



Avaya Solution & Interoperability Test Lab

Application Notes for Configuring Avaya IP Office 9.0 with HIPCOM SIP Trunk – Issue 1.0

Abstract

These Application Notes describe the procedures for configuring Session Initiation Protocol (SIP) trunking between HIPCOM SIP Trunk and Avaya IP Office.

The HIPCOM SIP Trunk service provides PSTN access via a SIP trunk connected to the HIPCOM Voice Over Internet Protocol (VoIP) network as an alternative to legacy Analogue or digital trunks. HIPCOM are a member of the Avaya DevConnect Service Provider program.

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe the procedures for configuring Session Initiation Protocol (SIP) trunking between HIPCOM SIP Trunk and Avaya IP Office. HIPCOM SIP Trunk provides PSTN access via a SIP trunk connected to the HIPCOM network as an alternative to legacy Analogue or Digital trunks. This approach generally results in lower cost for customers.

2. General Test Approach and Test Results

The general test approach was to configure a simulated enterprise site using Avaya IP Office to connect to HIPCOM SIP Trunk. This configuration (shown in **Figure 1**) was used to exercise the features and functionality listed in **Section 2.1**.

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.

Testing was performed with IP Office 500 v2 R9.0, but it also applies to IP Office Server Edition R9.0. Note that IP Office Server Edition requires an Expansion IP Office 500 v2 R9.0 to support analog or digital endpoints or trunks. IP Office Server Edition does not support TAPI Wave or Group Voicemail

2.1. Interoperability Compliance Testing

Avaya IP Office was connected to the HIPCOM SIP Trunk. To verify SIP trunking interoperability the following features and functionality were exercised during the interoperability compliance test:

- Incoming PSTN calls to various phone types including H.323, Digital and Analogue telephones at the enterprise.
- All inbound PSTN calls were routed to the enterprise across the SIP trunk from HIPCOM
- Outgoing PSTN calls from various phone types including H.323, Digital, and Analogue telephones at the enterprise.
- All outbound PSTN calls were routed from the enterprise across the SIP trunk to HIPCOM
- Inbound and outbound PSTN calls to/from an IP Office Softphone client
- Various call types including: local, international, toll free (outbound) and directory assistance
- Codecs G.711A, G.729A and G.711MU
- Caller ID presentation and Caller ID restriction
- DTMF transmission using RFC 2833

- Voicemail navigation for inbound and outbound calls
- User features such as hold and resume, transfer, and conference
- Off-net call forwarding and twinning

2.2. Test Results

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

- Outbound call to unallocated numbers and no reply were treated by playing announcements from the network. This worked well, but gave no indication in signalling as to the cause of the failure.
- Inbound Call attempts with no matching codecs in the SDP resulted in “488 Not Acceptable Here” being sent from the IP Office. When it received this, the network re-attempted the call several times before playing a tone to the caller. This resulted in a period of silence of approximately 15 seconds.
- Outbound call attempts with no matching codecs received a response from the network of “480 Temporarily Unavailable”. A more commonly used response is “488 Not Acceptable Here”
- During DTMF testing, the Avaya Galway voicemail system was dialled to test menu navigation using DTMF digit. It was found that when a hash (#) was pressed on a SIP phone, it was not recognized by the system. All other digits were recognized, however, and hash was recognized by two other IVR systems dialled. This was taken to be an issue on local test systems and set-up.
- Toll Free access was not available for incoming calls and was not tested.
- Access to Emergency Services was not tested as no test call was booked with the Emergency Services Operator.
- The network call hold test was not a true test of SIP trunk functionality as it was handled in the network and there was nothing in signalling to indicate the call was on hold. Similarly, IP Office provides no indication in signalling to the network that a call is on hold.
- Outbound fax was found during test to be unreliable with the first attempt failing after 6 pages of a 10 page fax. This was taken to be an issue specific to the test network.

2.3. Support

For technical support on HIPCOM products please contact an authorized HIPCOM representative.

3. Reference Configuration

Figure 1 illustrates the test configuration. The test configuration shows an enterprise site connected to HIPCOM SIP Trunk. Located at the enterprise site is an Avaya IP Office 500 v2. Endpoints include an Avaya 1600 Series IP Telephone (with H.323 firmware), an Avaya 9600 Series IP Telephone (with SIP firmware), an Avaya 2420 Digital Telephone, Avaya Analogue Telephone and fax machine. The site also has a Windows XP PC running Avaya IP Office Manager to configure the Avaya IP Office as well as an IP Office Softphone client for mobility testing. For security purposes, any public IP addresses or PSTN routable phone numbers used in the compliance test are not shown in these Application Notes. Instead, public IP addresses have been changed to a private format and all phone numbers have been obscured beyond the city code.

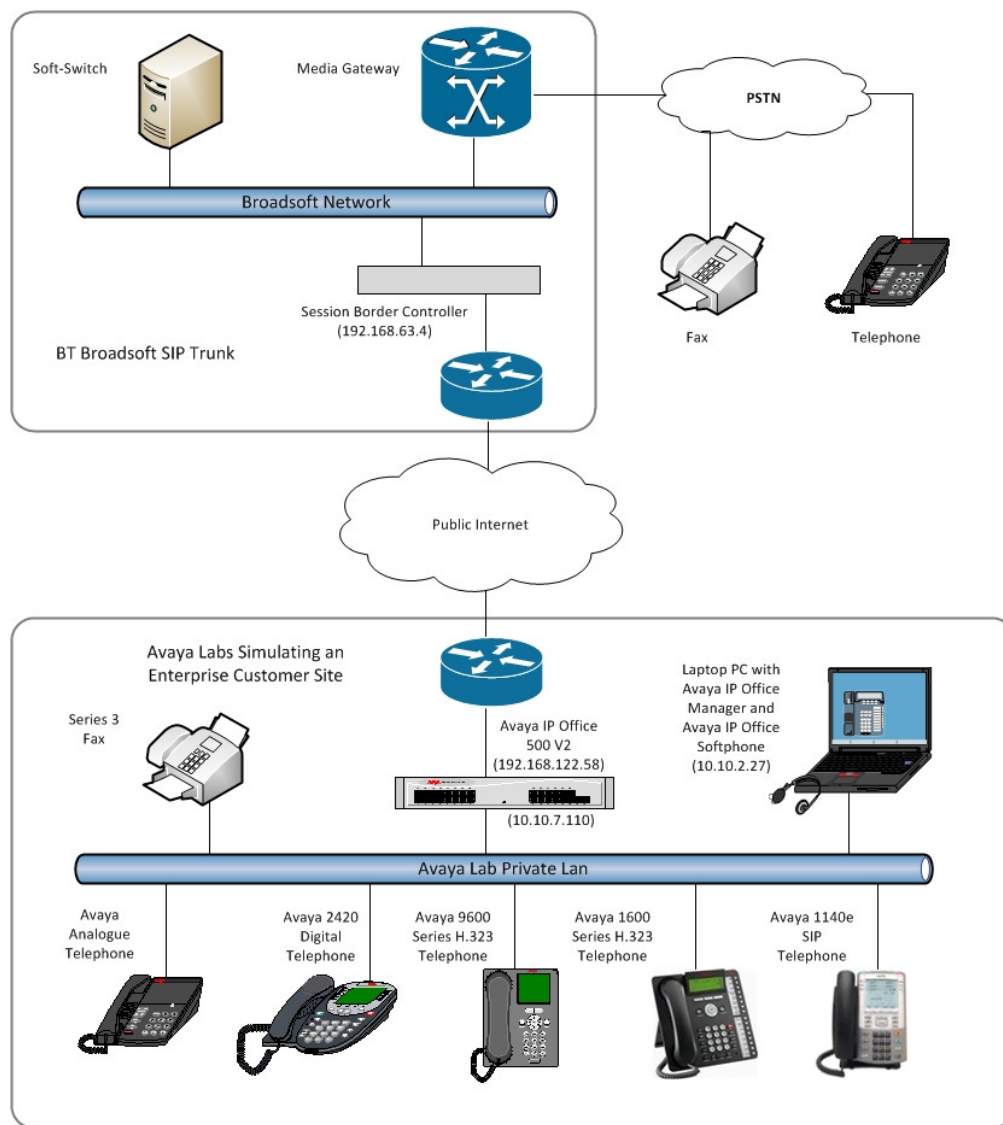


Figure 1: HIPCOM SIP Trunk to Avaya IP Office Topology

4. Equipment and Software Validated

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

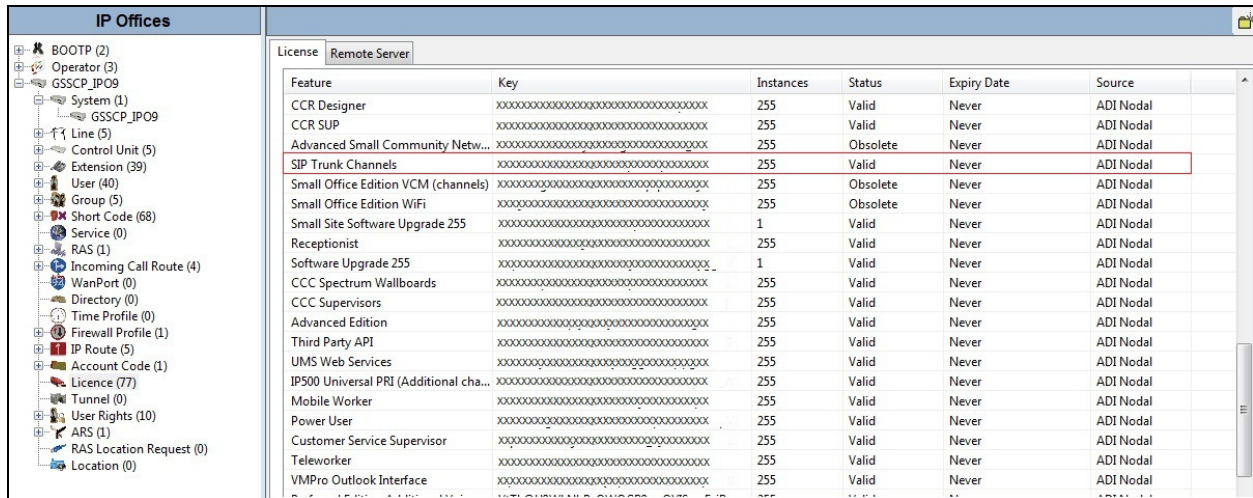
Equipment/Software	Release/Version
Avaya	
Avaya IP Office 500 V2	Avaya IP Office R9.0 (829)
Avaya 1140e SIP Telephone	04.03.09.00
Avaya 1603 Phone (H.323)	1.3.3
Avaya 9620 Phone (H.323)	3.2.0
Avaya 2420 Digital Phone	N/A
Avaya 98390 Analogue Phone	N/A
Avaya Softphone	3.2.3.48 (67009)
HIPCOM	
ACME Net-Net 4500 SBC	v6.1
BroadWorks	v17sp4

5. Configure Avaya IP Office

This section describes the Avaya IP Office configuration to support connectivity to the HIPCOM SIP Trunk. Avaya IP Office is configured through the Avaya IP Office Manager PC application. From a PC running the Avaya IP Office Manager application, select **Start → Programs → IP Office → Manager** to launch the application. Navigate to **File → Open Configuration**, select the proper Avaya IP Office system from the pop-up window, and log in with the appropriate credentials. A management window will appear similar to the one in the next section. All the Avaya IP Office configurable components are shown in the left pane known as the Navigation Pane. The pane on the right is the Details Pane. These panes will be referenced throughout the Avaya IP Office configuration. All licensing and feature configuration that is not directly related to the interface with the Service Provider (such as twinning) is assumed to already be in place.

5.1. Verify System Capacity

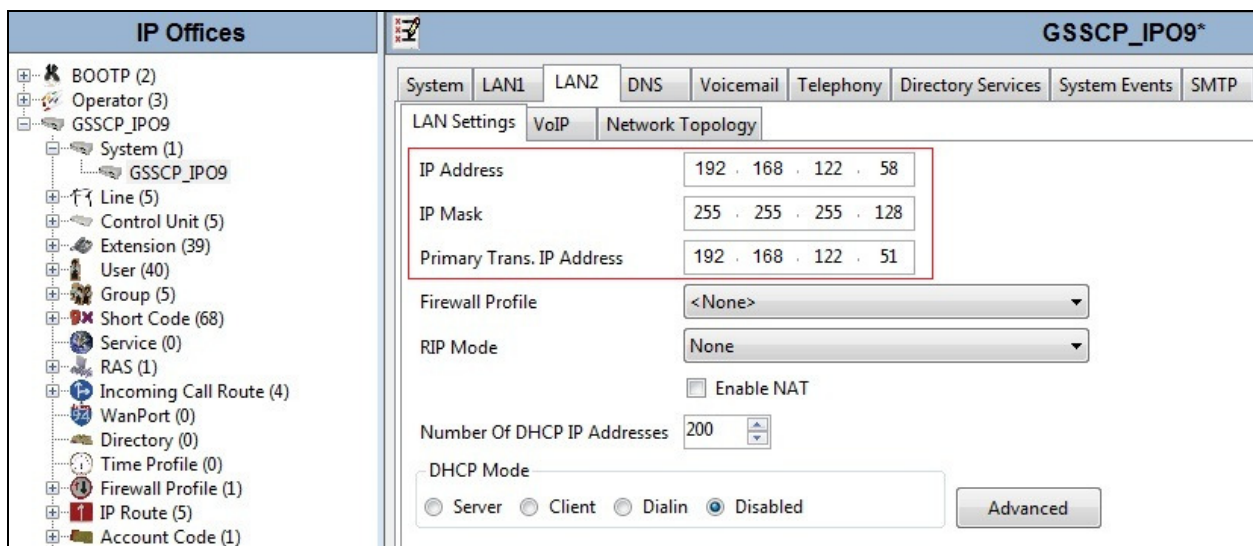
Navigate to **License** in the Navigation Pane. In the Details Pane verify that the **License Status** for **SIP Trunk Channels** is Valid and that the number of **Instances** is sufficient to support the number of SIP trunk channels provisioned by HIPCOM.



Feature	Key	Instances	Status	Expiry Date	Source
CCR Designer	xx	255	Valid	Never	ADI Nodal
CCR SUP	xx	255	Valid	Never	ADI Nodal
Advanced Small Community Netw...	xx	255	Obsolete	Never	ADI Nodal
SIP Trunk Channels	xx	255	Valid	Never	ADI Nodal
Small Office Edition VCM (channels)	xx	255	Obsolete	Never	ADI Nodal
Small Office Edition WiFi	xx	255	Obsolete	Never	ADI Nodal
Small Site Software Upgrade 255	xx	1	Valid	Never	ADI Nodal
Receptionist	xx	255	Valid	Never	ADI Nodal
Software Upgrade 255	xx	1	Valid	Never	ADI Nodal
CCC Spectrum Wallboards	xx	255	Valid	Never	ADI Nodal
CCC Supervisors	xx	255	Valid	Never	ADI Nodal
Advanced Edition	xx	255	Valid	Never	ADI Nodal
Third Party API	xx	255	Valid	Never	ADI Nodal
UMS Web Services	xx	255	Valid	Never	ADI Nodal
IP500 Universal PRI (Additional cha...	xx	255	Valid	Never	ADI Nodal
Mobile Worker	xx	255	Valid	Never	ADI Nodal
Power User	xx	255	Valid	Never	ADI Nodal
Customer Service Supervisor	xx	255	Valid	Never	ADI Nodal
Teleworker	xx	255	Valid	Never	ADI Nodal
VMPPro Outlook Interface	xx	255	Valid	Never	ADI Nodal

5.2. LAN2 Settings

In the sample configuration, the LAN2 port was used to connect the Avaya IP Office to the external internet. To access the LAN2 settings, first navigate to **System** → **<IP Office Name>** in the Navigation Pane where IP Office Name is the name of the IP Office. This is **GSSCP_IPO9** in the GSSCP test environment. Navigate to the **LAN2** → **LAN Settings** tab in the Details Pane. The **IP Address** and **IP Mask** fields are the public interface of the IP Office, **Primary Trans. IP Address** is the next hop, usually the default gateway address. All other parameters should be set according to customer requirements. On completion, click the OK button (not shown).



GSSCP_IPO9*	
System LAN1 LAN2 DNS Voicemail Telephony Directory Services System Events SMTP	
LAN Settings VoIP Network Topology	
IP Address	192 . 168 . 122 . 58
IP Mask	255 . 255 . 255 . 128
Primary Trans. IP Address	192 . 168 . 122 . 51
Firewall Profile	<None>
RIP Mode	None
<input type="checkbox"/> Enable NAT	
Number Of DHCP IP Addresses	200
DHCP Mode	
<input type="radio"/> Server <input type="radio"/> Client <input type="radio"/> Dialin <input checked="" type="radio"/> Disabled	
Advanced	

On the **VoIP** tab in the Details Pane, check the **SIP Trunks Enable** box to enable the configuration of SIP trunks. The IP Office Softphone uses SIP. If Softphone along with any other SIP endpoint is to be used, the **SIP Registrar Enable** box must also be checked. Define the port to be used for the signalling transport, in the test environment **UDP** was used and it the port number was left at the default value of **5060**.

GSSCP_IP09*

System LAN1 LAN2 DNS Voicemail Telephony Directory Services System Events SMTP SMDR Twinning VCM CCR Codecs

LAN Settings VoIP Network Topology

☒ H323 Gatekeeper Enable

☒ Auto-create Extn ☐ Auto-create User ☐ H323 Remote Extn Enable

☒ SIP Trunks Enable

☒ SIP Registrar Enable

☐ Auto-create Extn/User ☐ SIP Remote Extn Enable

Domain Name avaya.com

Layer 4 Protocol

☒ UDP UDP Port 5060 Remote UDP Port 5060

☒ TCP TCP Port 5060 Remote TCP Port 5060

☐ TLS TLS Port 5061 Remote TLS Port 5061

Challenge Expiry Time (secs) 10

RTP

Port Number Range

Scroll down for further configuration. The **RTP Port Number Range** can be customized to a specific range of receive ports for the RTP media. Based on this setting, Avaya IP Office would request RTP media be sent to a UDP port in the configurable range for calls using LAN2.

Avaya IP Office can also be configured to mark the Differentiated Services Code Point (DSCP) in the IP Header with specific values to support Quality of Services policies for both signalling and media. DSCP for media can be set for both voice and video. The **DSCP** field is the value used for voice, **Video DSCP** is the value used for video and the **SIG DSCP** is the value used for signalling. For the compliance test, the DSCP values were left at their default values which are shown in the example over the page.

All other parameters should be set according to customer requirements. On completion, click the **OK** button (not shown).

The screenshot shows the 'GSSCP_IPO9*' configuration window with the 'VoIP' tab selected. The 'Network Topology' section is active, displaying RTP settings. The 'Port Number Range' has a Minimum of 49152 and a Maximum of 64566. The 'Port Number Range (NAT)' has a Minimum of 49152 and a Maximum of 53246. The 'Enable RTCP Monitoring on Port 5005' checkbox is checked. The 'Keepalives' section shows a 'Scope' dropdown, a 'Periodic timeout' of 0, and an 'Initial keepalives' dropdown. The 'DiffServ Settings' section shows two rows of DSCP and Video DSCP values: the first row has DSCP (Hex) 88, Video DSCP (Hex) FC, DSCP Mask (Hex) 88, and SIG DSCP (Hex) 88; the second row has DSCP 46, Video DSCP 46, DSCP Mask 63, and SIG DSCP 34.

On the **Network Topology** tab in the Details Pane enter the information required if NAT is to be used. During test, NAT was not required and there was no requirement for a STUN server. To disable this facility, 0.0.0.0 is entered in the **STUN Server IP Address** and **Public IP Address** fields. If NAT is to be used, this tab can also be used to set the **Binding Refresh Time** for the periodic sending of OPTIONS

The screenshot shows the 'GSSCP_IPO9*' configuration window with the 'VoIP' tab selected. The 'Network Topology' section is active, displaying 'Network Topology Discovery' settings. The 'STUN Server Address' is 0.0.0.0 and the 'STUN Port' is 3478. The 'Firewall/NAT Type' is set to 'Open Internet'. The 'Binding Refresh Time (seconds)' is 300. The 'Public IP Address' is 0.0.0.0. There are 'Run STUN' and 'Cancel' buttons. The 'Public Port' section shows three rows: UDP 0, TCP 0, and TLS 0. The 'Run STUN on startup' checkbox is unchecked.

5.3. System Telephony Settings

Navigate to the **Telephony** → **Telephony** tab on the Details Pane. Choose the **Companding Law** typical for the enterprise location. For Europe, **ALAW** is used. Uncheck the **Inhibit Off-Switch Forward/Transfer** box to allow call forwarding and call transfer to the PSTN via the Service Provider across the SIP trunk. On completion, click the **OK** button (not shown).

5.4. System Twinning Settings

Navigate to the **Twining** tab, ensure that the box labeled **Send original calling party information for Mobile Twinning** is not checked. HIPCOM verifies the calling number in the SIP From header, so this has to be a number in the DDI range assigned to the IP Office. During test, the number assigned as the calling number was the same as that used for SIP registration messages. To assign a number, enter it in the **Calling party information for Mobile Twinning** field.

These settings only affects twinning and do not impact the messaging of other redirected calls such as forwarded calls. If a number other than the **Calling party information for Mobile Twinning** field is to be used, set the **Send Caller ID** parameter on the SIP line (**Section 5.6**). On completion, click the **OK** button (not shown).

The screenshot shows the 'GSSCP_IP09*' configuration window with the 'Twinning' tab selected. The 'Send original calling party information for Mobile Twinning' checkbox is unchecked. Below it, the 'Calling party information for Mobile Twinning' text field contains the value '4420355nnnn0'.

5.5. Codec Settings

Navigate to the **Codecs** tab (not shown) on the Details Pane. Check the Available Codecs boxes as required. Note that **G.711 ULAW 64K** and **G.711 ALAW 64K** are greyed out and always available. Once available codecs are selected, they can be used or unused by using the horizontal arrows as required. Note that in test, **G.711 ALAW 64K**, **G.729(a) 8K CS-ACELP** and **G.711 ULAW 64K** were used. The order of priority can be changed using the vertical arrows. On completion, click the **OK** button (not shown).

The screenshot shows the 'GSSCP_IP09*' configuration window with the 'Codecs' tab selected. The 'RFC2833 Default Payload' is set to '101'. The 'Available Codecs' list on the left includes:

- ☒ G.711 ULAW 64K
- ☒ G.711 ALAW 64K
- ☐ G.722 64K
- ☒ G.729(a) 8K CS-ACELP
- ☒ G.723.1 6K3 MP-MLQ

 The 'Default Codec Selection' area is divided into 'Unused' and 'Selected' sections. The 'Unused' section contains 'G.723.1 6K3 MP-MLQ'. The 'Selected' section, highlighted with a red border, contains:

- G.711 ALAW 64K
- G.729(a) 8K CS-ACELP
- G.711 ULAW 64K

 Navigation buttons (horizontal arrows) are located between the 'Unused' and 'Selected' sections, and vertical arrows are located within the 'Selected' section.

5.6. Administer SIP Line

A SIP line is needed to establish the SIP connection between Avaya IP Office and the HIPCOM SIP Trunk. The recommended method for configuring a SIP Line is to use the template associated with these Application Notes. The template is an .xml file that can be used by IP Office Manager to create a SIP Line. Follow the steps in **Section 5.6.1** to create the SIP Line from the template.

Some items relevant to a specific customer environment are not included in the template or may need to be updated after the SIP Line is created. Examples include the following:

- IP addresses
- SIP Credentials (if applicable)
- SIP URI entries
- Setting of the Use Network Topology Info field on the Transport tab.

Therefore, it is important that the SIP Line configuration be reviewed and updated if necessary after the SIP Line is created via the template. The resulting SIP Line data can be verified against the manual configuration shown in **Section 5.6.2**.

Also, the following SIP Line settings are not supported on Basic Edition:

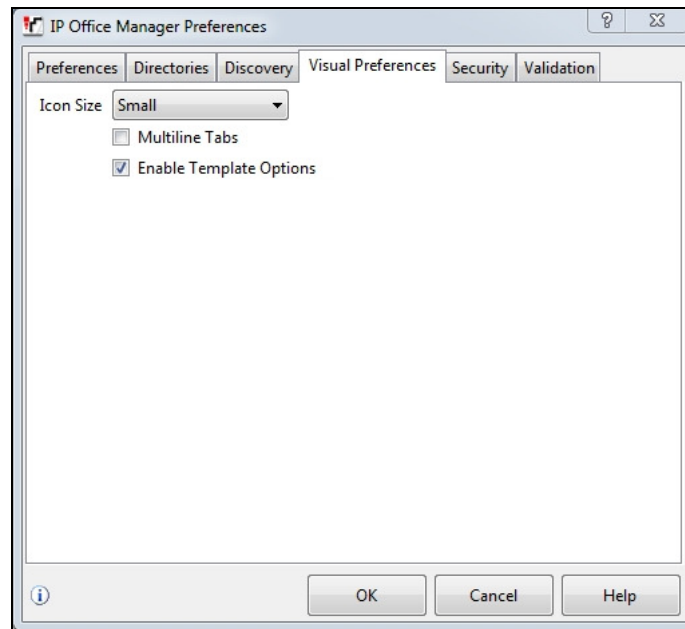
- SIP Line – Originator number for forwarded and twinning calls
- Transport – Second Explicit DNS Server
- SIP Credentials – Registration Required

Alternatively, a SIP Line can be created manually. To do so, right-click Line in the Navigation Pane and select **New→SIP Line** (not shown). Then, follow the steps outlined in **Section 5.6.2**.

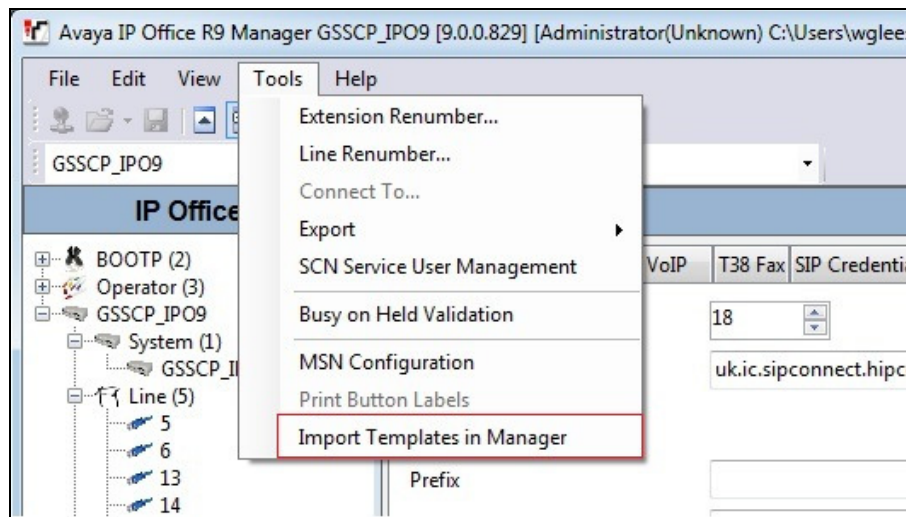
5.6.1. SIP Line From Template

Copy the template file to the computer where IP Office Manager is installed. Rename the template file to **IE_HIPCOM_SIPTrunk.xml**. The file name is important in locating the proper template file.

Verify that template options are enabled in IP Office Manager. Navigate to **File → Preferences**. In the IP Office Manager Preferences window that appears, select the Visual Preferences tab. Verify that the box is checked next to **Enable Template Options**. Click **OK**.

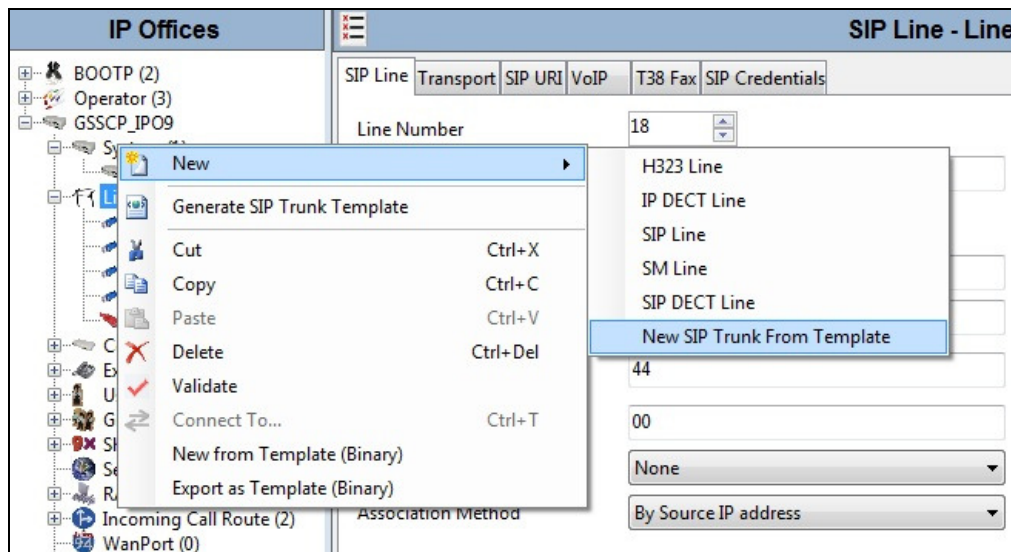


Import the template into IP Office Manager. Select **Tools → Import Templates in Manager**. This action will copy the template file into the IP Office template directory and make the template available in the IP Office Manager pull-down menus. The default template location is **C:\Program Files\Avaya\IP Office\Manager\Templates**.



In the pop-up window (not shown) that appears, select the directory where the template file was copied. After the import is complete, a final import status pop-up window (not shown) will appear stating success or failure. Click **OK** (not shown) to continue. If preferred, this step may be skipped if the template file is copied directly to the IP Office template directory.

To create the SIP Trunk from the template, right-click on **Line** in the Navigation Pane, then navigate to **New → New SIP Trunk From Template**.



In the subsequent Template Type Selection pop-up window, select Ireland from the **Country** pull-down menu and select HIPCOM from the Service Provider pull-down menu as shown below. These values correspond to parts of the file name (**IE_HIPCOM_SIPTrunk.xml**) created earlier. Click **Create new SIP Trunk** to finish creating the trunk.



Once the SIP Line is created, verify the configuration of the SIP Line with the configuration shown in **Section 5.6.2**.

5.6.2. Manual SIP Line Configuration

On the **SIP Line** tab in the Details Pane, configure the parameters below to connect to the HIPCOM SIP Trunk.

- Set **ITSP Domain Name** field to the domain name used by HIPCOM. In test this was **uk.ic.sipconnect.hipcom.co.uk**.
- Set **Send Caller ID** to **None** as the **Calling party information for Mobile Twinning** field in **Section 5.4** is populated with a number for the DDI range assigned to the IP Office. If a number is required that is representative of the extension making the call, this field can be used.
- Ensure the **In Service** box is checked.
- Check the **Send From In Clear** box to ensure that the calling number is inserted into the SIP From header even when the calling number is restricted.
- Default values may be used for all other parameters.

On completion, click the **OK** button (not shown).

The screenshot displays the 'SIP Line - Line 18' configuration window. The left pane shows a tree view of the IP Office configuration, with 'Line (5)' selected. The main pane shows the 'SIP Line' tab with the following configuration:

Field	Value
Line Number	18
ITSP Domain Name	uk.ic.sipconnect.hipcom.co.uk
In Service	<input checked="" type="checkbox"/>
URI Type	SIP
Check OOS	<input type="checkbox"/>
Call Routing Method	Request URI
Originator number for forwarded and twinning calls	
Name Priority	System Default
Caller ID from From header	<input type="checkbox"/>
Send From In Clear	<input checked="" type="checkbox"/>
User-Agent and Server Headers	
Service Busy Response	486 - Busy Here
Action on CAC Location Limit	Allow Voicemail

The 'Transport' tab is also visible, showing the following configuration:

Field	Value
Incoming	Auto
Outgoing	Auto

Note: The **Send From In Clear** box must be checked so that the calling number is inserted in the From header as it is required for verification by the HIPCOM network. The network uses the SIP Privacy header to identify where the calling number is restricted and does not require “anonymous@anonymous.invalid” in the From header.

Select the **Transport** tab and set the following:

- Set **ITSP Proxy Address** to the IP address of the HIPCOM SIP proxy.
- Set **Use Network Topology Info** to **None** if NAT is not to be used and the Network Topology settings defined in **Section 5.2** are not required. This was the case during test.
- Set **Layer 4 Protocol** to **UDP**.
- Set **Send Port** and **Listen Port** to **5060**.

On completion, click the OK button (not shown).

The screenshot shows the 'SIP Line - Line 18' configuration window with the 'Transport' tab selected. The 'ITSP Proxy Address' is set to '192.168.63.4'. Under 'Network Configuration', 'Layer 4 Protocol' is set to 'UDP', 'Use Network Topology Info' is set to 'None', 'Send Port' is '5060', and 'Listen Port' is '5060'. 'Explicit DNS Server(s)' are set to '0 . 0 . 0 . 0' and '0 . 0 . 0 . 0'. 'Calls Route via Registrar' is checked. 'Separate Registrar' is empty.

After the SIP line parameters are defined, the SIP URIs that Avaya IP Office will accept on this line must be created. To create a SIP URI entry, first select the **SIP URI** tab. Click the **Add** button and the **New Channel** area will appear at the bottom of the pane.

The screenshot shows the 'SIP Line - Line 18' configuration window with the 'SIP URI' tab selected. On the left, the 'IP Offices' tree shows 'Line (5)' selected. The main pane shows a table with columns: Channel, Groups, Via, Local URI, Contact, Display Name, PAI, Credential, Max Calls. Below the table are buttons for 'Add...', 'Remove', and 'Edit...'.

For the compliance test, a single SIP URI entry was created that matched any number assigned to an Avaya IP Office user. The entry was created with the parameters shown below.

- Set **Local URI**, **Contact**, **Display Name** and **PAI** to **Use Credentials User Name**. This will use the number in the DDI range that was supplied for SIP Registration. If the DDI number applied to the specific extension is required, this should be set to **Use Internal Data**.
- For **Registration**, only **0: <None>** is available at this point. Registration details are defined under the **SIP Credentials** tab and, once defined, are available in this drop down menu.
- Associate this line with an incoming line group by entering a line group number in the **Incoming Group** field. This line group number will be used in defining incoming call routes for this line. Similarly, associate the line to an outgoing line group using the **Outgoing Group** field. The outgoing line group number is used in defining short codes for routing outbound traffic to this line. For the compliance test, a new incoming and outgoing group **18** was defined that was associated to a single line (line 18).
- Set **Max Calls per Channel** to the number of simultaneous SIP calls that are allowed using this SIP URI pattern.

On completion, click the **OK** button.

SIP Line - Line 18

SIP Line Transport SIP URI VoIP T38 Fax SIP Credentials

Remove

Edit...

New Channel

Via <None>

Local URI Use Credentials User Name

Contact Use Credentials User Name

Display Name Use Credentials User Name

PAI Use Credentials User Name

Registration 0: <None>

Incoming Group 18

Outgoing Group 18

Max Calls per Channel 10

OK

Cancel

Note: It will be necessary to return to this screen after the SIP Credentials have been defined to select them in the **Registration** drop down menu.

Select the **VoIP** tab to set the Voice over Internet Protocol parameters of the SIP line. Set the parameters as shown below:

- Select **Custom** in the **Codec Selection** drop down menu to specify the preferred codecs
- Highlight codecs in the **Unused** box that are to be used on this line and click on the right arrows to move them to the **Selected** box
- Highlight codecs in the **Selected** box that are not to be used and click on the left arrows to move them to the **Unused** box
- Highlight codecs in the **Selected** box and use the up and down arrows to change the priority order of the offered codecs, for testing with HIPCOM this was **G.711 ALAW 64K**, **G.729(a) 8K CS-ACELP** and **G.711 ULAW 64K** in priority order from the highest to the lowest.
- Select **T38** in the **Fax Transport Support** drop down menu to allow T.38 fax operation
- Select **RFC2833** in the **DTMF Support** drop down menu. This directs Avaya IP Office to send DTMF tones using RTP events messages as defined in RFC2833
- Uncheck the **VoIP Silence Suppression** box
- Check the **Re-invite Supported** box, to allow for codec re-negotiation in cases where the target of the incoming call or transfer does not support the codec originally negotiated.
- Check the **PRACK/100rel Supported** box to allow for reliable responses to provisional call set-up messages such as 183 Session progress and 180 Ringing.
- Default values may be used for all other parameters.
- On completion, click the **OK** button (not shown).

The screenshot shows the 'SIP Line - Line 18*' configuration window with the 'VoIP' tab selected. The 'Codec Selection' section has a dropdown menu set to 'Custom'. Below it, there are two boxes: 'Unused' and 'Selected'. The 'Unused' box contains 'G.723.1 6K3 MP-MLQ'. The 'Selected' box contains 'G.711 ALAW 64K', 'G.729(a) 8K CS-ACELP', and 'G.711 ULAW 64K'. Between the boxes are arrows for moving codecs: '>>>' (top), '<<<' (middle), and '<<<' (bottom). To the right of the codec boxes are several checkboxes: 'VoIP Silence Suppression' (unchecked), 'Allow Direct Media Path' (unchecked), 'Re-invite Supported' (checked), 'Codec Lockdown' (unchecked), 'PRACK/100rel Supported' (checked), 'Force direct media with phones' (unchecked), and 'G.711 Fax ECAN' (unchecked). Below the codec boxes, there are three dropdown menus: 'Fax Transport Support' set to 'T38', 'Location' set to 'Cloud', and 'DTMF Support' set to 'RFC2833'. There is also a 'Call Initiation Timeout (s)' field set to '4'.

Select the **T.38 Fax** tab to set the T.38 parameters for the line. Un-check the Use Default Values box (not shown) and select **2** from the **T38 Fax Version** drop down menu. Set the **Max Bit Rate (bps)** to **14400**. All other field may retain their default values. On completion, click the **OK** button (not shown).

The screenshot shows the 'SIP Line - Line 18*' configuration window with the 'T38 Fax' tab selected. The 'T38 Fax Version' dropdown is set to '2' and the 'Max Bit Rate (bps)' dropdown is set to '14400'. Other settings include 'Transport' set to 'UDPTL', 'Redundancy' set to '0' for both Low and High Speed, 'TCF Method' set to 'Trans TCF', 'EFlag Start Timer (msecs)' set to '2600', 'EFlag Stop Timer (msecs)' set to '2300', and 'Tx Network Timeout (secs)' set to '150'. On the right, several checkboxes are visible: 'Scan Line Fix-up' (checked), 'TFOP Enhancement' (checked), 'Disable T30 ECM' (unchecked), 'Disable EFlags For First DIS' (unchecked), 'Disable T30 MR Compression' (unchecked), and 'NSF Override' (unchecked). Below these are 'Country Code' and 'Vendor Code' dropdowns, both set to '0'.

Select the **SIP Credentials** tab to configure the authentication parameters for the HIPCOM SIP Trunk. Click on Add (not shown).

The screenshot shows the 'SIP Line - Line 18' configuration window with the 'SIP Credentials' tab selected. The window displays a table with columns: Index, UserName, Authentication Name, Contact, Expiry (mins), and Register. To the right of the table are three buttons: 'Add...', 'Remove', and 'Edit...'. The 'Add...' button is highlighted with a red box.

The registration details are entered at the bottom of the screen.

The authentication takes place on the SIP registration. Define the login details in the **User name** and **Authentication Name** fields. Define the domain in the **Contact** field and the password in the **Password** field. Check the **Registration required** box

Note: At this stage, return to the SIP URI tab and select the registration details defined above in the **Registration** drop down menu. It is advisable to save the configuration as described in **Section 5.11** to make the Line Group ID defined in **Section 5.6** available.

5.7. Short Codes

Define a short code to route outbound traffic to the SIP line. To create a short code, right-click **Short Code** in the Navigation Pane and select **New**. On the **Short Code** tab in the Details Pane, configure the parameters as shown in the example below.

- In the **Code** field, enter the dial string which will trigger this short code, followed by a semi-colon
- The example shows **900N;** which will be invoked when the user dials 9 followed by an international number.
- Set **Feature** to **Dial**. This is the action that the short code will perform.
- Set **Telephone Number** to **00N** which inserts the international number with international dialling prefix into the Request URI and To headers in the outgoing SIP INVITE message
- Set the **Line Group Id** to the outgoing line group number defined on the SIP URI tab on the SIP Line in **Section 5.6**
- On completion, click the **OK** button (not shown).

Short codes are also used for routing of national calls and Operator calls. An example for national calls where the full number with country code has been dialled is shown below.

- The example shows **90044N;** which will be invoked when the user dials 9 followed by a UK number in international number.
- Set **Telephone Number** to **0N** which removes the country code and inserts the national number with leading 0 into the Request URI and To headers in the outgoing SIP INVITE message
- Set other parameters as shown in the first example.

IP Offices	90044N;; Dial
<ul style="list-style-type: none"> *84XX *9000* *92N; *DSSN *SDN *SKN 13N; 16N; 2N; 90044N; 900N; 90N; 9N; 	<p>Short Code</p> <p>Code: 90044N;</p> <p>Feature: Dial</p> <p>Telephone Number: 0N</p> <p>Line Group ID: 18</p> <p>Locale:</p> <p>Force Account Code: <input type="checkbox"/></p>

5.8. User

Configure the SIP parameters for each user that will be placing and receiving calls via the SIP line defined in **Section 5.6**. To configure these settings, first navigate to **User** in the Navigation Pane. Select the **User** tab if any changes are required.

The example over the page shows the configuration required for a SIP endpoint that can be used for a SIP phone or Softphone. Two types of Softphone were successfully tested; these were IP Office Softphone and Avaya Flare Experience for Windows. To configure a SIP User that can accommodate the different types of phone, it has to be given a profile that supports them. In test, **Power User** was used.

Change the **Name** of the User if required, this will be used for login to the IP Office Softphone

- Select **Power User** from the Profile drop down menu
- Check the **Enable Softphone** box
- Check the **Enable Flare** box

IP Offices		Extn89107: 89107									
89000 Extn89000		User	Voicemail	DND	ShortCodes	Source Numbers	Telephony	Forwarding	Dial In	Voice Recording	Button Programming
89001 Extn89001		Name	Extn89107								
89002 Extn89002		Password	*****								
89003 Extn89003		Confirm Password	*****								
89004 Extn89004		Account Status	Enabled								
89005 Extn89005		Full Name	Ext 89107								
89006 Extn89006		Extension	89107								
89007 Extn89007		Email Address									
89010 Extn89010		Locale									
89011 Extn89011		Priority	5								
89012 Extn89012		System Phone Rights	None								
89013 Extn89013		Profile	Power User								
89014 Extn89014		<input type="checkbox"/> Receptionist									
89015 Extn89015		<input checked="" type="checkbox"/> Enable Softphone									
89016 Extn89016		<input checked="" type="checkbox"/> Enable one-X Portal Services									
89017 Extn89017		<input checked="" type="checkbox"/> Enable one-X TeleCommuter									
89018 Extn89018		<input checked="" type="checkbox"/> Enable Remote Worker									
89020 Extn89020		<input checked="" type="checkbox"/> Enable Flare									
89100 Extn89100		<input checked="" type="checkbox"/> Enable Mobile VoIP Client									

SIP endpoints require setting of the **SIP Registrar Enable** as described in **Section 5.2**. Call forwarding and transfer make use of the SIP REFER message. To handle SIP REFER on IP Office, the Call waiting function is used. To turn on Call Waiting, navigate to **Telephony→Call Settings**. Check the **Call Waiting On** box.

Extn89107: 89107	
User	Voicemail
DND	ShortCodes
Source Numbers	Telephony
Forwarding	Dial In
Voice Recording	Button Programming
Call Settings	Supervisor Settings
Multi-line Options	Call Log
TUI	
Outside Call Sequence	Default Ring
Inside Call Sequence	Default Ring
Ringback Sequence	Default Ring
No Answer Time (secs)	System Default (15)
Wrap-up Time (secs)	2
Transfer Return Time (secs)	Off
Call Cost Mark-Up	100
<input checked="" type="checkbox"/> Call Waiting On	
<input checked="" type="checkbox"/> Answer Call Waiting On Hold	
<input type="checkbox"/> Busy On Held	
<input type="checkbox"/> Offhook Station	

Next Select the **SIP** (not shown) tab in the Details Pane. To reach the **SIP** tab click the right arrow on the right hand side of the Details Pane until it becomes visible. The values entered for the **SIP Name** and **Contact** fields are used as the user part of the SIP URI in the From header for outgoing SIP trunk calls. These allow matching of the SIP URI for incoming calls without having to enter this number as an explicit SIP URI for the SIP line (**Section 5.6**). As such, these fields should be set to one of the DDI numbers assigned to the enterprise from HIPCOM.

In the example below, one of the DDI numbers in the test range is used, though some of the digits have been obscured. The **SIP Display Name (Alias)** parameter must also be a DDI number as this is used as part of the network verification of the outgoing calls. On completion, click the **OK** button (not shown).

Extn89107: 89107	
ShortCodes	Source Numbers
Telephony	Forwarding
Dial In	Voice Recording
Button Programming	Menu Programming
Mobility	Group Membership
Announcements	SIP
SIP Name: 4420355nnnn3 SIP Display Name (Alias): 4420355nnnn3 Contact: 4420355nnnn3 <input type="checkbox"/> Anonymous	

Note: The **Anonymous** box can be checked if The Calling Line Identity is to be Restricted (CLIR).

5.9. Incoming Call Routing

An incoming call route maps an inbound DDI number on a specific line to an internal extension. To create an incoming call route, right-click **Incoming Call Routes** in the Navigation Pane and select **New**.

On the **Standard** tab of the Details Pane, enter the parameters as shown below:

- Set the **Bearer Capacity** to **Any Voice**
- Set the **Line Group Id** to the incoming line group of the SIP line defined in **Section 5.6**
- Set the **Incoming Number** to the incoming number that this route should match on.
Matching is right to left
- Default values can be used for all other fields

The screenshot shows the Avaya IP Office configuration interface. On the left is a tree view of the system hierarchy under 'IP Offices'. The right pane shows the configuration for an 'Incoming Call Route' (18 4420355nnnn1) on the 'Standard' tab. The configuration fields are as follows:

Field	Value
Bearer Capacity	Any Voice
Line Group ID	18
Incoming Number	4420355nnnn1
Incoming Sub Address	
Incoming CLI	
Locale	
Priority	1 - Low
Tag	
Hold Music Source	System Source
Ring Tone Override	None

Note: A number of digits of the DDI have been obscured. Number format is international.

On the **Destinations** tab, select the destination extension from the pull-down menu of the **Destination** field. On completion, click the **OK** button (not shown). In this example, incoming calls to the test DDI number on line 18 are routed to extension 89019.

The screenshot shows the 'Destinations' tab of the configuration interface for the same Incoming Call Route. It displays a table with the following data:

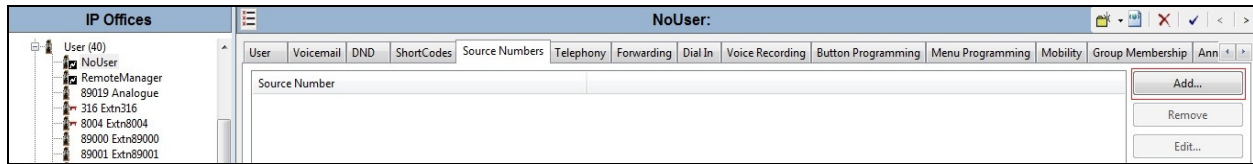
TimeProfile	Destination	Fallback Extension
Default Value	89019 Analogue	

5.10. SIP Options

Avaya IP Office can be configured to send SIP OPTIONS messages periodically to determine if the SIP connection is active. The rate at which the messages are sent is determined by the lower value of the **Binding Refresh Time** (in seconds) set on the **Network Topology** tab in **Section 5.2** and the **SIP_OPTIONS_PERIOD** parameter (in minutes) that can be set on the **Source Number** tab of the **NoUser** user. During test, the **Network Topology** information was not used as there was no requirement for NAT and a STUN server. Also, OPTIONS was not required as SIP registration is used and REGISTER messages were sent every 2 minutes.

If required, configure the **SIP_OPTIONS_PERIOD** parameter as follows:

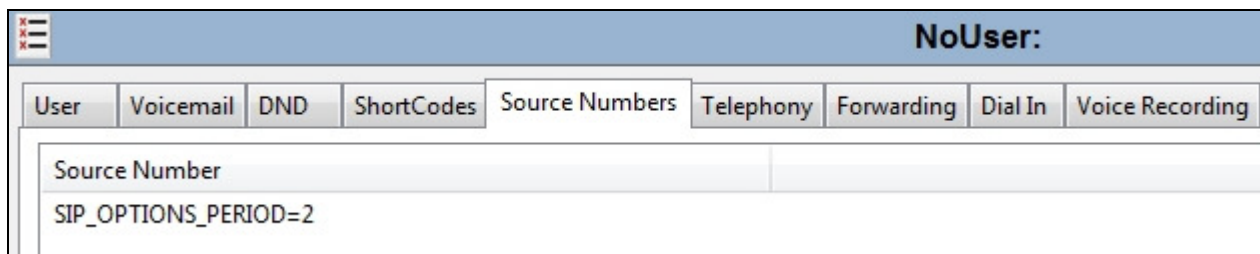
- Navigate to **User → NoUser** in the Navigation Pane.
- Select the **Source Numbers** tab in the Details Pane.
- Click the **Add** button



At the bottom of the subsequent Details Pane, the **Source Number** field will appear. Enter **SIP_OPTIONS_PERIOD=X**, where **X** is the desired value in minutes. Click **OK**.



The **SIP_OPTIONS_PERIOD** parameter will appear in the list of Source Numbers as shown below. For the compliance test, an OPTIONS period of 2 minutes was used.



5.11. Save Configuration

Navigate to **File → Save Configuration** in the menu bar at the top of the screen to save the configuration performed in the preceding sections.

6. HIPCOM SIP Trunk Configuration

HIPCOM is responsible for the configuration of the SIP Trunk. The customer will need to provide the public IP address used to reach the Avaya IP Office at the enterprise. HIPCOM will provide the customer the necessary information to configure the SIP connection to the SIP Trunking service including:

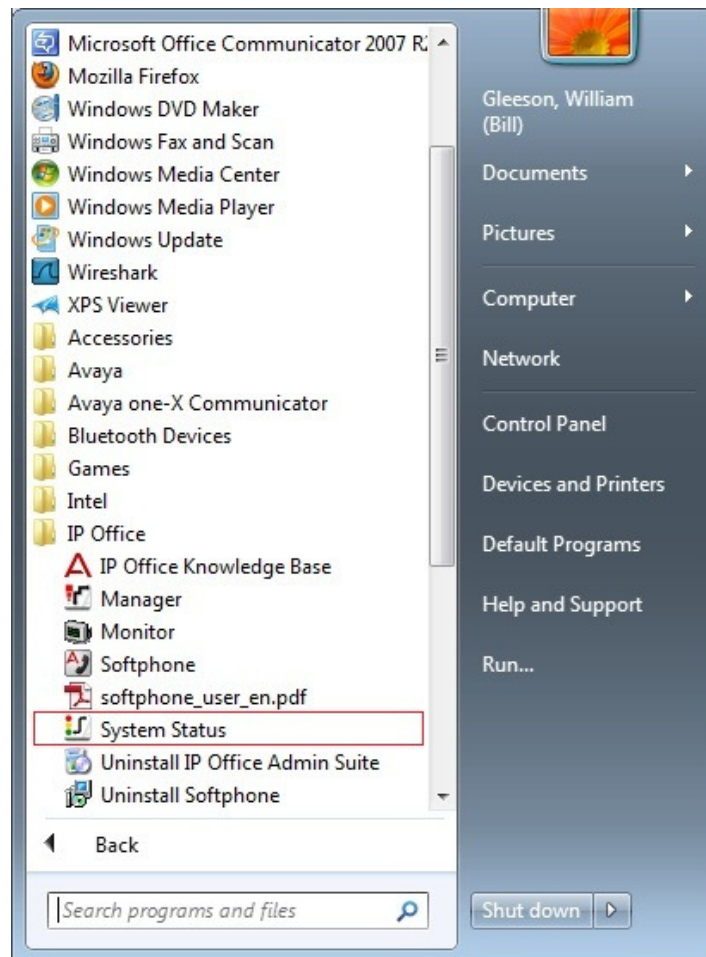
- IP address of HIPCOM SIP proxy
- Network SIP Domain
- Supported codecs
- DDI numbers
- All IP addresses and port numbers used for signalling or media that will need access to the enterprise network through any security devices.

7. Verification Steps

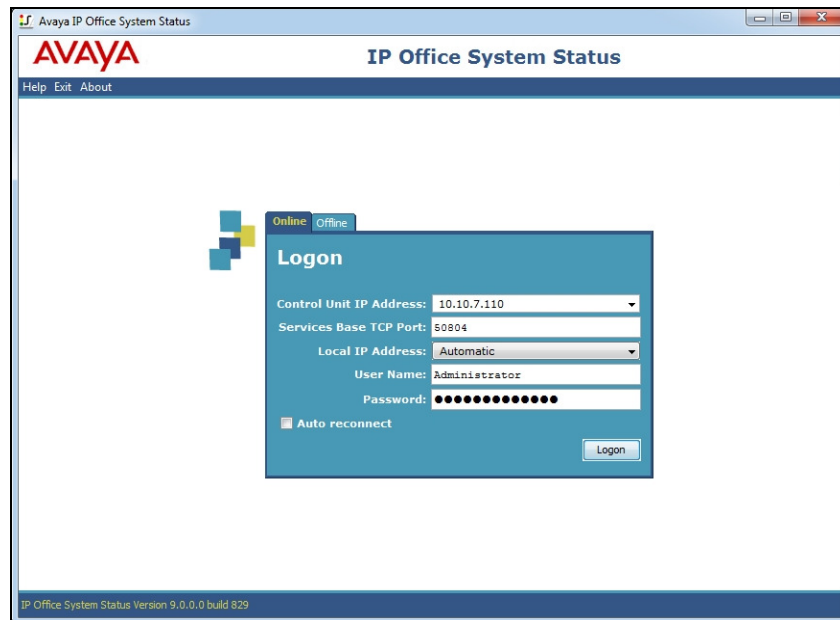
This section includes steps that can be used to verify that the configuration has been done correctly.

7.1. SIP Trunk status

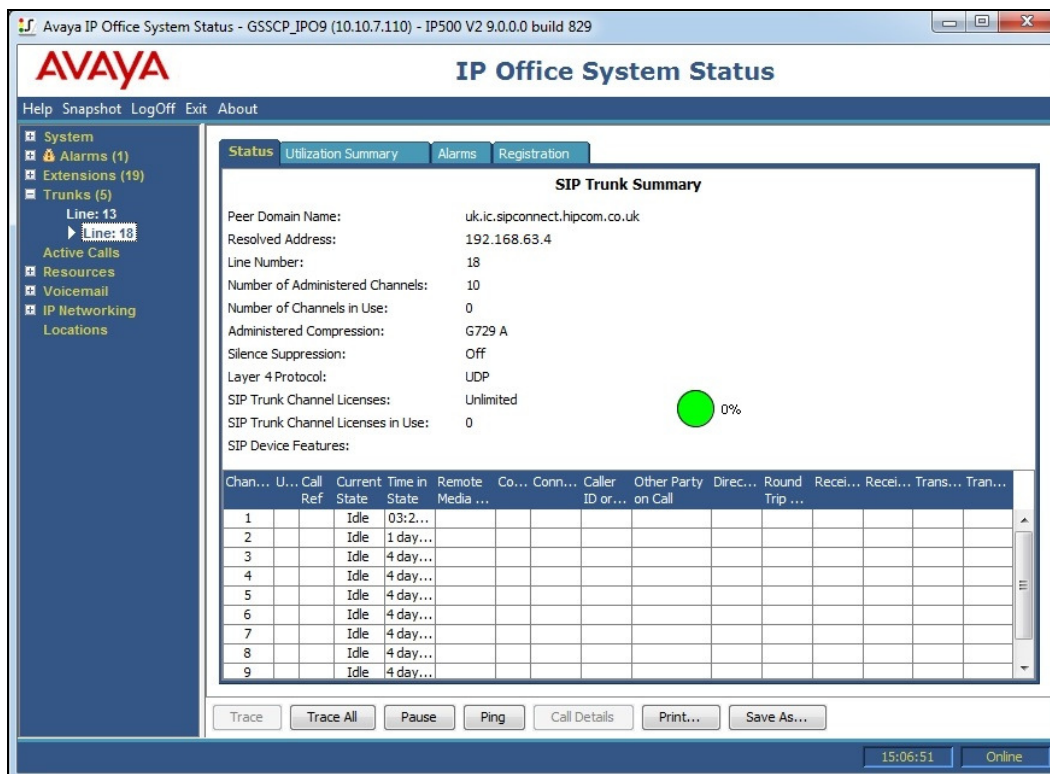
The status of the SIP trunk can be verified by opening the System Status application. A Windows 7 Laptop PC was used for testing and the application was opened by pressing the Start button and selecting **All Programs** → **IP Office** → **System Status**.



Log in to IP Office System Status at the prompt using the **Control Unit IP Address** for the IP Office. The **User Name** and **Password** are the same as those used for IP Office Manager.



From the left hand menu expand **Trunks** and choose the SIP trunk (**18** in this instance). The status window will show the status as being idle and time in state if the Trunk is operational. IP address has been changed.



8. Conclusion

The HIPCOM SIP Trunk passed compliance testing. Interoperability testing of the sample configuration was completed with successful results for the HIPCOM SIP Trunk. Refer to **Section 2.2** for test observations.

9. Additional References

Product documentation for Avaya products may be found at <http://support.avaya.com>.

- [1] *IP Office 9.0 KnowledgeBase Technical Documentation*, Web based.
- [2] *IP Office 9.0 Installing IP500/IP500 V2*, Document number15-601042, 11th October 2013.
- [3] *IP Office Application Server 9.0 Installation and Maintenance*, Document number15-601011, 29th August 2013.
- [4] *IP Office 9.0 Using System Status*, Document number15-601758, 15th August 2013
- [5] *IP Office 9.0 Installing IP Office Video Softphone*, Document number 100173998, 21st August 2013
- [6] *IP Office 9.0 SIP Extension Installation*, 21st August 2013

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