



Avaya Solution & Interoperability Test Lab

Application Notes for Configuring Avaya Aura® Communication Manager R7.0, Avaya Aura® Session Manager R7.0 and Avaya Session Border Controller for Enterprise R7.0 to support BT Ireland SIP Trunk Service - Issue 1.0

Abstract

These Application Notes describe the steps used to configure Session Initiation Protocol (SIP) trunking between BT Ireland SIP Trunk Service and an Avaya SIP enabled Enterprise Solution. The Avaya solution consists of Avaya Session Border Controller for Enterprise, Avaya Aura® Session Manager and Avaya Aura® Communication Manager as an Evolution Server. BT Ireland is a member of the 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 the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe the steps used to configure Session Initiation Protocol (SIP) trunking between the BT Ireland SIP Trunk Service and an Avaya SIP-enabled enterprise solution. The Avaya solution consists of the following: Avaya Aura® Communication Manager R7.0 (Communication Manager); Avaya Aura® Session Manager R7.0 (Session Manager); Avaya Session Border Controller for Enterprise R7.0 (Avaya SBCE). Note that the shortened names shown in brackets will be used throughout the remainder of the document. Customers using this Avaya SIP-enabled enterprise solution with the BT Ireland SIP Trunk Service are able to place and receive PSTN calls via a dedicated Internet connection and the SIP protocol. This converged network solution is an alternative to traditional PSTN trunks. This approach generally results in lower cost for the enterprise customer.

2. General Test Approach and Test Results

The general test approach was to configure a simulated enterprise site using an Avaya SIP telephony solution consisting of Communication Manager, Session Manager and Avaya SBCE. The enterprise site was configured to connect to the BT Ireland SIP Trunk Service.

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

2.1. Interoperability Compliance Testing

The interoperability test included the following:

- Incoming calls to the enterprise site from PSTN phones using the BT Ireland SIP Trunk Service, calls made to SIP and H.323 telephones at the enterprise.
- Outgoing calls from the enterprise site completed via the BT Ireland SIP Trunk Service to PSTN destinations, calls made from SIP and H.323 telephones.
- Calls using the G.711A and G.729A codecs.
- Fax calls to/from a Group 3 fax machine to a PSTN connected fax machine using T.38.
- DTMF transmission using RFC 2833 with successful Voice Mail/Vector navigation for inbound and outbound calls.
- User features such as hold and resume, transfer, conference, call forwarding, etc.
- Caller ID Presentation and Caller ID Restriction.
- Direct IP-to-IP media between the Avaya SBCE and the SIP and H.323 telephones.
- Call coverage and call forwarding for endpoints at the enterprise site.
- Transmission and response of SIP OPTIONS messages sent by the BT Ireland SIP Trunk Service requiring Avaya response and sent by Avaya requiring BT Ireland response.

2.2. Test Results

Interoperability testing of the sample configuration was completed with successful results for the BT Ireland SIP Trunk Service with the following observations:

- The Avaya SBCE did not function correctly with authentication, once the second INVITE was sent, the Avaya SBCE did not pass on any incoming messages from the network. At the time of testing, this was resolved by installing patch sbc700-p001-20151005-7.0.0-21.x86_64.rpm, described in Product Support Notice PSN004619u on the Avaya Support Website.
- The BT Ireland SIP Trunk was unable to handle SIP messages with an Avaya proprietary parameter in the Contact header. The parameter is “+avaya-cm-keep-mpro” and is present with a value of “no” when the Media Gateway is not used for call set-up i.e., when Initial IP-IP Direct Media is used on Communication Manager SIP Trunk. It was not possible to remove this parameter using the Header Manipulation tab in the Server Interworking profile in the Avaya SBCE, since this function was unable to handle a parameter with anything other than letters and dashes. A fault report AURORA-7477 was raised to address this issue. In the meantime, a Sigma Script in the Signalling Manipulation function in the Avaya SBCE was used to remove the parameter (See **Section 7.5**).
- Communication Manager uses empty INVITE messages when shuffling, and these are not supported by BT Ireland. To resolve this, “Delayed SDP” was configured on the Avaya SBCE which inserts an SDP into the INVITE message (See **Section 7.4**).
- When calling a busy extension from the PSTN, the network attempted to re-route the call via the alternative network SBC when it received 486 Busy Here. Though this is desirable behaviour under network failure conditions, it isn’t necessary when the failure is at the end point.
- Inbound Toll-Free calls were not tested as there was no Inbound Toll-Free access available
- Emergency calls were not tested as no test call was booked with the Emergency Services Operator.
- When Calling Party Number restriction (CLIR) on inbound calls was tested first, the number was displayed on H.323 phones. The CLI was present in the From and P-Asserted-ID headers and the Privacy header was present with a value of “id”. This value applies to P-Asserted-ID and when used, the calling number should not be present in the From header. After a fix from BT Ireland, CLIR was re-tested. It was observed that the From header contained “anonymous@anonymous.invalid” and the number was not displayed on H.323 phones as expected.
- When testing call forwarding, no ringback was heard on the calling phone at first. Initial IP-IP Direct Media was turned off on Communication Manager which caused it to use shuffling on call set-up whereby media is initially connected via the Media Gateway. Ringback was heard on subsequent tests.
- During the first test of Blind Call transfer to a PSTN phone, two ringbacks were heard. One was from the far end and the other was from Communication Manager. BT Ireland send 180 Ringing with SDP for early media, Communication Manager plays ringback when it receives 180 Ringing. This was resolved by changing the 180 Ringing to 183 Session Progress on the Avaya SBC so that only ringback from the far end is heard.

- When Avaya one-X® Communicator was tested in SIP mode using a Communication Manager extension as the “Other Phone”, no ringback was heard on outgoing calls. Ringback was present when a PSTN phone was used as the “Other Phone”.

2.3. Support

For technical support on BT Ireland products please contact BT Ireland on 1800 924 929 or visit their website at www.btireland.com

3. Reference Configuration

Figure 1 illustrates the test configuration. The test configuration shows an Enterprise site connected to the BT Ireland SIP Trunk Service. Located at the Enterprise site is an Avaya SBCE, Session Manager and Communication Manager. Endpoints are Avaya 96x0 series and Avaya 96x1 series IP deskphones (with SIP and H.323 firmware), Avaya 16xx series IP deskphones (with H.323 firmware), Avaya analogue telephones and an analogue fax machine. Also included in the test configuration was an Avaya one-X® Communicator soft phone and Avaya Communicator for Windows running on laptop PCs.

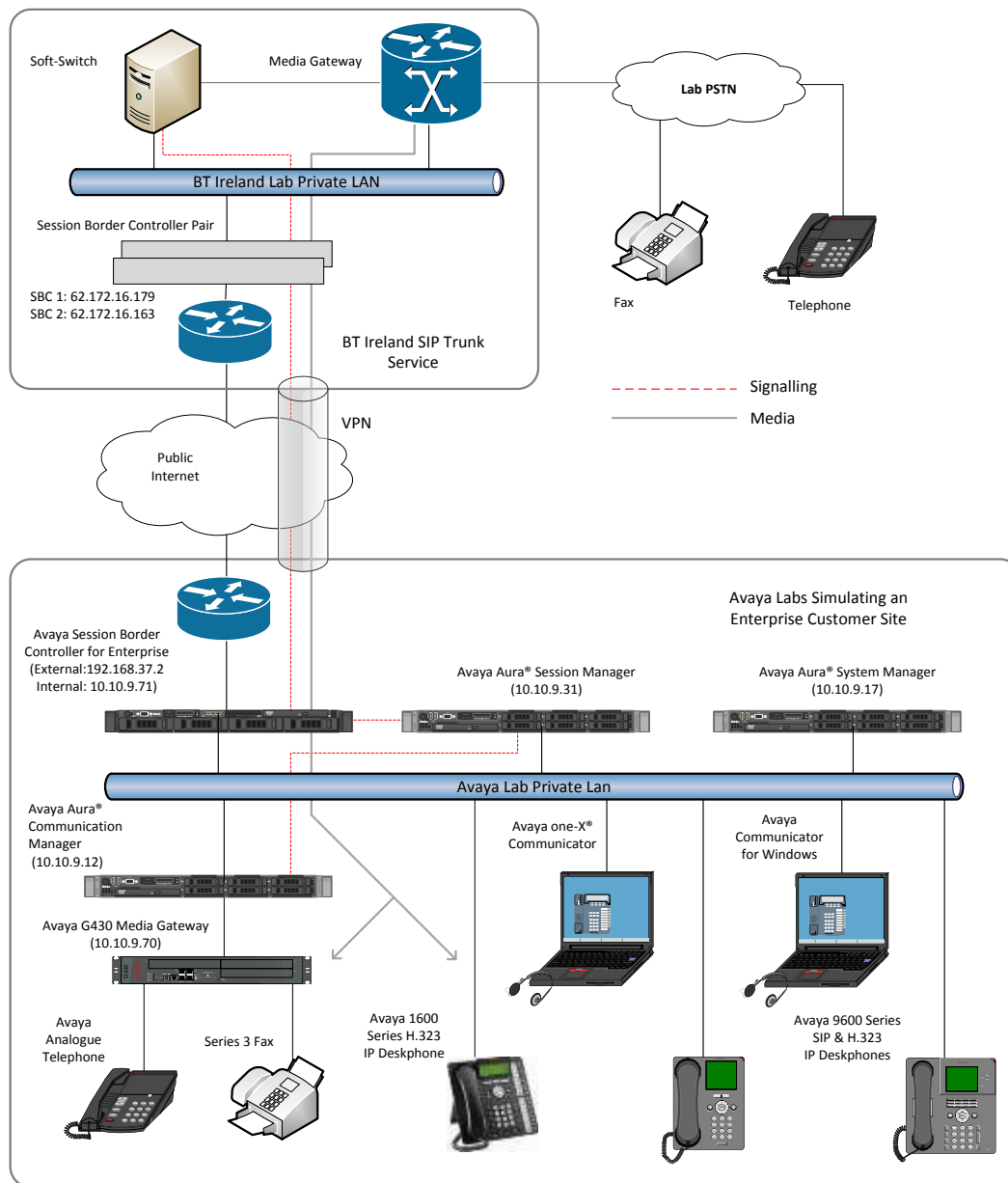


Figure 1: Test Setup BT Ireland SIP Trunk Service to Avaya Enterprise

4. Equipment and Software Validated

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

Equipment/Software	Release/Version
Avaya	
Avaya Aura® Session Manager	7.0.0.0.700007
Avaya Aura® System Manager	7.0.0.0.16266
Avaya Aura® Communication Manager	7.0-441 Build 0.22477
Avaya Session Border Controller for Enterprise	7.0.0-21-6602 Patch sbc700-p001-20151005-7.0.0-21.x86_64.rpm
Avaya G430 Media Gateway	37.19.0
Avaya Aura® Media Server	7.7.0.236_2015.07.24
Avaya 96x0 Deskphone (SIP)	2_6_14_5
Avaya 9608 Deskphone (SIP)	7.0.0 R39
Avaya 96x0 Deskphone (H.323)	3.230A
Avaya 9608 Deskphone (H.323)	6.3116
Avaya 1616 Deskphone (H.323)	1.380B
Avaya One-X Communicator	6.2.7.03-SP7
Avaya Communicator for Windows	2.1.2.75
Avaya 2400 Series Digital Handsets	N/A
Analogue Handset	N/A
Analogue Fax	N/A
BT Ireland	
Genband Annapolis SBC S3	V8.3.2.0
Genband A2 Call Server	MCP_17.0.18.5

5. Configure Avaya Aura® Communication Manager

This section describes the steps for configuring Communication Manager for SIP Trunking. SIP trunks are established between Communication Manager and Session Manager. These SIP trunks will carry SIP signalling associated with the BT Ireland SIP Trunk Service. For incoming calls, Session Manager receives SIP messages from the Avaya SBCE and directs the incoming SIP messages to Communication Manager. Once the message arrives at Communication Manager further incoming call treatment, such as incoming digit translations and class of service restrictions may be performed. All outgoing calls to the PSTN are processed within Communication Manager and may be first subject to outbound features such as automatic route selection, digit manipulation and class of service restrictions. Once Communication Manager selects a SIP trunk, the SIP signalling is routed to Session Manager. Session Manager directs the outbound SIP messages to the Avaya SBCE at the enterprise site that then sends the SIP messages to the BT Ireland network. Communication Manager configuration was performed using the System Access Terminal (SAT). Some screens in this section have been abridged and highlighted for brevity and clarity in presentation. The general installation of the Servers and Avaya G430 Media Gateway is presumed to have been previously completed and is not discussed here.

5.1. Confirm System Features

The license file installed on the system controls the maximum values for these attributes. If a required feature is not enabled or there is insufficient capacity, contact an authorised Avaya sales representative to add additional capacity. Use the **display system-parameters customer-options** command and on **Page 2**, verify that the **Maximum Administered SIP Trunks** supported by the system is sufficient for the combination of trunks to the BT Ireland SIP Trunk Service and any other SIP trunks used.

display system-parameters customer-options		Page	2 of 12
OPTIONAL FEATURES			
IP PORT CAPACITIES		USED	
	Maximum Administered H.323 Trunks:	4000	0
	Maximum Concurrently Registered IP Stations:	2400	3
	Maximum Administered Remote Office Trunks:	4000	0
	Maximum Concurrently Registered Remote Office Stations:	2400	0
	Maximum Concurrently Registered IP eCons:	68	0
	Max Concur Registered Unauthenticated H.323 Stations:	100	0
	Maximum Video Capable Stations:	2400	0
	Maximum Video Capable IP Softphones:	2400	0
	Maximum Administered SIP Trunks:	4000	20
	Maximum Administered Ad-hoc Video Conferencing Ports:	4000	0
	Maximum Number of DS1 Boards with Echo Cancellation:	80	0

On **Page 5**, verify that **IP Trunks** field is set to **y**.

```
display system-parameters customer-options                                     Page 5 of 12
                                OPTIONAL FEATURES

Emergency Access to Attendant? y                                           IP Stations? y
  Enable 'dadmin' Login? y
  Enhanced Conferencing? y
    Enhanced EC500? y
Enterprise Survivable Server? n
Enterprise Wide Licensing? n
  ESS Administration? y
  Extended Cvg/Fwd Admin? y
  External Device Alarm Admin? y
  Five Port Networks Max Per MCC? n
    Flexible Billing? n
  Forced Entry of Account Codes? y
  Global Call Classification? y
    Hospitality (Basic)? y
  Hospitality (G3V3 Enhancements)? y
    IP Trunks? y

                                ISDN Feature Plus? n
                                ISDN/SIP Network Call Redirection? y
                                ISDN-BRI Trunks? y
                                ISDN-PRI? y
                                Local Survivable Processor? n
                                Malicious Call Trace? y
                                Media Encryption Over IP? n
                                Mode Code for Centralized Voice Mail? n
                                Multifrequency Signaling? y
                                Multimedia Call Handling (Basic)? y
                                Multimedia Call Handling (Enhanced)? y
                                Multimedia IP SIP Trunking? y

IP Attendant Consoles? y
```

5.2. Administer IP Node Names

The node names defined here will be used in other configuration screens to define a SIP signalling group between Communication Manager and Session Manager. In the **IP Node Names** form, assign the node **Name** and **IP Address** for Session Manager. In this case, **Session_Manager** and **10.10.9.31** are the **Name** and **IP Address** for the Session Manager SIP interface. Also note the **procr** IP address as this is the processor interface that Communication Manager will use as the SIP signalling interface to Session Manager.

```
display node-names ip
                                IP NODE NAMES

Name          IP Address
AMS           10.10.9.75
Session_Manager  10.10.9.31
default       0.0.0.0
procr           10.10.9.12
procr6        ::
```


5.3. Administer IP Network Region

Use the **change ip-network-region n** command where **n** is the chosen value of the configuration for the SIP Trunk. Set the following values:

- The **Authoritative Domain** field is configured to match the domain name configured on Session Manager. In this configuration, the domain name is **avaya.com**.
- By default, **IP-IP Direct Audio** (both **Intra-** and **Inter-Region**) is enabled (**yes**) to allow audio traffic to be sent directly between endpoints without using gateway VoIP resources. When a PSTN call is shuffled, the media stream is established directly between the enterprise end-point and the internal media interface of the Avaya SBCE.
- The **Codec Set** is set to the number of the IP codec set to be used for calls within the IP network region. In this case, codec set **2** is used.
- The rest of the fields can be left at default values.

```
change ip-network-region 2                                     Page 1 of 20
                                                                IP NETWORK REGION
Region: 2
Location: Authoritative Domain: avaya.com
Name: Trunk Stub Network Region: n
MEDIA PARAMETERS Intra-region IP-IP Direct Audio: yes
Codec Set: 2 Inter-region IP-IP Direct Audio: yes
UDP Port Min: 2048 IP Audio Hairpinning? n
UDP Port Max: 3329
DIFFSERV/TOS PARAMETERS
Call Control PHB Value: 46
Audio PHB Value: 46
Video PHB Value: 26
802.1P/Q PARAMETERS
Call Control 802.1p Priority: 6
Audio 802.1p Priority: 6
Video 802.1p Priority: 5 AUDIO RESOURCE RESERVATION PARAMETERS
H.323 IP ENDPOINTS RSVP Enabled? n
H.323 Link Bounce Recovery? y
Idle Traffic Interval (sec): 20
Keep-Alive Interval (sec): 5
Keep-Alive Count: 5
```

Note: In the test configuration, ip-network-region 1 was used within the enterprise and ip-network-region 2 was used for the SIP Trunk. In the configuration of the G430 (not shown) ip-network-region 1 was selected so that the G430 is used for calls within the enterprise and for analogue and digital endpoints. In the configuration of the Avaya Media Server (not shown), ip-network-region 2 was selected so that the Avaya Media Server (AMS) is used for the SIP Trunk.

5.4. Administer IP Codec Set

Open the IP Codec Set form for the codec set specified in the IP Network Region form in **Section 5.3** by typing **change ip-codec set n** where **n** is the chosen value of the configuration for the SIP Trunk. Enter the list of audio codecs eligible to be used in order of preference. For the interoperability test the codecs supported by BT Ireland were configured, namely **G.711A** and **G.729A**.

```
change ip-codec-set 2                                     Page 1 of 2
```



```
                                IP CODEC SET
```



```
Codec Set: 2
```


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

The BT Ireland SIP Trunk Service supports T.38 for transmission of fax. Navigate to **Page 2** and define T.38 fax as follows:

- Set the **FAX - Mode** to **t.38-standard**
- Leave **ECM** at default value of **y**

```
change ip-codec-set 2                                     Page 2 of 2
```



```
                                IP CODEC SET
```



```
                                Allow Direct-IP Multimedia? n
```


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

Note: Redundancy can be used to send multiple copies of T.38 packets which can help the successful transmission of fax over networks where packets are being dropped. This was not experienced in the test environment and **Redundancy** was left at the default value of **0**.

5.5. Administer SIP Signaling Groups

This signalling group (and trunk group) will be used for inbound and outbound PSTN calls to the BT Ireland SIP Trunk Service. During test, this was configured to use TCP and port 5060 though it's recommended to use TLS and port 5061 in the live environment to enhance security.

Configure the **Signaling Group** using the **add signaling-group n** command as follows:

- Set **Group Type** to **sip**.
- Set **Transport Method** to **tcp**.
- Set **Peer Detection Enabled** to **y** allowing Communication Manager to automatically detect if the peer server is a Session Manager.
- Set **Near-end Node Name** to the processor interface (node name **procr** as defined in the **IP Node Names** form shown in **Section 5.2**).
- Set **Far-end Node Name** to the Session Manager (node name **Session_Manager** as defined in the **IP Node Names** form shown in **Section 5.2**).
- Set **Near-end Listen Port** and **Far-end Listen Port** as required. The standard value for TCP is **5060**, though **5062** was used in test to separate the SIP Trunk from the SIP endpoints on the Session Manager (See **Section 6.5**).
- Set **Far-end Network Region** to the IP Network Region configured in **Section 5.3** (logically establishes the far-end for calls using this signalling group as network region 2).
- Leave **Far-end Domain** blank (allows Communication Manager to accept calls from any SIP domain on the associated trunk).
- Set **Direct IP-IP Audio Connections** to **y**.
- Leave **DTMF over IP** at default value of **rtp-payload** (Enables **RFC2833** for DTMF transmission from Communication Manager).

The default values for the other fields may be used.

change signaling-group 2		Page 1 of 2
SIGNALING GROUP		
Group Number: 2	Group Type: sip	
IMS Enabled? n	Transport Method: tcp	
Q-SIP? n		
IP Video? n	Enforce SIPS URI for SRTP? y	
Peer Detection Enabled? y	Peer Server: SM	
Prepend '+' to Outgoing Calling/Alerting/Diverting/Connected Public Numbers? y		
Remove '+' from Incoming Called/Calling/Alerting/Diverting/Connected Numbers? n		
Alert Incoming SIP Crisis Calls? n		
Near-end Node Name: procr	Far-end Node Name: Session_Manager	
Near-end Listen Port: 5062	Far-end Listen Port: 5062	
	Far-end Network Region: 2	
Far-end Domain:		
Incoming Dialog Loopbacks: eliminate		Bypass If IP Threshold Exceeded? n
DTMF over IP: rtp-payload		RFC 3389 Comfort Noise? n
Session Establishment Timer(min): 3	Direct IP-IP Audio Connections? y	
Enable Layer 3 Test? y	IP Audio Hairpinning? n	
H.323 Station Outgoing Direct Media? n	Initial IP-IP Direct Media? n	
	Alternate Route Timer(sec): 6	

5.6. Administer SIP Trunk Group

A trunk group is associated with the signaling group described in **Section 5.5**. Configure the trunk group using the **add trunk-group n** command, where **n** is an available trunk group for the SIP Trunk. On **Page 1** of this form:

- Set the **Group Type** field to **sip**.
- Choose a descriptive **Group Name**.
- Specify a trunk access code (**TAC**) consistent with the dial plan.
- The **Direction** is set to **two-way** to allow incoming and outgoing calls.
- Set the **Service Type** field to **tie** (set to **public-ntwrk** if the Diversion header is to be supported).
- Specify the signalling group associated with this trunk group in the **Signaling Group** field as previously configured in **Section 5.5**.
- Specify the **Number of Members** supported by this SIP trunk group.

add trunk-group 2		Page 1 of 21	
TRUNK GROUP			
Group Number: 2	Group Type: sip	CDR Reports: y	
Group Name: SIP_Trunk	COR: 1	TN: 1	TAC: 102
Direction: two-way	Outgoing Display? n		
Dial Access? n	Night Service:		
Queue Length: 0			
Service Type: tie	Auth Code? n		
		Member Assignment Method: auto	
		Signaling Group: 2	
		Number of Members: 10	

On **Page 2** of the trunk-group form, the Preferred **Minimum Session Refresh Interval (sec)** field should be set to a value mutually agreed with BT Ireland to prevent unnecessary SIP messages during call setup. During testing, a value of **600** was used that sets Min-SE to 1200 in the SIP signalling.

add trunk-group 2		Page 2 of 21	
Group Type: sip			
TRUNK PARAMETERS			
Unicode Name: auto			
Redirect On OPTIM Failure: 5000			
SCCAN? n	Digital Loss Group: 18		
Preferred Minimum Session Refresh Interval(sec): 600			
Disconnect Supervision - In? y Out? y			

On **Page 3**, set the **Numbering Format** field to **private**. This allows delivery of CLI in formats other than E.164 with leading “+”. In test, CLIs were sent as Communication Manager extension numbers and were reformatted by Session Manager in an Adaptation described in **Section 6.4**. This format was successfully verified in the network.

add trunk-group 2	Page 3 of 21
TRUNK FEATURES	
ACA Assignment? n	Measured: none
	Maintenance Tests? y
Numbering Format: private	
	UUI Treatment: service-provider
	Replace Restricted Numbers? n
	Replace Unavailable Numbers? n

On **Page 4** of this form:

- Set **Support Request History** to **y**.
- Set the **Telephone Event Payload Type** to **101** to match the value preferred by BT Ireland (this Payload Type is not applied to calls from SIP end-points).
- Set the **Identity for Calling Party Display** to **From** to ensure that where CLI for incoming calls is withheld, it is not displayed on Communication Manager extension.

add trunk-group 2	Page 4 of 21
PROTOCOL VARIATIONS	
	Mark Users as Phone? n
Prepend '+' to Calling/Alerting/Diverting/Connected Number? n	
Send Transferring Party Information? n	
Network Call Redirection? n	
	Send Diversion Header? n
	Support Request History? y
	Telephone Event Payload Type: 101
	Convert 180 to 183 for Early Media? n
	Always Use re-INVITE for Display Updates? y
	Identity for Calling Party Display: From
Block Sending Calling Party Location in INVITE? n	
Accept Redirect to Blank User Destination? n	
	Enable Q-SIP? n

Note: - The above screenshot shows **Network Call Redirection** set to **n**. This was temporarily set to **y** for some of the last tests that involved testing of 302 Moved Temporarily and REFER messages. When set, REFER messages are sent that are not acted on by the BT Ireland SIP Trunk Service and so are unnecessary additional signalling. Note also that **Always Use re-INVITE for Display Updates?** is set to **y**. Although BT Ireland supports UPDATE, re-INVITE was used during testing as it gave slightly better performance on a poor network connection.

5.7. Administer Calling Party Number Information

Use the **change private-unknown-numbering** command to configure Communication Manager to send the calling party number in the format required. In test, calling party numbers were sent as Communication Manager extension numbers to be modified in Session Manager. Adaptations are used in Session Manager to format the number as described in **Section 6.4**. These calling party numbers are sent in the SIP From, Contact and PAI headers. The numbers are displayed on display-equipped PSTN telephones with any reformatting performed in the network.

change private-numbering 0					Page 1 of 2
NUMBERING - PRIVATE FORMAT					
Ext	Ext	Trk	Private	Total	
Len	Code	Grp(s)	Prefix	Len	
4	2	1-2		4	Total Administered: 2
					Maximum Entries: 540

5.8. Administer Route Selection for Outbound Calls

In the test environment, the Automatic Route Selection (ARS) feature was used to route outbound calls via the SIP trunk to the BT Ireland SIP Trunk Service. The single digit **9** was used as the ARS access code providing a facility for telephone users to dial 9 to reach an outside line. Use the **change feature-access-codes** command to configure a digit as the **Auto Route Selection (ARS) - Access Code 1**.

change feature-access-codes		Page 1 of 10
FEATURE ACCESS CODE (FAC)		
Abbreviated Dialing List1 Access Code:		
Abbreviated Dialing List2 Access Code:		
Abbreviated Dialing List3 Access Code:		
Abbreviated Dial - Prgm Group List Access Code:		
Announcement Access Code: *69		
Answer Back Access Code:		
Attendant Access Code:		
Auto Alternate Routing (AAR) Access Code: 8		
Auto Route Selection (ARS) - Access Code 1: 9		Access Code 2:

Use the **change ars analysis** command to configure the routing of dialled digits following the first digit 9. A small sample of dial patterns are shown here as an example. Further administration of ARS is beyond the scope of this document. The example entries shown will match outgoing calls to numbers beginning 0. Note that exact maximum number lengths should be used where possible to reduce post-dial delay. Calls are sent to **Route Pattern 2**.

change ars analysis 0							Page 1 of 2
ARS DIGIT ANALYSIS TABLE							
Location: all							Percent Full: 0
Dialed String	Total Min	Total Max	Route Pattern	Call Type	Node Num	ANI Req'd	
0	9	12	2	pubu		n	
00	13	15	2	pubu		n	
1	3	3	2	pubu		n	
118	5	6	2	pubu		n	
7000	4	4	1	pubu		n	

Use the **change route-pattern n** command, where **n** is an available route pattern, to add the SIP trunk group to the route pattern that ARS selects. In this configuration, route pattern **2** is used to route calls to trunk group **2**. **Numbering Format** is applied to CLI and is used to set TDM signalling parameters such as type of number and numbering plan indicator. This doesn't have the same significance in SIP calls and during testing it was set to **lev0-pvt** to ensure that calling party number was not prefixed with a leading "+".

change route-pattern 2													Page 1 of 3															
Pattern Number: 2													Pattern Name: SIP_Endpoints															
SCCAN? n													Secure SIP? n		Used for SIP stations? n													
Grp FRL NPA Pfx Hop Toll No.													Inserted		DCS/ IXC													
No													Mrk Lmt List Del		Digits		QSIG											
													Dgts		Intw													
1: 2 0													n		user													
2:													n		user													
3:													n		user													
4:													n		user													
5:													n		user													
6:													n		user													
BCC VALUE													TSC		CA-TSC		ITC BCIE		Service/Feature		PARM		Sub		Numbering		LAR	
0 1 2 M 4 W															Request								Dgts		Format			
1: y y y y y n													n		rest						lev0-pvt		none					
2: y y y y y n													n		rest								none					
3: y y y y y n													n		rest								none					
4: y y y y y n													n		rest								none					
5: y y y y y n													n		rest								none					
6: v v v v v n													n		rest								none					

5.9. Administer Incoming Digit Translation

This step configures the settings necessary to map incoming DDI calls to Communication Manager extensions. The incoming digits sent in the INVITE message from BT Ireland can be manipulated as necessary to route calls to the desired extension. During test, the incoming DDI numbers were changed in Session Manager to Communication Manager extension numbers using an Adaptation as described in **Section 6.4**. When done this way, there is no requirement for any incoming digit translation in Communication Manager. If incoming digit translation is required, use the **change inc-call-handling-trmt trunk-group x** command where **x** is the Trunk Group defined in **Section 5.6**.

change inc-call-handling-trmt trunk-group 2					Page	1 of	3
INCOMING CALL HANDLING TREATMENT							
Service/	Number	Number	Del	Insert			
Feature	Len	Digits					
tie							

Note: One reason for configuring the enterprise in this way is to allow the use of the extension number as a common identifier with other network elements within the enterprise such as voice mail.

5.10. EC500 Configuration

When EC500 is enabled on a Communication Manager station, a call to that station will generate a new outbound call from Communication Manager to the configured EC500 destination, typically a mobile phone. The following screen shows an example EC500 configuration for the user with station extension 2391. Use the command **change off-pbx-telephone station-mapping x** where **x** is Communication Manager station.

- The **Station Extension** field will automatically populate with station extension.
- For **Application** enter **EC500**.
- Enter a **Dial Prefix** if required by the routing configuration.
- For the **Phone Number** enter the phone that will also be called (e.g. **089434nnnn**).
- Set the **Trunk Selection** to **ars** so that the ARS table will be used for routing.
- Set the **Config Set** to **1**.

change off-pbx-telephone station-mapping 2391								Page	1 of	3
STATIONS WITH OFF-PBX TELEPHONE INTEGRATION										
Station	Application	Dial	CC	Phone Number	Trunk	Config	Dual			
Extension		Prefix			Selection	Set	Mode			
2391	EC500	-		089434nnnn	ars	1				

Note: The phone number shown is for a mobile phone in the Avaya Lab. To use facilities for calls coming in from EC500 mobile phones, the calling party number received in Communication Manager must exactly match the number specified in the above table.

Save the Communication Manager configuration by entering **save translation**.

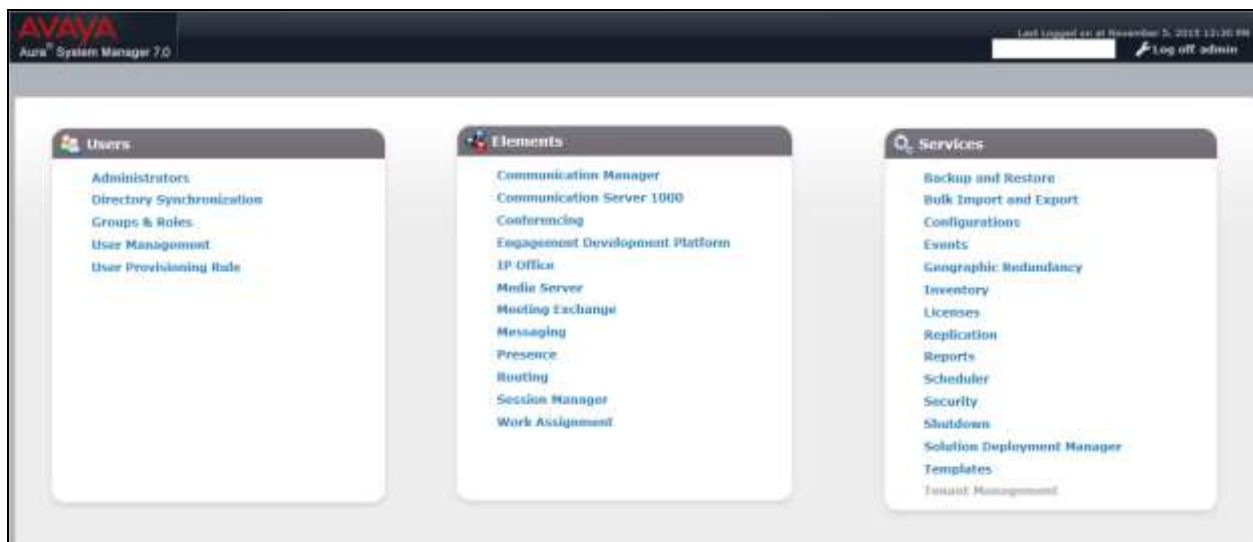
6. Configuring Avaya Aura® Session Manager

This section provides the procedures for configuring Session Manager. Session Manager is configured by opening a web browser to System Manager. The procedures include the following areas:

- Log in to Avaya Aura® System Manager
- Administer SIP domain
- Administer Locations
- Administer Adaptations
- Administer SIP Entities
- Administer Entity Links
- Administer Routing Policies
- Administer Dial Patterns
- Administer Application for Avaya Aura® Communication Manager
- Administer Application Sequence for Avaya Aura® Communication Manager
- Administer SIP Extensions

6.1. Log in to Avaya Aura® System Manager

Access the System Manager using a web browser and entering **http://<FQDN>/SMGR**, where **<FQDN>** is the fully qualified domain name of System Manager. Log in using appropriate credentials (not shown) and the **Home** tab will be presented with menu options shown below.



6.2. Administer SIP Domain

To add the SIP domain that will be used with Session Manager, select **Routing** from the **Home** tab menu and in the resulting tab select **Domains** from left hand menu. Click the **New** button to create a new SIP domain entry. In the **Name** field enter the domain name of the enterprise site or a name agreed with BT Ireland; this will be the same as specified in the Authoritative Domain specified in the IP Network Region on Communication Manager. Refer to **Section 5.3** for details. In test, **avaya.com** was used. Optionally, a description for the domain can be entered in the Notes field (not shown). Click **Commit** to save changes.

The screenshot shows the 'Domain Management' interface. On the left is a navigation menu with 'Routing' expanded, showing sub-items: Domains, Locations, Adaptations, SIP Entities, Entity Links, Time Ranges, Routing Policies, and Dial Patterns. The main area has a breadcrumb 'Home / Elements / Routing / Domains' and a title 'Domain Management'. Below the title are buttons: 'New', 'Edit', 'Delete', 'Duplicate', and 'More Actions'. A table below shows '1 Item' with a refresh icon. The table has columns: Name, Type, and Notes. One row is visible with 'avaya.com' in the Name column and 'sip' in the Type column. Below the table is a 'Select : All, None' dropdown.

Name	Type	Notes
avaya.com	sip	

Note: If the existing domain name used in the enterprise equipment does not match that used in the network, a Session Manager Adaptation can be used to change it (see **Section 6.4**).

6.3. Administer Locations

Locations can be used to identify logical and/or physical locations where SIP Entities reside for the purposes of bandwidth management. One location is added to the sample configuration for all of the enterprise SIP entities. On the **Routing** tab select **Locations** from the left hand menu (not shown). Under **General**, in the **Name** field, enter an informative name for the location. Scroll to the bottom of the page and under **Location Pattern**, click **Add**, then enter an **IP Address Pattern** in the resulting new row, * is used to specify any number of allowed characters at the end of the string. Below is the location configuration used for the test enterprise.

The screenshot shows the 'Location Details' configuration page. At the top, there is a breadcrumb trail 'Home / Elements / Routing / Locations' and a 'Help ?' link. The page title is 'Location Details' with 'Commit' and 'Cancel' buttons. The 'General' section contains a 'Name' field with 'Galway' and a 'Notes' field. The 'Dial Plan Transparency in Survivable Mode' section has an 'Enabled' checkbox, a 'Listed Directory Number' field, and an 'Associated CM SIP Entity' field. The 'Overall Managed Bandwidth' section includes 'Managed Bandwidth Units' (set to 'Kbit/sec'), 'Total Bandwidth', 'Multimedia Bandwidth', and an 'Audio Calls Can Take Multimedia Bandwidth' checkbox. The 'Per-Call Bandwidth Parameters' section has fields for 'Maximum Multimedia Bandwidth (Intra-Location)', 'Maximum Multimedia Bandwidth (Inter-Location)', 'Minimum Multimedia Bandwidth', and 'Default Audio Bandwidth'. The 'Alarm Threshold' section includes 'Overall Alarm Threshold', 'Multimedia Alarm Threshold', and latency triggers for both overall and multimedia alarms. The 'Location Pattern' section at the bottom has 'Add' and 'Remove' buttons, a table with one row containing '*10.10.9.x' under the 'IP Address Pattern' column, and a 'Select : All, None' option.

Home / Elements / Routing / Locations Help ?

Location Details

Commit Cancel

General

* Name:

Notes:

Dial Plan Transparency in Survivable Mode

Enabled: ☐

Listed Directory Number:

Associated CM SIP Entity:

Overall Managed Bandwidth

Managed Bandwidth Units:

Total Bandwidth:

Multimedia Bandwidth:

Audio Calls Can Take Multimedia Bandwidth: ☐

Per-Call Bandwidth Parameters

Maximum Multimedia Bandwidth (Intra-Location): Kbit/Sec

Maximum Multimedia Bandwidth (Inter-Location): Kbit/Sec

* Minimum Multimedia Bandwidth: Kbit/Sec

* Default Audio Bandwidth:

Alarm Threshold

Overall Alarm Threshold: %

Multimedia Alarm Threshold: %

* Latency before Overall Alarm Trigger: Minutes

* Latency before Multimedia Alarm Trigger: Minutes

Location Pattern

Add Remove

1 Item Filter: Enable

<input type="checkbox"/>	IP Address Pattern	Notes
<input type="checkbox"/>	*10.10.9.x	

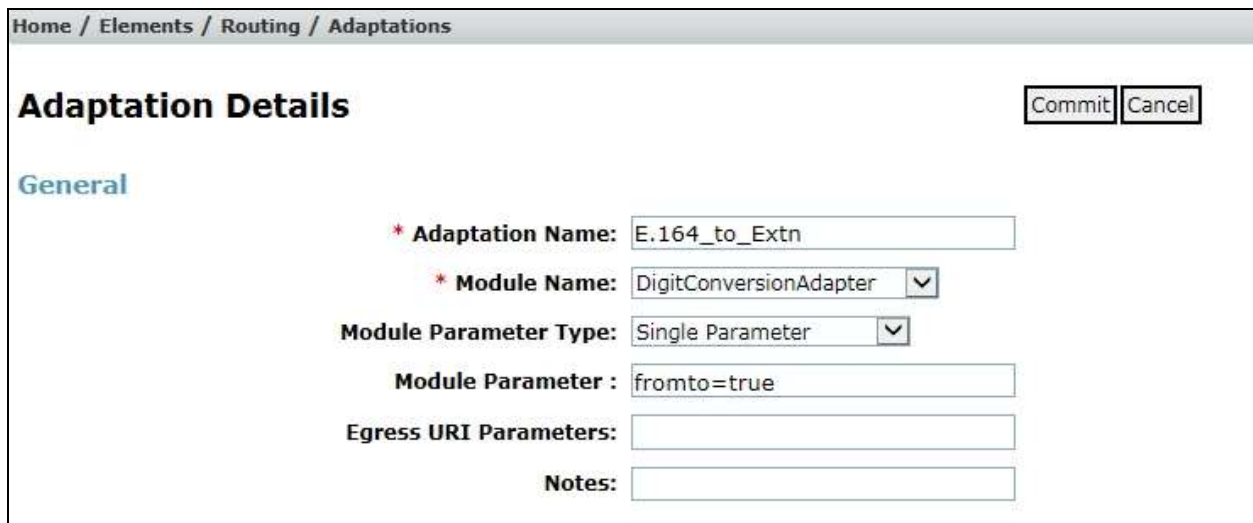
Select : All, None

6.4. Administer Adaptations

Calls from BT Ireland are received at the enterprise in national format with leading “0” on the Request URI. An Adaptation specific to Communication Manager is used to convert the called party number to a pre-defined extension number before onward routing to the Communication Manager SIP Entity, removing the requirement for incoming digit manipulation on Communication Manager.

On the **Routing** tab select **Adaptations** from the left-hand menu. Click on **New** (not shown).

- In the **Adaptation name** field, enter a descriptive title for the adaptation.
- In the **Module name** drop down menu, select **DigitConversionAdapter**. This is used for simple digit conversion adaptations.
- In the **Module Parameter Type** drop down menu, select **Single Parameter**.
- In the Module Parameter box (not shown), type **fromto=true**. This will apply the adaptation to the From and To headers as well as the Request URI.



Home / Elements / Routing / Adaptations

Adaptation Details

General

* **Adaptation Name:**

* **Module Name:**

Module Parameter Type:

Module Parameter :

Egress URI Parameters:

Notes:

Scroll down and in the section **Digit Conversion for Outgoing Calls from SM**, click on **Add**. An additional row will appear (not shown). This allows information to be entered for the manipulation of numbers coming from the network. This is where the called party number is translated from national format to the extension number for termination of calls on Communication Manager. In addition, the calling party number is adapted to diallable format for display on Communication Manager extensions.

The screenshot below shows a translation for each called party number. This is not normally necessary where the extension number forms part of the national number. When this is the case, a simple deletion of the leading digits is required.

- Under **Matching Pattern** enter the DDI number as received from the network.
- Under **Min** and **Max** enter the Minimum and Maximum digits of the incoming DDI number.
- Under **Delete Digits** enter the number of digits to delete to leave only the extension number remaining, during test all had to be deleted as the extension number did not form part of the national number.
- Under **Insert Digits** enter digits to be inserted. During test, this was the full extension number. If the extension number forms part of the DDI number, there will be no entry required here.
- Under **Address to Modify** choose **destination** from the drop down box to apply this rule to the To and Request-Line headers only.

	Matching Pattern	Min	Max	Phone Context	Delete Digits	Insert Digits	Address to modify	Adaptation Data	Notes
<input type="checkbox"/>	* *	12	15		1	00	origination		
<input type="checkbox"/>	+353	12	13		4	0	origination		
<input type="checkbox"/>	0144nnnn0	9	9		9	2000	destination		
<input type="checkbox"/>	0144nnnn1	9	9		9	2391	destination		
<input type="checkbox"/>	0144nnnn2	9	9		9	2291	destination		
<input type="checkbox"/>	0144nnnn3	9	9		9	2396	destination		
<input type="checkbox"/>	0144nnnn4	9	9		9	2316	destination		
<input type="checkbox"/>	0144nnnn5	9	9		9	2400	destination		
<input type="checkbox"/>	0144nnnn6	9	9		9	7000	destination		
<input type="checkbox"/>	0144nnnn7	9	9		9	6099	destination		
<input type="checkbox"/>	0144nnnn8	9	9		9	6002	destination		
<input type="checkbox"/>	0144nnnn9	9	9		9	7000	destination		

Note: In the above screenshots the DDI numbers are partially obscured. If the number is to be changed to diallable format for display on Communication Manager extensions, additional rows may be required. These would replace a leading “+” with “00” for international calling party numbers and “+353” would be replaced by “0” for national calling party numbers.

An additional Adaptation is required to convert extension numbers to national format. Calls from Communication Manager are received at Session Manager with the extension number in the From header. An Adaptation specific to BT Ireland is used to convert the calling party number to national format with no leading “0” before onward routing to the BT Ireland SIP Trunk Service.

On the **Routing** tab select **Adaptations** from the left-hand menu. Click on **New** (not shown).

- In the **Adaptation name** field, enter a descriptive title for the adaptation.
- In the **Module name** drop down menu, select **DigitConversionAdapter**. This is used for simple digit conversion adaptations.
- In the **Module parameter Type** drop down menu, select **Single Parameter**.
- In the Module Parameter box, type **fromto=true**. This will apply the adaptation to the From and To headers as well as the Request URI.

Home / Elements / Routing / Adaptations

Adaptation Details

Commit Cancel

General

* Adaptation Name: Extn_to_E164

* Module Name: DigitConversionAdapter

Module Parameter Type: Single Parameter

Module Parameter : fromto=true

Egress URI Parameters:

Notes:

Scroll down and in the section **Digit Conversion for Outgoing Calls from SM**, click on **Add**. An additional row will appear (not shown). This allows information to be entered for the manipulation of numbers coming from Communication Manager. This is where the calling party number is translated from the extension number to national format for display on the terminating PSTN phones as the diallable DDI number assigned to the extension.

The screenshot below shows a translation for each calling party number. This is not normally necessary where the extension number forms part of the national number. When this is the case, a simple additional of the leading digits to build up the national format is required.

- Under **Matching Pattern** enter the extension number as received from Communication Manager.
- Under **Min** and **Max** enter the Minimum and Maximum digits of the incoming DDI number.
- Under **Delete Digits** enter the number of digits to delete to remove any digits that will not form part of the national number, during test all had to be deleted as the extension number did not form part of the national number.
- Under **Insert Digits** enter digits to be inserted. During test, this was the full national number with no leading “0”. If the extension number forms part of the DDI number, only the necessary prefix digits will be required.
- Under **Address to Modify** choose **origination** from the drop down box to apply this rule to the From header only.

Digit Conversion for Outgoing Calls from SM

Add Remove

6 Items Filter: Enable

<input type="checkbox"/>	Matching Pattern	Min	Max	Phone Context	Delete Digits	Insert Digits	Address to modify	Adaptation Data	Notes
<input type="checkbox"/>	*2000	*4	*4		*4	144nnnn0	origination		
<input type="checkbox"/>	*2291	*4	*4		*4	144nnnn2	origination		
<input type="checkbox"/>	*2316	*4	*4		*4	144nnnn4	origination		
<input type="checkbox"/>	*2391	*4	*4		*4	144nnnn1	origination		
<input type="checkbox"/>	*2396	*4	*4		*4	144nnnn3	origination		
<input type="checkbox"/>	*2400	*4	*4		*4	144nnnn5	origination		

Select : All, None

Commit Cancel

Note: In the above screenshots the DDI numbers are partially obscured.

6.5. Administer SIP Entities

A SIP Entity must be added for each SIP-based telephony system supported by a SIP connection to Session Manager. To add a SIP Entity, select **SIP Entities** on the left panel menu, and then click on the **New** button (not shown). The following will need to be entered for each SIP Entity.

Under **General**:

- In the **Name** field enter an informative name.
- In the **FQDN or IP Address** field enter the IP address of Session Manager or the signalling interface on the connecting system.
- In the **Type** field use **Session Manager** for a Session Manager SIP entity, **CM** for a Communication Manager SIP entity and **SIP Trunk** for the Avaya SBCE SIP entity.
- In the **Adaptation** field (not available for the Session Manager SIP Entity), select the appropriate Adaptation from the drop down menu.
- In the **Location** field select the appropriate location from the drop down menu.
- In the **Time Zone** field enter the time zone for the SIP Entity.

In this configuration there are four SIP Entities:

- Avaya Aura® Session Manager SIP Entity.
- Avaya Aura® Communication Manager SIP Entity for the SIP Endpoints
- Avaya Aura® Communication Manager SIP Entity for the SIP Trunk
- Avaya Session Border Controller for Enterprise (Avaya SBCE) SIP Entity.

6.5.1. Avaya Aura® Session Manager SIP Entity

The following screens show the SIP entity for Session Manager. The **FQDN or IP Address** field is set to the IP address of the Session Manager SIP signalling interface.

The screenshot shows the 'SIP Entity Details' configuration page. At the top, there is a breadcrumb trail: 'Home / Elements / Routing / SIP Entities'. The page title is 'SIP Entity Details' with 'General' selected. In the top right corner, there are 'Commit' and 'Cancel' buttons. The 'General' section contains the following fields: 'Name' (text box with 'Session_Manager'), 'FQDN or IP Address' (text box with '10.10.9.31'), 'Type' (dropdown menu with 'Session Manager' selected), 'Notes' (text box), 'Location' (dropdown menu with 'Galway' selected), 'Outbound Proxy' (dropdown menu), 'Time Zone' (dropdown menu with 'Europe/Dublin' selected), and 'Credential name' (text box). Below the 'General' section is the 'SIP Link Monitoring' section, which contains a 'SIP Link Monitoring' dropdown menu with 'Use Session Manager Configuration' selected.

Session Manager must be configured with the port numbers on the protocols that will be used by the other SIP entities. To configure these scroll to the bottom of the page and under **Port**, click **Add**, then edit the fields in the resulting new row.

- In the **Port** field enter the port number on which the system listens for SIP requests.
- In the **Protocol** field enter the transport protocol to be used for SIP requests.
- In the **Default Domain** field, from the drop down menu select the domain added in **Section 6.2** as the default domain.

Listen Ports	Protocol	Default Domain	Notes
<input type="checkbox"/> 5060	TCP	avaya.com	
<input type="checkbox"/> 5060	UDP	avaya.com	
<input type="checkbox"/> 5061	TLS	avaya.com	
<input type="checkbox"/> 5062	TCP	avaya.com	

6.5.2. Avaya Aura® Communication Manager SIP Entities

The following screen shows one of the SIP entities for Communication Manager which is configured as an Evolution Server. This SIP Entity is used for the SIP Trunk. The **FQDN or IP Address** field is set to the IP address of the interface on Communication Manager that will be providing SIP signalling. Set the **Location** to that defined in **Section 6.3**.

SIP Entity Details [Commit] [Cancel]

General

* **Name:** CM Trunk

* **FQDN or IP Address:** 10.10.9.12

Type: CM

Notes:

Adaptation: E.164_to_Extn

Location: Galway

Time Zone: Europe/Dublin

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

Credential name:

Securable: ☐

Call Detail Recording: none

Other parameters can be set for the SIP Entity as shown in the following screenshot, but for test, these were left at default values.

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 ▼

Supports Call Admission Control: ☐

Shared Bandwidth Manager: ☐

Primary Session Manager Bandwidth Association: ▼

Backup Session Manager Bandwidth Association: ▼

Note: An identical SIP Entity for Communication Manager is required for SIP Endpoints.

6.5.3. Avaya Session Border Controller for Enterprise SIP Entity

The following screen shows the SIP Entity for the Avaya SBCE. The **FQDN or IP Address** field is set to the IP address of the Avaya SBCE private network interface (see **Figure 1**). Set the **Adaptation** to that defined in **Section 6.4**, the **Location** to that defined in **Section 6.3** and the **Time Zone** to the appropriate time zone.

Home / Elements / Routing / SIP Entities

SIP Entity Details Commit Cancel

General

* Name: ASBCE

* FQDN or IP Address: 10.10.9.71

Type: SIP Trunk ▼

Notes:

Adaptation: Extn_to_E164 ▼

Location: Galway ▼

Time Zone: Europe/Dublin ▼

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

Credential name:

Securable: ☐

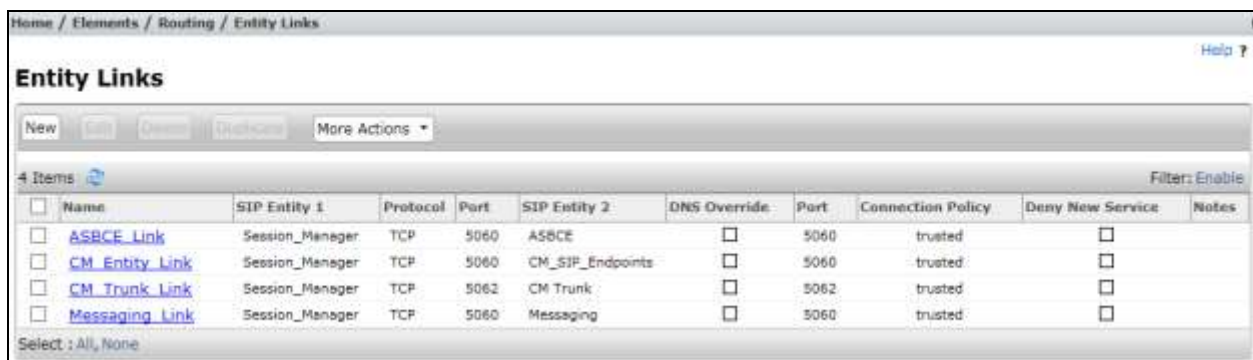
Call Detail Recording: egress ▼

6.6. Administer Entity Links

A SIP trunk between a Session Manager and another system is described by an Entity Link. To add an Entity Link, select **Entity Links** on the left panel menu and click on the **New** button (not shown). Fill in the following fields in the new row that is displayed.

- In the **Name** field enter an informative name.
- In the **SIP Entity 1** field select **Session Manager**.
- In the **Port** field enter the port number to which the other system sends its SIP requests.
- In the **SIP Entity 2** field enter the other SIP Entity for this link, created in **Section 6.5**.
- In the **Port** field enter the port number to which the other system expects to receive SIP requests.
- Select the **Trusted** tick box to make the other system trusted.
- In the **Protocol** field enter the transport protocol to be used to send SIP requests.

Click **Commit** to save changes. The following screen shows the Entity Links used in this configuration.



	Name	SIP Entity 1	Protocol	Port	SIP Entity 2	DNS Override	Port	Connection Policy	Deny New Service	Notes
<input type="checkbox"/>	ASBCE_Link	Session_Manager	TCP	5060	ASBCE	<input type="checkbox"/>	5060	trusted	<input type="checkbox"/>	
<input type="checkbox"/>	CM_Entity_Link	Session_Manager	TCP	5060	CM_SIP_Endpoints	<input type="checkbox"/>	5060	trusted	<input type="checkbox"/>	
<input type="checkbox"/>	CM_Trunk_Link	Session_Manager	TCP	5062	CM Trunk	<input type="checkbox"/>	5062	trusted	<input type="checkbox"/>	
<input type="checkbox"/>	Messaging_Link	Session_Manager	TCP	5060	Messaging	<input type="checkbox"/>	5060	trusted	<input type="checkbox"/>	

Note: There are two Entity Links for Communication Manager, one for the SIP Endpoints and the other for the SIP Trunk. These are differentiated by port number. The **Messaging_Link** Entity Link is used for the Avaya Aura ® Messaging system and is not described in this document.

6.7. Administer Routing Policies

Routing policies must be created to direct how calls will be routed to a system. To add a routing policy, select **Routing Policies** on the left panel menu and then click on the **New** button (not shown).

Under **General**:

- Enter an informative name in the **Name** field
- Under **SIP Entity as Destination**, click **Select**, and then select the appropriate SIP entity to which this routing policy applies
- Under **Time of Day**, click **Add**, and then select the time range

The following screen shows the routing policy for calls inbound from the SIP Trunk to Communication Manager.

Home / Elements / Routing / Routing Policies

Routing Policy Details [Commit] [Cancel] [Help ?]

General

* Name: CM_Inbound

Disabled: ☐

* Retries: 0

Notes:

SIP Entity as Destination

Select

Name	FQDN or IP Address	Type	Notes
CM Trunk	10.10.9.12	CM	

Time of Day

Add Remove View Gaps/Overlaps

1 Item Filter: Enable

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

Select : All, None

The following screen shows the Routing Policy for the Avaya SBCE interface that will be routed to the PSTN via the BT Ireland SIP Trunk Service.

Home / Elements / Routing / Routing Policies

Routing Policy Details [Commit] [Cancel] [Help ?]

General

* Name: PSTN

Disabled: ☐

* Retries: 0

Notes:

SIP Entity as Destination

Select

Name	FQDN or IP Address	Type	Notes
ASBCE	10.10.9.71	SIP Trunk	

Time of Day

Add Remove View Gaps/Overlaps

1 Item Filter: Enable

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

Select : All, None

6.8. Administer Dial Patterns

A dial pattern must be defined to direct calls to the appropriate telephony system. To configure a dial pattern select **Dial Patterns** on the left panel menu and then click on the **New** button (not shown).

Under **General**:

- In the **Pattern** field enter a dialled number or prefix to be matched.
- In the **Min** field enter the minimum length of the dialled number.
- In the **Max** field enter the maximum length of the dialled number.
- In the **SIP Domain** field select **ALL** or alternatively one of those configured in **Section 6.2**.

Under **Originating Locations and Routing Policies**:

- Click **Add**, in the resulting screen (not shown).
- Under **Originating Location**, select the location defined in **Section 6.3** or **ALL**.
- Under **Routing Policies** select one of the routing policies defined in **Section 6.7**.
- Click **Select** button to save.

The following screen shows an example dial pattern configured for the Avaya SBCE which will route the calls out to the PSTN via the BT Ireland SIP Trunk Service.

Home / Elements / Routing / Dial Patterns

Dial Pattern Details Commit Cancel Help ?

General

* Pattern:

* Min:

* Max:

Emergency Call: ☐

Emergency Priority:

Emergency Type:

SIP Domain:

Notes:

Originating Locations and Routing Policies

Add Remove

1 Item Filter: Enable

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

Select : All, None

The following screen shows the test dial pattern configured for Communication Manager.

Dial Pattern Details [Commit] [Cancel] [Help ?](#)

General

* Pattern: 0144nnnn x

* Min: 8

* Max: 9

Emergency Call: ☐

Emergency Priority: 1

Emergency Type:

SIP Domain: -ALL- v

Notes:

Originating Locations and Routing Policies

Add Remove

1 Item Filter: Enable

<input type="checkbox"/>	Originating Location Name	Originating Location Notes	Routing Policy Name	Rank	Routing Policy Disabled	Routing Policy Destination	Routing Policy Notes
<input type="checkbox"/>	-ALL-		CM_Inbound	0	<input type="checkbox"/>	CM Trunk	

Select : All, None

Note: The above configuration is used to analyse the DDI numbers assigned to the extensions on Communication Manager. Some of the digits of the pattern to be matched have been obscured.

6.9. Administer Application for Avaya Aura® Communication Manager

The Application for Communication Manager would normally be defined at system installation, but is shown here for reference. From the **Home** tab select **Session Manager** from the menu. In the resulting tab from the left panel menu select **Application Configuration → Applications** and click **New** (not shown).

- In the **Name** field enter a name for the application.
- In the **SIP Entity** field select the SIP entity for Communication Manager.
- In the **CM System for SIP Entity** field select the SIP entity for Communication Manager SIP Endpoints and select **Commit** to save the configuration.

Application Editor [Commit] [Cancel]

Application

* Name: CM_App x

* SIP Entity: CM_Entity

* CM System for SIP Entity: CM1_Element Refresh View/Add CM Systems

Description:

6.10. Administer Application Sequence for Avaya Aura® Communication Manager

The Application Sequence for Communication Manager would normally be defined at system installation, but is shown here for reference. From the left panel navigate to **Session Manager** → **Application Configuration** → **Application Sequences** and click on **New** (not shown).

- In the **Name** field enter a descriptive name.
- Under **Available Applications**, click the + sign in front of the appropriate application instance. When the screen refreshes the application should be displayed under the **Applications in this Sequence** heading. Select **Commit**.

Home / Elements / Session Manager / Application Configuration / Application Sequences

Application Sequence Editor [Commit] [Cancel] [Help ?]

Application Sequence

*Name: CM_App_Seq x

Description:

Applications in this Sequence

Move First Move Last Remove

1 Item

<input type="checkbox"/>	Sequence Order (first to last)	Name	SIP Entity	Mandatory	Description
<input type="checkbox"/>	1	CM_App	CM_Entity	<input checked="" type="checkbox"/>	

Select: All, None

Available Applications

1 Item Filter: Enable

	Name	SIP Entity	Description
+	CM_App	CM_Entity	

6.11. Administer SIP Extensions

SIP extensions are registered with the Session Manager and use Communication Manager for their feature and configuration settings. From the **Home** tab select **User Management** from the menu. Then select **Manage Users** and click **New** (not shown).

On the **Identity** tab:

- Enter the user's name in the **Last Name** and **First Name** fields.
- In the **Login Name** field enter a unique system login name in the form of user@domain e.g. 2291@avaya.com which is used to create the user's primary handle.
- The **Authentication Type** should be **Basic**.
- In the **Password/Confirm Password** fields enter an alphanumeric password.
- Set the **Language Preference** and **Time Zone** as required.


The screenshot shows the 'New User Profile' form in the Avaya User Management interface. The form is divided into tabs: Identity, Communication Profile, Membership, and Contacts. The Identity tab is active, showing fields for User Provisioning Rule, Last Name, First Name, Login Name, Authentication Type, Password, Confirm Password, Localized Display Name, Endpoint Display Name, Title, Language Preference, Time Zone, Employee ID, Department, and Company. The form is pre-filled with example data: Last Name: SIP, First Name: 9608, Login Name: 2291@avaya.com, Authentication Type: Basic, Password: 9608, Confirm Password: 9608, Language Preference: English (United Kingdom), Time Zone: (0:0)GMT : Dublin, Edinburgh, L.

On the **Communication Profile** tab, enter a numeric **Communication Profile Password** and confirm it.

Expand the **Communication Address** section and click **New**. For the **Type** field select **Avaya SIP** from the drop-down menu. In the **Fully Qualified Address** field, enter an extension number and select the relevant domain from the drop-down menu. Click the **Add** button.

Expand the **Session Manager Profile** section.

- Make sure the **Session Manager Profile** check box is checked.
- Select the appropriate Session Manager instance from the drop-down menu in the **Primary Session Manager** field.
- Select the appropriate application sequence from the drop-down menu in the **Origination Sequence** field configured in **Section 6.10**.
- Select the appropriate application sequence from the drop-down menu in the **Termination Sequence** field configured in **Section 6.10**.
- Select the appropriate location from the drop-down menu in the **Home Location** field.


☒ **Session Manager Profile** 

SIP Registration


* Primary Session Manager

Secondary Session Manager


Survivability Server


Max. Simultaneous Devices 

Block New Registration When Maximum Registrations Active? ☐


Primary	Secondary	Maximum
4	0	4
		


Application Sequences

Origination Sequence 

Termination Sequence 

Call Routing Settings

* Home Location 

Conference Factory Set 

Call History Settings

Enable Centralized Call History? ☐

Expand the **Endpoint Profile** section.

- Select Communication Manager Element from the **System** drop-down menu.
- Select **Endpoint** from the drop-down menu for **Profile Type**.
- Enter the extension in the **Extension** field.
- Select the desired template from the **Template** drop-down menu.
- In the **Port** field **IP** is automatically inserted.
- Select the **Delete Endpoint on Unassign of Endpoint from User or on Delete User** check box.
- Select **Commit** (Not Shown) to save changes and System Manager will add the Communication Manager user configuration automatically.

☒ **CM Endpoint Profile** ▼

* System

CM1_Element ▼

* Profile Type

Endpoint ▼

Use Existing Endpoints ☐

* Extension

Q 2291

Endpoint Editor

* Template

9608SIP_DEFAULT_CM_7_0 ▼

Set Type

9608SIP

Security Code

Port

IP

Voice Mail Number

Preferred Handle

(None) ▼

Calculate Route Pattern ☐

Sip Trunk

aar

Enhanced Callr-Info display for 1-line phones ☐

Delete Endpoint on Unassign of Endpoint from User or on Delete User ☒

Override Endpoint Name and Localized Name ☒

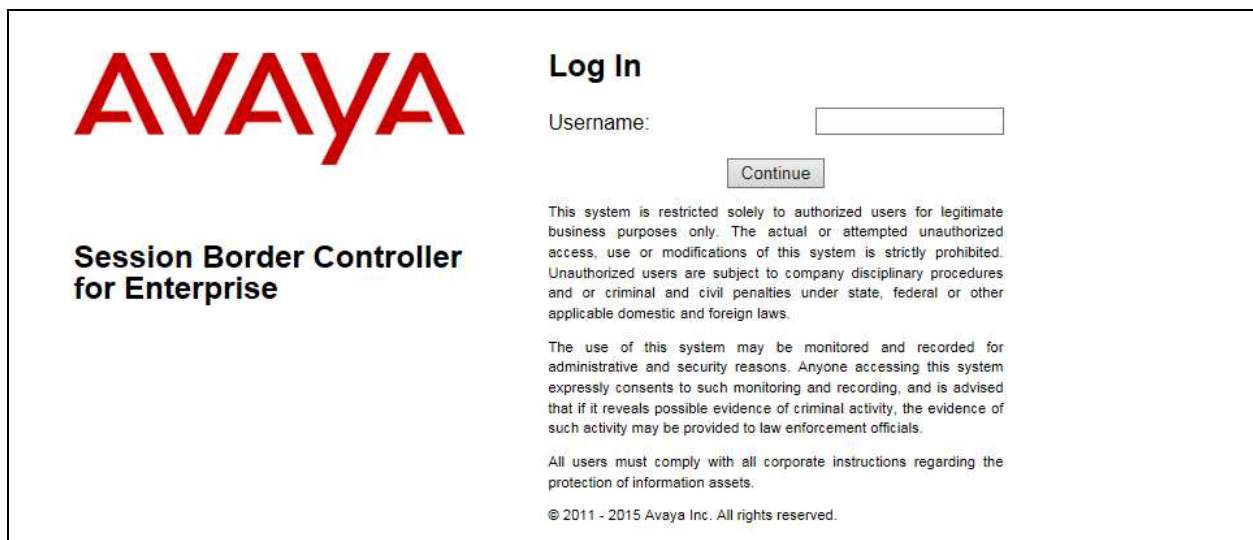
Allow H.323 and SIP Endpoint Dual Registration ☐

7. Configure Avaya Session Border Controller for Enterprise

This section describes the configuration of the Avaya Session Border Controller for Enterprise (Avaya SBCE). The Avaya SBCE provides security and manipulation of signalling to provide an interface to the Service Provider's SIP Trunk that is standard where possible and adapted to the Service Provider's SIP implementation where necessary.

7.1. Access Avaya Session Border Controller for Enterprise

Access the Session Border Controller using a web browser by entering the URL **https://<ip-address>**, where **<ip-address>** is the private IP address configured at installation. A log in screen is presented. Log in using the appropriate username and password.



The login screen features the Avaya logo in red on the left. To the right, under the heading "Log In", is a "Username:" label followed by a text input field and a "Continue" button. Below the input field, there is a block of legal disclaimer text. At the bottom, it states "© 2011 - 2015 Avaya Inc. All rights reserved."

AVAYA

Session Border Controller for Enterprise

Log In

Username:

Continue

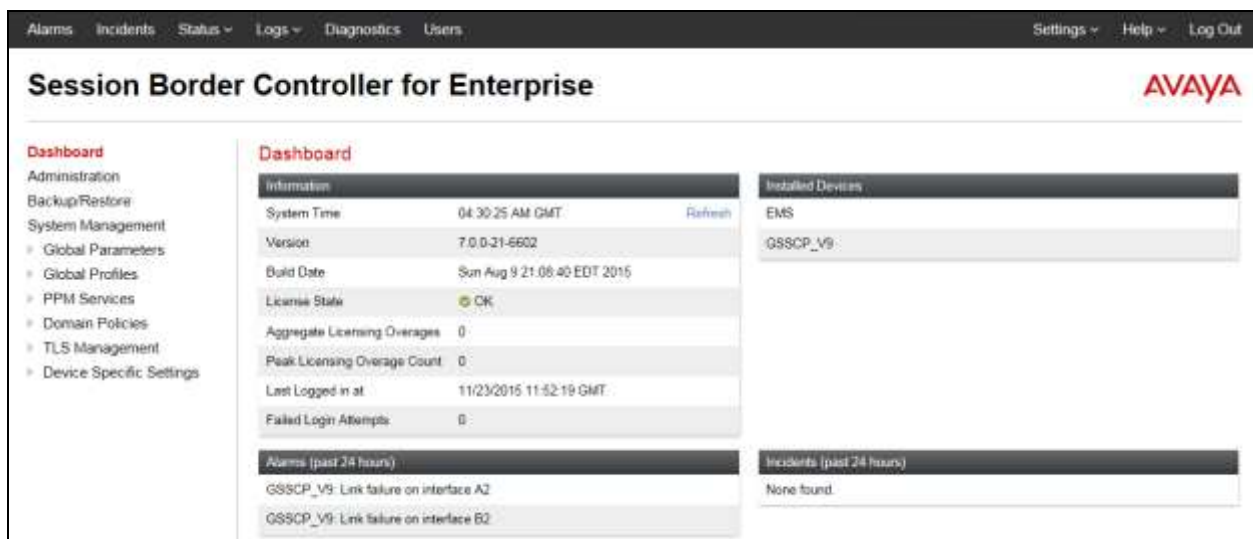
This system is restricted solely to authorized users for legitimate business purposes only. The actual or attempted unauthorized access, use or modifications of this system is strictly prohibited. Unauthorized users are subject to company disciplinary procedures and or criminal and civil penalties under state, federal or other applicable domestic and foreign laws.

The use of this system may be monitored and recorded for administrative and security reasons. Anyone accessing this system expressly consents to such monitoring and recording, and is advised that if it reveals possible evidence of criminal activity, the evidence of such activity may be provided to law enforcement officials.

All users must comply with all corporate instructions regarding the protection of information assets.

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Once logged in, a dashboard is presented with a menu on the left-hand side. The menu is used as a starting point for all configuration of the Avaya SBCE.



The dashboard has a top navigation bar with links: Alarms, Incidents, Status, Logs, Diagnostics, Users, Settings, Help, and Log Out. The main header reads "Session Border Controller for Enterprise" with the Avaya logo. A left-hand menu lists: 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 contains several sections: "Information" with system details, "Installed Devices" showing EMS and GSSCP_V9, "Alarms (past 24 hours)" listing link failures, and "Incidents (past 24 hours)" showing none found.

Alarms Incidents Status Logs Diagnostics Users Settings Help Log Out

Session Border Controller for Enterprise **AVAYA**

Dashboard

Administration
Backup/Restore
System Management
Global Parameters
Global Profiles
PPM Services
Domain Policies
TLS Management
Device Specific Settings

Dashboard

Information

System Time	04:30:25 AM GMT	Refresh
Version	7.0.0-21-6602	
Build Date	Sun Aug 9 21:06:40 EDT 2015	
License State	OK	
Aggregate Licensing Overages	0	
Peak Licensing Overage Count	0	
Last Logged in at	11/23/2015 11:52:19 GMT	
Failed Login Attempts	0	

Installed Devices

EMS
GSSCP_V9

Alarms (past 24 hours)

GSSCP_V9: Link failure on interface A2
GSSCP_V9: Link failure on interface B2

Incidents (past 24 hours)

None found

7.2. Define Network Management

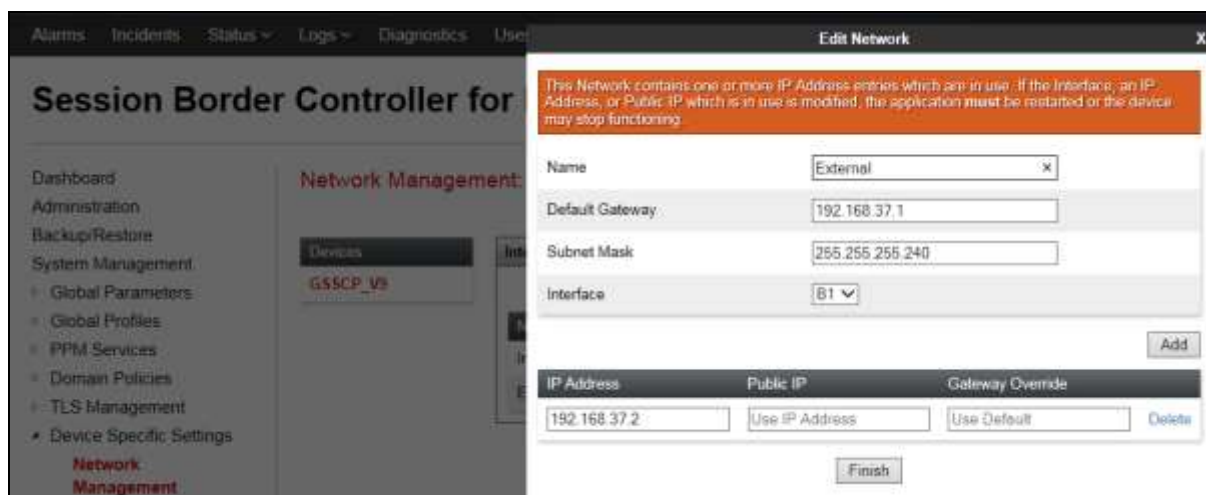
Network information is required on the Avaya SBCE to allocate IP addresses and subnet masks to the interfaces. Note that only the **A1** and **B1** interfaces are used, typically the **A1** interface is used for the internal side and **B1** is used for external. Each side of the Avaya SBCE can have only one physical interface assigned.

To define the network information, navigate to **Device Specific Settings** → **Network Management** in the main menu on the left hand side and click on **Add**.



Enter details for the external interface in the dialogue box (not shown):

- Enter a descriptive name in the **Name** field.
- Enter the default gateway IP address for the external interface in the **Default Gateway** field.
- Enter the subnet mask in the **Subnet Mask** field.
- Select the external interface to be used from the **Interface** drop down menu. In the test environment, this was **B1**.
- Click on **Add** and an additional row will appear allowing an IP address to be entered.
- Enter the external IP address in the **IP Address** field and leave the **Public IP** and **Gateway Override** fields blank.
- Click on **Finish** to complete the interface definition.



Click on **Add** to define the internal interface. Enter details in the dialogue box (not shown):

- Enter a descriptive name in the **Name** field.
- Enter the default gateway IP address for the internal interface in the **Default Gateway** field.
- Enter the subnet mask in the **Subnet Mask** field.
- Select the internal interface to be used from the **Interface** drop down menu. In the test environment, this was **A1**.
- Click on **Add** and an additional row will appear allowing an IP address to be entered.
- Enter the internal IP address in the **IP Address** field and leave the **Public IP** and **Gateway Override** fields blank.
- Click on **Finish** to complete the interface definition.

The following screenshot shows the completed Network Management configuration:



Network Management: GSSCP_V9

Devices: GSSCP_V9

Interfaces Networks

Add

Name	Gateway	Subnet Mask	Interface	IP Address	Edit	Delete
Internal	10.10.9.1	255.255.255.0	A1	10.10.9.71	Edit	Delete
External	192.168.37.1	255.255.255.240	B1	192.168.37.2	Edit	Delete

Select the **Interface Configuration** tab and click on the **Status** to toggle it. A status of **Disabled** will be changed to **Enabled**.



Network Management: GSSCP_V9

Devices: GSSCP_V9

Interfaces Networks

Add VLAN

Interface Name	VLAN Tag	Status
A1		Enabled
A2		Disabled
B1		Enabled
B2		Disabled

Note: to ensure that the Avaya SBCE uses the interfaces defined, the Application must be restarted.

- Click on **System Management** in the main menu (not shown).
- Select **Restart Application** indicated by an icon in the status bar (not shown).

7.3. Define Interfaces

When the IP addresses and masks are assigned to the interfaces, these are then configured as signalling and media interfaces. Testing was carried out with TCP used for transport of signalling between Session Manager and the Avaya SBCE, and UDP for transport of signalling between the Avaya SBCE and the BT Ireland SIP Trunk Service. This document shows the configuration for TCP and UDP, if additional security is required, it's recommended to use TLS and port 5061.

7.3.1. Signalling Interfaces

To define the signalling interfaces on the Avaya SBCE, navigate to **Device Specific Settings** → **Signaling Interface** (not shown) in the main menu on the left hand side. Details of transport protocol and ports for the external and internal SIP signalling are entered here.

- Select **Add** and enter details of the external signalling interface in the pop-up menu.
- In the **Name** field enter a descriptive name for the external signalling interface.
- In the **IP Address** drop down menus, select the external network interface and IP address. Note that when the external network interface is selected, the bottom drop down menu is populated with the available IP addresses as defined in **Section 7.2**. In the test environment, this was a single IP address **192.168.37.2**.
- Enter the UDP port number in the **UDP Port** field, **5060** is used for the BT Ireland SIP Trunk Service.

The screenshot displays the 'Session Border Controller for Enterprise' web interface. On the left is a navigation menu with options like Dashboard, Administration, Backup/Restore, System Management, and Device Specific Settings. The 'Signaling Interface' option is highlighted in red. A 'Signaling Interface: GSSCP_V9' section is visible. On the right, the 'Edit Signaling Interface' dialog box is open. It contains the following fields: Name (set to 'External'), IP Address (set to 'External (B1, VLAN 0)' with a dropdown showing '192.168.37.2'), TCP Port (empty, with a note 'Leave blank to disable'), UDP Port (set to '5060', with a note 'Leave blank to disable'), TLS Port (empty, with a note 'Leave blank to disable'), TLS Profile (set to 'None'), Enable Shared Control (checkbox), and Shared Control Port (empty). A 'Finish' button is at the bottom right of the dialog.

The internal signalling interface is defined in the same way; the dialogue box is not shown:

- Select **Add** and enter details of the internal signalling interface in the pop-up menu.
- In the **Name** field enter a descriptive name for the internal signalling interface.
- In the **IP Address** drop down menus, select the internal network interface and IP address.
- Select **TCP** port number, **5060** is used for Session Manager.

The following screenshot shows details of the signalling interfaces:

Signaling Interface: GSSCP_V9

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

Name	Signaling IP Network	TCP Port	UDP Port	TLS Port	TLS Profile	
Internal	10.10.9.71 Internal (A1, VLAN 0)	5060	5060	---	None	Edit Delete
External	192.168.37.2 External (B1, VLAN 0)	5060	5060	---	None	Edit Delete

Note. In the test environment, the internal IP address was **10.10.9.71**.

7.3.2. Media Interfaces

To define the media interfaces on the Avaya SBCE, navigate to **Device Specific Settings** → **Media Interface** in the main menu on the left hand side. Details of the RTP port ranges for the internal and external media streams are entered here. The IP addresses for media can be the same as those used for signalling.

- Select **Add** and enter details of the external media interface in the pop-up menu.
- In the **Name** field enter a descriptive name for the external media interface.
- In the **IP Address** drop down menus, select the external network interface and IP address. Note that when the external network interface is selected, the bottom drop down menu is populated with the available IP addresses as defined in **Section 7.2**. In the test environment, this was a single IP address **192.168.37.2**.
- Define the RTP **Port Range** for the media path with the BT Ireland SIP Trunk Service, during testing this was left at the default values.

Media Interface: GSSCP_V9

Edit Media Interface

Name: External

IP Address: External (B1, VLAN 0)

Port Range: 35000 - 40000

[Finish](#)

The internal media interface is defined in the same way; the dialogue box is not shown:

- Select **Add** and enter details of the internal media interface in the pop-up menu.
- In the **Name** field enter a descriptive name for the internal media interface.
- In the **IP Address** drop down menus, select the internal network interface and IP address.

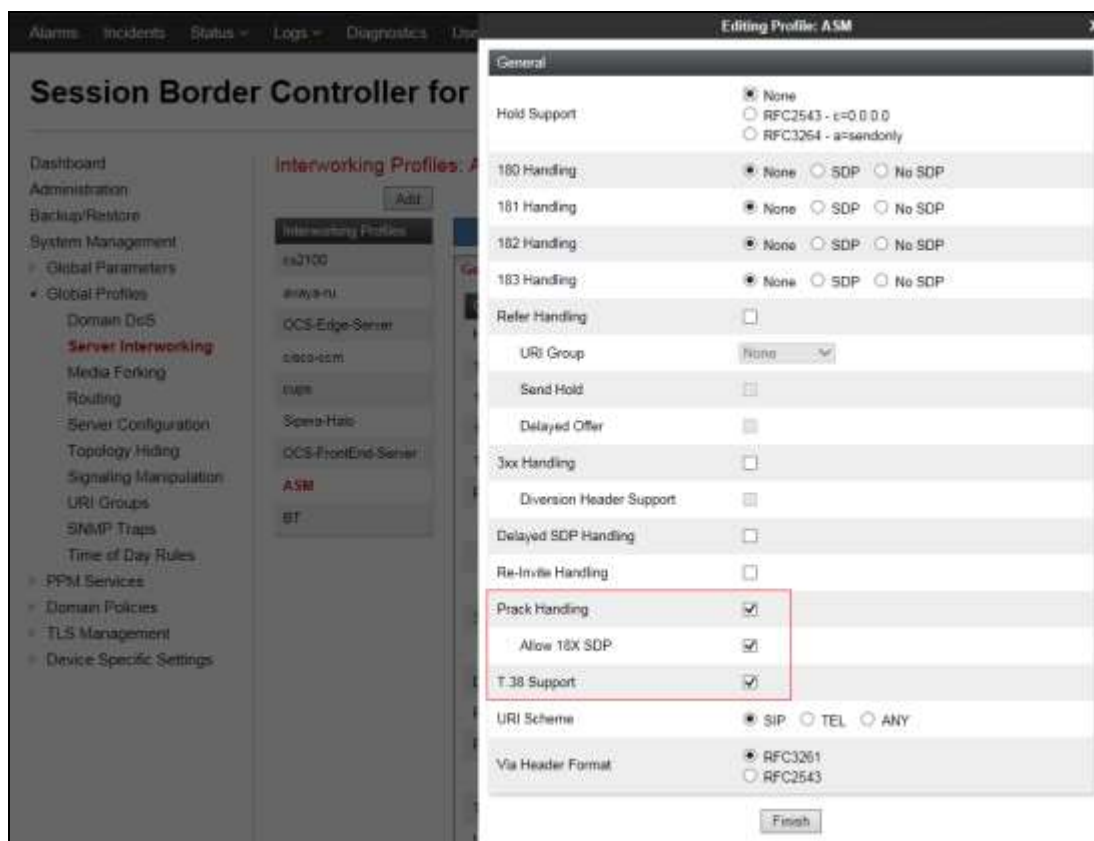
The following screenshot shows details of the media interfaces:



7.4. Define Server Interworking

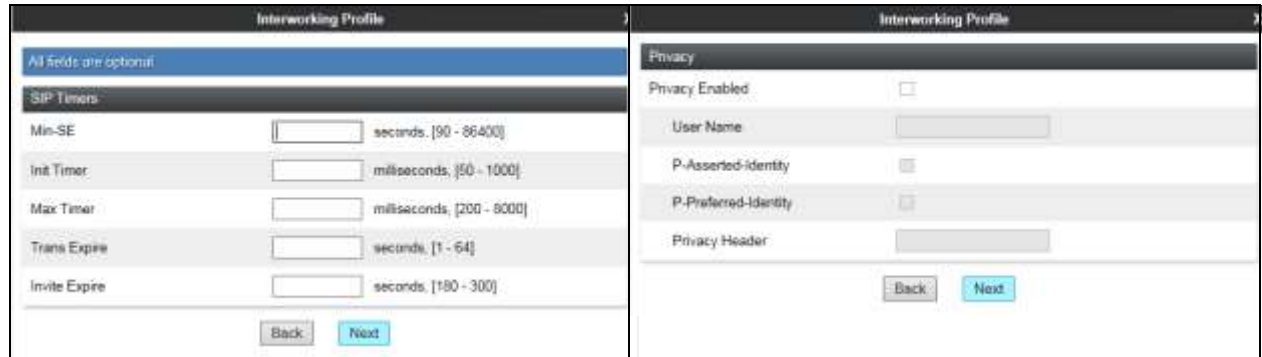
Server interworking is defined for each server connected to the Avaya SBCE. In this case, the BT Ireland SIP Trunk Service is connected as the Trunk Server and Session Manager is connected as the Call Server.

To define server interworking on the Avaya SBCE, navigate to **Global Profiles → Server Interworking** in the main menu on the left hand side. To define Server Interworking for Session Manager, click on **Add** (not shown). A pop-up menu (not shown) is generated. In the **Name** field enter a descriptive name for Session Manager and click **Next**.

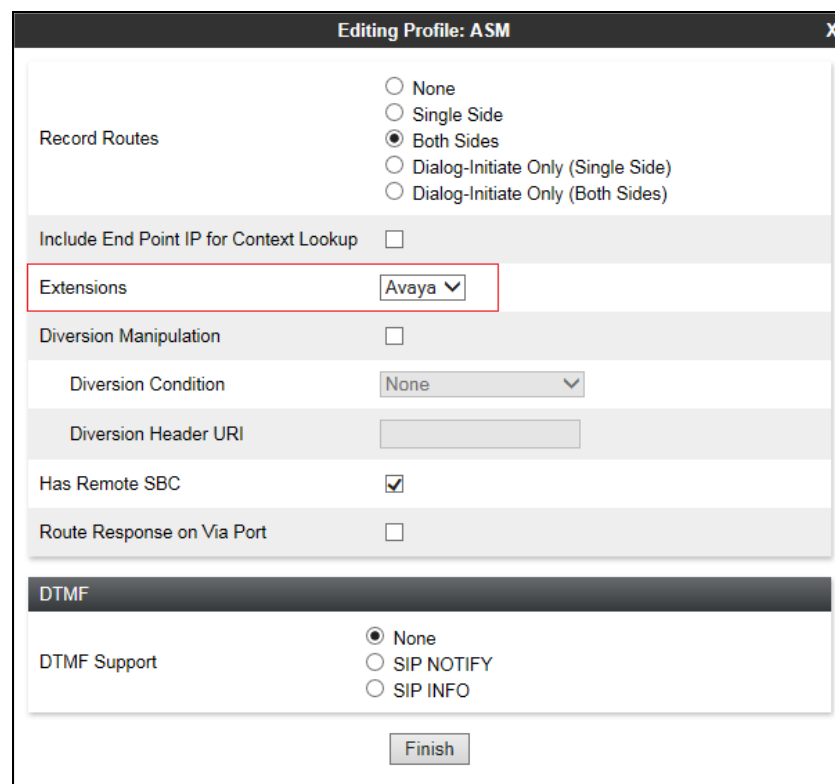


Configuration of interworking includes Hold support, T.38 fax support and SIP extensions.

- In the General dialogue box shown in the previous screenshot, check the **T.38 Support** box.
- Check the **Prack Handling** and **Allow 18X SDP** boxes to convert 180 Ringing with SDP to 183 Session Progress with SDP.
- During testing, the rest of the parameters were left at default values.
- Click on **Next** and **Next** again to go through the next two dialogue boxes. During testing, these were left at default values.

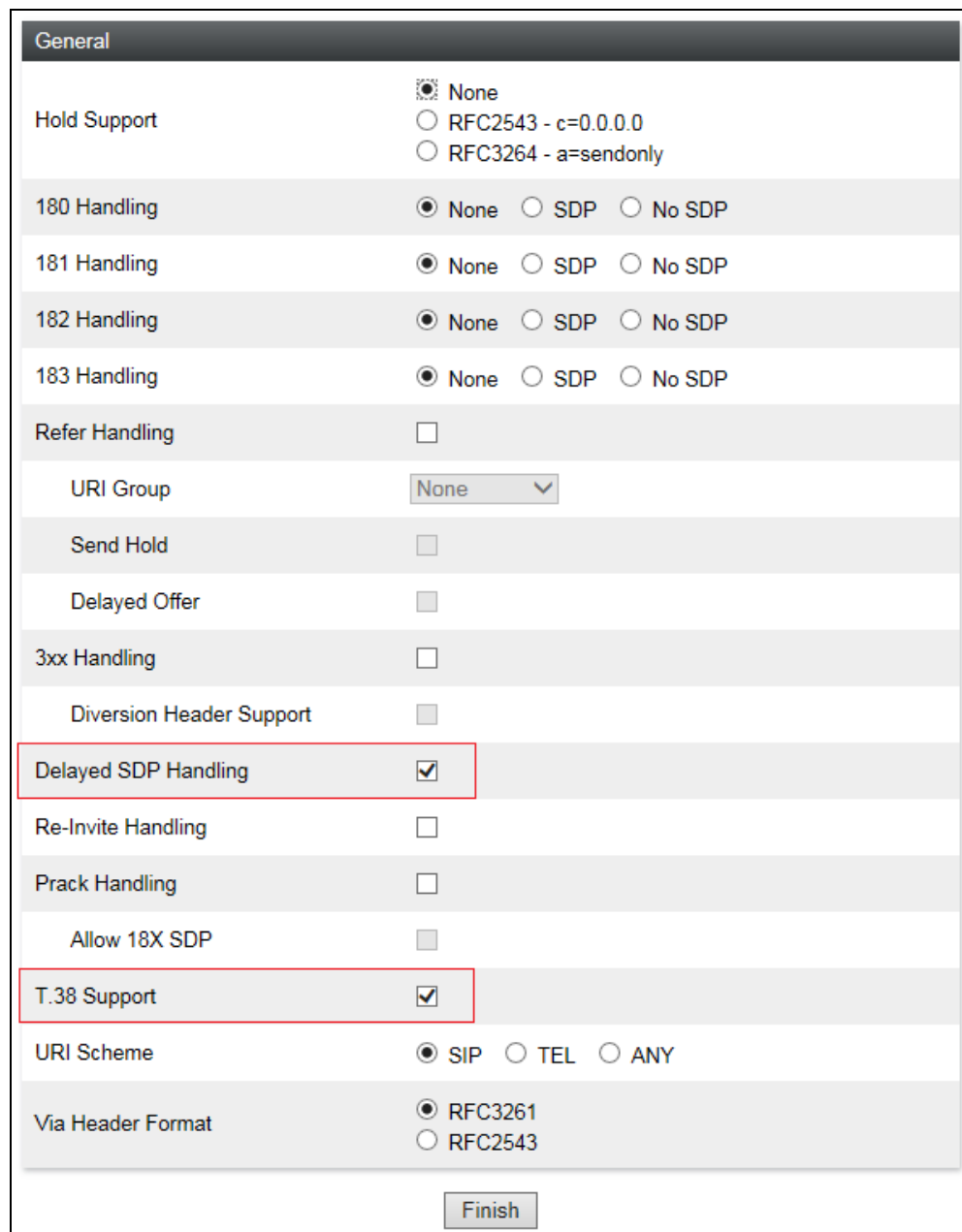


In the final dialogue box, select the required extensions from the **Extensions** drop down menu. Note that Avaya extensions are not supported for the SIP Trunk though they were applied to the Session Manager during testing. Click on **Finish**



To define Server Interworking for the BT Ireland SIP Trunk Service, click on **Add** (not shown). A pop-up menu (not shown) is generated. In the **Name** field enter a descriptive name for the BT Ireland SIP Trunk Service and click **Next**.

- In the General dialogue box that appears, check the Delayed SDP Handling. This avoids sending empty INVITE messages that are not supported by BT Ireland
- Check the **T.38** box.



General	
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 type="checkbox"/>
Delayed Offer	<input type="checkbox"/>
3xx Handling	<input type="checkbox"/>
Diversion Header Support	<input type="checkbox"/>
Delayed SDP Handling	<input checked="" 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
Finish	

- Click on **Next** and **Next** again to go through the next two dialogue boxes. During testing, these were left at default values.

In the final dialogue box, select **None** from the **Extensions** box and click on **Finish**.

7.5. Define Signalling Manipulation

Signalling manipulation is required in cases where there is non-standard signalling between the Call Server and Trunk Server that can't be resolved by the Server Interworking described in the previous section. During testing, an issue was found with the handling of an Avaya specific parameter in the Contact header.

The Avaya proprietary parameter is “+avaya-cm-keep-mpro” and is present with a value of “no” when the Media Gateway is not used for call set-up i.e., when Initial IP-IP Direct Media is used on Communication Manager SIP Trunk. This can’t be removed using the Header Manipulation tab in the Server Interworking profile described in the previous section, and a fault report AURORA-7477 has been raised to address this. During testing, Signalling Manipulation was used to remove the parameter

To define the signalling manipulation to remove the Avaya proprietary parameter, navigate to **Global Profiles → Signaling Manipulation** in the main menu on the left hand side. Click on **Add** and enter a title and the script in the script editor. The script text is as follows:

```
within session "INVITE"
{
  act on message where %DIRECTION="OUTBOUND" and %ENTRY_POINT="POST_ROUTING"
  {
    if (exists(%HEADERS["Contact"][1].PARAMS["+avaya-cm-keep-mpro"])) then
    {
      remove(%HEADERS["Contact"][1].PARAMS["+avaya-cm-keep-mpro"]);
    }
  }
}
```

Once entered and saved, the script appears as shown in the following screenshot:



7.6. Define Servers

A server definition is required for each server connected to the Avaya SBCE. In this case, the BT Ireland SIP Trunk Service is connected as the Trunk Server and Session Manager is connected as the Call Server.

To define the BT Ireland SIP Trunk Server, navigate to **Global Profiles → Server Configuration** in the main menu on the left hand side. Click on **Add** and enter an appropriate name in the pop-up menu (not shown). Click on **Next** and enter details in the dialogue box.

- In the **Server Type** drop down menu, select **Trunk Server**.
- Click on **Add** to enter an IP address
- In the **IP Addresses / FQDN** box, type the first BT Ireland network SBC interface address.
- In the **Port** box, enter the port to be used for the SIP Trunk. This was left blank during testing which defaults to 5060 when UDP is used for transport.
- In the **Transport** drop down menu, select **UDP**.
- Click on **Add** and repeat the above for the alternative network SBC. Click on **Next**.

Session Border Controller for Enterprise

Edit Server Configuration Profile - General

Server Type can not be changed while this Server Configuration profile is associated to a Server Flow.

Server Type: Trunk Server

Add

IP Address / FQDN	Port	Transport	
62.172.16.163	5060	UDP	Delete
62.172.16.179	5060	UDP	Delete

Finish

Click on **Next** and enter details as provided by BT Ireland in the Authentication dialogue box.

Edit Server Configuration Profile - Authentication

Enable Authentication ☒

User Name: 0144nnnn0

Realm: (Leave blank to detect from server challenge)

Password: (Leave blank to keep existing password)

Confirm Password

Finish

Click on **Next** again to go through the Heartbeat dialogue box, this may be required for initial testing but is not necessary for normal operation as Session Manager uses **OPTIONS** to monitor the SIP Trunk.

The final dialogue box is the **Advanced** settings:

- In the **Interworking Profile** drop down menu, select the **Interworking Profile** for the BT Ireland SIP Trunk Service defined in **Section 7.4**.
- In the **Signaling Manipulation Script** dialogue box, select the signalling manipulation script defined in **Section 7.5** to remove the Avaya proprietary parameter from the Contact header.
- Click **Finish**.

Use the process above to define the Call Server configuration for the Session Manager if not already defined.

- Ensure that **Call Server** is selected in the **Server Type** drop down menu in the **General** dialogue box.
- Ensure that the Interworking Profile defined for the Session Manager in **Section 7.4** is selected in the **Interworking Profile** drop down menu in the Advanced dialogue box

The following screenshot shows the **General** tab of the completed Server Configuration:

The next screenshot shows the Advanced tab.

The screenshot shows the 'Server Configuration: CPE' dialog box with the 'Advanced' tab selected. The 'General' tab is also visible. The 'Advanced' tab contains the following settings:

Setting	Value
Enable DoS Protection	<input type="checkbox"/>
Enable Grooming	<input type="checkbox"/>
Interworking Profile	ASM
Signaling Manipulation Script	None
Connection Type	SUBID
Securable	<input type="checkbox"/>

Buttons: Add, Rename, Clone, Delete, Edit.

7.7. Define Routing

Routing information is required for routing to the BT Ireland SIP Trunk Service on the external side and Session Manager on the internal side. The IP addresses and ports defined here will be used as the destination addresses for signalling.

To define routing to the BT Ireland SIP Trunk, navigate to **Global Profiles → Routing** in the main menu on the left hand side. Click on **Add** and enter an appropriate name in the dialogue box (not shown), click on **Next** and enter details for the Routing Profile:

- In the **Load Balancing** drop down menu, select the method of load balancing required. During testing this was set to **Priority**. If an even distribution across the network SBCs is required, **Round Robin** could be used.
- Click on **Add** to specify an IP address for the first network SBC.
- Assign a priority in the **Priority / Weight** field.
- Select the Server Configuration defined in **Section 7.6** in the **Server Configuration** drop down menu. This automatically populates the **Next Hop Address** field
- Repeat for the alternative network SBC. Click **Finish**.

The screenshot shows the 'Session Border Controller' interface with the 'Routing Profiles' configuration. The 'WAN' profile is selected. The 'Edit Rule' dialog box is open, showing the following settings:

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

Buttons: Add, Finish.

Priority / Weight	Server Configuration	Next Hop Address	Transport	Action
1	BT_Trunk	62.172.16.163:5060 (UDP)	None	Delete
2	BT_Trunk	62.172.16.179:5060 (UDP)	None	Delete

Repeat the above process for the Routing Profile for Session Manager: The following screenshot shows the completed configuration:

Routing Profiles: LAN

Click here to add a description

Routing Profile

Update Priority Add

Priority	URI Group	Time of Day	Load Balancing	Next Hop Address	Transport	
1	*	default	Priority	10.10.9.31	TCP	Edit Delete

7.8. Topology Hiding

Topology Hiding is used to hide local information such as private IP addresses and local domain names. The local information can be overwritten with a domain name or IP addresses. The default **Replace Action** is **Auto**, this replaces local information with IP addresses, generally the next hop or external interfaces. Topology Hiding has the advantage of presenting single Via and Record-Route headers externally where multiple headers may be received from the enterprise, particularly from Session Manager. In some cases where Topology Hiding can't be applied, in particular the Contact header, IP addresses are translated to the Avaya SBCE external addresses using NAT.

To define Topology Hiding for the BT Ireland SIP Trunk Service, navigate to **Global Profiles** → **Topology Hiding** in the main menu on the left hand side. Click on **Add** to bring up a dialogue box, assign an appropriate name and click on **Next** to configure Topology Hiding for each header as required:

Session Border Controller for Enterprise

Topology Hiding Profiles

Add

default

BT

Edit Topology Hiding Profile

Header	Criteria	Replace Action	Overwrite Value	
From	IPDomain	Auto		Delete
SDP	IP	Auto		Delete
To	IPDomain	Auto		Delete
Request-Line	IPDomain	Auto		Delete
Record-Route	IPDomain	Auto		Delete
Refered-By	IP	Auto		Delete
Refer-To	IPDomain	Auto		Delete
Via	IPDomain	Auto		Delete

Finish

Enter details in the **Topology Hiding Profile** pop-up menu.

- In the **Profile Name** field enter a descriptive name for the BT Ireland SIP Trunk Service and click **Next**.
- Click on **Add Header** and select from the **Header** drop down menu.
- Select **IP** or **IP/Domain** from the **Criteria** drop down menu depending on requirements. During testing **IP** was used for the From header so that the domain name of “anonymous.invalid” for CLI restricted calls was not overwritten.
- Leave the **Replace Action** at the default value of **Auto** unless a specific domain name is required. In this case, select **Overwrite** and define a domain name in the **Overwrite Value** field.
- Topology Hiding was defined for all headers where the function is available.

To define Topology Hiding for Session Manager, follow the same process. This can be simplified by cloning the profile defined for the BT Ireland SIP Trunk Service. Do this by highlighting the profile defined for the BT Ireland and clicking on **Clone**. Enter an appropriate name for the Session Manager profile and click on **Next**. Make any changes where required, in the test environment the settings were left at the same values.

Topology Hiding Profiles: ASM

Click here to add a description

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

7.9. End Point Policy Groups

End Point Policy Groups are used to bring together a number of different rules for use in a server flow described in **Section 7.10**. The BT Ireland SIP Trunk Service was tested with a signalling rule to remove unnecessary and Avaya proprietary SIP headers. This was not necessary for the effective functioning of the SIP Trunk but was used to reduce the SIP message size.

7.9.1. Signalling Rules

Signalling rules are used to handle any non-standard signalling that may be encountered on a SIP Trunk, in this case the transmission of Avaya proprietary and unnecessary SIP message headers from the Avaya equipment.

To define the signalling rule, navigate to **Domain Policies** → **Signaling Rules** in the main menu on the left hand side. Click on **Add** and enter details in the Signaling Rule pop-up box. In the **Rule Name** field enter a descriptive name for the signalling rule and click **Next** and **Next** again, then **Finish**

- Click on the **Request Headers** tab and then click on **Add Out Header Control** (not shown).
- Either select a standard header from the **Header Name** drop down menu or check the **Proprietary Request Header** box and enter the name manually. The example shows **P-Location**.
- Select **INVITE** from the **Method Name** drop down menu.
- Check the **Forbidden** button in the **Header Criteria** menu.
- Select **Remove Header** from the **Presence Action** drop down menu.

Apply the above to the following SIP Headers: Accept-Language; Alert-Info; Av-Global-Session-ID; Endpoint-View; P-AV-Message-Id; P-Charging-Vector; P-Location: The following screenshot shows the applied Request Header removal:

Signaling Rules: Header_Removal

Buttons: Add, Filter By Device..., Rename, Clone, Delete

Click here to add a description

Tabs: General, Requests, Responses, **Request Headers**, Response Headers, Signaling QoS, UCID

Buttons: Add In Header Control, Add Out Header Control

Row	Header Name	Method Name	Header Criteria	Action	Proprietary	Direction	Edit	Delete
1	Accept-Language	INVITE	Forbidden	Remove Header	No	OUT	Edit	Delete
2	Alert-Info	INVITE	Forbidden	Remove Header	No	OUT	Edit	Delete
3	Av-Global-Session-ID	INVITE	Forbidden	Remove Header	Yes	OUT	Edit	Delete
4	P-AV-Message-Id	INVITE	Forbidden	Remove Header	Yes	OUT	Edit	Delete
5	P-Charging-Vector	INVITE	Forbidden	Remove Header	Yes	OUT	Edit	Delete
6	P-Location	INVITE	Forbidden	Remove Header	Yes	OUT	Edit	Delete

Response headers are defined in the same way as request headers. The screenshot shows the additional drop down menu for **Response Code**. During testing this was applied to **180** and **200** response codes so the header could be removed from 180 Ringing and 200 OK messages. The removal of the P-Location header from 200 OK messages is shown as an example:

Add Header Control [X]

Proprietary Response Header ☒

Header Name

Response Code

Method Name

Header Criteria
☒ Forbidden
☐ Mandatory
☐ Optional

Presence Action

The screenshot below shows the applied Response Header removal:

Signaling Rules: Header_Removal

Click here to add a description

General **Requests** **Responses** **Request Headers** **Response Headers** **Signaling QoS** **UCID**

Row	Header Name	Response Code	Method Name	Header Criteria	Action	Proprietary	Direction		
1	Accept-Language	180	ALL	Forbidden	Remove Header	No	OUT	Edit	Delete
2	Accept-Language	200	ALL	Forbidden	Remove Header	No	OUT	Edit	Delete
3	Av-Global-Session-ID	180	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete
4	Av-Global-Session-ID	200	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete
5	P-AV-Message-Id	180	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete
6	P-AV-Message-Id	200	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete
7	P-Location	180	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete
8	P-Location	200	ALL	Forbidden	Remove Header	Yes	OUT	Edit	Delete

Note that the header removal signalling rule shown was applied to headers seen in the signalling during testing. As mentioned previously, this is not necessary for the functioning of the SIP Trunk, but can be used as a tool to reduce message size.

7.9.2. End Point Policy Group

An End Point Policy Group is required to implement the signalling rule. To define one for use in the Session Manager server flow, navigate to **Domain Policies → End Point Policy Groups** in the main menu on the left hand side. Click on **Add** and enter an appropriate name in the pop-up box (not shown). Click on **Next** to configure the Policy Set. Enter details as follows:.

- Leave the **Application Rule**, **Border Rule**, **Media Rule** and **Security Rule** at their default values
- Select the **Signaling Rule** created in the previous section in the drop down menu
- Click on **Finish**

The screenshot shows the 'Edit Policy Set' dialog box in the Avaya Session Manager configuration interface. The dialog is titled 'Edit Policy Set' and has a close button 'X' in the top right corner. It contains five rows of configuration options, each with a label and a dropdown menu:

Rule Type	Selected Value
Application Rule	default-trunk
Border Rule	default
Media Rule	default-low-med
Security Rule	default-low
Signaling Rule	Header_Removal

At the bottom of the dialog is a 'Finish' button. The background shows the 'Policy Groups: Trunk-def-low' page with a list of policy groups including 'avaya-def-high-server' and 'Trunk-def-low'.

7.10. Server Flows

Server Flows combine the previously defined profiles into two End Point Server Flows, one for the BT Ireland SIP Trunk Service and another for Session Manager. These End Point Server Flows allow calls to be routed from Session Manager to the BT Ireland SIP Trunk and vice versa.

To define a Server Flow for the BT Ireland SIP Trunk Service, navigate to **Device Specific Settings → End Point Flows**.

- Click on the **Server Flows** tab.
- Select **Add Flow** and enter details in the pop-up menu.
- In the **Name** field enter a descriptive name for the server flow for the BT Ireland SIP Trunk Service, in the test environment **BT_Trunk** was used.
- In the **Received Interface** drop-down menu, select the internal SIP signalling interface defined in **Section 7.3**. This is the interface that signalling bound for the BT Ireland SIP Trunk Service is received on.
- In the **Signaling Interface** drop-down menu, select the external SIP signalling interface defined in **Section 7.3**. This is the interface that signalling bound for the BT Ireland SIP Trunk Service is sent on.
- In the **Media Interface** drop-down menu, select the external media interface defined in **Section 7.3**. This is the interface that media bound for the BT Ireland SIP Trunk Service is sent on.
- In the **End Point Policy Group** drop-down menu, select the End Point Policy Group defined in **Section 7.9**.
- In the **Routing Profile** drop-down menu, select the routing profile of the Session Manager defined in **Section 7.7**.
- In the **Topology Hiding Profile** drop-down menu, select the topology hiding profile of the BT Ireland SIP Trunk Service defined in **Section 7.8** and click **Finish**.

Edit Flow: BT_Trunk	
Flow Name	BT_Trunk
Server Configuration	BT_Trunk
URI Group	*
Transport	*
Remote Subnet	*
Received Interface	Internal
Signaling Interface	External
Media Interface	External
End Point Policy Group	Trunk-def-low
Routing Profile	LAN
Topology Hiding Profile	BT
Signaling Manipulation Script	None
Remote Branch Office	Any
Finish	

To define a Server Flow for Session Manager, navigate to **Device Specific Settings → End Point Flows**.

- Click on the **Server Flows** tab.
- Select **Add Flow** and enter details in the pop-up menu.
- In the **Name** field enter a descriptive name for the server flow for Session Manager, in the test environment **CPE** was used.
- In the **Received Interface** drop-down menu, select the external SIP signalling interface defined in **Section 7.3**. This is the interface that signalling bound for Session Manager is received on.
- In the **Signaling Interface** drop-down menu, select the internal SIP signalling interface defined in **Section 7.3**. This is the interface that signalling bound for Session Manager is sent on.
- In the **Media Interface** drop-down menu, select the internal media interface defined in **Section 7.3**. This is the interface that media bound for Session Manager is sent on.
- In the **Routing Profile** drop-down menu, select the routing profile of the BT Ireland SIP Trunk Service defined in **Section 7.6**.
- In the **Topology Hiding Profile** drop-down menu, select the topology hiding profile of Session Manager defined in **Section 7.7** and click **Finish**.

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

Field	Value
Flow Name	CPE
Server Configuration	CPE
URI Group	*
Transport	*
Remote Subnet	*
Received Interface	External
Signaling Interface	Internal
Media Interface	Internal
End Point Policy Group	default-low
Routing Profile	WAN
Topology Hiding Profile	ASM
Signaling Manipulation Script	None
Remote Branch Office	Any

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

The information for all Server Flows is shown on a single screen on the Avaya SBCE.

End Point Flows: GSSCP_V9

Devices
GSSCP_V9

Subscriber Flows

Server Flows

Add

Click here to add a row description

Server Configuration: BT_Trunk

Priority	Flow Name	URI Group	Received Interface	Signaling Interface	End Point Policy Group	Routing Profile	
1	BT_Trunk	*	Internal	External	Trunk-def-low	LAN	View Clone Edit Delete

Server Configuration: CPE

Priority	Flow Name	URI Group	Received Interface	Signaling Interface	End Point Policy Group	Routing Profile	
1	CPE	*	External	Internal	default-low	WAN	View Clone Edit Delete

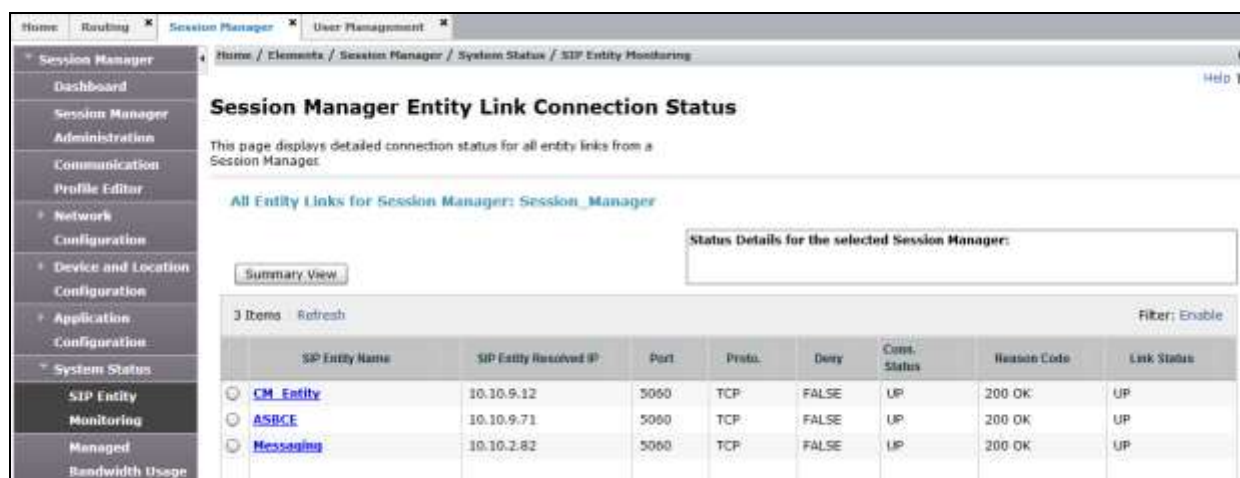
8. Configure the BT Ireland SIP Trunk Service Equipment

The configuration of the BT Ireland equipment used to support the SIP Trunk is outside the scope of these Application Notes and will not be covered. To obtain further information on BT Ireland equipment and system configuration please contact an authorised BT Ireland representative.

9. Verification Steps

This section provides steps that may be performed to verify that the solution is configured correctly.

1. From System Manager **Home** tab click on **Session Manager** and navigate to **Session Manager → System Status → SIP Entity Monitoring**. Select the relevant SIP Entities from the list and observe if the **Conn Status** and **Link Status** are showing as **UP**.



SIP Entity Name	SIP Entity Resolved IP	Port	Proto.	Deny	Conn. Status	Reason Code	Link Status
CM_Entity	10.10.9.12	5060	TCP	FALSE	UP	200 OK	UP
ASBCE	10.10.9.71	5060	TCP	FALSE	UP	200 OK	UP
Messaging	10.10.2.82	5060	TCP	FALSE	UP	200 OK	UP

2. From Communication Manager SAT interface run the command **status trunk n** where **n** is a previously configured SIP trunk. Observe if all channels on the trunk group display **in-service/idle**.

```
status trunk 2
```

TRUNK GROUP STATUS			
Member	Port	Service State	Mtce Connected Ports Busy
0001/001	T00001	in-service/idle	no
0001/002	T00002	in-service/idle	no
0001/003	T00003	in-service/idle	no
0001/004	T00004	in-service/idle	no
0001/005	T00005	in-service/idle	no
0001/006	T00006	in-service/idle	no
0001/007	T00007	in-service/idle	no
0001/008	T00008	in-service/idle	no
0001/009	T00009	in-service/idle	no

3. Verify that endpoints at the enterprise site can place calls to the PSTN and that the call remains active.
4. Verify that endpoints at the enterprise site can receive calls from the PSTN and that the call can remain active.
5. Verify that the user on the PSTN can end an active call by hanging up.
6. Verify that an endpoint at the enterprise site can end an active call by hanging up.
7. Should issues arise with the SIP trunk, use the Avaya SBCE trace facility to check that the OPTIONS requests sent from the Session Manager via the Avaya SBCE to the network SBCs are receiving a response.

To define the trace, navigate to **Device Specific Settings → Advanced Options → Troubleshooting → Trace** in the main menu on the left hand side and select the **Packet Capture** tab.

- Select the SIP Trunk interface from the **Interface** drop down menu.
- Select the signalling interface IP address or **All** from the **Local Address** drop down menu.
- Enter the IP address of the network SBC in the **Remote Address** field or enter a * to capture all traffic.
- Specify the **Maximum Number of Packets to Capture**, 10000 is shown as an example.
- Specify the filename of the resultant pcap file in the **Capture Filename** field.
- Click on **Start Capture**.

The screenshot displays the 'Packet Capture Configuration' window in the Avaya SBCE interface. The left-hand navigation pane shows the path: Dashboard > Administration > System Management > Device Specific Settings > Troubleshooting > Trace. The main content area is titled 'Trace: GSSCP_V9'. Within this area, there is a 'Devices' list on the left showing 'GSSCP_V9' and a 'Packet Capture' configuration form on the right. The form has two tabs: 'Packet Capture' (active) and 'Captures'. The configuration fields are as follows:

Field	Value
Status	Ready
Interface	B1
Local Address (IP Port)	All
Remote Address	*
Protocol	All
Maximum Number of Packets to Capture	10000
Capture Filename	SIP_Trunk_Test.pcap

At the bottom of the configuration form are two buttons: 'Start Capture' and 'Clear'. A note below the filename field states: 'Using the name of an existing capture will overwrite it.'

To view the trace, select the **Captures** tab and click on the relevant filename in the list of traces.



The trace is viewed as a standard pcap file in Wireshark. If the SIP trunk is working correctly, a SIP response to OPTIONS in the form of a 200 OK will be seen from the BT Ireland network.

10. Conclusion

These Application Notes describe the configuration necessary to connect Avaya Aura ® Communication Manager R7.0, Avaya Aura ® Session Manager 7.0 and Avaya Session Border Controller for Enterprise R7.0 to the BT Ireland SIP Trunk Service. The BT Ireland SIP Trunk Service is a SIP-based Voice over IP solution providing businesses a flexible, cost-saving alternative to traditional hardwired telephony trunks. The service was successfully tested with a number of observations listed in **Section 2.2**.

11. Additional References

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

- [1] *Migrating and Installing Avaya Appliance Virtualization Platform*, Release 7.0, Nov 2015.
- [2] *Upgrading and Migrating Avaya Aura® applications to 7.0*, Release 7.0, Nov 2015.
- [3] *Deploying Avaya Aura® applications*, Release 7.0, Oct 2015
- [4] *Deploying Avaya Aura® Communication Manager in Virtualized Environment*, August 2015
- [5] *Administering Avaya Aura® Communication Manager*, Release 7.0, August 2015.
- [6] *Deploying Avaya Aura® System Manager*, Release 7.0 Nov 2015
- [7] *Upgrading Avaya Aura® Communication Manager to Release 7.0*, Release 7.0, August 2015
- [8] *Upgrading Avaya Aura® System Manager to Release 7.0*, Nov 2015.
- [9] *Administering Avaya Aura® System Manager for Release 7.0*, Release 7.0, Nov 2015
- [10] *Deploying Avaya Aura® Session Manager on VMware*, Release 7.0 August 2015
- [11] *Upgrading Avaya Aura® Session Manager Release 7.0*, August 2015
- [12] *Administering Avaya Aura® Session Manager Release 7.0*, August 2015,
- [13] *Deploying Avaya Session Border Controller for Enterprise*, Release 7.0, August 2015
- [14] *Upgrading Avaya Session Border Controller for Enterprise*, Release 7.0, August 2015
- [15] *Administering Avaya Session Border Controller for Enterprise*, Release 7.0, Nov 2015
- [16] *RFC 3261 SIP: Session Initiation Protocol*, <http://www.ietf.org/>

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