". The user is logged in as "admin" with IP address "100.20.2.136". The navigation path is "System » IP Network » IP Telephony Nodes » Node Details » VGW and Codecs". The current page is "Node ID: 1000 - Voice Gateway (VGW) and Codecs".

The interface has a left-hand navigation menu with categories like "UCM Network Services", "System", "Interfaces", "Routes and Trunks", etc. The main content area has three tabs: "General", "Voice Codecs", and "Fax". The "Fax" tab is active and contains the following configuration options:

- Codec G723.1: Enabled
- Voice payload size: 30 (milliseconds per frame)
- Voice playout (jitter buffer) delay: 60 (Nominal) / 120 (Maximum) (milliseconds)
- Coding rate: 5.3 (kbps)
- Codec name: T.38 FAX
- Maximum rate: 14400 (bps)
- Fax TCF method: 2
- Fax playout nominal delay: 100 (0 - 300 milliseconds)
- FAX no activity timeout: 20 (10 - 32000 milliseconds)
- Packet size: 30 (bps)

At the bottom of the page, there is a note: "Note: Changes made on this page will NOT be transmitted until the Node is also saved." Below this note are "Save" and "Cancel" buttons. The "Save" button is highlighted with a red box.

5.2.4 Synchronize New Configuration

On **Node Details** page shown in **Section 5.2.1**, click on **Save** button. The **Node Saved** screen is displayed. Click on **Transfer Now** (not shown).

The **Synchronize Configuration Files (Node ID <1000>)** screen is displayed (not shown). Check the **cs1k** box and click on **Start Sync**. When the synchronization completes, check the **cs1k** box and click on the **Restart Applications** (not shown).

5.2.5 Enable Voice Codec on Media Gateways

From the left menu of the **Element Manager** page, navigate to **System > IP Network > Media Gateways**. The Media Gateways page will appear (not shown). Click on the MGC which is located on the right of the page. In the following screen, uncheck **Enable modem/fax pass through mode** box then scroll down to make sure only Codec **G.711**, **G.729A** and **T.38 FAX** are selected. Scroll down to the bottom of the page and click on the **Save** button.

The screenshot displays the configuration page for a Media Gateway (MGC) in the Element Manager. The left sidebar shows a navigation tree with categories like IP Network, Interfaces, Customers, Routes and Trunks, Dialing and Numbering Plans, Phones, Tools, and Security. The main content area is titled 'Hostname DB32' and contains a section for '- VGW and IP phone codec profile'. This section includes various settings such as 'Enable echo canceller', 'Echo canceller tail delay', 'Enable dynamic attenuation', 'Voice activity detection threshold', 'Idle noise level', 'R factor calculation', 'DTMF tone detection', 'Enable low latency mode', 'Remove DTMF delay (squelch DTMF from TDM to IP)', 'Enable modem/fax pass through mode', 'Enable V.21 FAX tone detection', 'Fax TCF method', 'FAX maximum rate', 'FAX playout nominal delay', 'FAX no activity timeout', and 'FAX packet size'. At the bottom of this section is a table for selecting codecs. The 'Save' button is highlighted with a red box.

- VGW and IP phone codec profile	
Enable echo canceller	<input checked="" type="checkbox"/>
Echo canceller tail delay	128 (milliseconds)
Enable dynamic attenuation	<input checked="" type="checkbox"/>
Voice activity detection threshold	1 (0 - 4 DBM)
Idle noise level	0 (0 - 1 DBM)
R factor calculation	<input type="checkbox"/>
DTMF tone detection	<input checked="" type="checkbox"/>
Enable low latency mode	<input type="checkbox"/>
Remove DTMF delay (squelch DTMF from TDM to IP)	<input checked="" type="checkbox"/>
Enable modem/fax pass through mode	<input checked="" type="checkbox"/>
Enable V.21 FAX tone detection	<input checked="" type="checkbox"/>
Fax TCF method	2
FAX maximum rate	14400 (bps)
FAX playout nominal delay	100 (0 - 300 milliseconds)
FAX no activity timeout	20 (10 - 32000 milliseconds)
FAX packet size	30
+ Codec G711	Select <input checked="" type="checkbox"/>
+ Codec G729A	Select <input checked="" type="checkbox"/>
+ Codec G723.1	Select <input type="checkbox"/>
+ Codec T38 FAX	Select <input checked="" type="checkbox"/>
+ QoS	
+ Media Based CLID	
+ Call Server LAN	

Buttons: Save, Cancel, VGW Channels

5.3 Zones and Bandwidth Management

Navigate to **System > IP Network > Zones** from the left pane (not shown), click on **Bandwidth Zones** (not shown). Click on **Add** to create new zones for IP Phones and Virtual Trunk.

Input these values for **Zone 1** which is used for IP Phones and Voice Gateway:

- **Intrazone Bandwidth (INTRA_BW): 1000000.**
- **Intrazone Strategy (INTRA_STGY):** Set codec for local calls. Select **Best Bandwidth (BB)** to use **G.729** as the first priority codec for negotiation or select **Best Quality (BQ)** to use **G.711** as the first priority codec for negotiation. In this example, **BQ** was chosen.
- **Interzone Bandwidth (INTER_BW): 1000000.**
- **Interzone Strategy (INTER_STGY):** Set codec for the calls over trunk. Select **Best Bandwidth (BB)** to use **G.729** as the first priority codec for negotiation or select **Best Quality (BQ)** to use **G.711** as the first priority codec for negotiation. In this example, **BQ** was chosen.
- **Zone Intent (ZBRN):** Select **MO** for IP phones, and Voice Gateway.

Use the same above values for **Zone 255** which is used for virtual trunk except for **Zone Intent (ZBRN)** field. Select **VTRK** for this field.

The screenshot shows the 'Bandwidth Zones' configuration page in the AVAYA CS1000 Element Manager. The page includes a navigation menu on the left and a main content area with a table of zones. The table has columns for Zone, Intrazone Bandwidth, Intrazone Strategy, Interzone Bandwidth, Interzone Strategy, Resource Type, Zone Intent, Description, and Location Name. Two zones are listed: Zone 1 and Zone 255. Zone 1 has an Intrazone Bandwidth of 1000000, Intrazone Strategy of BQ, Interzone Bandwidth of 1000000, and Interzone Strategy of BQ. Zone 255 has an Intrazone Bandwidth of 1000000, Intrazone Strategy of BQ, Interzone Bandwidth of 1000000, and Interzone Strategy of BQ. The Zone Intent for Zone 1 is MO and for Zone 255 is VTRK. The Description for Zone 1 is MAIN and for Zone 255 is VTRK. The Resource Type for both is SHARED. The Location Name column is empty for both zones.

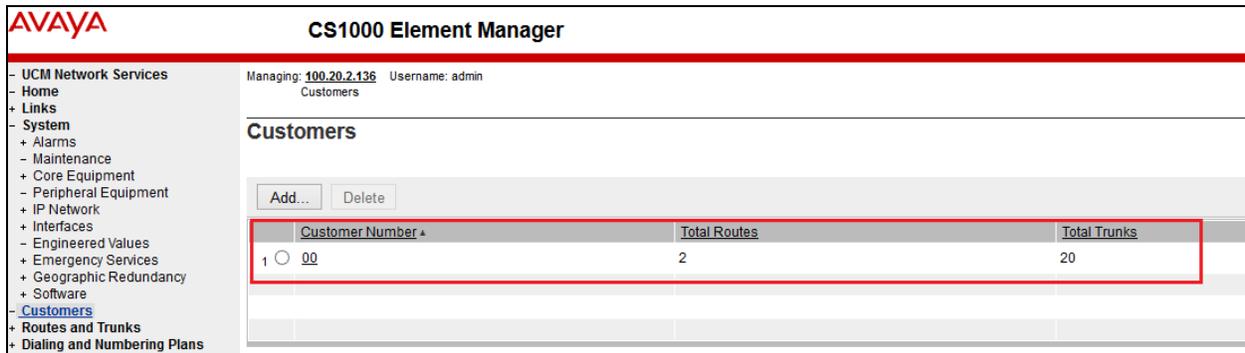
Zone	Intrazone Bandwidth	Intrazone Strategy	Interzone Bandwidth	Interzone Strategy	Resource Type	Zone Intent	Description	Location Name
1	1000000	BQ	1000000	BQ	SHARED	MO	MAIN	
255	1000000	BQ	1000000	BQ	SHARED	VTRK	VTRK	

5.4 Administer SIP Trunk

This section describes the steps for establishing a SIP connection between the SIP Signaling Gateway and Avaya Aura® Session Manager (Session Manager).

5.4.1 Integrated Services Digital Network (ISDN)

Select **Customers** in the left pane. The **Customers** screen is displayed. Click on the link associated with the appropriate customer, in this case **00**.

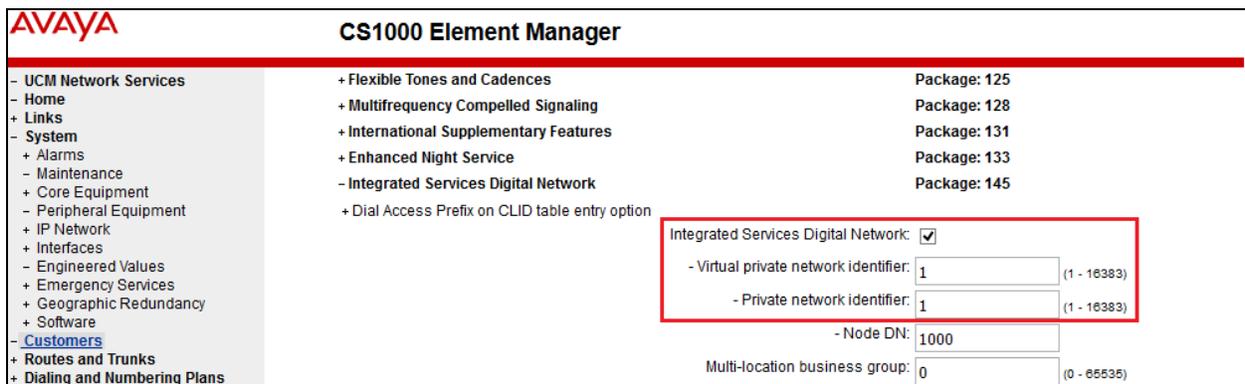


The screenshot shows the AVAYA CS1000 Element Manager interface. The left sidebar contains a navigation menu with options like UCM Network Services, Home, Links, System, Alarms, Maintenance, Core Equipment, Peripheral Equipment, IP Network, Interfaces, Engineered Values, Emergency Services, Geographic Redundancy, Software, Customers, Routes and Trunks, and Dialing and Numbering Plans. The main content area is titled 'Customers' and includes an 'Add...' button and a 'Delete' button. Below these is a table with the following data:

Customer Number	Total Routes	Total Trunks
1 00	2	20

The **Customer Details** page will appear. Select the **Feature Packages** option from **Customer Details** page (not shown).

The screen is updated with a list of available **Feature Packages**. Select **Integrated Services Digital Network** to edit the parameters shown below. Check the **Integrated Services Digital Network** option, enter **1** into **Virtual private network identifier** and **Private network identifier**, then click on the **Save** button (not shown).



The screenshot shows the AVAYA CS1000 Element Manager interface. The left sidebar contains a navigation menu with options like UCM Network Services, Home, Links, System, Alarms, Maintenance, Core Equipment, Peripheral Equipment, IP Network, Interfaces, Engineered Values, Emergency Services, Geographic Redundancy, Software, Customers, Routes and Trunks, and Dialing and Numbering Plans. The main content area is titled 'Feature Packages' and includes a list of packages with their respective package numbers:

- + Flexible Tones and Cadences Package: 125
- + Multifrequency Compelled Signaling Package: 128
- + International Supplementary Features Package: 131
- + Enhanced Night Service Package: 133
- Integrated Services Digital Network Package: 145

Below the list, there is a section for 'Integrated Services Digital Network' with the following parameters:

- Integrated Services Digital Network:
- Virtual private network identifier: 1 (1 - 16383)
- Private network identifier: 1 (1 - 16383)
- Node DN: 1000
- Multi-location business group: 0 (0 - 65535)

5.4.2 Administer SIP Trunk Gateway

Navigate to **System > IP Network > Nodes: Servers, Media Cards** from the left pane. In the **IP Telephony Nodes** screen displayed (not shown), select the **Node ID** of the CS1000 system. The **Node Details** screen is displayed as shown in **Section 5.2.1**.

On the **Node Details** screen, select **Enable gateway service on this node** for the **Vtrk gateway application** field. Under the **General** tab of the **Virtual Trunk Gateway Configuration Details** screen, enter the following values (highlighted in red boxes) for the specified fields, and retain the default values for the remaining fields as shown below. The **SIP domain name** and **Local SIP port** should be matched with the configuration of Session Manager in **Section 6.2**, and **6.5**.

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » Virtual Trunk Gateway Configuration

Node ID: 1000 - Virtual Trunk Gateway Configuration Details

General | SIP Gateway Settings | SIP Gateway Services

Vtrk gateway application: Enable gateway service on this node

General

Vtrk gateway application: SIP Gateway (SIPGw) *
SIP domain name: sipinterop.com *
Local SIP port: 5060 * (1 - 65535)
Gateway endpoint name: cs1k *
Gateway password: *
Application node ID: 1000 * (0-9999)

Enable failsafe NRS:

Note: FailSafe NRS will be enabled only on those servers in the node where NRS application is not deployed.

SIP ANAT: IPv4

Virtual Trunk Network Health Monitor

Monitor IP addresses (listed below)
Information will be captured for the IP addresses listed below.

Monitor IP:

Monitor addresses:

Click on the **SIP Gateway Settings** tab. Under **Proxy or Redirect Server**, enter the following values (highlighted in red boxes) for the specified fields and retain the default values for the remaining fields, as shown below. Enter the IP address of Session Manager in the **Primary TLAN IP address** field. Enter **5061** for **Port** and select **TLS** for **Transport protocol**. This should be matched with the configuration of Avaya Aura® Session Manager (see in **Section 6.5.1**). Uncheck the **Support registration** checkbox.

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » Virtual Trunk Gateway Configuration

Node ID: 1000 - Virtual Trunk Gateway Configuration Details

General | SIP Gateway Settings | SIP Gateway Services

Proxy Or Redirect Server:
Proxy Server Route 1:

Primary TLAN IP address:
The IP address can have either IPv4 or IPv6 format based on the value of "TLAN address type"

Port: (1 - 65535)

Transport protocol: ▼

Options: Support registration
 Primary CDS proxy

Secondary TLAN IP address:
The IP address can have either IPv4 or IPv6 format based on the value of "TLAN address type"

Port: (1 - 65535)

Transport protocol: ▼

Options: Support registration
 Primary CDS proxy

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved.

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » Virtual Trunk Gateway Configuration

Node ID: 1000 - Virtual Trunk Gateway Configuration Details

General | SIP Gateway Settings | SIP Gateway Services

Proxy Server Route 2:

Primary TLAN IP address:
The IP address can have either IPv4 or IPv6 format based on the value of "TLAN address type"

Port: (1 - 65535)

Transport protocol: ▼

Options: Registration not supported
 Primary CDS proxy

CLID Presentation:

Country code (CCC):

Area code: NPA in North America

Number translation: Strip: Prefix: CLID display format:

Subscriber (SN): <CCC><Area code><SN>

National (NN): <CCC><NN>

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved.

Scroll down to the **SIP URI Map** section. Under **Public E.164 domain names**, leave blank for: **National, Subscriber, Special Number, Unknown.**

Under **Private domain names**, leave blank for: **UDP, CDP, Special Number, Vacant number, Unknown.**

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » IP Network » IP Telephony Nodes » Node Details » Virtual Trunk Gateway Configuration

Node ID: 1000 - Virtual Trunk Gateway Configuration Details

General | SIP Gateway Settings | SIP Gateway Services

SIP URI Map:

Public E.164 domain names	Private domain names
National: <input type="text"/>	UDP: <input type="text"/>
Subscriber: <input type="text"/>	CDP: <input type="text"/>
Special number: <input type="text"/>	Special number: <input type="text"/>
Unknown: <input type="text"/>	Vacant number: <input type="text"/>
	Unknown: <input type="text"/>

SIP Gateway Services

SIP Converged Desktop: Enable CD service

Service DN: Used for making VTRK call from agent.

Converged telephone call forward DN:

RAN route for announce: (route number 0 - 511)

Wait time before RAN queue: 1 (-1 - 32767 msec)

Timeout for ringing indication: 10 (5 - 60 seconds)

* Required Value. Note: Changes made on this page will NOT be transmitted until the Node is also saved.

Synchronize the new configuration (please refer to **Section 5.2.4**).

5.4.3 Administer Virtual D-Channel

Navigate to **Routes and Trunks > D-Channels** (not shown) from the left pane to display the **D-Channels** screen (not shown) . In the **Choose a D-Channel Number** field, select an available **D-channel** from the drop-down list and type **DCH**. Click on **Add** button (not shown).

The **D-Channels 10 Property Configuration** screen is displayed next, as shown below. Enter the following values for the specified fields, and retain the default values for the remaining fields.

- **D-channel Card Type: D-Channel is over IP (DCIP).**
- **Designator: A descriptive name.**
- **User: Integrated Services Signaling Link Dedicated (ISLD).**
- **Interface type for D-channel: Meridian Meridian1 (SL1).**
- **Meridian 1 node type: Slave to the controller (USR).**
- **Release ID of the switch at the far end: 25.**

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
Routes and Trunks » D-Channels » D-Channels 10 Property Configuration

D-Channels 10 Property Configuration

- Basic Configuration

Input	Description	Input Value
Action Device And Number (ADAN):		DCH
D channel Card Type :		DCIP
Designator:		vtrk
Recovery to Primary:		<input type="checkbox"/>
PRI loop number for Backup D-channel:		
User :		Integrated Services Signaling Link Dedicated (ISLD) v *
Interface type for D-channel:		Meridian Meridian1 (SL1) v
Country:		ETS 300 =102 basic protocol (ETSI) v
D-Channel PRI loop number:		
Primary Rate Interface:		<input type="text"/> more PRI
Secondary PRI2 loops:		<input type="text"/>
Meridian 1 node type:		Slave to the controller (USR) v
Release ID of the switch at the far end:		25 v
Central Office switch type:		100% compatible with Bellcore standard (STD) v
Integrated Services Signaling Link Maximum:		4000 Range: 1 - 4000
Signalling server resource capacity:		3700 Range: 0 - 3700

+ Basic options (BSCOPT)
+ Advanced options (ADVOPT)
+ Feature Packages

Submit Refresh Delete Cancel

5.4.4 Administer Virtual Super-Loop

Navigate to **System > Core Equipment > Superloops** from the left pane to display the **Superloops** screen. If the Superloop does not exist, click the **Add** button to create a new one as shown below. In this example, **Virtual Superloops 92, 96** have been added and were being used.

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
System » Core Equipment » Superloops

Superloops

Superloop Number	Superloop Type
1 <input type="radio"/> 4	IPMG
2 <input type="radio"/> 92	Virtual
3 <input type="radio"/> 96	Virtual

5.4.5 Administer Virtual SIP Routes

Navigate to **Routes and Trunks > Routes and Trunks** (not shown) from the left pane to display the **Routes and Trunks** screen. In this example, **Customer 0** was being used. Click on the **Add route** button as shown below.

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
Routes and Trunks » Routes and Trunks

Routes and Trunks

- Customer: 0	Total routes: 2	Total trunks: 20	<input type="button" value="Add route"/>
+ Route: 10	Type: TIE	Description: SIP	<input type="button" value="Edit"/> <input type="button" value="Add trunk"/>
+ Route: 11	Type: TIE	Description: SIPLINE	<input type="button" value="Edit"/> <input type="button" value="Add trunk"/>

The **Customer 0, New Route Configuration** screen is displayed next (not shown). The **Basic Configuration** section is displayed. Enter the following values for the specific fields, and retain the default values for the remaining fields. The screenshot of **Basic Configuration** section of existing **Route 10** is displayed to edit as shown below.

- **Route data block (RDB) (TYPE):** RDB as default.
- **Customer number (CUST):** 0 as customer 0 is used.
- **Route number (ROUT):** Enter an available route number (example: route 10).
- **Designator field for trunk (DES):** A descriptive text (SIP).
- **Trunk type (TKTP):** TIE trunk data block (TIE).
- **Incoming and outgoing trunk (ICOG):** Incoming and Outgoing (IAO).

- **Access code for the trunk route (ACOD):** An available access code (example: **8753**)
- Check **The route is for a virtual trunk route (VTRK)** field, to enable four additional fields to appear.
- For **Zone for codec selection and bandwidth management (ZONE)** field, enter **255** (created in **Section 5.3**). Note: the Zone value is filled out as 255, but after it is added, the screen is displayed with prefix 00.
- For **Node ID of signaling server of this route (NODE)** field, enter the node number 1000 (created in **Section 5.2.1**).
- Select **SIP (SIP)** from the drop-down list for **Protocol ID for the route (PCID)** field.
- Check **Integrated Services Digital Network option (ISDN)** box to enable additional fields to appear. Scrolling down to the bottom of the screen, enter the following values for the specified fields, and retain the default values for the remaining fields.
 - **Mode of operation (MODE):** Select **Route uses ISDN Signalling Link (ISLD)**.
 - **D channel number (DCH):** Enter **10** (created in **Section 5.4.3**).
 - **Interface type for route (IFC):** Select **Meridian M1 (SL1)**.
 - **Private network identifier (PNI):** Enter **1**. Note: the value is filled out as 1, but after it is added, the screen is displayed with prefix 0000.
 - **Network calling name allowed (NCNA):** Check this option to allow calling name display.
 - **Network call redirection (NCRD):** Check this option to allow call redirection.
 - **Call type for outgoing direct dialed TIE route (CTYP):** select **Unknown Call type (UKWN)**.
 - **Insert ESN access code (INAC):** Check this option to insert ESN access code.

- UCM Network Services
- Home
- Links
- Virtual Terminals
- System
 - + Alarms
 - Maintenance
 - + Core Equipment
 - Peripheral Equipment
 - + IP Network
 - + Interfaces
 - Engineered Values
 - + Emergency Services
 - + Geographic Redundancy
 - + Software
- Customers
- Routes and Trunks
 - [Routes and Trunks](#)
 - D-Channels
 - Digital Trunk Interface
- Dialing and Numbering Plans
 - Electronic Switched Network
 - Flexible Code Restriction
 - Incoming Digit Translation
- Phones
 - Templates
 - Reports
 - Views
 - Lists
 - Properties
 - Migration
- Tools
 - + Backup and Restore
 - Date and Time
 - + Logs and reports
- Security
 - + Passwords
 - + Policies
 - + Login Options

Customer 0, Route 10 Property Configuration

- Basic Configuration

Route data block (RDB) (TYPE):	RDB
Customer number (CUST):	00
Route number (ROUT):	10
Designator field for trunk (DES):	SIP
Trunk type (TKTP):	TIE
Incoming and outgoing trunk (ICOG):	Incoming and Outgoing (IAO) ▼
Access code for the trunk route (ACOD):	8753

Trunk type M911P (M911P):	<input type="checkbox"/>
The route is for a virtual trunk route (VTRK):	<input checked="" type="checkbox"/>
- Zone for codec selection and bandwidth management (ZONE):	00255 (0 - 8000)
- Node ID of signaling server of this route (NODE):	1000 (0 - 9999)
- Protocol ID for the route (PCID):	SIP (SIP) ▼

- Print correlation ID in CDR for the route (CRID):	<input type="checkbox"/>
- Enable Shared Bandwidth Management for the route (SBWM):	<input type="checkbox"/>
Integrated services digital network option (ISDN):	<input checked="" type="checkbox"/>
- Mode of operation (MODE):	Route uses ISDN Signaling Link (ISLD) ▼
- D channel number (DCH):	10 (0 - 254)
- Interface type for route (IFC):	Meridian M1 (SL1) ▼
- Private network identifier (PNI):	00001 (0 - 32700)
- Network calling name allowed (NCNA):	<input checked="" type="checkbox"/>
- Network call redirection (NCRD):	<input checked="" type="checkbox"/>

- Trunk route optimization (TRO):	<input type="checkbox"/>
- Recognition of DTI2 ABCD FALT signal for ISL (FALT):	<input type="checkbox"/>
- Channel type (CHTY):	B-channel (BCH) ▼
- Call type for outgoing direct dialed TIE route (CTYP):	Unknown Call type (UKWN) ▼
- Insert ESN access code (INAC):	<input checked="" type="checkbox"/>

- Integrated service access route (ISAR):	<input type="checkbox"/>
- Display of access prefix on CLID (DAPC):	<input type="checkbox"/>

- Click on **Basic Route Options**, check the **Incoming DID digit conversion on this route (IDC)** box. Enter **0** for both **Day IDC tree number** and **Night IDC tree number**.



CS1000 Element Manager

- UCM Network Services
- Home
- Links
 - Virtual Terminals
- System
 - + Alarms
 - Maintenance
 - + Core Equipment
 - Peripheral Equipment
 - + IP Network
 - + Interfaces
 - Engineered Values
 - + Emergency Services
 - + Geographic Redundancy
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- Security
 - + Passwords
 - + Policies
 - + Login Options

Managing: [100.20.2.136](#) Username: admin
Routes and Trunks » [Routes and Trunks](#) » Customer 0, Route 10 Property Configuration

Customer 0, Route 10 Property Configuration

+ **Basic Configuration**

- **Basic Route Options**

Attendant announcement (ATAN):

Billing number required (BILN):

Call detail recording (CDR):

North American toll scheme (NATL):

Controls or timers (CNTL):

Conventional (Tie trunk only) (CNVT):

Incoming DID digit conversion on this route (IDC):

- Day IDC tree number (DCNO): (0 - 254)

- Night IDC tree number (NDNO): (0 - 254)

- Display external dialed digits (DEXT):

Multifrequency compelled or MFC signaling (MFC):

Process notification networked calls (PNNC):

+ **Network Options**

+ **General Options**

+ **Advanced Configurations**

5.4.6 Administer Virtual Trunks

Navigate to **Routes and Trunks > Route and Trunks** (not shown). The Route list is now updated with the newly added routes in **Section 5.4.5**. In the example, **Route 10** was added. Click on the **Add** trunk button (not shown).

The **Customer 0, Route 10, Trunk type TIE trunk data block** screen is displayed. Enter the following values for the specified fields and retain the default values for the remaining fields. Media Security (sRTP) needs to be disabled at the trunk level by editing the **Class of Service (CLS)** at the bottom of the **Basic Configuration** page. Click on the **Edit** button as shown below.

In the sample configuration, 10 trunks were created.

- **Multiple trunk input number:** Enter the number of channels (in this example, there are 10 channels).
- Select **Auto increment member number**.
- **Trunk data block: IP Trunk (IPTI).**
- **Terminal Number:** Available terminal number (**Superloop 92** created in **Section 5.4.4**).
- **Designator field for trunk:** A descriptive text (**sip**).
- **Member number:** Current route number and starting member.
- **Start arrangement Incoming:** Select **Immediate (IMM)**.
- **Start arrangement Outgoing:** Select **Immediate (IMM)**.
- **Channel ID for this trunk:** An available starting channel ID.

Managing: 100.20.2.136 Username: admin
Routes and Trunks » Routes and Trunks » Customer 0, Route 10

Customer 0, Route 10, Trunk type TIE trunk data block

- Basic Configuration

Multiple trunk input number: 10 Range: 2 - 3700
Auto increment member number:
Trunk data block: IP Trunk (IPTI) v
Terminal number: 92 0 0 0 *
Designator field for trunk: sip
Extended trunk: VTRK
Member number: 1 *
Level 3 Signaling: v
Card density: v
Start arrangement Incoming: Immediate (IMM) v
Start arrangement Outgoing: Immediate (IMM) v
Trunk group access restriction: v
Channel ID for this trunk: 1
Class of Service: Edit

+ Advanced Trunk Configurations

For **Media Security**, select **Media Security Never (MSNV)**. Enter the values for the specified fields as shown below. Scroll down to the bottom of the screen and click **Return Class of Service** and then click on the **Save** button (not shown).

- Class of Service	
Input Description	Input Value
- ACD Priority :	<input type="text"/>
- Analog Semi-Permanent Connections :	<input type="text"/>
- ARF Supervised COT:	<input type="text"/>
- Barring:	<input type="text"/>
- Battery Supervised COT :	<input type="text"/>
- Busy Tone Supervised COT:	<input type="text"/>
- Calling Line Identification:	<input type="text"/>
- Calling party:	<input type="text"/>
- Central Office Ringback:	<input type="text"/>
- Centrex Switchhook Flash:	<input type="text"/>
- Dial Pulse:	<input type="text"/>
- DTR PAD value:	<input type="text"/>
- Echo Canceling:	<input type="text"/>
- Hong Kong DTI :	<input type="text"/>
- Loop Break Supervised COT:	<input type="text"/>
- Make-break ratio for dial pulse:	<input type="text"/>
- Manual Incoming:	<input type="text"/>
-Media Security:	Media Security Never (MSNV)
-Network Hook Flash Over M911P:	<input type="text"/>
- Polarity:	<input type="text"/>
- Priority:	<input type="text"/>
- Restriction level:	<input type="text"/>
- Reversed Ear Piece:	<input type="text"/>
- Short or long line:	<input type="text"/>
- Transmission Class of Service:	<input type="text"/>
- Warning Tone:	<input type="text"/>
- Reversed Ear Piece:	<input type="text"/>
- ARF Supervised COT:	<input type="text"/>

5.4.7 Administer Calling Line Identification Entries

Navigate to **Customers** on the left pane, and then select **00 > ISDN and ESN Networking** (not shown). Click on **Calling Line Identification Entries**:

Integrated services digital network:

Microsoft converged office dialing plan:

Private dialing plan for non-DID users: Coordinated dialing plan
 Uniform dialing plan

Extended Local Calls:

Extended Local Calls Route list index: (0 - 1999)

Information for incoming/outgoing calls:

Size: (0 - 4000)

Country code: (0 - 9999)

Code displayed as part of calling number

Calling Line Identification Entries

Click on **Add**. The add **entry 0** screen will display. Enter or select the following values for the specified fields and retain the default values for the remaining fields.

- **National Code:** Enter **4456**.
- **Local Code:** Enter **0065**.
- **Home Location Code:** Leave blank
- **Local Steering Code:** Leave blank.
- **Use DN as DID:** **YES**.

Managing: 100.20.2.136 Username: admin
Customers > Customer 00 > Customer Details > ISDN and ESN Networking > Calling Line Identification Entries

Calling Line Identification Entries

Search for CLID

Start range:
End range:
'End range' should not exceed the CLID size specified

Entry Id	National Code	Local Code	Home location code	Local steering code	Use DN as DID	Emergency Local Code
1 <input type="checkbox"/> 0	4456	0065			YES	

5.4.8 Enable External Trunk to Trunk Transfer

External Trunk to Trunk Transfer feature is a mandatory configuration to make call transfer and conference work properly over a SIP trunk.

Access the Call Server Overlay CLI (please refer to **Section 5.1.2** for more details). Allow External Trunk to Trunk Transfer for **Customer Data Block** by using **ld 15**.

```
>ld 15
CDB000
MEM AVAIL: (U/P): 33600126 USED U P: 8345621 954062 TOT: 45579868
DISK SPACE NEEDED: 1722 KBYTES
REQ: chg
TYPE: net
TYPE NET_DATA
CUST 0
OPT
...
TRNX YES → Enable transfer feature
EXTT YES → Enable external trunk to trunk transfer
...
```

5.5 Administer Dialing Plans

This section describes the steps to configure dialing plans for outbound and inbound calls.

5.5.1 Define ESN Access Codes and Parameters (ESN)

Access the CS1000 Element Manager then navigate to **Dialing and Numbering Plans** > **Electronic Switched Network** from the left pane to display the **Electronic Switched Network (ESN)** screen. Select **ESN Access Codes and Parameters** to define **NARS/BARS Access Code 1**, **NARS Access Code 2** and **Number of digits in CDP DN (DSC+DN or LSC+DN)** as shown below.

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
Dialing and Numbering Plans » Electronic Switched Network (ESN) » Customer 00 » Network Control 8

ESN Access Codes and Basic Parameters

General Properties

NARS/BARS Access Code 1: 9
NARS Access Code 2: 6

NARS/BARS Dial Tone after dialing AC1 or AC2 access codes:

Expensive Route Warning Tone:

- Expensive Route Delay Time: 6 (0 - 10)

Coordinated Dialing Plan feature for this customer:

- Maximum number of Steering Codes: 100 (1 - 64000)

- Number of digits in CDP DN (DSC + DN or LSC + DN): 4 (3 - 10)

Routing Controls:

Check for Trunk Group Access Restrictions:

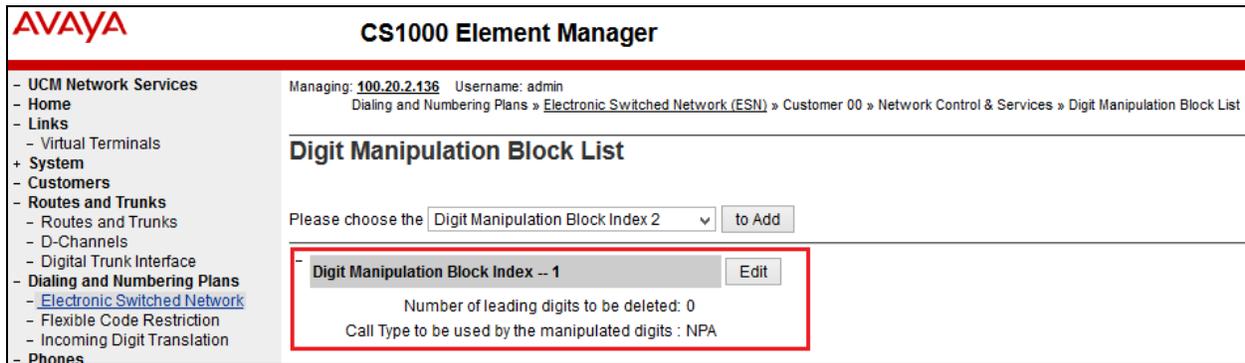
Limits

Maximum number of Digit Manipulation tables: 100 (0 - 2000)

Maximum number of Route Lists: 100 (0 - 2000)

5.5.2 Digit Manipulation Block Index (DMI)

In this sample configuration, **Digit Manipulation Block Index 1** was added as shown below.



AVAYA CS1000 Element Manager

Managing: [100.20.2.136](#) Username: admin
Dialing and Numbering Plans » [Electronic Switched Network \(ESN\)](#) » Customer 00 » Network Control & Services » Digit Manipulation Block List

Digit Manipulation Block List

Please choose the

Digit Manipulation Block Index -- 1 <input type="button" value="Edit"/>
Number of leading digits to be deleted: 0 Call Type to be used by the manipulated digits : NPA

5.5.3 Route List Block Index

Navigate to **Dialing and Numbering Plans > Electronic Switched Network** from the left pane to display the **Electronic Switched Network (ESN)** screen. Select **Route List Block**. Enter an available value in the textbox for the **Please enter a route list index** (in this example **10**) and click on **Add** (not shown).

Enter the following values for the specified fields, and retain the default values for the remaining fields as shown below.

- **Digit Manipulation Index: 1.**
- **Incoming CLID Table: 0** (created in **Section 5.4.7**).
- **Route number: 10** (created in **Section 5.4.5**).

AVAYA CS1000 Element Manager

Managing: 100.20.2.136 Username: admin
Dialing and Numbering Plans > Electronic Switched Network (ESN) > Customer 00 > Network Control & Services > Route List Blocks > Route List Block > Data Entry of a Route List Block

Data Entry of a Route List Block

Route List Block Index: 10

General Properties

Entry Number for the Route List: 0

Indexes

Time of Day Schedule: 0

Facility Restriction Level: 0 (0 - 7)

Digit Manipulation Index: 1

ISL D-Channel Down Digit Manipulation Index: 0 (0 - 1999)

Free Calling Area Screening Index: 0

Free Special Number Screening Index: 0

Business Network Extension Route:

Incoming CLID Table: 0 (0 - 100)

Options

Local Termination entry:

Route Number: 10

Skip Conventional Signaling:

Use Tone Detector:

Conversion to LDN:

Expensive Route:

Strategy on Congestion: No Reroute (NRR)

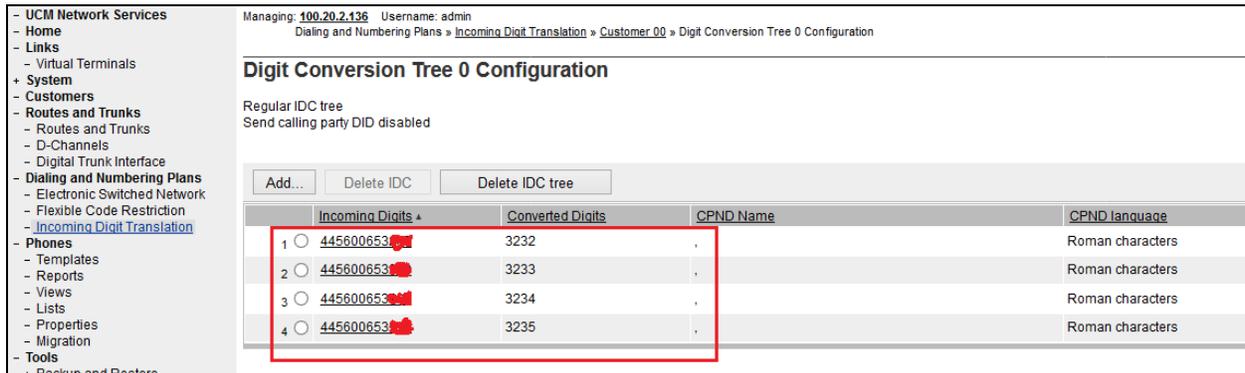
5.5.4 Incoming Digit Translation Configuration

Navigate to **Dialing and Numbering Plans > Incoming Digit Translation** from the left pane to display the **Incoming Digit Translation** screen. Click on the **Edit IDC** button (not shown). Click on the **New DCNO** to create the digit translation mapping. In this example, **Digit Conversion Tree 0** has been previously created (not shown).

Detailed configuration of the **Digit Conversion Tree 0 Configuration** is shown below. The **Incoming Digits** can be added to map to the **Converted Digits** which would be the associated Avaya CS1000 system phone DN. This **DCNO** has been configured on **route 10** as shown in **Section 5.4.5**.

In the following configuration, the incoming call from the PSTN to DID with prefix 445600653xxx will be translated to the associated DN with 4 digits.

Note: For confidentiality and privacy purposes, the actual 4 remaining digits used for DID numbers in this testing have been masked.



The screenshot displays the configuration page for 'Digit Conversion Tree 0 Configuration'. The left sidebar shows a navigation menu with 'Incoming Digit Translation' selected. The main content area shows the configuration details, including a table of digit mappings. The table has four columns: 'Incoming Digits', 'Converted Digits', 'CPND Name', and 'CPND language'. The 'Incoming Digits' column contains four entries, each with a radio button and a masked number (445600653 followed by four redacted digits). The 'Converted Digits' column contains the values 3232, 3233, 3234, and 3235. The 'CPND Name' column contains a single dot '.' for all entries. The 'CPND language' column contains 'Roman characters' for all entries. A red box highlights the first four rows of the table.

	Incoming Digits	Converted Digits	CPND Name	CPND language
1	445600653[redacted]	3232	.	Roman characters
2	445600653[redacted]	3233	.	Roman characters
3	445600653[redacted]	3234	.	Roman characters
4	445600653[redacted]	3235	.	Roman characters

5.5.5 Outbound Call – Trunk Steering Code Configuration

The Trunk Steering Code **012**, **029** and **056** were added for making outbound call to BT Wholesale. This number was associated to **Route list index 10** created in **Section 5.5.3**.

Navigate to **Dialing and Numbering Plans > Electronic Switched Network** from the left pane to display the **Electronic Switched Network (ESN)** screen. Select **Trunk Steering Code (TSC)**. Enter a TSC number and then click on **Add** button. Below figure shows the TSC number used for this testing.

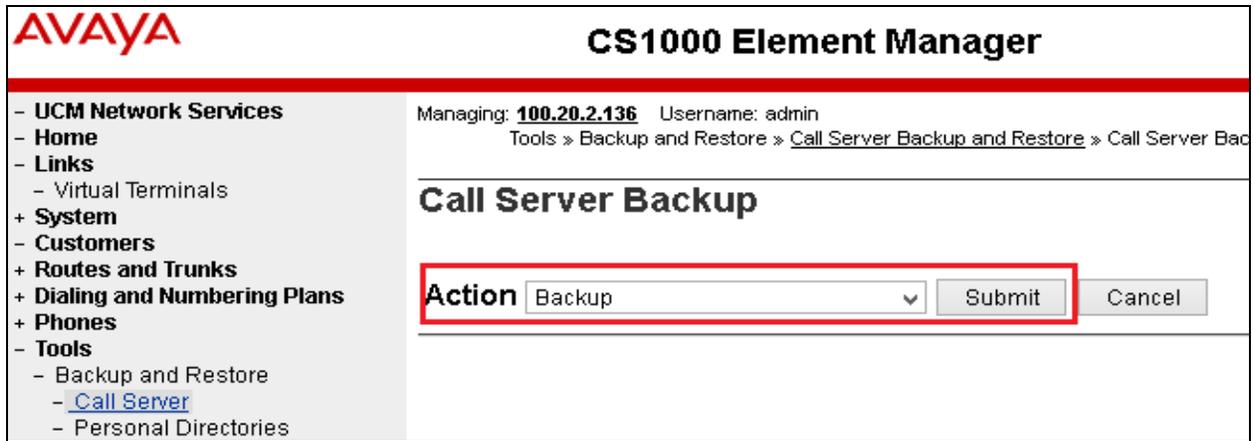
The screenshot shows the Avaya ESN configuration interface. On the left is a navigation menu with categories like UCM Network Services, System, Customers, Routes and Trunks, and Dialing and Numbering Plans. The 'Dialing and Numbering Plans' section is expanded to 'Electronic Switched Network'. The main content area is titled 'Trunk Steering Code List' and includes a 'Display' dropdown menu. Below this, there are input fields for 'Starting Trunk Steering Code' (set to 0) and 'Number of Steering Codes to display' (set to 4), with a 'View' button. A list of three Trunk Steering Codes is shown, each with an 'Edit' button. The codes are 00, 012, 029, and 056. The code 012 is highlighted with a red box. Each code entry displays the following configuration details: Flexible Length number of digits: 11, Inhibit Time-out option: N, Route List to be accessed for trunk steering code: 10, and Collect Call Blocking: N.

5.6 Enable Plug-ins on CS1000

In order for off-net call transfer to operate successfully, **plug-in 201** must be enabled on CS1000. Please refer to **CS 1000 Plug-in Feature** document which is available at <https://downloads.avaya.com/css/P8/documents/100166144> .

5.7 Save the configuration

Expand **Tools** → **Backup and Restore** on the left navigation panel and select **Call Server**. Select **Backup** and click **Submit** to save configuration changes as shown below.



The screenshot shows the Avaya CS1000 Element Manager interface. The top left features the Avaya logo. The main header is "CS1000 Element Manager". Below the header, there is a navigation menu on the left with the following items: UCM Network Services, Home, Links, Virtual Terminals, System, Customers, Routes and Trunks, Dialing and Numbering Plans, Phones, Tools, Backup and Restore, Call Server, and Personal Directories. The main content area displays "Managing: 100.20.2.136 Username: admin" and a breadcrumb trail: "Tools » Backup and Restore » Call Server Backup and Restore » Call Server Backup". The title of the page is "Call Server Backup". Below the title, there is a form with an "Action" dropdown menu set to "Backup", a "Submit" button, and a "Cancel" button. The "Action" dropdown and the "Submit" button are highlighted with a red box.

The backup process will take several minutes to complete.

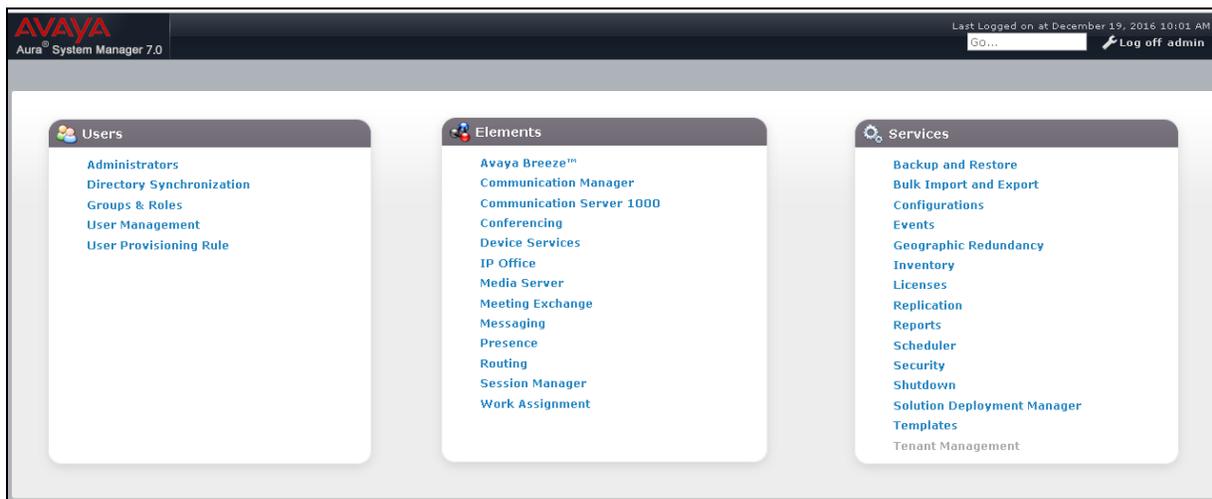
6. Configure Avaya Aura® Session Manager

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

- SIP domain.
- Logical/physical Location that can be used by SIP Entities.
- Adaptations.
- SIP Entities corresponding to Avaya CS1000, 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.
-

It may not be necessary to configure all the items above when creating a connection to the service provider since some of these items would have already been defined as part of the initial Session Manager installation. This includes items such as certain SIP domains, locations, SIP entities, and Session Manager itself. However, each item should be reviewed to verify the configuration.

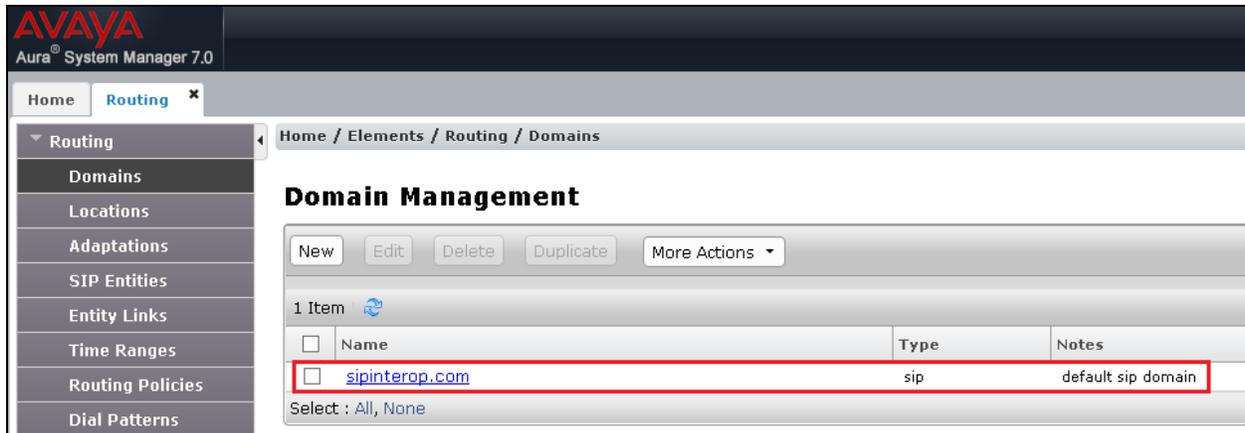
Session Manager configuration is accomplished by accessing the browser-based GUI of System Manager, using the URL **http://<ip-address>/SMGR**, where **<ip-address>** is the IP address of System Manager. In the **Log On** screen (not shown), enter appropriate **User ID** and **Password** and click the **Log On** button. Once logged in, the **Home** screen is displayed. From the **Home** screen, under the **Elements** heading in the center, select **Routing**.



6.1 Configure SIP Domain

Follow the steps shown below:

1. Select **Domains** from the left navigation menu. In the reference configuration, domain **sipinterop.com** was defined.
2. Click **New** (not shown). Enter the following values and use default values for remaining fields.
 - **Name:** Enter the enterprise SIP Domain Name. In the sample screen below, **sipinterop.com** is shown.
 - **Type:** Verify **sip** is selected.
 - **Notes:** Add a brief description.
3. Click **Commit** to save (not shown).



6.2 Configure Locations

Locations are used to identify logical and/or physical locations where SIP Entities reside. In the reference configuration, location **siptrunking** was configured.

Follow the steps shown below:

1. Select **Locations** from the left navigational menu. Click on **New** (not shown). In the **General** section, enter the following values and use default values for remaining fields.
 - **Name:** Enter a descriptive name for the Location (e.g., **siptrunking**).
 - **Notes:** Add a brief description.
2. In the **Overall Managed Bandwidth** section:
 - **Total Bandwidth:** Enter a desired value (e.g., **2048**).
 - **Multimedia Bandwidth:** Enter a desired value (e.g., **1024**).
3. Click on **Commit** to save.

The screenshot displays the Avaya Aura System Manager 7.0 interface. The left sidebar shows the 'Routing' menu with 'Locations' selected. The main content area is titled 'Location Details' and contains the following sections:

- General:** Includes fields for '* Name:' (siptrunking) and 'Notes:' (for SBCE sip trunking). A 'Commit' button is visible in the top right corner.
- Dial Plan Transparency in Survivable Mode:** Includes an 'Enabled:' checkbox (unchecked), 'Listed Directory Number:' field, and 'Associated CM SIP Entity:' field.
- Overall Managed Bandwidth:** Includes a 'Managed Bandwidth Units:' dropdown (set to Kbit/sec), 'Total Bandwidth:' field (2048), and 'Multimedia Bandwidth:' field (1024).

At the bottom, the checkbox 'Audio Calls Can Take Multimedia Bandwidth:' is checked.

6.3 Configure Adaptations

An Adaptation was configured to remove MIME part generated by Avaya CS1000 before routing to BT Wholesale. To add a new Adaptation, navigate to **Routing > Adaptations**. Click on **New** button in the right pane (not shown). Enter an appropriate **Adaptation Name** to identify the Adaptation. Select **DigitConversionAdapter** from the **Module Name** drop-down menu. Select **Name-Value Parameter** from the **Module Parameter Type** drop-down menu. Click on **Add** button two times to add **Name** as **MIME** and **Value** as **no**, and **Name** as **Fromto** and **Value** as **true**. Scroll down to **Digit Conversion for Outgoing Calls from SM** to add records for outgoing numbers to Avaya SBCE. Click on **Commit** button after changes are completed.

Adaptation Details Commit Cancel

General

* Adaptation Name:

* Module Name:

Module Parameter Type:

<input type="checkbox"/>	Name	Value
<input type="checkbox"/>	fromto	true
<input type="checkbox"/>	MIME	no

Select : All, None

Egress URI Parameters:

Notes:

Digit Conversion for Incoming Calls to SM

Add Remove

0 Items

<input type="checkbox"/>	Matching Pattern	Min	Max	Phone Context	Delete Digits	Insert Digits	Address to modify
<input type="checkbox"/>	* 012	* 11	* 11		* 0		both
<input type="checkbox"/>	* 029	* 11	* 11		* 0		both
<input type="checkbox"/>	* 056	* 11	* 11		* 0		both

Digit Conversion for Outgoing Calls from SM

Add Remove

3 Items

<input type="checkbox"/>	Matching Pattern	Min	Max	Phone Context	Delete Digits	Insert Digits	Address to modify	Adaptation Data
<input type="checkbox"/>	* 012	* 11	* 11		* 0		both	
<input type="checkbox"/>	* 029	* 11	* 11		* 0		both	
<input type="checkbox"/>	* 056	* 11	* 11		* 0		both	

6.4 Configure SIP Entities

A SIP Entity must be added for Session Manager and for each SIP telephony system connected to it which includes Avaya CS1000 and Avaya SBCE.

6.4.1 Configure Session Manager SIP Entity

Follow the steps shown below:

1. In the left pane under **Routing**, click on **SIP Entities**. In the **SIP Entities** page, click on **New** (not shown).
2. In the **General** section of the **SIP Entity Details** page, provision the following:
 - **Name** – Enter a descriptive name (e.g., **sm01**).
 - **FQDN or IP Address** – Enter the IP address of Session Manager signaling interface, (*not* the management interface), provisioned during installation (e.g., **100.20.2.165**).
 - **Type** – Verify **Session Manager** is selected.
 - **Location** – Select location **siptrunking**.
 - **Outbound Proxy** – (Optional) Leave blank or select another SIP Entity. For calls to SIP domains for which Session Manager is not authoritative, Session Manager routes those calls to this **Outbound Proxy** or to another SIP proxy discovered through DNS if **Outbound Proxy** is not specified.
 - **Time Zone** – Select the time zone in which Session Manager resides.
3. In the **SIP Link Monitoring** section of the **SIP Entity Details** page, configure as follows:
 - Select **Use Session Manager Configuration** for **SIP Link Monitoring** field.
 - Use the default values for the remaining parameters. Click on **Commit**.

The screenshot shows the Avaya Aura System Manager 7.0 interface. The left navigation pane is expanded to 'Routing' and 'SIP Entities' is selected. The main content area is titled 'SIP Entity Details' and has a 'Commit' button. The 'General' section contains the following fields:

- Name:** sm01
- FQDN or IP Address:** 100.20.2.165
- Type:** Session Manager
- Location:** siptrunking
- Time Zone:** Asia/Ho_Chi_Minh

The 'SIP Link Monitoring' section has a dropdown menu set to 'Use Session Manager Configuration'.

6.4.2 Configure Avaya CS1000 SIP Entity

Follow the steps shown below:

1. In the **SIP Entities** page, click on **New** (not shown).
2. In the **General** section of the **SIP Entity Details** page, provision the following:
 - **Name** – Enter a descriptive name (e.g., **cs1k**).
 - **FQDN or IP Address** – Enter the IP address of CS1000 Node IP as in **Section 5.2.1** (e.g., **100.20.2.197**).
 - **Type** – Select **SIP Trunk**.
 - **Location** – Select location **siptrunking** administered in **Section 6.2**.
 - **Time Zone** – Select the time zone in which CS1000 resides.
3. In the **SIP Link Monitoring** section of the **SIP Entity Details** page select
 - Select **Use Session Manager Configuration** for **SIP Link Monitoring** field, and use the default values for the remaining parameters.
4. Click on **Commit**.

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Aura® System Manager 7.0

Home Routing ×

Home / Elements / Routing / SIP Entities

SIP Entity Details

Commit Cancel

General

* Name: cs1k

* FQDN or IP Address: 100.20.2.197

Type: SIP Trunk

Notes:

Adaptation:

Location: siptrunking

Time Zone: Asia/Ho_Chi_Minh

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

Credential name:

Securable:

Call Detail Recording: egress

Loop Detection

Loop Detection Mode: On

Loop Count Threshold: 5

Loop Detection Interval (in msec): 200

SIP Link Monitoring

SIP Link Monitoring: Use Session Manager Configuration

6.4.3 Configure Avaya SBCE SIP Entity

Repeat the steps in **Section 6.4.2** with the following changes:

- **Name** – Enter a descriptive name (e.g., **sbce-A1**).
- **FQDN or IP Address** – Enter the IP address of the A1 (private) interface of the Avaya SBCE (e.g., **10.128.197.22**).
- **Adaptation** – Select **BTWholesale** created in **Section 6.3**.

The screenshot shows the 'SIP Entity Details' configuration page. The left navigation pane is expanded to 'SIP Entities'. The main content area is titled 'SIP Entity Details' and has a 'Commit' button highlighted with a red box. The 'General' section contains the following fields:

- Name:** sbce-A1
- FQDN or IP Address:** 10.128.197.22
- Type:** SIP Trunk
- Notes:** sip trunk to sbce A1 interface
- Adaptation:** BTWholesale
- Location:** siptrunking
- Time Zone:** Asia/Ho_Chi_Minh

Below the 'General' section are the following fields:

- SIP Timer B/F (in seconds):** 4
- Credential name:** [empty]
- Securable:**
- Call Detail Recording:** egress

The 'Loop Detection' section contains:

- Loop Detection Mode:** On
- Loop Count Threshold:** 5
- Loop Detection Interval (in msec):** 200

The 'SIP Link Monitoring' section contains:

- SIP Link Monitoring:** Use Session Manager Configuration

6.5 Configure Entity Links

A SIP trunk between Session Manager and a telephony system is described by an Entity Link. During compliance testing, two Entity Links were created, one for Avaya CS1000 and another one for Avaya SBCE. To add an Entity Link, navigate to **Routing** → **Entity Links** in the left navigation pane and click on **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 defined in **Section 6.4.1**.
- **Protocol:** Select the transport protocol used for this link, **TLS** for the Entity Link to Avaya CS1000 and Avaya SBCE.
- **Port:** Port number on which Session Manager will receive SIP requests from the far-end.
- **SIP Entity 2:** Select the name of the other systems. For Avaya CS1000, select the Avaya

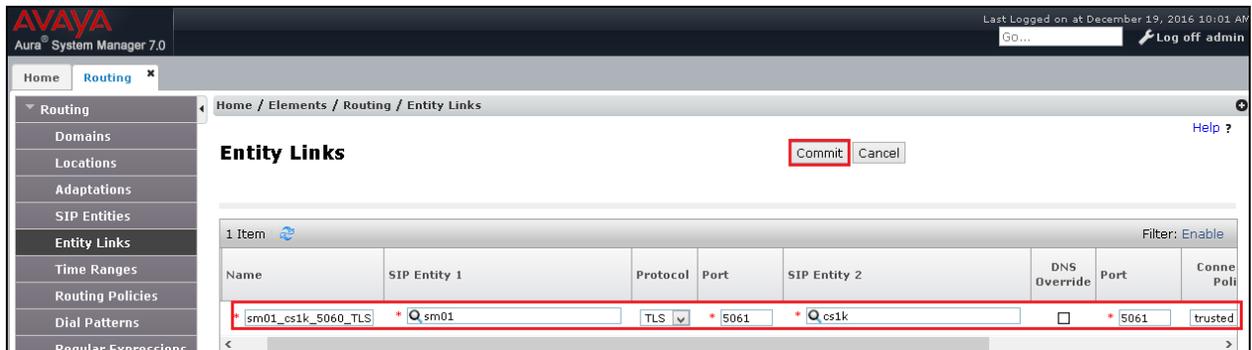
CS1000 SIP Entity defined in **Section 6.4.2**. For Avaya SBCE, select the Avaya SBCE SIP Entity defined in **Section 6.4.3**.

- **Port:** Port number on which the other system receives SIP requests from Session Manager.
- **Connection Policy:** Select **Trusted**.
- Click **Commit** to save.

6.5.1 Configure Entity Link to Avaya CS1000

Follow the steps shown below:

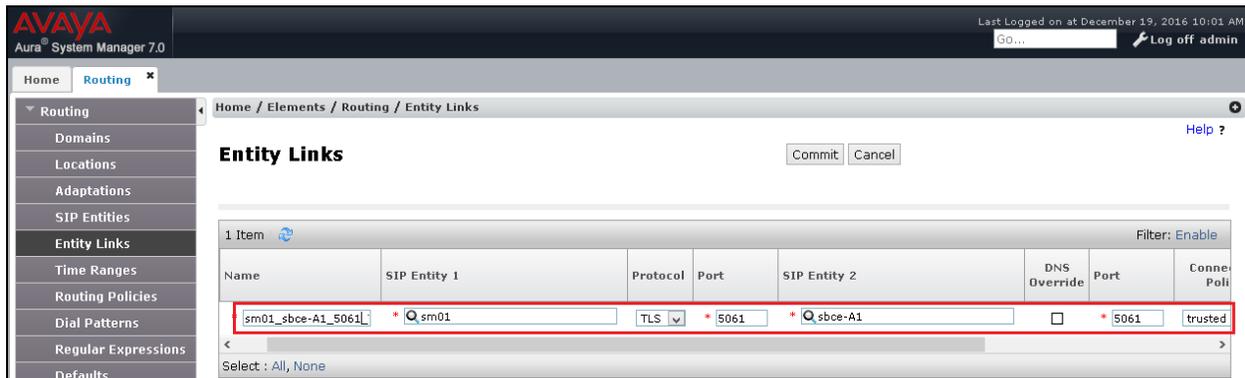
1. In the left pane under **Routing**, click on **Entity Links**, then click on **New** button (not shown).
2. Continuing in the **Entity Links** page, provision the following:
 - **Name** – Enter a descriptive name (or have it created automatically) for this link to CS1000 (e.g., **sm01_cs1k_5061_TLS**).
 - **SIP Entity 1** – Select the SIP Entity administered in **Section 6.4.1** for Session Manager (e.g., **sm01**).
 - **SIP Entity 1 Port** – Enter **5061**.
 - **Protocol** – Select **TLS**.
 - **SIP Entity 2** – Select the SIP Entity administered in **Section 6.4.2** for the CS1000 entity (e.g., **cs1k**).
 - **SIP Entity 2 Port** - Enter **5061**.
 - **Connection Policy** – Select **Trusted**.
3. Click on **Commit**.



6.5.2 Configure Entity Link for Avaya SBCE

To configure this Entity Link, repeat the steps in **Section 6.5.1**, with the following changes:

- **Name** – Enter a descriptive name (or have it created automatically) for this link to the Avaya SBCE (e.g., **sm01_sbce-A1_5061_TLS**).
- **SIP Entity 2** – Select the SIP Entity administered in **Section 6.4.3** for the Avaya SBCE entity (e.g., **sbce-A1**).



6.6 Configure Routing Policies

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, one for Avaya CS1000 and another one for Avaya SBCE. To add a routing policy, navigate to **Routing → Routing Policies** in the left navigation pane and click on **New** button in the right pane (not shown).

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

- **Name:** Enter a descriptive name.
- **Notes:** Add a brief description (optional).

In the **SIP Entity as Destination** section, click on **Select**. The **SIP Entity List** page opens (not shown). Select appropriate SIP entity to which this routing policy applies and click on **Select**. The selected SIP Entity is displayed in the **Routing Policy Details** page as shown below. Use default values for remaining fields. Click on **Commit** to save.

6.6.1 Configure Routing Policy for Avaya CS1000

This Routing Policy was used for inbound calls from BT Wholesale.

1. In the left pane under **Routing**, click on **Routing Policies**. In the **Routing Policies** page click on **New** button (not shown).
2. In the **General** section of the **Routing Policy Details** page, enter a descriptive **Name** for routing calls from BT Wholesale to Avaya CS1000 (e.g., **to cs1k**), and ensure that the **Disabled** checkbox is unchecked to activate this Routing Policy.
3. **Retries: 0**.
4. In the **SIP Entity as Destination** section of the **Routing Policy Details** page, click on **Select** and the SIP Entity list page will open.
5. In the **SIP Entity List** page, select the SIP Entity administered in **Section 6.4.2** for the CS1000 SIP Entity (**cs1k**), and click on **Select**.
6. Note that once the **Dial Patterns** are defined they will appear in the **Dial Pattern** section of this form.
7. No **Regular Expressions** were used in the reference configuration.
8. Click on **Commit**.

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Home / Elements / Routing / Routing Policies

Routing Policy Details

Commit Cancel

General

* Name:

Disabled:

* Retries:

Notes:

SIP Entity as Destination

Select

Name	FQDN or IP Address	Type	No
cs1k	100.20.2.197	SIP Trunk	

6.6.2 Configure Routing Policy for Avaya SBCE

This Routing Policy is used for outbound calls to the service provider. Repeat the steps in **Section 6.6.1**, with the following changes:

- **Name** – Enter a descriptive name for this link to the Avaya SBCE (e.g., **to SBCE A1**).
- **SIP Entity List** –Select the SIP Entity administered in **Section 6.4.3** for the Avaya SBCE entity (e.g., **sbce-A1**).

The screenshot shows the Avaya Aura System Manager 7.0 interface. The left sidebar contains a navigation menu with the following items: Home, Routing, Domains, Locations, Adaptations, SIP Entities, Entity Links, Time Ranges, Routing Policies (highlighted), Dial Patterns, Regular Expressions, and Defaults. The main content area is titled "Routing Policy Details" and includes "Commit" and "Cancel" buttons. Under the "General" tab, the following fields are visible: "* Name:" with the value "to SBCE A1", "Disabled:" with an unchecked checkbox, "* Retries:" with the value "0", and "Notes:" with the value "outbound calls to SP". Below this is a section titled "SIP Entity as Destination" which contains a "Select" button and a table with the following data:

Name	FQDN or IP Address	Type	Notes
sbce-A1	10.128.197.22	SIP Trunk	sip trunk to sbce A1 interface

6.7 Configure Dial Patterns

Dial Patterns are needed to route specific calls through Session Manager. For the compliance testing, dial patterns were needed to route calls from Avaya CS1000 to BT Wholesale and vice versa. Dial Patterns define which routing 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 **New** button in the right pane (not shown).

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.
- **Notes:** Add a brief description (optional).

In the **Originating Locations and Routing Policies** section, click on **Add**. From the **Originating Locations and Routing Policy List** that appears (not shown), select the appropriate originating location for use in the match criteria. Lastly, select the routing policy from the list that will be used to route all calls that match the specified criteria. Click on **Select**.

Default values can be used for the remaining fields. Click **Commit** to save.

The first example shows that 11-digit dialed numbers that begin with **012** and have a destination domain of “**ALL**” uses route policy to Avaya SBCE as defined in **Section 6.6.2**. Do the same for 11-digit dialed numbers that begin with **029** and **056**.

The screenshot displays the 'Dial Pattern Details' configuration page in the Avaya Session Manager web interface. The left navigation pane shows 'Routing' expanded, with 'Dial Patterns' selected. The main content area is titled 'Dial Pattern Details' and includes a 'Commit' button. The 'General' section contains the following fields:

- Pattern:** 012
- Min:** 11
- Max:** 11
- Emergency Call:**
- Emergency Priority:** 1
- Emergency Type:** (empty)
- SIP Domain:** -ALL- (selected in a dropdown)
- Notes:** (empty)

The 'Originating Locations and Routing Policies' section shows a table with one item selected:

Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
-ALL-		to SBCE A1	0	<input type="checkbox"/>	sbce-A1	outbound calls to SP

The second example shows that 12-digit pattern that starts with 44560065 is used for inbound calls from BT Wholesale to DID numbers on Avaya CS1000.

Dial Pattern Details [Commit] [Cancel]

General

* Pattern: 44560065
* Min: 12
* Max: 12

Emergency Call:
Emergency Priority: 1
Emergency Type:
SIP Domain: -ALL-
Notes:

Originating Locations and Routing Policies

Add Remove

1 Item

<input type="checkbox"/>	Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	R
<input type="checkbox"/>	-ALL-		to cs1k	0	<input type="checkbox"/>	cs1k	

Select : All, None

7. Configure Avaya Session Border Controller for Enterprise

Note: The installation and initial provisioning of the Avaya SBCE is beyond the scope of this document.

As described in **Section 3**, the reference configuration places the private interface (A1) of the Avaya SBCE in the enterprise site (10.128.197.21). The connection to BT Wholesale uses the Avaya SBCE public interface B1 (192.168.5.48). The follow provisioning is performed via the Avaya SBCE GUI interface, using the “M1” management LAN connection on the chassis.

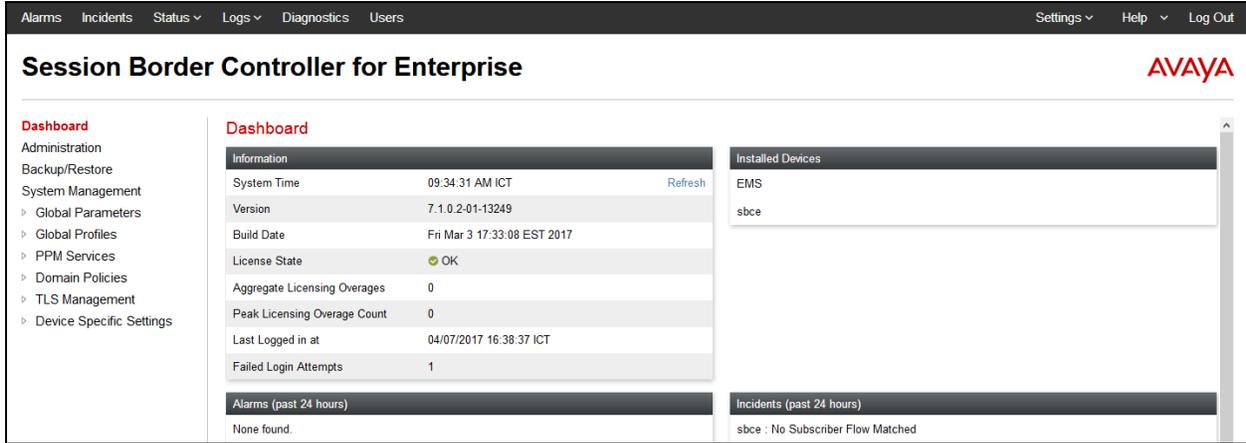
1. Access the web interface by typing “**https://x.x.x.x**” (where x.x.x.x is the management IP address of the Avaya SBCE).
2. Enter the **Username** and click on **Continue**.



3. Enter the password and click on **Log In**.



The main menu window will open. Note that the installed software version is displayed. Verify that the **License State** is **OK**. The SBCE will only operate for a short time without a valid license. Contact your Avaya representative to obtain a license.



The screenshot displays the Avaya Session Border Controller for Enterprise dashboard. The top navigation bar includes links for Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header reads "Session Border Controller for Enterprise" with the Avaya logo on the right. A left sidebar lists navigation options: Dashboard, Administration, Backup/Restore, System Management, Global Parameters, Global Profiles, PPM Services, Domain Policies, TLS Management, and Device Specific Settings. The main content area is titled "Dashboard" and is divided into several sections:

- Information:** A table showing system details:

System Time	09:34:31 AM ICT	Refresh
Version	7.1.0.2-01-13249	
Build Date	Fri Mar 3 17:33:08 EST 2017	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	04/07/2017 16:38:37 ICT	
Failed Login Attempts	1	
- Installed Devices:** A list showing "EMS" and "sbce".
- Alarms (past 24 hours):** A section indicating "None found".
- Incidents (past 24 hours):** A section showing "sbce : No Subscriber Flow Matched".

7.1 System Management – Status

1. Select **System Management** and verify that the **Status** column says **Commissioned**.

System Management

Devices Updates SSL VPN Licensing Key Bundles

Device Name	Management IP	Version	Status	
sbce	10.128.197.21	7.1.0.2-01-13249	Commissioned	Reboot Shutdown Restart Application View Edit Uninstall

2. Click on **View** (shown above) to display the **System Information** screen.

System Information: sbce

General Configuration

Appliance Name	sbce
Box Type	SIP
Deployment Mode	Proxy

Device Configuration

HA Mode	No
Two Bypass Mode	No

License Allocation

Standard Sessions Requested: 20	20
Advanced Sessions Requested: 20	20
Scopia Video Sessions Requested: 0	0
CES Sessions Requested: 0	0
Transcoding Sessions Requested: 0	0
Encryption	<input checked="" type="checkbox"/>

Network Configuration

IP	Public IP	Network Prefix or Subnet Mask	Gateway	Interface
10.128.197.22	10.128.197.22	255.255.255.192	10.128.197.1	A1
103.199.6.29	103.199.x.x	255.255.255.240	103.199.x.x	B1

DNS Configuration

Primary DNS	8.8.8.8
Secondary DNS	
DNS Location	DMZ
DNS Client IP	103.199.6.29

Management IP(s)

IP #1 (IPv4)	10.128.197.21
--------------	---------------

7.2 Global Profiles

The Global Profiles Menu, on the left navigation pane, allows the configuration of parameters across all Avaya SBCE appliances.

7.2.1 Uniform Resource Identifier (URI) Groups

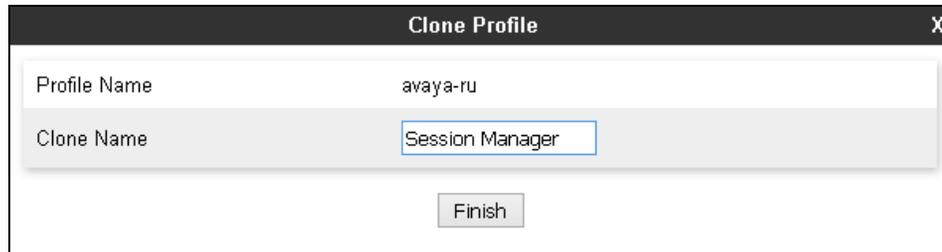
URI Group feature allows a user to create any number of logical URI Groups that are comprised of individual SIP subscribers located in that particular domain or group. These groups are used by the various domain policies to determine which actions (Allow, Block, or Apply Policy) should be used for a given call flow.

For this configuration testing, “*” is used for all incoming and outgoing traffic.

7.2.2 Server Interworking – Session Manager

Server Interworking allows users to configure and manage various SIP call server-specific capabilities such as call hold and T.38 faxing. This section defines the profile for the connection to Session Manager.

1. Navigate to **Global Profiles > Server Interworking** from the left-hand menu.
2. Select **avaya-ru** then click on **Clone** button.
3. Enter profile name: (e.g., **Session Manager**), and click on **Finish**.



Clone Profile	
Profile Name	avaya-ru
Clone Name	Session Manager
<input type="button" value="Finish"/>	

4. Click on **Edit** in **General** tab (not shown).
- Check **T38 Support** box.
 - Click on **Finish**.

The screenshot shows a dialog box titled "Editing Profile: Session Manager" with a close button (X) in the top right corner. The "General" tab is selected. The following settings are visible:

Hold Support	<input checked="" type="radio"/> None <input type="radio"/> RFC2543 - c=0.0.0.0 <input type="radio"/> RFC3264 - a=sendonly
180 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
181 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
182 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
183 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
Refer Handling	<input type="checkbox"/>
URI Group	None (dropdown)
Send Hold	<input type="checkbox"/>
Delayed Offer	<input type="checkbox"/>
3xx Handling	<input type="checkbox"/>
Diversion Header Support	<input type="checkbox"/>
Delayed SDP Handling	<input type="checkbox"/>
Re-Invite Handling	<input type="checkbox"/>
Prack Handling	<input type="checkbox"/>
Allow 18X SDP	<input type="checkbox"/>
T:38 Support	<input checked="" type="checkbox"/>
URI Scheme	<input checked="" type="radio"/> SIP <input type="radio"/> TEL <input type="radio"/> ANY
Via Header Format	<input checked="" type="radio"/> RFC3261 <input type="radio"/> RFC2543

At the bottom of the dialog, there is a "Finish" button, which is highlighted with a red box.

5. Click on **Edit** in the **Advanced** tab (not shown).
- **Record Routes:** Choose **None**.
 - Click on **Finish**.

The screenshot shows a configuration window titled "Editing Profile: Session Manager". The window contains several sections with various settings:

- Record Routes:** A radio button selection with "None" selected (highlighted with a red box). Other options are "Single Side", "Both Sides", "Dialog-Initiate Only (Single Side)", and "Dialog-Initiate Only (Both Sides)".
- Include End Point IP for Context Lookup:** A checked checkbox.
- Extensions:** A dropdown menu showing "Avaya".
- Diversion Manipulation:** An unchecked checkbox.
- Diversion Condition:** A dropdown menu showing "None".
- Diversion Header URI:** An empty text input field.
- Has Remote SBC:** A checked checkbox.
- Route Response on Via Port:** An unchecked checkbox.
- Relay INVITE Replace for SIPREC:** An unchecked checkbox.
- DTMF:** A section header.
- DTMF Support:** A radio button selection with "None" selected. Other options are "SIP Notify", "SIP Info", and "Inband".
- Finish:** A button at the bottom of the window, highlighted with a red box.

7.2.3 Server Interworking – BT Wholesale

Navigate to **Global Profiles > Server Interworking** from the left-hand menu to add an Interworking Profile for the connection to BT Wholesale network.

1. Click on **Add** (not shown) then enter **BT** as the **profile name** and click on **Next** (not shown).
2. In **General** window: Check **T.38 Support** then click on **Next**.

The screenshot shows the 'Interworking Profile' configuration window with the 'General' tab selected. The 'T.38 Support' checkbox is checked and highlighted with a red box. The 'Next' button at the bottom right is also highlighted with a red box. Other settings include 'Hold Support' (None), '180 Handling' (None), '181 Handling' (None), '182 Handling' (None), '183 Handling' (None), 'Refer Handling' (unchecked), 'URI Group' (None), 'Send Hold' (checked), 'Delayed Offer' (checked), '3xx Handling' (unchecked), 'Diversion Header Support' (unchecked), 'Delayed SDP Handling' (unchecked), 'Re-Invite Handling' (unchecked), 'Prack Handling' (unchecked), 'Allow 18X SDP' (unchecked), 'URI Scheme' (SIP), and 'Via Header Format' (RFC3261).

Setting	Value
Hold Support	<input checked="" type="radio"/> None <input type="radio"/> RFC2543 - c=0.0.0.0 <input type="radio"/> RFC3264 - a=sendonly
180 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
181 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
182 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
183 Handling	<input checked="" type="radio"/> None <input type="radio"/> SDP <input type="radio"/> No SDP
Refer Handling	<input type="checkbox"/>
URI Group	None
Send Hold	<input checked="" type="checkbox"/>
Delayed Offer	<input checked="" type="checkbox"/>
3xx Handling	<input type="checkbox"/>
Diversion Header Support	<input type="checkbox"/>
Delayed SDP Handling	<input type="checkbox"/>
Re-Invite Handling	<input type="checkbox"/>
Prack Handling	<input type="checkbox"/>
Allow 18X SDP	<input type="checkbox"/>
T.38 Support	<input checked="" type="checkbox"/>
URI Scheme	<input checked="" type="radio"/> SIP <input type="radio"/> TEL <input type="radio"/> ANY
Via Header Format	<input checked="" type="radio"/> RFC3261 <input type="radio"/> RFC2543

Buttons: Back, **Next**

3. Leave default values in **SIP Timers** window and **Privacy** window (not shown).
4. In **Advance** window: Select **None** for **Record Routes** then click on **Finish**.

The screenshot shows the 'Interworking Profile' configuration window. The 'Record Routes' section has a radio button selected for 'None'. The 'DTMF Support' section has a radio button selected for 'None'. The 'Finish' button is highlighted with a red box.

Interworking Profile	
Record Routes	<input checked="" type="radio"/> None <input type="radio"/> Single Side <input type="radio"/> Both Sides <input type="radio"/> Dialog-Initiate Only (Single Side) <input type="radio"/> Dialog-Initiate Only (Both Sides)
Include End Point IP for Context Lookup	<input type="checkbox"/>
Extensions	None
Diversion Manipulation	<input type="checkbox"/>
Diversion Condition	None
Diversion Header URI	
Has Remote SBC	<input checked="" type="checkbox"/>
Route Response on Via Port	<input type="checkbox"/>
Relay INVITE Replace for SIPREC	<input type="checkbox"/>
DTMF	
DTMF Support	<input checked="" type="radio"/> None <input type="radio"/> SIP Notify <input type="radio"/> SIP Info <input type="radio"/> Inband
Back Finish	

7.2.4 Signaling Manipulation

The Signaling Manipulation feature allows the ability to add, change and delete any of the headers in a SIP message. This feature will add the ability to configure such manipulation in a highly flexible manner using a proprietary scripting language called SigMa. The SigMa scripting language is designed to express any of the SIP header manipulation operations to be done by the Avaya SBCE.

On outbound calls from the Avaya CS1000, BT Wholesale requires the P-Asserted-Identity (PAI) header should contain either trunk Pilot number or any number in the assigned DID numbers. In this solution test, trunk Pilot number was used.

To define the signaling manipulation, navigate to **Global Profiles > Signaling Manipulation** in the main menu on the left hand side (not shown). Click on **Add** and enter **BT** for the **Title** in the script editor (not shown). The script text is displayed below. Note that the real trunk Pilot number was masked for security reason.

```
within session "INVITE"
{
act on request where %DIRECTION="OUTBOUND" and %ENTRY_POINT="POST_ROUTING"
{
%HEADERS["P-Asserted-Identity"][1].URI.USER = "445600653xxx";
}
}
```

7.2.5 Server Configuration – Session Manager

This section defines the Server Configuration for the Avaya SBCE connection to Session Manager.

1. Navigate to **Global Profiles > Server Configuration** from the left-hand menu.
2. Select **Add** and the **Profile Name** window will open. Enter a Profile Name (e.g., **Session Manager**) and click on **Next** (not shown).
3. The **Edit Server Configuration Profile - General** window will open.
 - Select **Server Type: Call Server**.
 - **IP Address / FQDN: 100.20.2.165** (Session Manager signaling IP Address as configured in **Section 6.4.1**).
 - **Transport: Select TLS**.
 - **Port: 5061**.
 - **TLS Client Profile: Select Avaya**.
 - Click on **Next**.

The screenshot shows the 'Edit Server Configuration Profile - General' window. The fields are as follows:

Field	Value
Server Type	Call Server
SIP Domain	
TLS Client Profile	Avaya
IP Address / FQDN	100.20.2.165
Port	5061
Transport	TLS

Buttons: Add, Delete, Back, Next.

4. The **Add Server Configuration Profile - Authentication** window will open (not shown).
 - Click on **Next** to accept default values.

- The **Add Server Configuration Profile - Heartbeat** window will open.
 - Check **Enable Heartbeat** box.
 - Method:** Select **OPTIONS**.
 - Frequency:** Enter **300** (or desired number of seconds in the range of 30 - 7200).
 - From URI and To URI:** Enter **ping@sipinterop.com**
 - Click on **Next** button.

Add Server Configuration Profile - Heartbeat

Enable Heartbeat	<input checked="" type="checkbox"/>
Method	OPTIONS
Frequency	300 seconds
From URI	ping@sipinterop.com
To URI	ping@sipinterop.com

Back Next

- The **Add Server Configuration Profile - Advanced** window will open.
 - Check **Enable Grooming** box.
 - For **Interworking Profile**, select the profile created for Session Manager in **Section 7.2.2**.
 - Click on **Finish**.

Add Server Configuration Profile - Advanced

Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input checked="" type="checkbox"/>
Interworking Profile	Session Manager
Signaling Manipulation Script	None
Securable	<input type="checkbox"/>
Enable FGDN	<input type="checkbox"/>
TCP Failover Port	5060
TLS Failover Port	5061

Back Finish

7.2.6 Server Configuration – BT Wholesale

Repeat the steps in **Section 7.2.5**, with the following changes, to create a Server Configuration for the Avaya SBCE connection to BT Wholesale.

1. Select **Add Profile** and enter a Profile Name (e.g., **BT**) and click on **Next** (not shown).
2. On the **Edit Server Configuration Profile - General** window, enter the following.
 - Select **Server Type: Trunk Server**.
 - **IP Address / FQDN:** add one FQDN of BT Wholesale SBC server (e.g., **ipcomms-sipt-metro2.bt.com**).
 - **Transport:** Select **UDP**.
 - **Port:** **5060**.
 - Click on **Next**.

The screenshot shows the 'Edit Server Configuration Profile - General' window. The 'Server Type' dropdown is set to 'Trunk Server'. The 'IP Address / FQDN' field contains 'ipcomms-sipt-metro2.bt.com', the 'Port' field contains '5060', and the 'Transport' dropdown is set to 'UDP'. The 'Next' button is highlighted with a red box.

IP Address / FQDN	Port	Transport
ipcomms-sipt-metro2.bt.com	5060	UDP

3. Under **Add Server Configuration Profile – Authentication:**

- Select **Enable Authentication**.
- **User Name:** Enter authentication name provided by BT Wholesale.
- **Realm:** Enter domain name provided by BT Wholesale.
- **Password** and **Confirm Password:** Enter authentication password provided by BT Wholesale.

Add Server Configuration Profile - Authentication X

Enable Authentication

User Name

Realm
(Leave blank to detect from server challenge)

Password

Confirm Password

Back **Next**

4. Under **Add Server Configuration Profile - Heartbeat:**

- Select **Enable Heartbeat**.
- **Method:** Select **REGISTER**.
- **Frequency:** Enter **30** (or desired number of seconds in the range of 30-7200).
- **From URI** and **To URI:** Enter trunk Pilot number 445600653xxx@siptavaya.com.
- Click on **Next** button.

Add Server Configuration Profile - Heartbeat X

Enable Heartbeat

Method

Frequency seconds

From URI

To URI

Back **Next**

5. Under **Add Server Configuration Profile - Advanced** window:
- Select **BT** for **Interworking Profile**.
 - Select **BT** for **Signaling Manipulation Script** as configured in **Section 7.2.4**.

Add Server Configuration Profile - Advanced X

Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input type="checkbox"/>
Interworking Profile	BT ▼
Signaling Manipulation Script	BT ▼
Securable	<input type="checkbox"/>
Enable FGDN	<input type="checkbox"/>
TCP Failover Port	5060
TLS Failover Port	5061

Back Finish

7.2.7 Routing – To Session Manager

This provisioning defines the Routing Profile for the connection to Session Manager.

1. Navigate to **Global Profiles > Routing** from the left-hand menu, and click on **Add** (not shown).
2. Enter a **Profile Name**: (e.g., **Session Manager**) and click **Next** (not shown).
3. The **Routing Profile** window will open. Using the default values shown, click on **Add**.
4. Populate the following fields:
 - **Priority/Weight = 1.**
 - **Server Configuration = Session Manager.**
 - **Next Hop Address:** Verify that the **100.20.2.165:5061 (TLS)** entry from the drop down menu is selected (Session Manager IP address). Also note that the **Transport** field is grayed out.
5. Click on **Finish**.

URI Group	*	Time of Day	default
Load Balancing	Priority	NAPTR	<input type="checkbox"/>
Transport	None	Next Hop Priority	<input checked="" type="checkbox"/>
Next Hop In-Dialog	<input type="checkbox"/>	Ignore Route Header	<input type="checkbox"/>
ENUM	<input type="checkbox"/>	ENUM Suffix	

Add

Priority / Weight	Server Configuration	Next Hop Address	Transport	
1	Session Manager	100.20.2.165:5061 (TLS)	None	Delete

Back **Finish**

7.2.8 Routing – To BT

Repeat the steps in **Section 7.2.7**, with the following changes, to add a Routing Profile for the Avaya SBCE connection to BT Wholesale.

1. On the **Global Profiles** → **Routing** window (not shown), enter a **Profile Name**: (e.g., **BT**).
2. **Load Balancing**: Select **Priority**.
3. Check to **Next Hop Priority**.
4. On the **Routing Profile** window, populate the following fields:
 - **Priority / Weight**: Enter 1.
 - **Server Configuration**: Select **BT**.
 - Click on **Finish**.

URI Group	*	Time of Day	default
Load Balancing	Priority	NAPTR	<input type="checkbox"/>
Transport	None	Next Hop Priority	<input checked="" type="checkbox"/>
Next Hop In-Dialog	<input type="checkbox"/>	Ignore Route Header	<input type="checkbox"/>
ENUM	<input type="checkbox"/>	ENUM Suffix	

Add

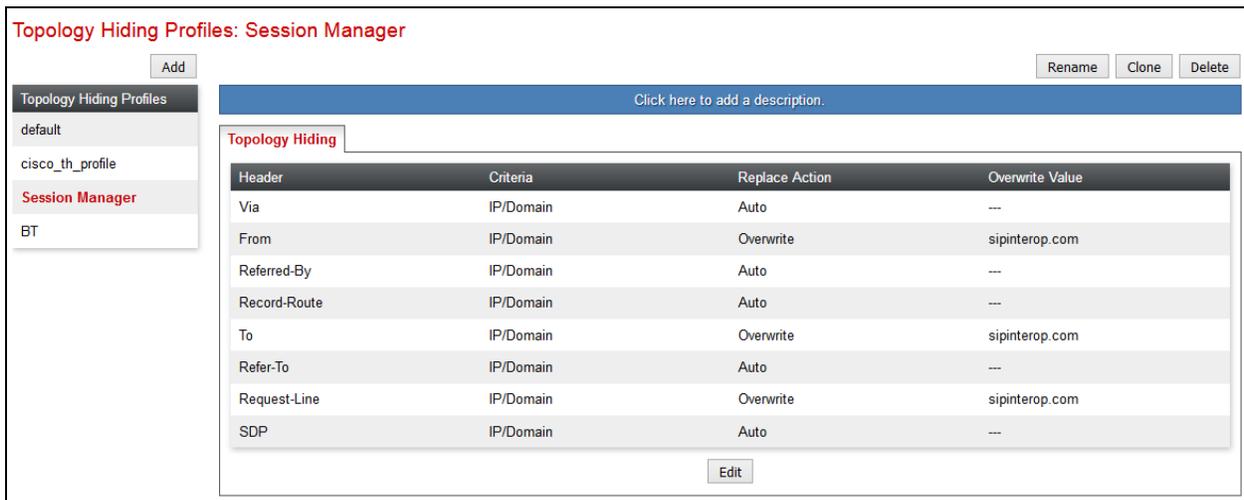
Priority / Weight	Server Configuration	Next Hop Address	Transport	
1	BT	ipcomms-sipt-dynamic-metro2.	None	Delete

Back Finish

7.2.9 Topology Hiding – Session Manager

The **Topology Hiding** screen allows users to manage how various source, destination and routing information in SIP and SDP message headers are substituted or changed to maintain the security of the network. It hides the topology of the enterprise network from external networks.

1. Navigate to **Global Profiles > Topology Hiding** from the left-hand side menu.
2. Click on **Add** button, enter **Profile Name:** (e.g., **Session Manager**), and click **Next** (not shown).
3. The **Topology Hiding Profile** window will open. Click on the **Add Header** button repeatedly to add headers.
4. Populate the fields as shown below, and click on **Finish** (not shown). Note that the **Overwrite Value** is **sipinterop.com**.



Topology Hiding Profiles: Session Manager

Buttons: Add, Rename, Clone, Delete

Click here to add a description.

Topology Hiding

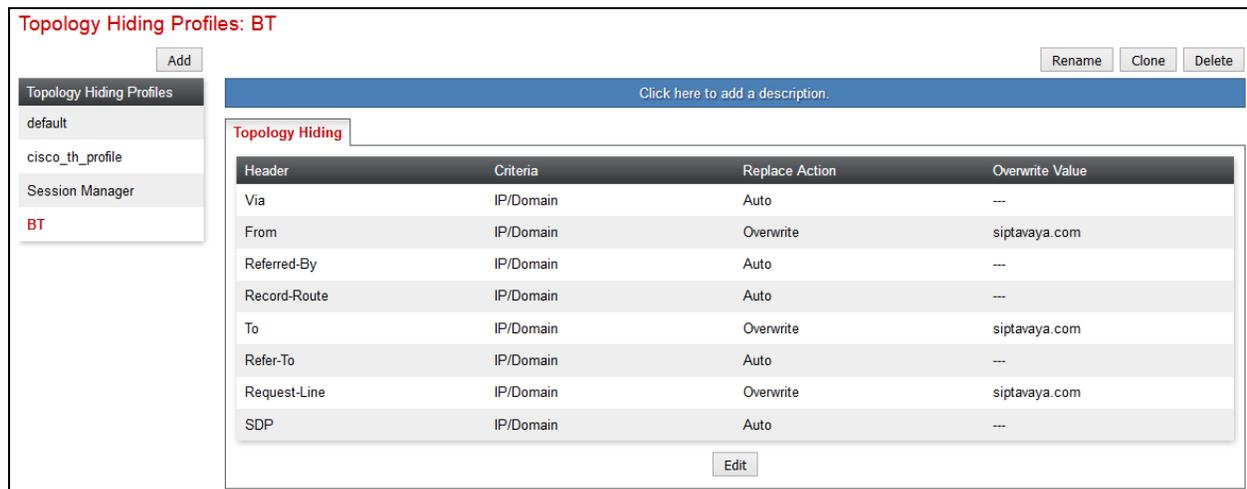
Header	Criteria	Replace Action	Overwrite Value
Via	IP/Domain	Auto	---
From	IP/Domain	Overwrite	sipinterop.com
Referred-By	IP/Domain	Auto	---
Record-Route	IP/Domain	Auto	---
To	IP/Domain	Overwrite	sipinterop.com
Refer-To	IP/Domain	Auto	---
Request-Line	IP/Domain	Overwrite	sipinterop.com
SDP	IP/Domain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

Buttons: Edit

7.2.10 Topology Hiding – BT

Repeat the steps in **Section 7.2.9**, with the following changes, to create a Topology Hiding Profile for the Avaya SBCE connection to BT Wholesale.

1. Enter a **Profile Name**: (e.g., **BT**).
2. Click on the **Add Header** button repeatedly to add headers.
3. Populate the fields as shown below, and click on **Finish** (not shown). Note that the **Overwrite Value** is **siptavaya.com**.



Topology Hiding Profiles: BT

Click here to add a description.

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

7.3 Domain Policies

The Domain Policies feature allows users to configure, apply and manage various rule sets (policies) to control unified communications based upon various criteria of communication sessions originating from or terminating in the enterprise.

7.3.1 Application Rules

Ensure that the Application rule used in the End Point Policy Group reflects the licensed sessions that the customer has purchased. In the lab setup, the default rule was used.

Note: It is not recommended to edit default rules. New rules should be added or cloned from default rules.

7.3.2 Border Rules

The Border rules specifies if NAT is utilized (on by default), as well as detecting SIP and SDP published IP addresses. In the solution as tested, the **default** rule was utilized. No customization was required.

7.3.3 Media Rules

The Media rules will be applied to both directions. In the solution as tested, the **default-low-med** rule was utilized. No customization was required.

7.3.4 Security Rules

The Security rule will be applied to both directions. In the solution as tested, the **default-low** rule was utilized. No customization was required.

7.3.5 Signaling Rules

Signaling rules are a mechanism on the Avaya SBCE to manipulate the signaling beyond simple header manipulation. Signaling rules allow action to be taken (Allow, Block, Block with Response, etc.) for each type of SIP-specific signaling request and response message.

In the flow to BT Wholesale, the SIP messages are manipulated to avoid the overhead of re-assembling fragmented UDP packets, reduce packet size and removed unnecessary headers. This is achieved by removing Avaya proprietary and unnecessary headers to reduce the SIP messages packet size to below the Maximum Transmission Unit (MTU) so that fragmentation does not occur.

To define the signaling rule, navigate to **Domain Policies > Signaling Rules** in the main menu on the left hand side.

1. Click on **Add** and enter details in the **Signaling Rule** pop-up box. In the **Rule Name** field enter a descriptive name such as **Session Manager** for the signaling rule to remove Avaya proprietary and unnecessary headers.
2. Click on **Next** and **Next** again, then **Finish** (not shown).

The screenshot shows the 'Signaling Rules: Session Manager' configuration page. On the left, a sidebar lists 'Signaling Rules' with sub-items 'default', 'No-Content-Type-Checks', and 'Session Manager' (highlighted in red). The main area has an 'Add' button, a 'Filter By Device...' dropdown, and 'Rename', 'Clone', and 'Delete' buttons. Below this is a blue bar with 'Click here to add a description.' and tabs for 'General', 'Requests', 'Responses', 'Request Headers', 'Response Headers', 'Signaling QoS', and 'UCID'. The 'General' tab is active, showing 'Inbound' and 'Outbound' sections. Each section has a table with columns for 'Request Headers', 'Response Headers', and 'Action'. The 'Content-Type Policy' section has a checked 'Enable Content-Type Checks' box and a table with 'Action' set to 'Allow' and 'Multipart Action' set to 'Allow'. An 'Exception List' field is at the bottom.

Direction	Request Headers	Response Headers	Action
Inbound	Requests		Allow
	Non-2XX Final Responses		Allow
	Optional Request Headers		Allow
	Optional Response Headers		Allow
Outbound	Requests		Allow
	Non-2XX Final Responses		Allow
	Optional Request Headers		Allow
	Optional Response Headers		Allow

Section	Field	Value
Content-Type Policy	Enable Content-Type Checks	<input checked="" type="checkbox"/>
	Action	Allow
Multipart Action	Multipart Action	Allow
	Exception List	Exception List

Select the **Request Headers** tab (not shown) and define the rules to remove Avaya proprietary headers and unnecessary headers as follows:

- Click on **Add In Header Control** (not shown).

- Check the **Proprietary Request Header** box to remove Avaya proprietary headers or uncheck it to remove unnecessary headers.
- Enter the name of the header to be removed in the **Header Name** field.
- Select **ALL** in the **Method Name** field.
- Check **Forbidden** in the **Header Criteria** options.
- In the **Presence Action** drop down menu, select **Remove Header**.
- Click on **Finish**.

The following example shows configuration for removal of **P-Location** header from request messages.

The screenshot shows a dialog box titled "Edit Header Control" with a close button (X) in the top right corner. The dialog contains the following fields and options:

- Proprietary Request Header:** A checkbox that is checked.
- Header Name:** A text input field containing "P-Location".
- Method Name:** A dropdown menu with "ALL" selected.
- Header Criteria:** Three radio button options: "Forbidden" (selected), "Mandatory", and "Optional".
- Presence Action:** A dropdown menu with "Remove header" selected.
- Below the Presence Action dropdown, there are two buttons: "486" and "Busy Here".
- At the bottom center of the dialog is a "Finish" button.

Note: During the test, the same was done for **Alert-Info**, **Av-Global-Session-ID**, **P-AV-Message-Id**, **P-Charging-Vector**, **x-nt-e164-clid** and **P-Location** headers.

When finished, all the Request Headers defined will be displayed under the Request Headers tab as shown below.

The screenshot shows the 'Signaling Rules: Session Manager' interface. On the left is a sidebar with 'Session Manager' selected. The main area has tabs for 'General', 'Requests', 'Responses', 'Request Headers', 'Response Headers', 'Signaling QoS', and 'UCID'. The 'Request Headers' tab is active, displaying a table with the following data:

Row	Header Name	Method Name	Header Criteria	Action	Proprietary	Direction		
1	Alert-Info	ALL	Forbidden	Remove Header	No	IN	Edit	Delete
2	Av-Global-Session-ID	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
3	P-AV-Message-Id	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
4	P-Charging-Vector	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
5	P-Location	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
6	x-nt-e164-clid	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete

The same is required for **Response Headers**. Select the **Response Headers** tab (not shown) and define the rules to remove Avaya proprietary headers as follows:

- Click on **Add In Header Control** (not shown).
- Check the **Proprietary Request Header** box to remove Avaya proprietary headers or uncheck it to remove unnecessary headers.
- Enter the name of the header to be removed in the **Header Name** field.
- Select **1XX** in the **Response Code** drop down menu, this will remove the header from 183 Session Progress and 180 Ringing messages.
- Select **ALL** in the **Method Name** field.
- Check **Forbidden** in the **Header Criteria** options.
- In the **Presence Action** drop down menu, select **Remove Header**.
- Click on **Finish**.

Repeat above process and select **2XX** in the **Response Code** so that the header is removed from 200 OK messages.

The following example shows configuration for removal of **Av-Global-Session-ID** header from 1XX responses.

Proprietary Response Header	<input checked="" type="checkbox"/>
Header Name	Av-Global-Session-ID
Response Code	1XX
Method Name	ALL
Header Criteria	<input checked="" type="radio"/> Forbidden <input type="radio"/> Mandatory <input type="radio"/> Optional
Presence Action	Remove header
	486 Busy Here
Finish	

Note: During the test, the same was done for **Alert-Info**, **Av-Global-Session-ID**, **Endpoint-View**, **P-AV-Message-Id**, **P-Charging-Vector** and **P-Location** headers.

When finished, all the **Response Headers** defined will be shown under the **Response Headers** tab as shown below.

Signaling Rules: Session Manager

Add Filter By Device... Rename Clone Delete

Click here to add a description.

Signaling Rules
default
No-Content-Type-Checks
Session Manager

General Requests Responses Request Headers Response Headers Signaling QoS UCID

Add In Header Control Add Out Header Control

Row	Header Name	Response Code	Method Name	Header Criteria	Action	Proprietary	Direction		
1	Alert-Info	1XX	ALL	Forbidden	Remove Header	No	IN	Edit	Delete
2	Alert-Info	2XX	ALL	Forbidden	Remove Header	No	IN	Edit	Delete
3	Av-Global-Session-ID	1XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
4	Av-Global-Session-ID	2XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
5	P-AV-Message-Id	1XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
6	P-AV-Message-Id	2XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
7	P-Charging-Vector	1XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
8	P-Charging-Vector	2XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
9	P-Location	1XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
10	P-Location	2XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
11	x-nt-e164-clid	1XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete
12	x-nt-e164-clid	2XX	ALL	Forbidden	Remove Header	Yes	IN	Edit	Delete

7.3.6 Endpoint Policy Groups

End point policy groups are required to implement the signaling rules. In the solution as tested, one group was defined.

To add a new policy group for Session Manager, navigate to **Domain Policies > End Point Policy Groups** in the main menu on the left hand side:

1. Click on **Add** button to add a new policy group, name it as **Session Manager**.
2. Select **default** for **Application Rules**.
3. Select **default** for **Border Rules**.
4. Select **default-low-med** for **Media Rules**.
5. Select **default-low** for **Security Rules**.
6. Select **Session Manager** (created in **Section 7.3.5**) for **Signaling Rules**.

Policy Groups: Session Manager

Add Filter By Device... Rename Clone Delete

Policy Groups

- default-low
- default-low-enc
- default-med
- default-med-enc
- default-high
- default-high-enc
- avaya-def-low-enc
- avaya-def-high-subscriber
- avaya-def-high-server
- Session Manager**

Click here to add a description.

Hover over a row to see its description.

Policy Group Summary

Order	Application	Border	Media	Security	Signaling	Edit
1	default	default	default-low-med	default-low	Session Manager	Edit

7.4 Device Specific Settings

The **Device Specific Settings** feature for SIP allows you to view aggregate system information, and manage various device-specific parameters which determine how a particular device will function when deployed in the network. Specifically, you have the ability to define and administer various device-specific protection features such as Message Sequence Analysis (MSA) functionality, end-point and session call flows.

7.4.1 Network Management

1. Select **Device Specific Settings** > **Network Management** from the menu on the left-hand side.
2. The **Interfaces** tab displays the enabled/disabled interfaces. In the reference configuration, interfaces A1 (private) and B1 (public) interfaces are used.

Network Management: sbce

Devices
sbce

Interfaces Networks

Interface Name	VLAN Tag	Status
A1		Enabled
A2		Disabled
B1		Enabled

Add VLAN

3. Select the **Networks** tab to display the IP provisioning for the A1 and B1 interfaces. These values are normally specified during installation. These can be modified by selecting **Edit**; however, some of these values may not be changed if associated provisioning is in use.

Network Management: sbce

Devices
sbce

Interfaces Networks

Name	Gateway	Subnet Mask / Prefix Length	Interface	IP Address	
A1	10.128.197.1	255.255.255.192	A1	10.128.197.22	Edit Delete
B1	103.199.xx	255.255.255.240	B1	103.199.xx	Edit Delete

Add

7.4.2 Media Interfaces

1. Navigate to **Device Specific Settings** from the menu on the left-hand side (not shown).
2. Select **Media Interface**.
3. Click on **Add** (not shown). The **Add Media Interface** window will open. Enter the following:
 - **Name: Int_med.**
 - **IP Address: 10.128.197.22** (Avaya SBCE A1 address).
 - **Port Range: 35000-40000.**
4. Click on **Finish** (not shown).

5. Click on **Add** (not shown). The **Add Media Interface** window will open. Enter the following:
 - **Name: Ext_med.**
 - **IP Address: 103.199.x.x** (Avaya SBCE B1 address).
6. **Port Range: 35000-40000.**
7. Click on **Finish** (not shown). Note that changes to these values require an application restart. The completed **Media Interface** screen is shown below.

Media Interface: sbce

Devices

sbce

Media Interface

Modifying or deleting an existing media interface will require an application restart before taking effect. Application restarts can be issued from [System Management](#).

[Add](#)

Name	Media IP Network	Port Range	
Int_med	10.128.197.22 A1 (A1, VLAN 0)	35000 - 40000	Edit Delete
Ext_med	103.199.x.x B1 (B1, VLAN 0)	35000 - 40000	Edit Delete

7.4.3 Signaling Interface

1. Navigate to **Device Specific Settings** from the menu on the left-hand side (not shown).
2. Select **Signaling Interface**.
3. Click on **Add** (not shown) and enter the following:
 - **Name: Int_sig.**
 - **IP Address: 10.128.197.22** (Avaya SBCE A1 address).
 - **TLS Port: 5061.**
4. Click on **Finish** (not shown).
5. Click on **Add** again, and enter the following:
 - **Name: Ext_sig.**
 - **IP Address: 103.199.x.x** (Avaya SBCE B1 address).
 - **UDP Port: 5060.**
6. Click on **Finish** (not shown). Note that changes to these values require an application restart.

Signaling Interface: sbce

Devices

sbce

Signaling Interface

Modifying or deleting an existing signaling interface will require an application restart before taking effect. Application restarts can be issued from [System Management](#).

[Add](#)

Name	Signaling IP Network	TCP Port	UDP Port	TLS Port	TLS Profile	
Ext_sig	103.199.x.x B1 (B1, VLAN 0)	---	5060	---	None	Edit Delete
Int_sig	10.128.197.22 A1 (A1, VLAN 0)	---	---	5061	internalServer	Edit Delete

7.4.4 Endpoint Flows – For Session Manager

1. Navigate to **Device Specific Settings** → **Endpoint Flows** from the menu on the left-hand side (not shown).
2. Select the **Server Flows** tab (not shown).
3. Click on **Add**, (not shown) and enter the following:
 - **Name: Session Manager.**
 - **Server Configuration: Session Manager.**
 - **URI Group: ***
 - **Transport: ***
 - **Remote Subnet: ***
 - **Received Interface: Ext_sig.**
 - **Signaling Interface: Int_sig.**
 - **Media Interface: Int_med.**
 - **End Point Policy Group: Session Manager.**
 - **Routing Profile: BT.**
 - **Topology Hiding Profile: Session Manager.**
 - Let other values default.
4. Click on **Finish**.

Edit Flow: Session Manager X

Flow Name	<input type="text" value="Session Manager"/>
Server Configuration	<input type="text" value="Session Manager"/>
URI Group	<input type="text" value="*"/>
Transport	<input type="text" value="*"/>
Remote Subnet	<input type="text" value="*"/>
Received Interface	<input type="text" value="Ext_sig"/>
Signaling Interface	<input type="text" value="Int_sig"/>
Media Interface	<input type="text" value="Int_med"/>
Secondary Media Interface	<input type="text" value="None"/>
End Point Policy Group	<input type="text" value="Session Manager"/>
Routing Profile	<input type="text" value="BT"/>
Topology Hiding Profile	<input type="text" value="Session Manager"/>
Signaling Manipulation Script	<input type="text" value="None"/>
Remote Branch Office	<input type="text" value="Any"/>

7.4.5 Endpoint Flows – For BT Wholesale

Repeat step 1 through 4 from Section 7.4.4, with the following changes:

- **Name:** BT.
- **Server Configuration:** BT.
- **Received Interface:** Int_sig.
- **Signaling Interface:** Ext_sig.
- **Media Interface:** Ext_sig.
- **End Point Policy Group:** default-low.
- **Routing Profile:** Session Manager.
- **Topology Hiding Profile:** BT.

Flow Name	BT
Server Configuration	BT
URI Group	*
Transport	*
Remote Subnet	*
Received Interface	Int_sig
Signaling Interface	Ext_sig
Media Interface	Ext_med
Secondary Media Interface	None
End Point Policy Group	default-low
Routing Profile	Session Manager
Topology Hiding Profile	BT
Signaling Manipulation Script	None
Remote Branch Office	Any

Finish

8. Verification Steps

The following steps may be used to verify the configuration.

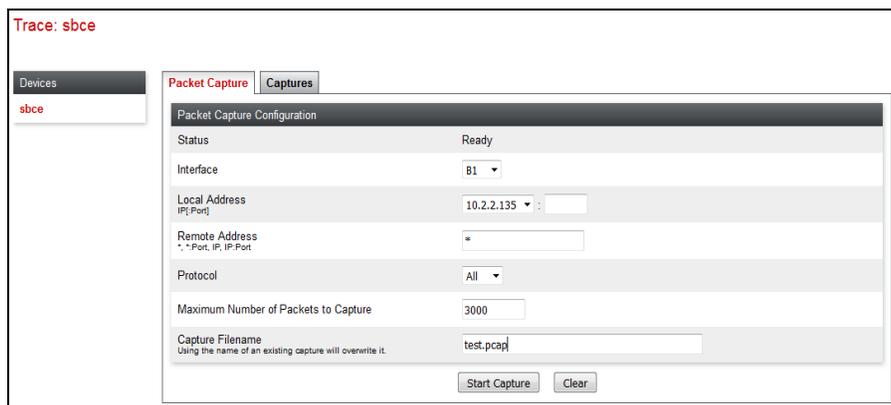
8.1 Avaya Session Border Controller for Enterprise

Log into the Avaya SBCE as shown in **Section 7**. Across the top of the display are options to display **Alarms, Incidents, Logs, and Diagnostics**. In addition, the most recent Incidents are listed in the lower right of the screen.

Protocol Traces

The Avaya SBCE can take internal traces of specified interfaces.

1. Navigate to **Device Specific Settings → Troubleshooting → Trace**.
2. Select the **Packet Capture** tab and select the following:
 - Select the desired **Interface** from the drop down menu (e.g., **All**).
 - Specify the **Maximum Number of Packets to Capture** (e.g., **5000**).
 - Specify a **Capture Filename** (e.g., **test.pcap**).
 - Unless specific values are required, the default values may be used for the **Local Address, Remote Address, and Protocol** fields.
 - Click **Start Capture** to begin the trace.

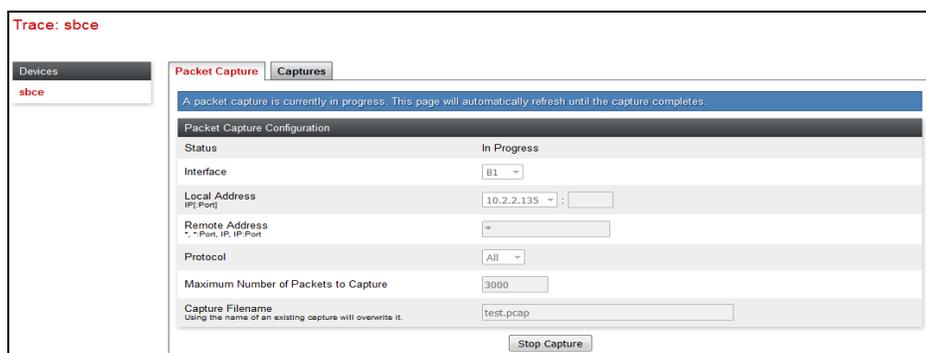


The screenshot shows the 'Packet Capture Configuration' window in the Avaya SBCE interface. The status is 'Ready'. The configuration includes:

Field	Value
Status	Ready
Interface	B1
Local Address (IP:Port)	10.2.2.135 : []
Remote Address (*Port, IP, IP:Port)	[]
Protocol	All
Maximum Number of Packets to Capture	3000
Capture Filename (Using the name of an existing capture will overwrite it.)	test.pcap

Buttons: Start Capture, Clear

The capture process will initialize and then display the following **In Progress** status window:



The screenshot shows the 'Packet Capture Configuration' window in the Avaya SBCE interface. The status is 'In Progress'. A message at the top reads: 'A packet capture is currently in progress. This page will automatically refresh until the capture completes.' The configuration fields are the same as in the previous screenshot.

Field	Value
Status	In Progress
Interface	B1
Local Address (IP:Port)	10.2.2.135 : []
Remote Address (*Port, IP, IP:Port)	[]
Protocol	All
Maximum Number of Packets to Capture	3000
Capture Filename (Using the name of an existing capture will overwrite it.)	test.pcap

Buttons: Stop Capture

3. Run the test.
4. When the test is completed, select the **Stop Capture** button shown above.
5. Click on the **Captures** tab and the packet capture is listed as a *.pcap* file with the date and time added to filename specified in **Step 2**.
6. Click on the **File Name** link to download the file and use Wireshark to open the trace.

Trace: sbce

Devices

Packet Capture

Captures

Refresh

File Name	File Size (bytes)	Last Modified	Delete
test_20160405184126.pcap	0	April 5, 2016 6:41:26 PM AEST	Delete

The following section details various methods and procedures to help diagnose call failure or service interruptions. As detailed in previous sections, the demarcation point between the BT Wholesale Hosted SIP Trunking Service and the customer SIP PABX is the customer SBC.

On either side of the SBC, various diagnostic commands and tools may be used to determine the cause of the service interruption. These diagnostics can include:

- Ping from the SBC to the network gateway.
- Ping from the SBC to DNS.
- Note any Incidents or Alarms on the Dashboard screen of the SBC.

Diagnostics

Devices
sbce

Full Diagnostic

Ping Test

Outgoing pings from this device can only be sent via the primary IP (determined by the OS) of each respective interface or VLAN.

Start Diagnostic

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 (10.128.197.1)	Average ping from 10.128.197.22 [A1] to 10.128.197.1 is 0.288ms.
✗ Ping: SBC (A1) to Primary DNS (8.8.8.8)	Error: Unable to reach 8.8.8.8 from 10.128.197.22 [A1].
✓ Ping: SBC (B1) to Gateway (103.199.6.17)	Average ping from 103.199.6.29 [B1] to 103.199.6.17 is 2.445ms.
✓ Ping: SBC (B1) to Primary DNS (8.8.8.8)	Average ping from 103.199.6.29 [B1] to 8.8.8.8 is 43.468ms.

Incident Viewer



Device Category

Displaying results 1 to 15 out of 44.

Type	ID	Date	Time	Category	Device	Cause
Server Heartbeat	729881580397602	4/4/16	7:46 PM	Policy	sbce	Heartbeat Successful, Server is UP
Server Heartbeat	729881580396121	4/4/16	7:46 PM	Policy	sbce	Heartbeat Successful, Server is UP
Server Heartbeat	729881580393451	4/4/16	7:46 PM	Policy	sbce	Heartbeat Successful, Server is UP
Server Heartbeat	729881402194116	4/4/16	7:40 PM	Policy	sbce	Heartbeat Successful, Server is UP

8.2 Avaya CS1000

SIP Trunk monitoring (ld 32): Place an inbound call from PSTN to an Avaya CS1000 phone. Then check the SIP trunk status by using **ld 32**, and verify one trunk is **BUSY**.

```
>ld 32
NPR000
.stat 92 0
009 UNIT(S) IDLE
001 UNIT(S) BUSY
000 UNIT(S) DSBL
000 UNIT(S) MBSY
```

After the call is released, check that SIP trunk status. It should change to the **IDLE** state.

```
>ld 32
NPR000
.stat 92 0
010 UNIT(S) IDLE
000 UNIT(S) BUSY
000 UNIT(S) DSBL
000 UNIT(S) MBSY
```

8.3 Avaya Aura® Session Manager Status

The Session Manager configuration may be verified via System Manager.

- Using the procedures described in **Section 6**, access the System Manager GUI. From the **Home** screen, under the **Elements** heading, select **Session Manager**.

Session Manager Dashboard

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

Session Manager Instances

Service State: Shutdown System As of 10:52 AM

Session Manager	Type	Tests Pass	Alarms	Security Module	Service State	Entity Monitoring	Active Call Count	Registrations	Data Replication	User Data Storage Status	License Mode	Version
sm01	Core	✓	0/0/0	Up	Accept New Service	0/2	0	0/0	✓	✓	Normal	7.0.1.2.701230

- The Session Manager Dashboard is displayed. Note that the **Test Passed**, **Alarms**, **Service State**, and **Data Replication** columns.
- Clicking on the **0/2** entry in the **Entity Monitoring** column, results in the following display:

Session Manager Entity Link Connection Status

This page displays detailed connection status for all entity links from a Session Manager.

All Entity Links for Session Manager: sm01

Summary View

Status Details for the selected Session Manager:

SIP Entity Name	SIP Entity Resolved IP	Port	Proto.	Deny	Conn. Status	Reason Code	Link Status
cs1k	100.20.2.197	5061	TLS	FALSE	UP	200 OK	UP
sbce-A1	10.128.197.22	5061	TLS	FALSE	UP	403 Forbidden-Source Endpoint Lookup Failed	UP

8.4 Telephony Services

- Place inbound/outbound calls, answer the calls, and verify that two-way talk path exists. Verify that the call remains stable for several minutes and disconnects properly.
- Verify basic call functions such as hold, transfer, and conference.
- Verify the use of DTMF signaling.

9. Conclusion

As illustrated in these Application Notes, Avaya Communication Server 1000 Release 7.6 SP8, Avaya Aura® Session Manager Release 7.0.1 SP2, and Avaya Session Border Control for Enterprise Release 7.1 SP2 can be configured to interoperate successfully with BT Wholesale Hosted SIP Trunking Service. This solution allows enterprise users access to the PSTN using the BT Wholesale Hosted SIP Trunking Service connection. Please refer to **Section 2.2** for exceptions.

10. Additional References

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

- [1] *Deploying Avaya Aura® System Manager Release 7.0.1.*
- [2] *Administering Avaya Aura® System Manager for Release 7.0.1.*
- [3] *Administering Avaya Aura® Session Manager Release 7.0.1.*
- [4] *Deploying Avaya Aura Session Manager Release 7.0.1.*
- [5] *Deploying Avaya SBCE on VMware in Virtualized Environment Release 7.1.*
- [6] *Administering Avaya Session Border Controller Release 7.1.*
- [7] *Document Collection - Communication Server 1000 Release 7.6.*
- [8] *RFC 3261 SIP: Session Initiation Protocol*, <http://www.ietf.org/>
- [9] *RFC 3515, The Session Initiation Protocol (SIP) Refer Method*, <http://www.ietf.org/>
- [10] *RFC 2833 RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*, <http://www.ietf.org/>

Product documentation for BT Wholesale Hosted SIP Trunking Service is available from BT Wholesale.

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