Amazon Chime Voice Connector

SIP Trunking Configuration Guide:

Microsoft Skype for Business 2015 and AudioCodes Mediant Cloud Edition

October 2019

Document History

Rev. No.	Date	Description
1.0	Oct-29-2019	SIP Trunk Configuration Guide

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1 Audience

This document is intended for technical staff and Value Added Resellers (VAR) with installation and operational responsibilities. This configuration guide provides steps for configuring SIP trunks using **Microsoft Skype for Business 2015 (Skype for Business)** and **AudioCodes Mediant Cloud Edition (AudioCodes CE)** to connect to **Amazon Chime Voice Connector** for inbound and/or outbound telephony capabilities.

1.1 Amazon Chime Voice Connector

Amazon Chime Voice Connector is a pay-as-you-go service that enables companies to make or receive secure phone calls over the internet or AWS Direct Connect using their existing telephone system or session border controller (SBC). The service has no upfront fees, elastically scales based on demand, supports calling both landline and mobile phone numbers in over 100 countries, and gives customers the option to enable inbound calling, outbound calling, or both.

Amazon Chime Voice Connector uses the industry-standard Session Initiation Protocol (SIP). Amazon Chime Voice Connector does not require dedicated data circuits. A company can use their existing Internet connection or AWS Direct Connect public virtual interface for SIP connectivity to AWS. Voice connectors can be configured in minutes using the AWS Management Console or Amazon Chime API. Amazon Chime Voice Connector offers cost-effective rates for inbound and outbound calls. Calls into Amazon Chime meetings, as well as calls to other Amazon Chime Voice Connector customers are at no additional cost. With Amazon Chime Voice Connector, companies can reduce their voice calling costs without having to replace their on-premises phone system.

2 SIP Trunking Network Components

The network for the SIP trunk reference configuration is illustrated below and is representative of Microsoft Skype for Business 2015 and AudioCodes CE configuration.

IP PBX-2 is used as a secondary PBX in the topology to perform call failover and call distribution

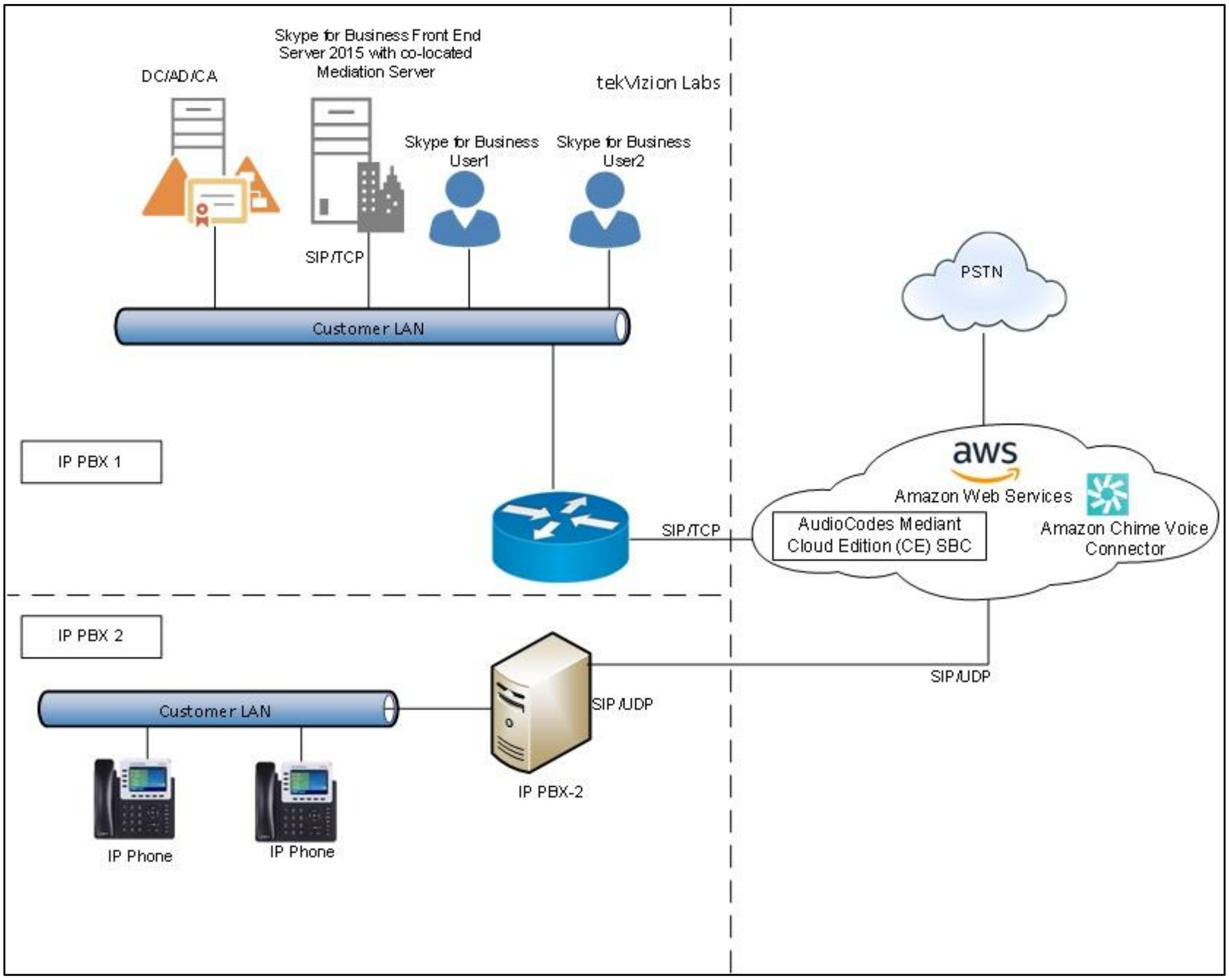

Figure 1: Network Topology

2.1 Hardware Components

- Windows 10 hosting Microsoft Skype for Business Server 2015
- AudioCodes CE running on Amazon Web Service

2.2 Software Requirements

- Microsoft Skype for Business Server 2015: 6.0.9319.562
- AudioCodes Mediant Cloud Edition: 7.20A.252.274
- Skype for Business Client: 15.0.5159.1000

3 Features

3.1 Features Supported

- Calls to and from non-Toll Free number
- Calls to Toll Free number
- Calls to Premium Telephone number
- Calling Party Number Presentation
- Calling Party Number Restriction
- Inbound Calls to an IVR
- International Calls
- Call Authentication
- Anonymous call
- DTMF-RFC 2833
- Long duration calls
- Calls to conference scheduled by Amazon Chime user
- Calls to Amazon Chime Business number
- Call Distribution
- Call Failover

3.2 Features Not Supported

Amazon Chime Voice Connector does not support following features

- Keep Alive SIP OPTIONS
- Keep Alive – Double CRLF

3.3 Features Not Tested

- None

3.4 Caveats and Limitations

- Amazon Chime Voice Connector does not send 'Allow' header for any request or response. Skype for Business requires 'UPDATE' method in 'Allow' header to send session refresh. SIP message manipulation is created in AudioCodes CE to add 'Allow' header with 'UPDATE' method for all request and response from AudioCodes CE towards Skype for Business.
- Amazon Chime Voice Connector,
    - does not support SIP NOTIFY or SIP INFO for DTMF
    - does not send SIP session refresher for long duration calls
- When the WAN link is down and a call is in progress, the PSTN call leg is not disconnected automatically after a period of inactivity. The call has to be cleared manually.

4 Configuration

4.1 Configuration Checklist

In this section we present an overview of the steps that are required to configure **Skype for Business** and **AudioCodes CE** for SIP Trunking with **Amazon Chime Voice Connector.**

Table 1 – PBX Configuration Steps

Steps	Description	Reference
Step 1	Skype for Business Configuration	Section 4.2
Step 2	AudioCodes CE Configuration	Section 4.3

4.2 Skype for Business Configuration

This section with screen shots taken from Skype for Business used for the interoperability testing, gives a general overview of the PBX configuration.

4.2.1 PSTN gateway configuration

Open Skype for Business Server 2015 Topology Builder to create a trunk from Skype for Business to AudioCodes CE. Navigate to '*Shared Components*' and select '*PSTN gateways*' in Topology Builder window. Right click on '*PSTN gateways*' and select '*New IP/PSTN Gateway*'.

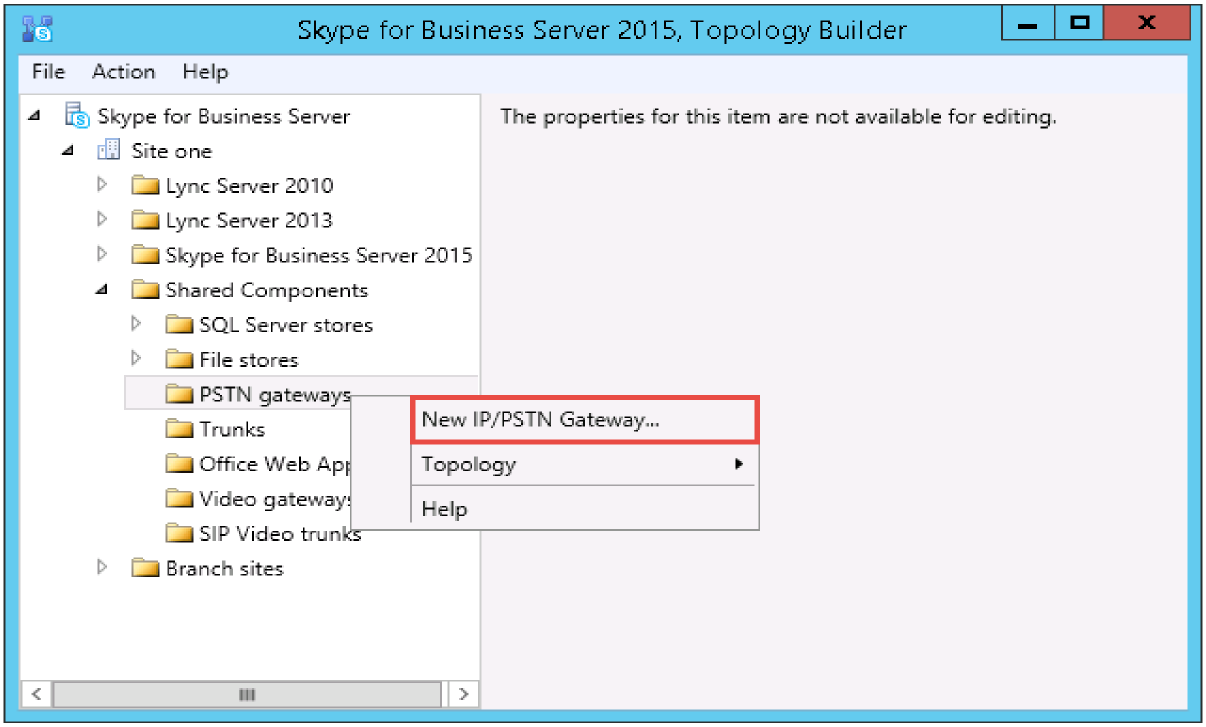

Figure 2: Add new IP/PSTN Gateway

The IP address or FQDN of AudioCodes Mediant CE is configured in '*Define New IP/PSTN Gateway*' window.

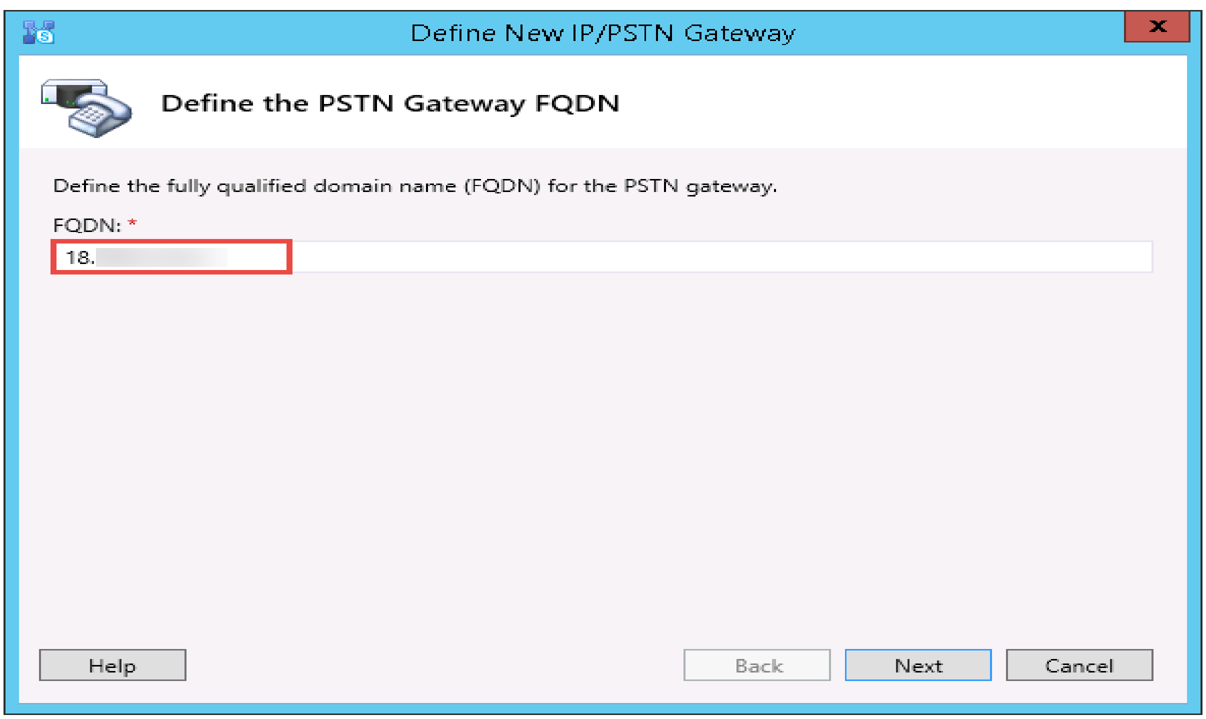

Figure 3: Enter the PSTN Gateway FQDN

Click on '*Next*' and select '*Enable IPv4*' and '*Use all configured IP addresses*'.

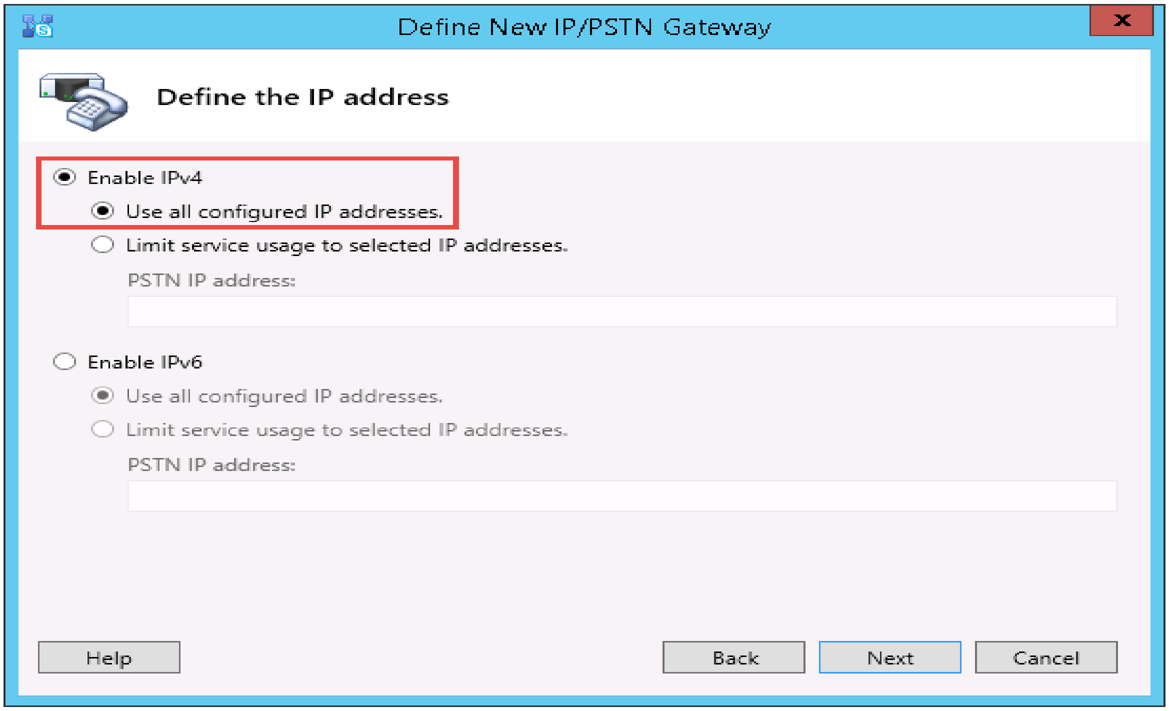

Figure 4: Define the IP address

Click on '*Next*'. Configure the port number, transport protocol and associated Mediation Server.

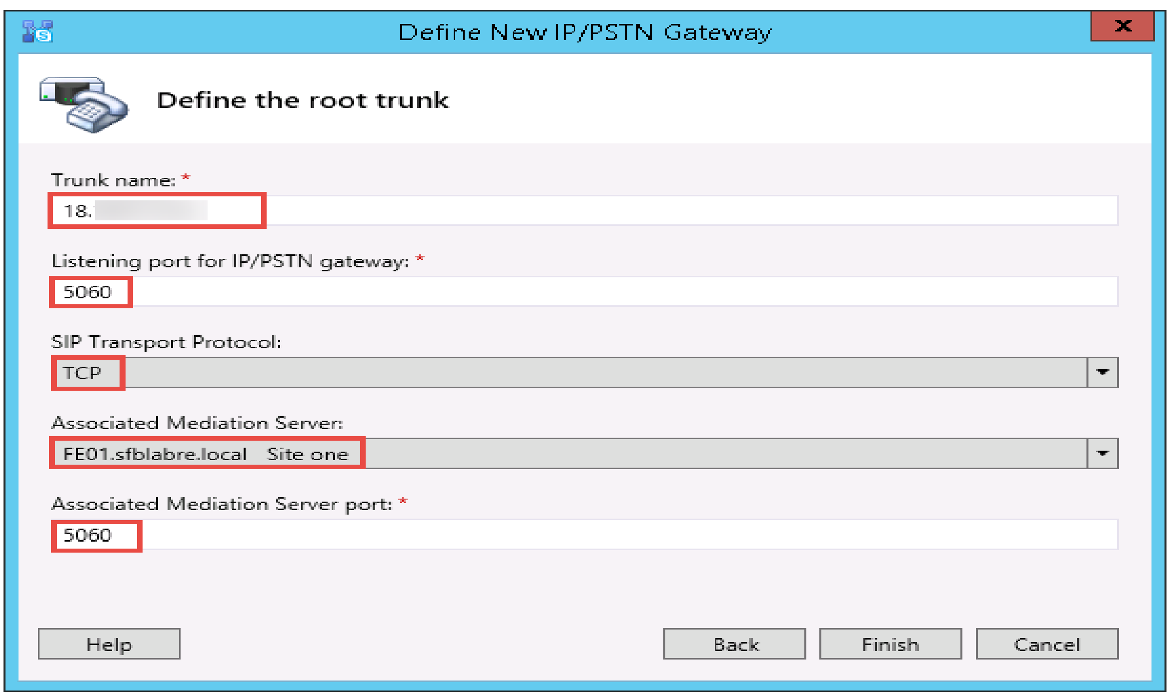

Figure 5: Define the root trunk

Click on '*Finish*'. The newly created trunk will appear under the PSTN gateways with the associated Mediation Server.

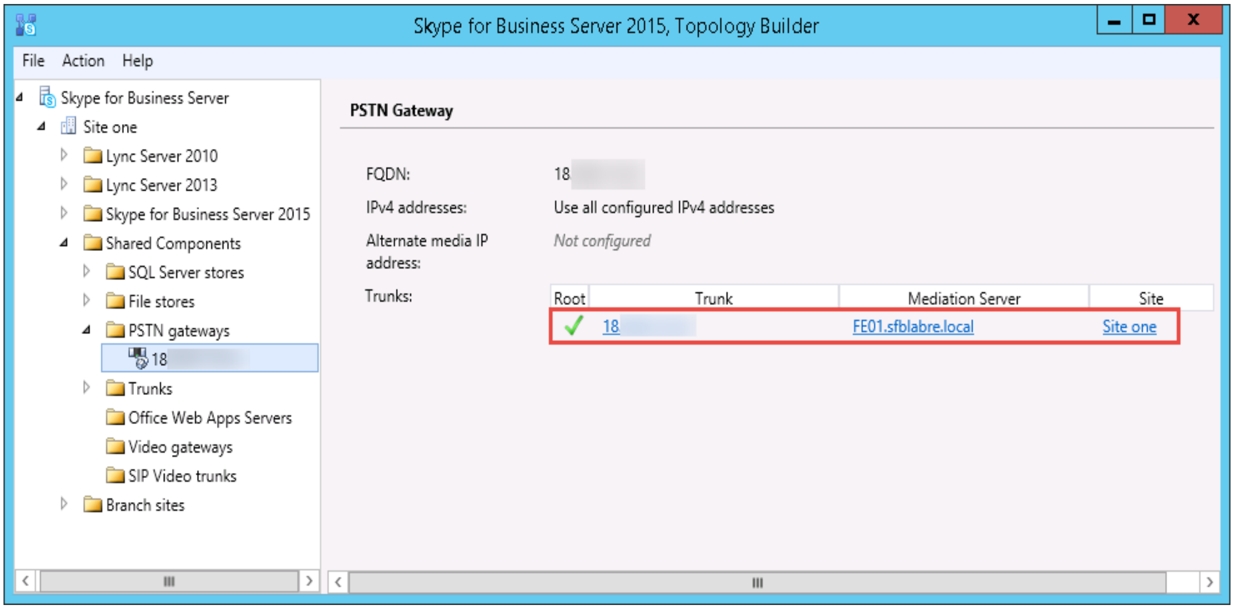

Figure 6: PSTN Gateways List

Navigate to menu '*Action*' and select '*Topology*', and in the submenu select '*Publish*' to publish the topology.

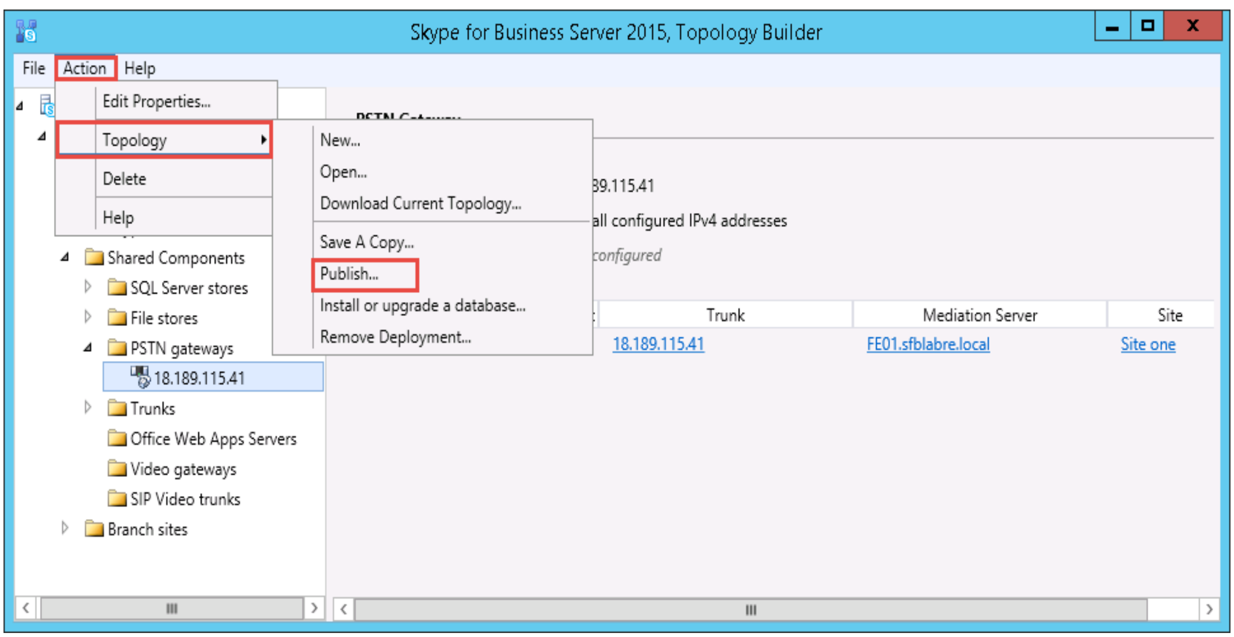

Figure 7: Publish the Topology

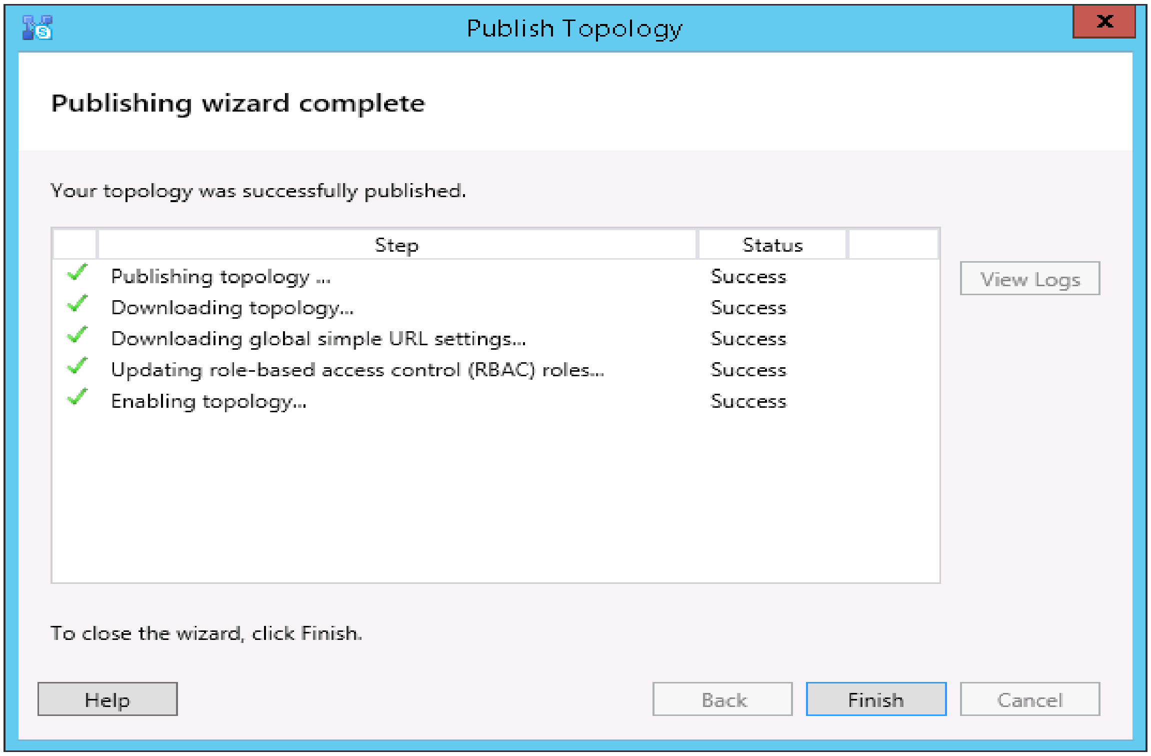

Figure 8: Successfully Published Topology

4.2.2 Voice Routing Configuration

Open Skype for Business Server 2015 Control Panel and click on '*Voice Routing*' in left pane. Now navigate to '*Voice Policy*' and click on '*New*' and select '*User Policy*' to add the new Voice Policy as shown below

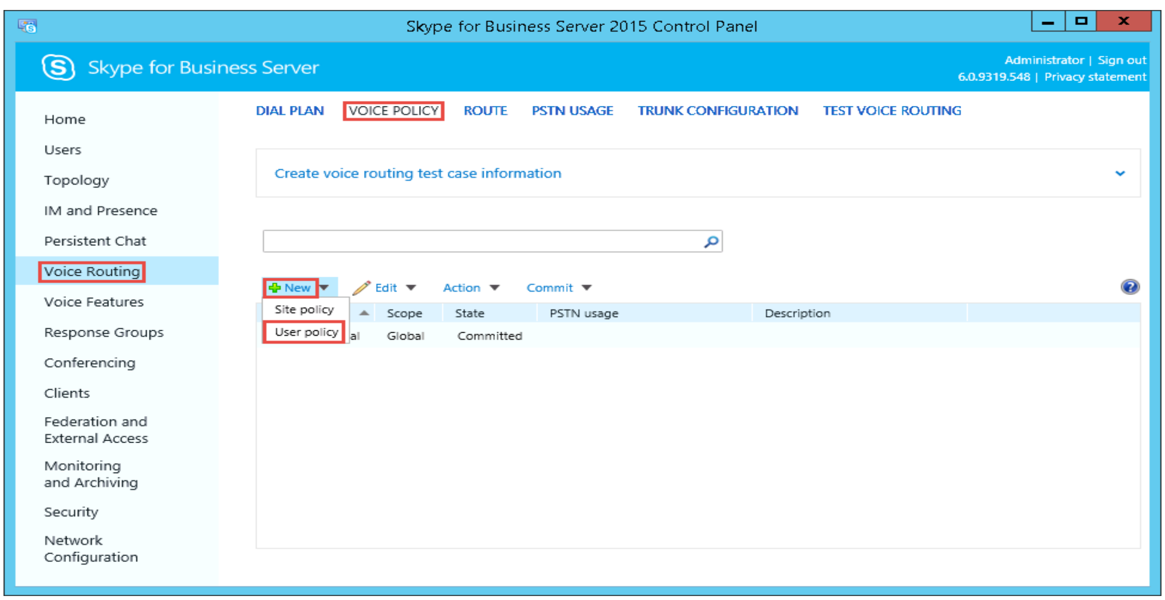

Figure 9: Add New User Voice Policy

Enter the name and description for the New Voice Policy and select the Calling Features. Click on '*New*' under '*Associated PSTN Usages*' to create a new PSTN Usage.

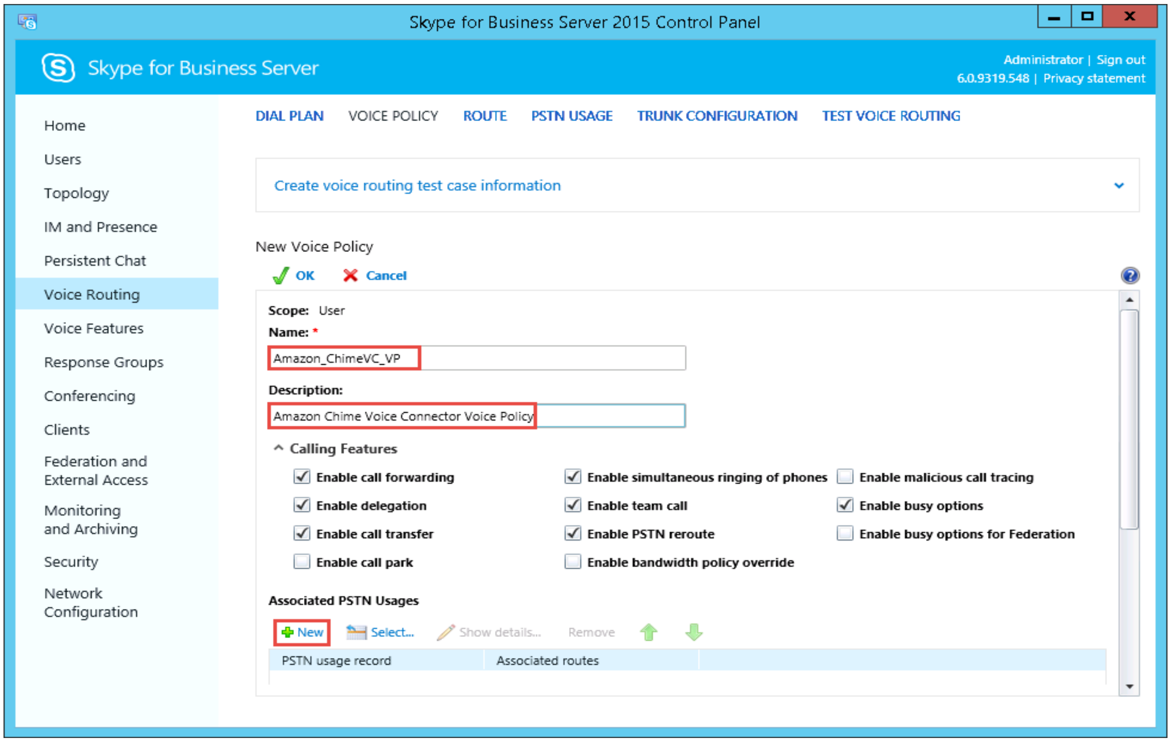

Figure 10: New Voice Policy

Enter the name of the PSTN Usage and click on '*New*' under '*Associated Routes*' to create a new Route.

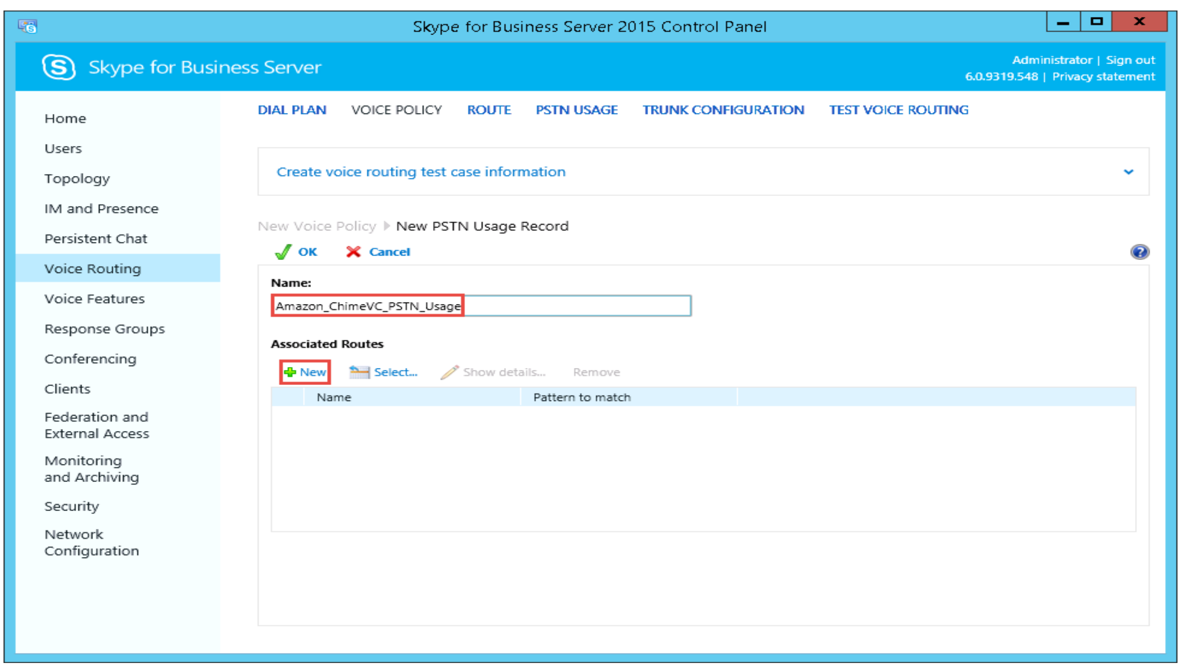

Figure 11: New PSTN Usage Record

Enter the name and the description for the new voice route.

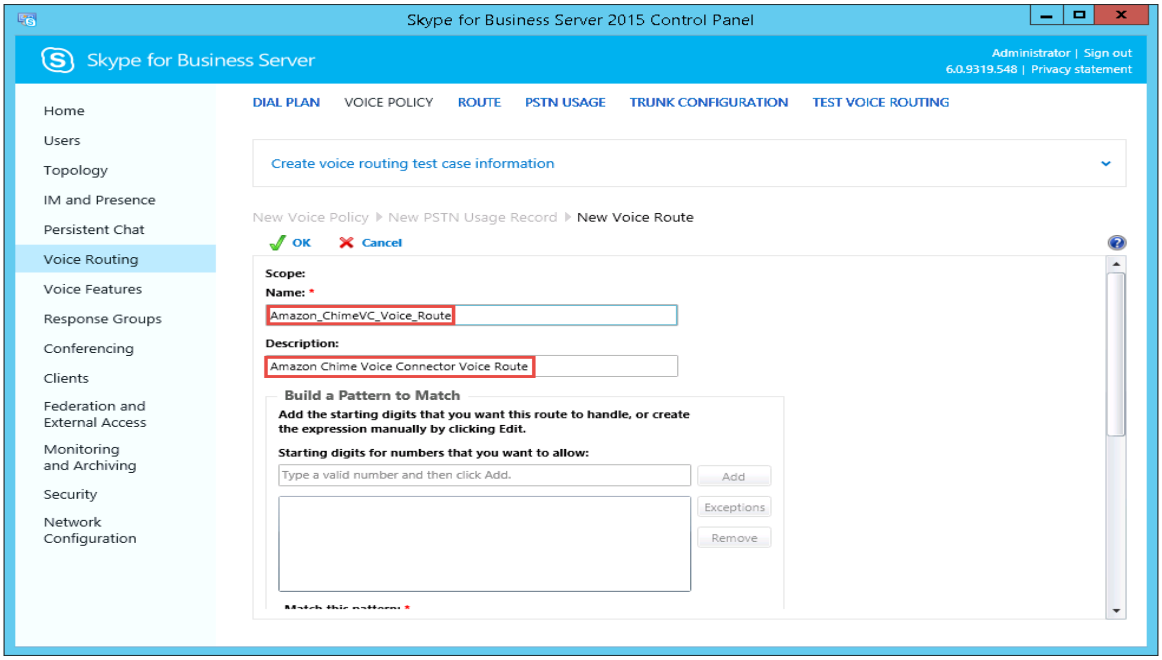

Figure 12: Creating New Voice Route

The pattern to match is set as '.*' which matches any dialed number from this voice policy. In the Associated Trunks section, select '*Add*' to choose the trunk towards AudioCodes CE.

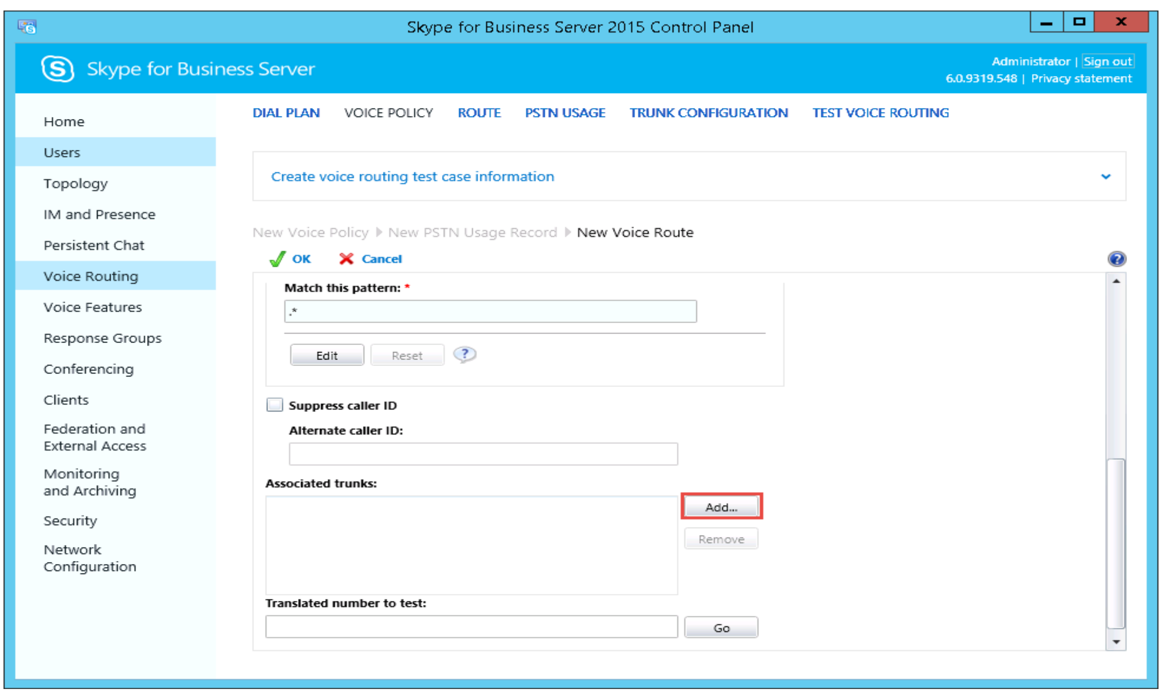

Figure 13: Create Route continuation

In the list of Trunks, select the appropriate trunk and click *OK*. Click *OK* in '*New Voice Route'* window and click *OK* in '*New PSTN Usage Record*' window. Click *OK* in '*New Voice Policy*' window.

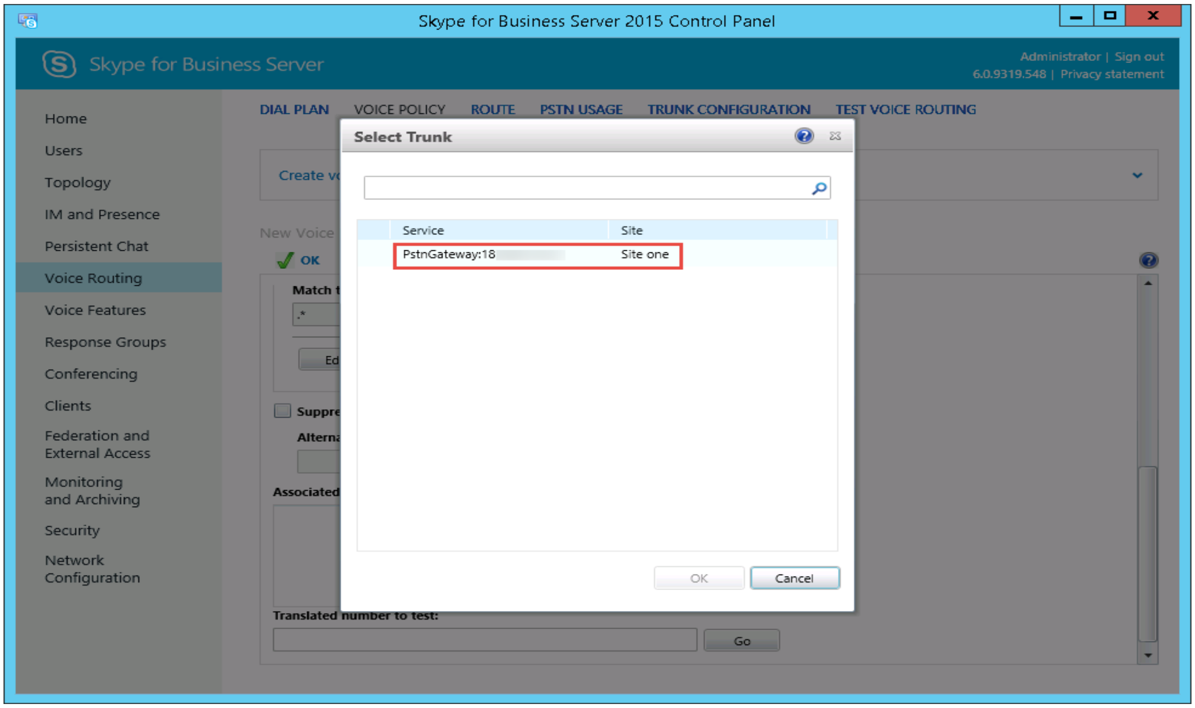

Figure 14: Trunk Association in Route

Click on '*Commit*' drop down and select '*Commit all*' to save the changes made.

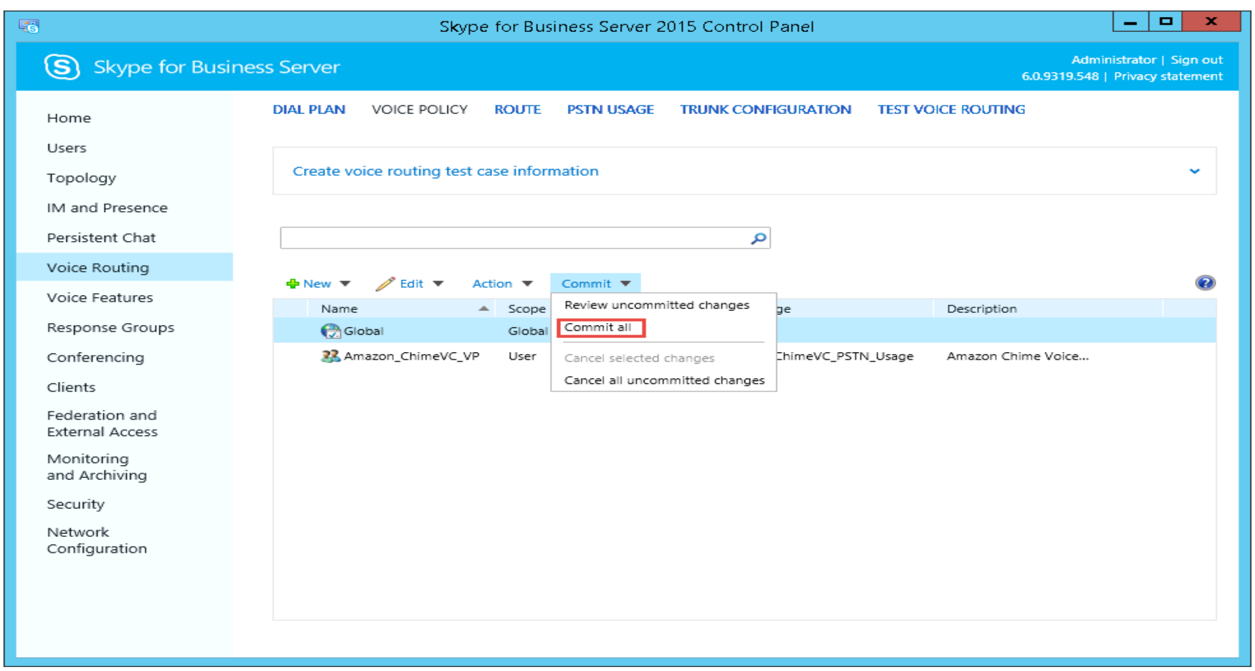

Figure 15: Commit all save the changes

All the changes made is displayed in the Uncommitted Voice Configuration Settings.

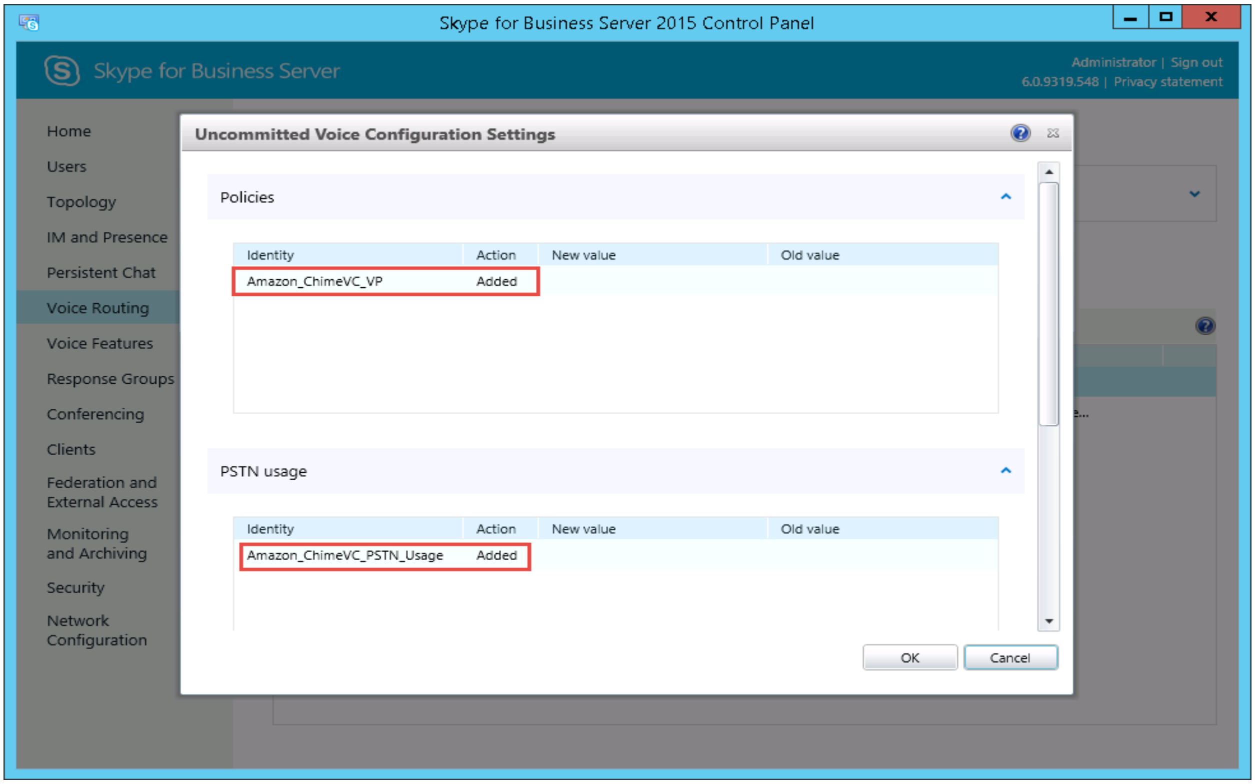

Figure 16: Uncommitted Voice Configuration Settings

The successfully published voice routing configuration window is displayed after the changes are committed.

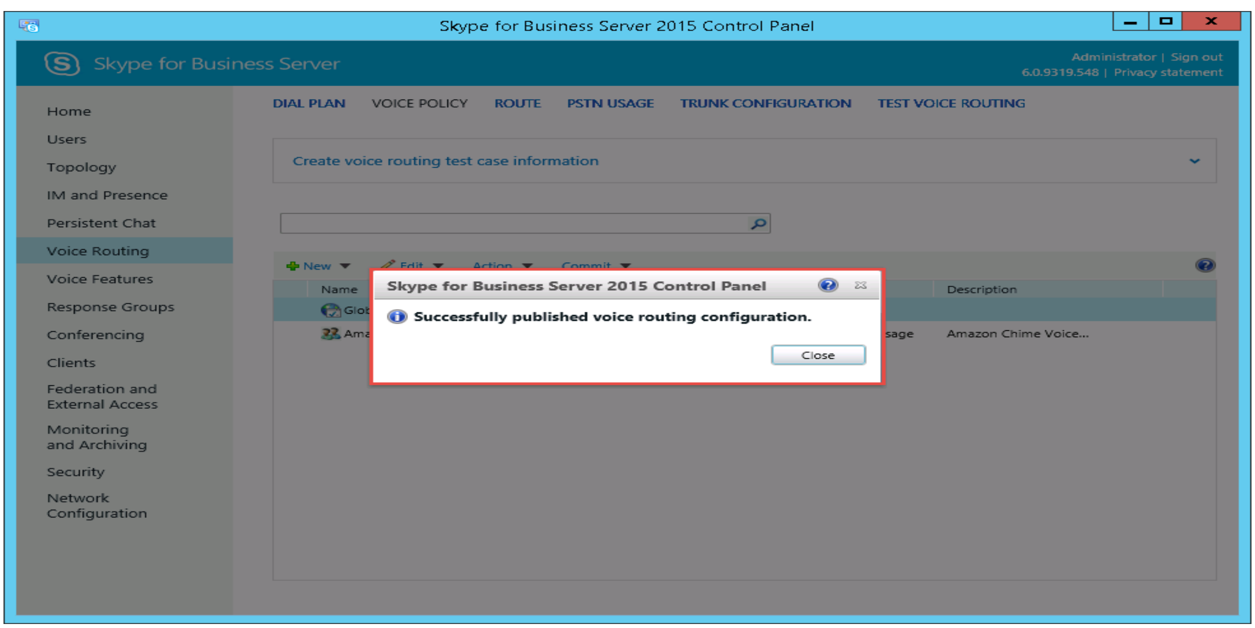

Figure 17: Successfully published voice routing changes

4.2.3 Trunk Configuration

In Skype for Business Control Panel, navigate to '*Trunk Configuration*' under Voice Routing. Click on '*New*' and select '*Pool trunk'*.

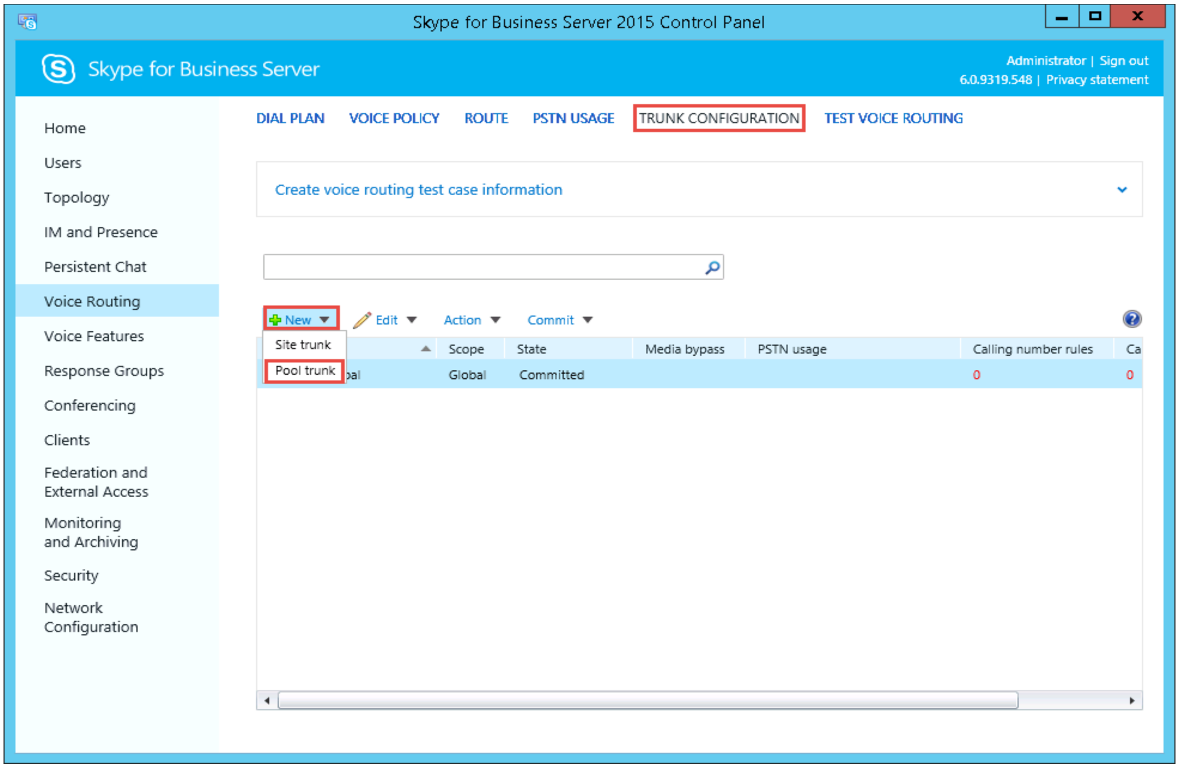

Figure 18: New Pool Trunk

Select the appropriate service created.

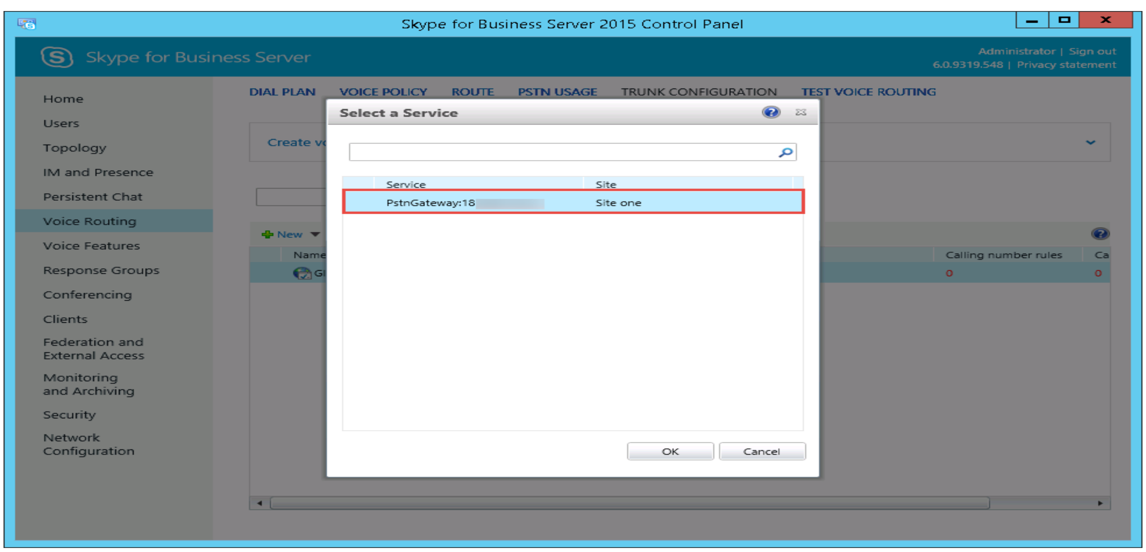

Figure 19: Select a Service

Ensure the parameters '*Enable media bypass*', '*Centralized media processing*', '*Enable forward call history*' and '*Enable outbound routing failover timer*' is enabled and the remaining parameters are set to default.

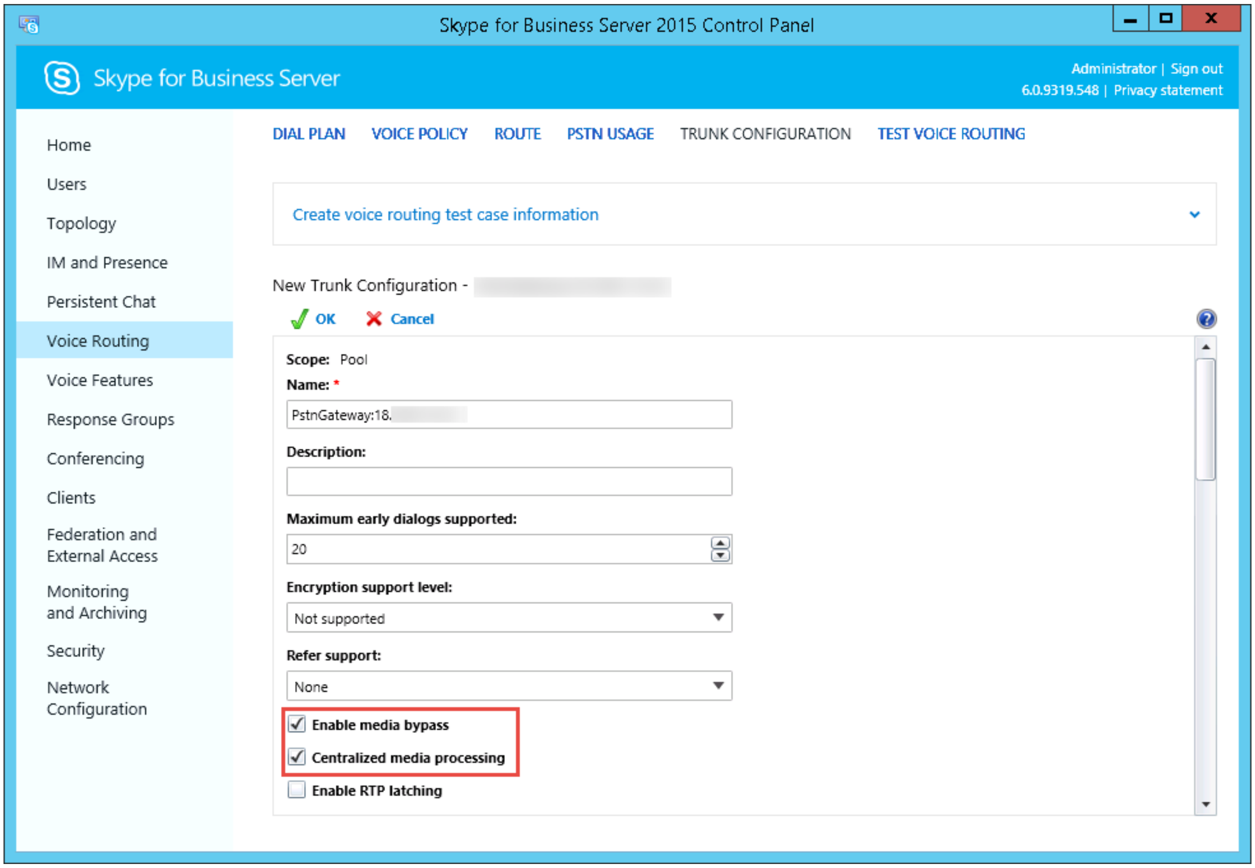

Figure 20: Trunk Configuration

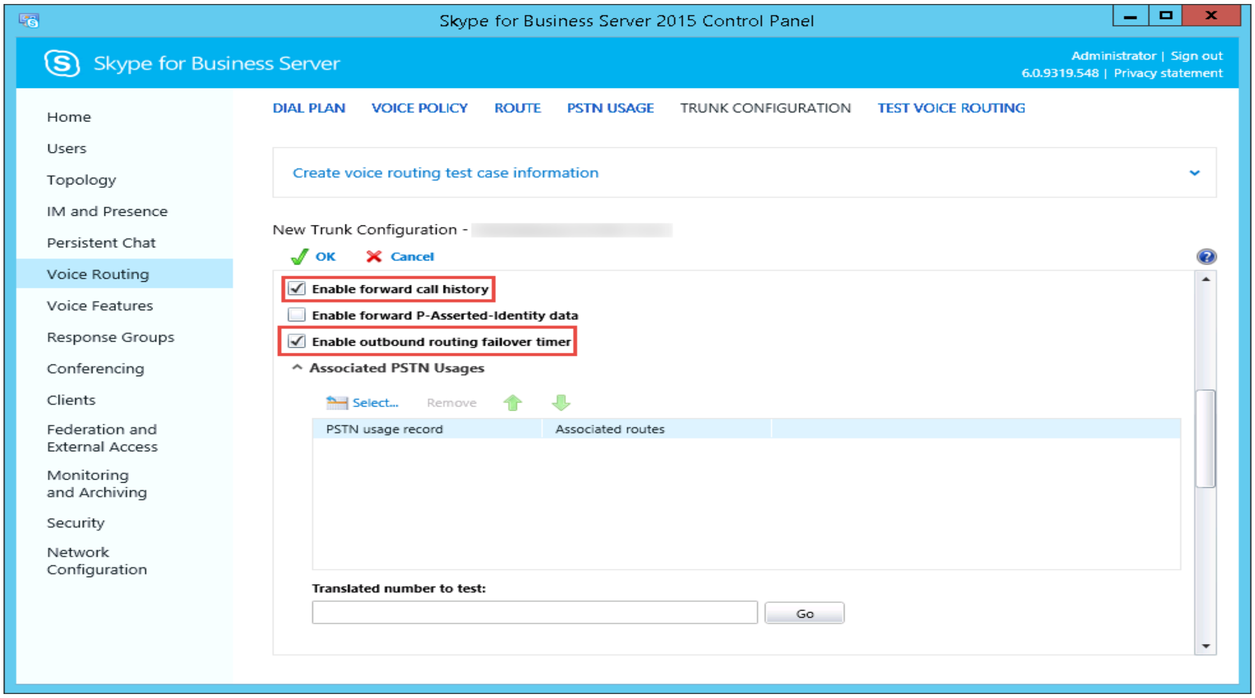

Figure 21: Trunk Configuration Continuation

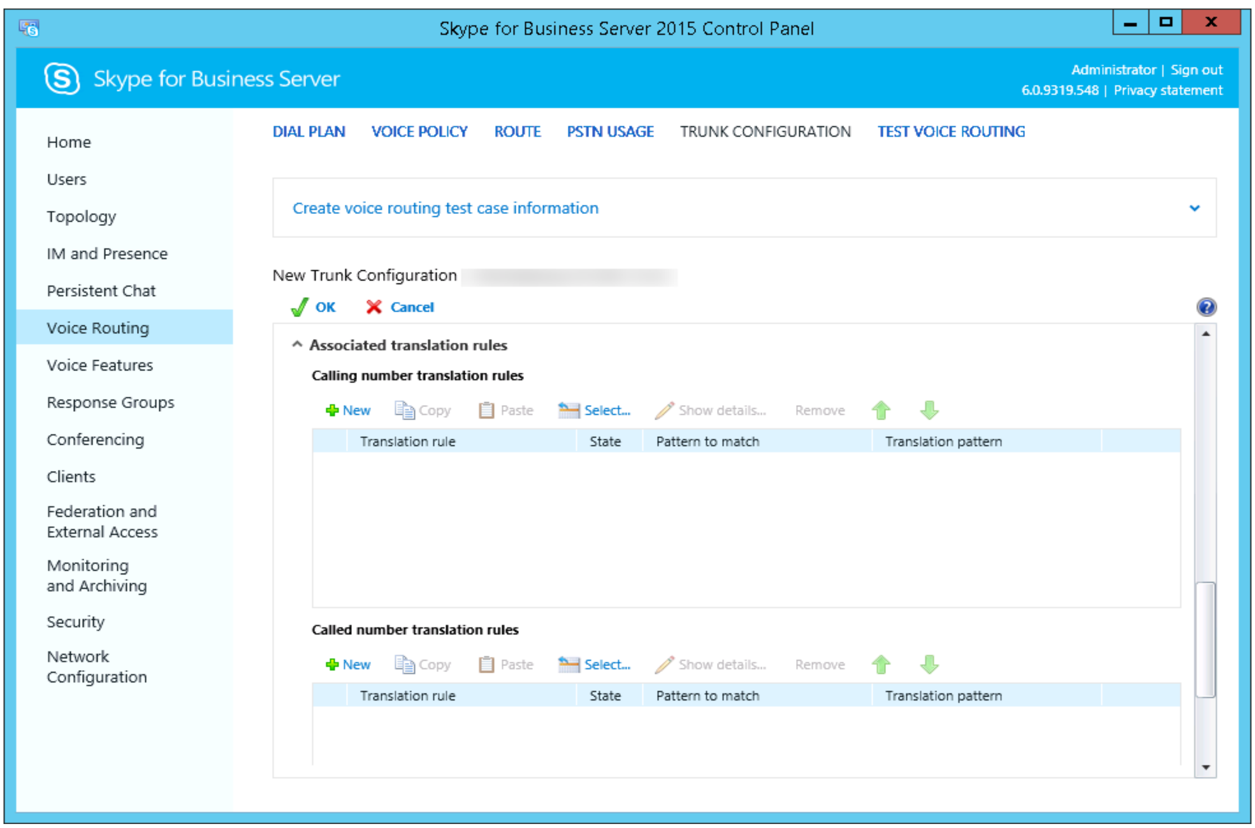

Figure 22: Trunk Configuration Continuation

Click on '*OK'* and commit all unsaved changes.

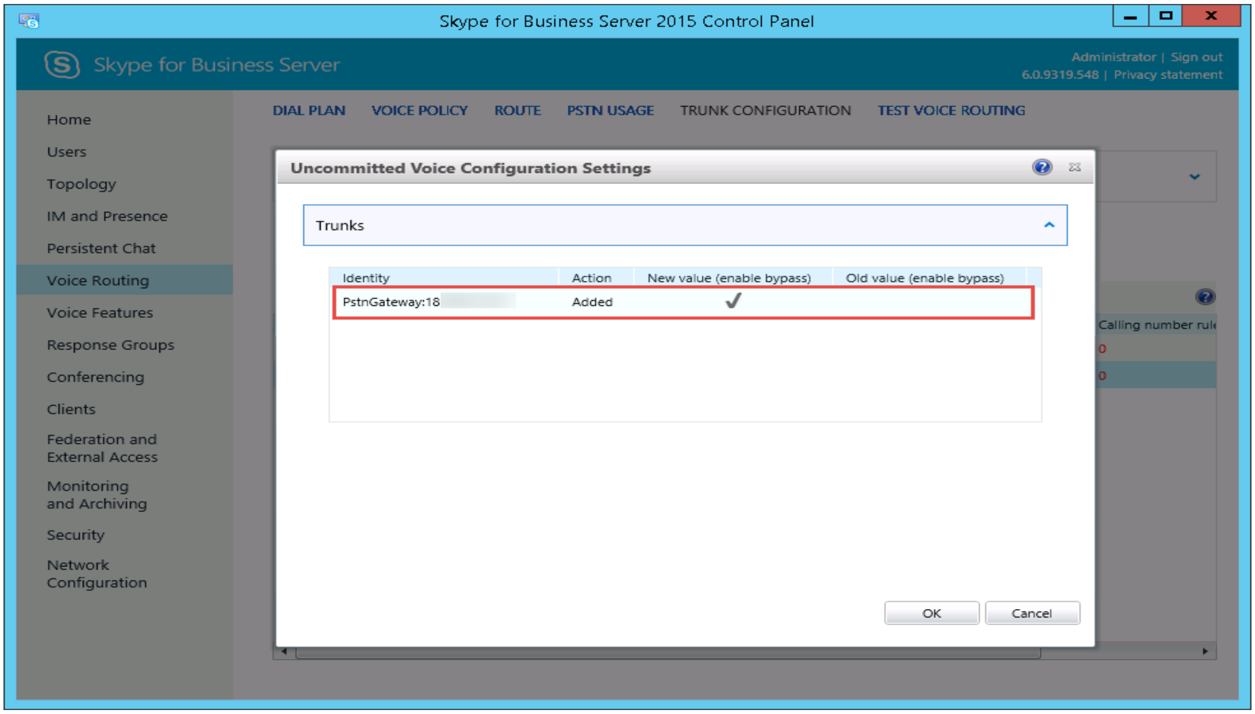

Figure 23: Uncommitted Trunk Configuration settings

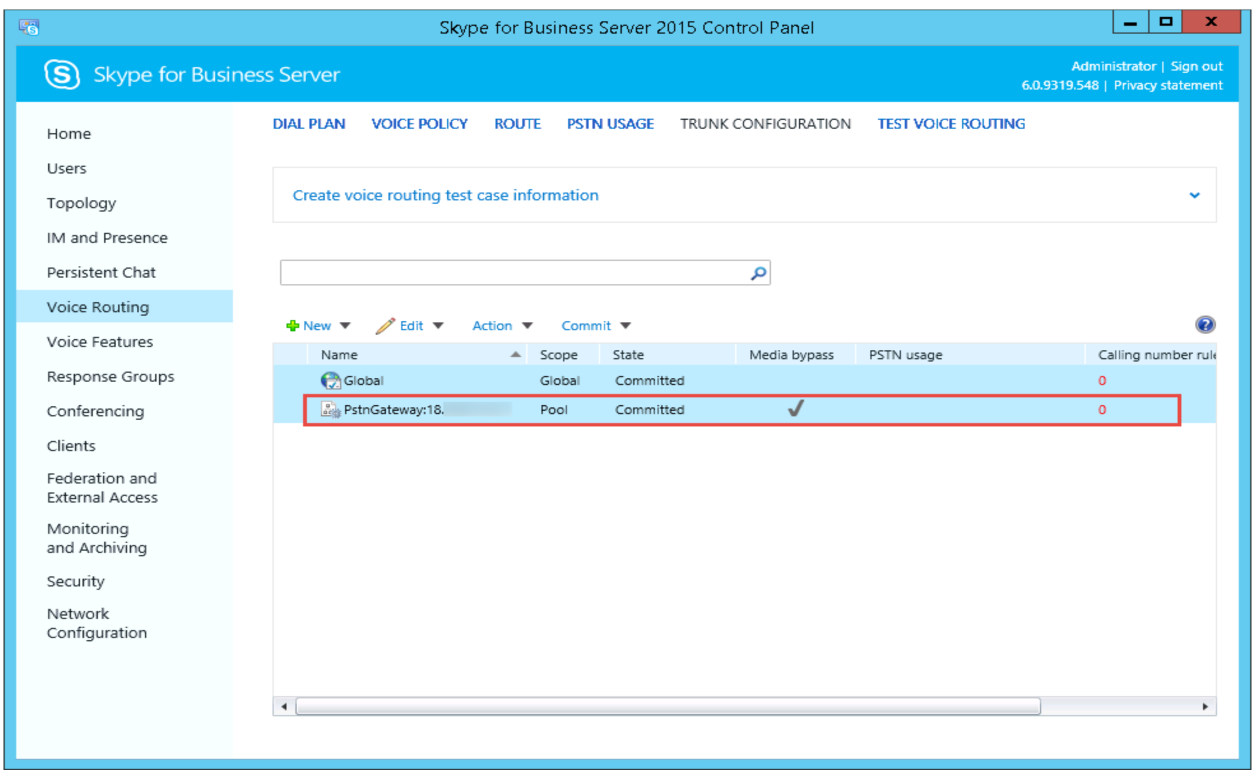

Figure 24: Trunk Configuration after committed changes

4.2.4 User Configuration

The user configuration step involves enabling users for Skype for Business with a sip address and Line URI. Amazon Chime Voice Connector DID is associated with the users and appropriate voice policy is selected for the user.

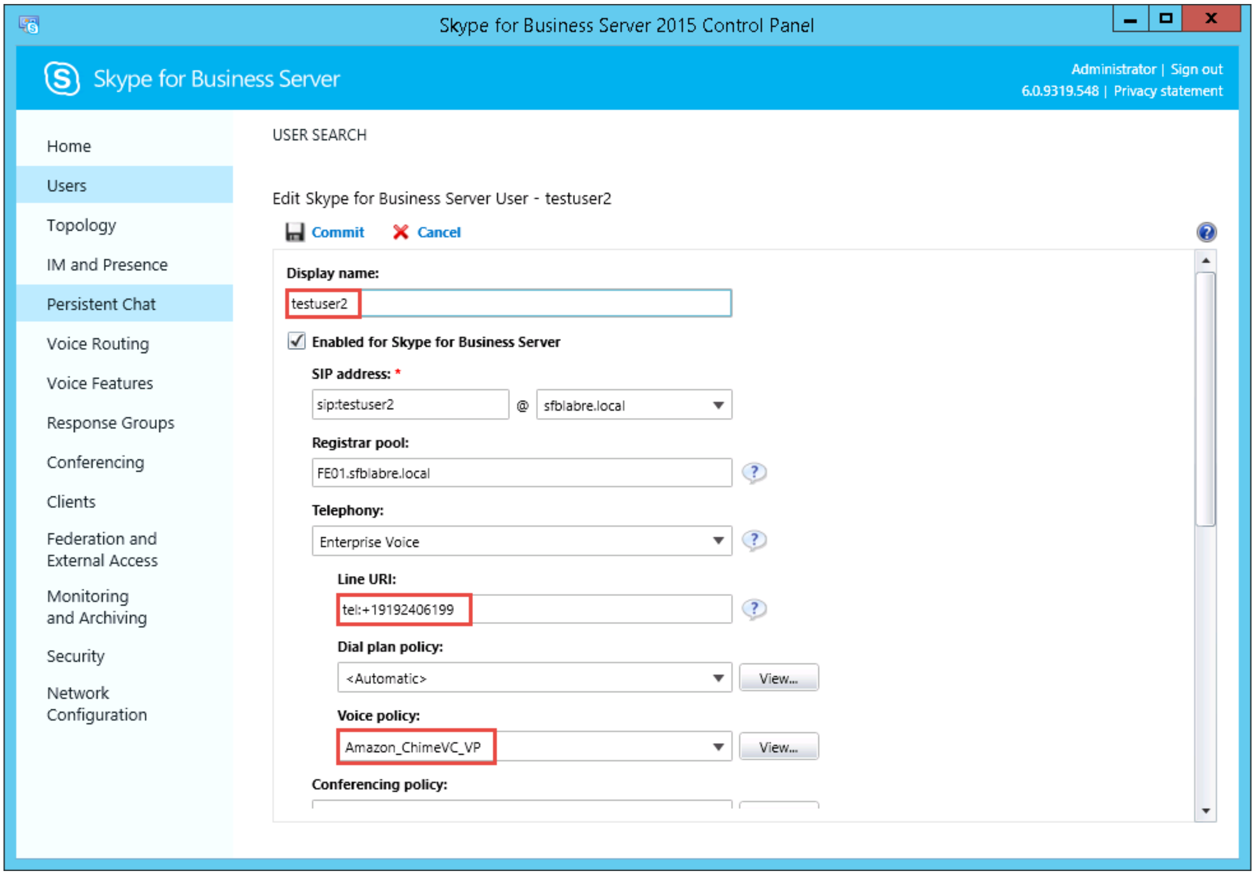

Figure 25: User Configuration

4.3 AudioCodes CE Configuration

The AudioCodes CE is configured with one trunk pointing to Skype for Business server and another trunk pointing to Amazon Chime Voice Connector. The steps involved in configuring the IP and Trunks are shown below

4.3.1 Network IP Interface configuration

Navigate to '*SETUP*', '*IP NETWORK'* and expand '*CORE ENTITIES'*. Click '*IP Interfaces*' and the below figure shows the interfaces that are been used.

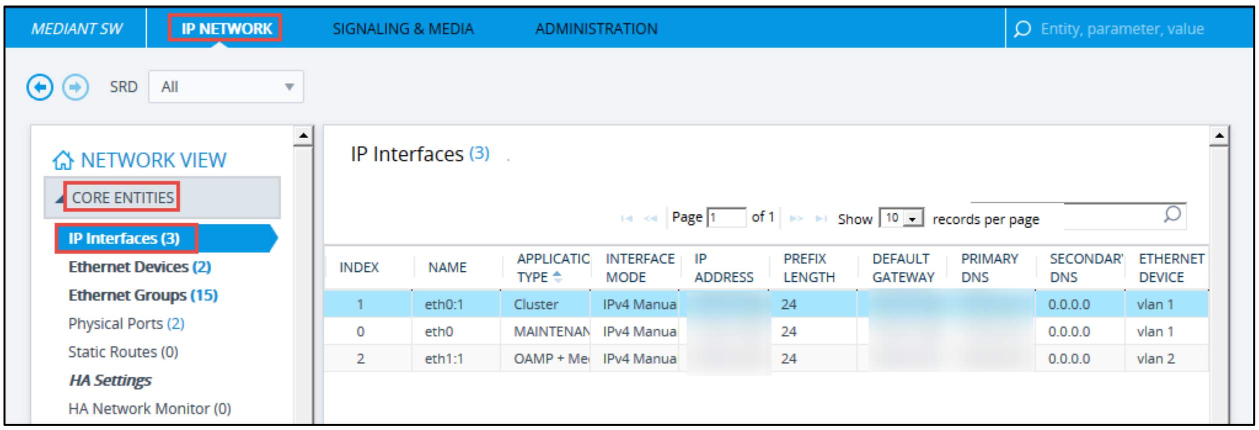

Figure 26: IP Interfaces

4.3.2 Media Realm configuration

Two media realms are created, one is associated to Skype for Business and another is associated with Amazon Chime Voice Connector. To configure media realm, navigate to '*SETUP* 'and select '*SIGNALING & MEDIA'*. Expand '*CORE ENTITIES'* and select '*Media Realms'*.

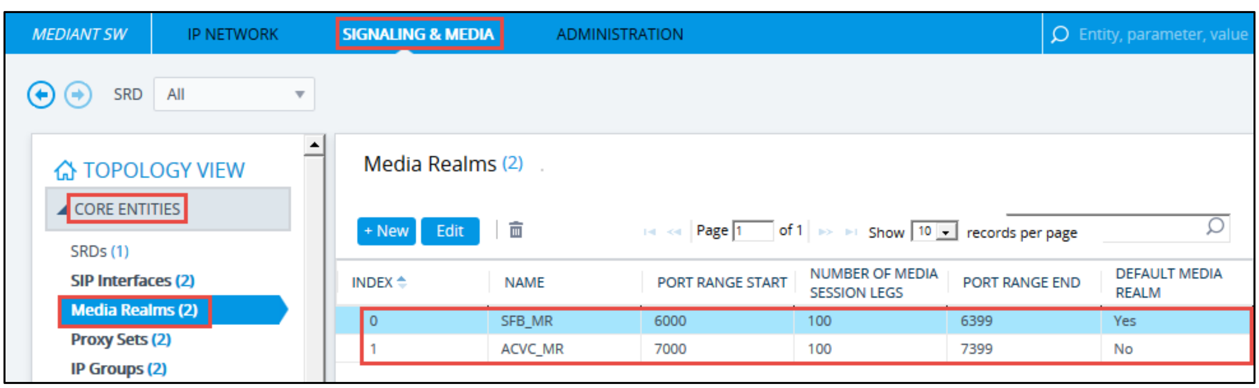

Figure 27: Media Realms Table

Enter the name of the Media Realm, *Port Range Start* value and *Number of Media Session* Legs. Select the appropriate IPv4 Interface Name for Skype for Business.

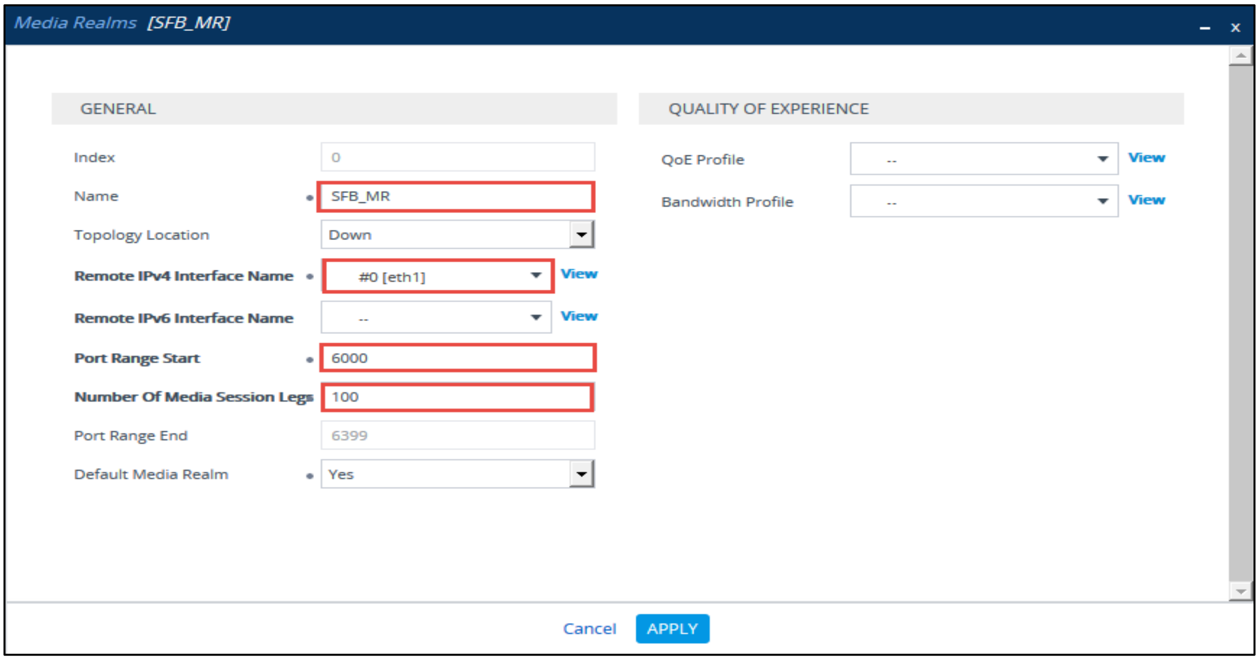

Figure 28: Media Realm for Skype for Business

Enter the name of the Media Realm, *Port Range Start* value and *Number of Media Session* Legs. Select the appropriate IPv4 Interface Name for Amazon Chime Voice Connector.

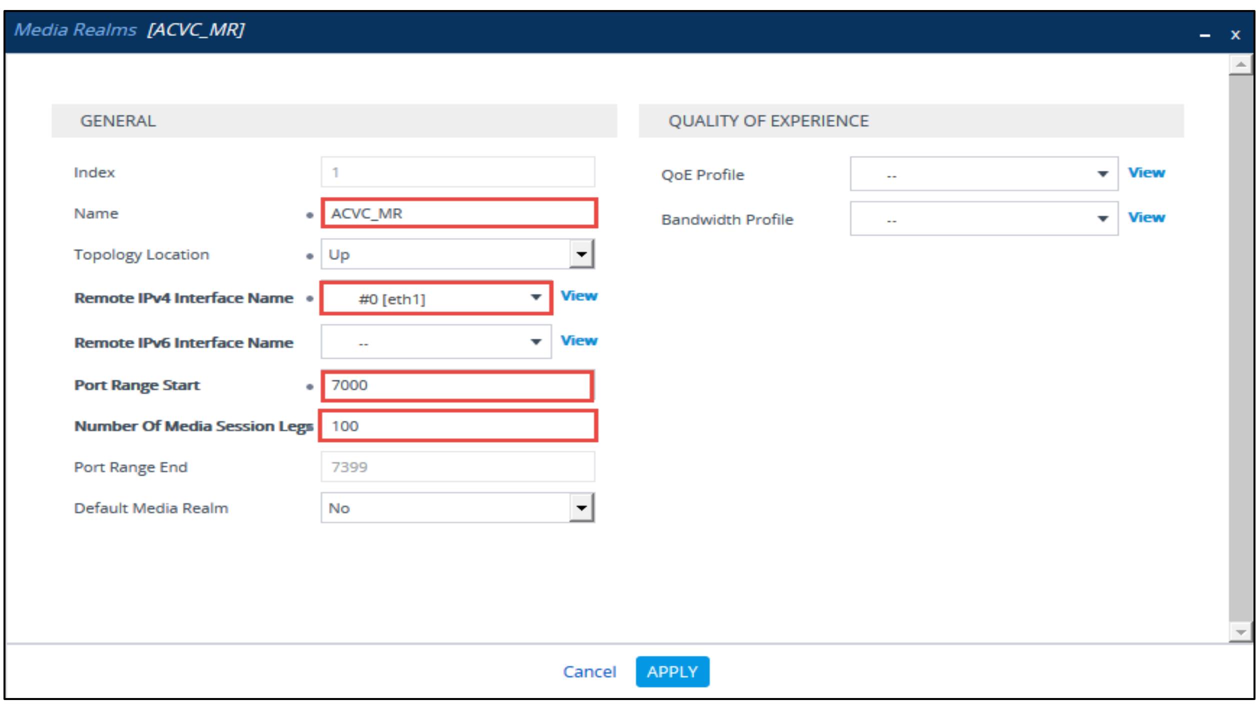

Figure 29: Media Realm for Amazon Chime Voice Connector

4.3.3 SRD configuration

To configure SRD, navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*CORE ENTITIES*' and select *SRDs*.

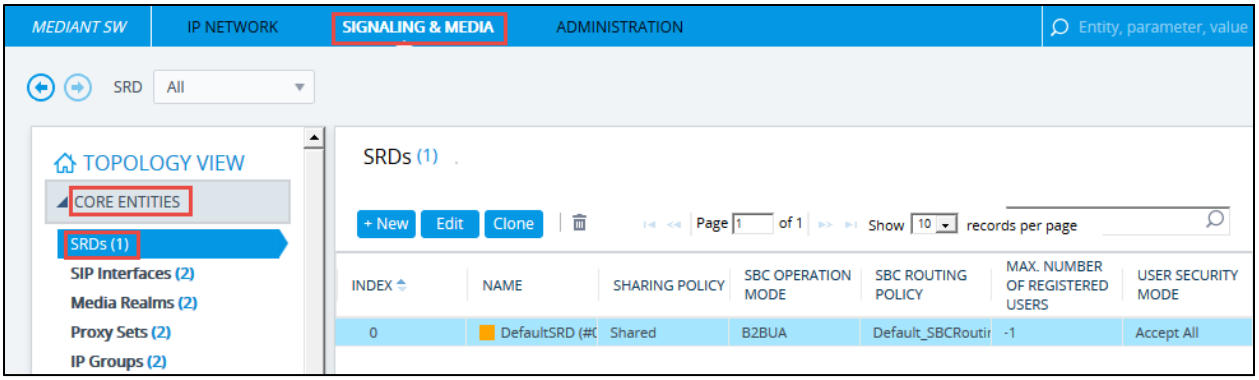

Figure 30: Default SRD

The default SRD configuration is used.

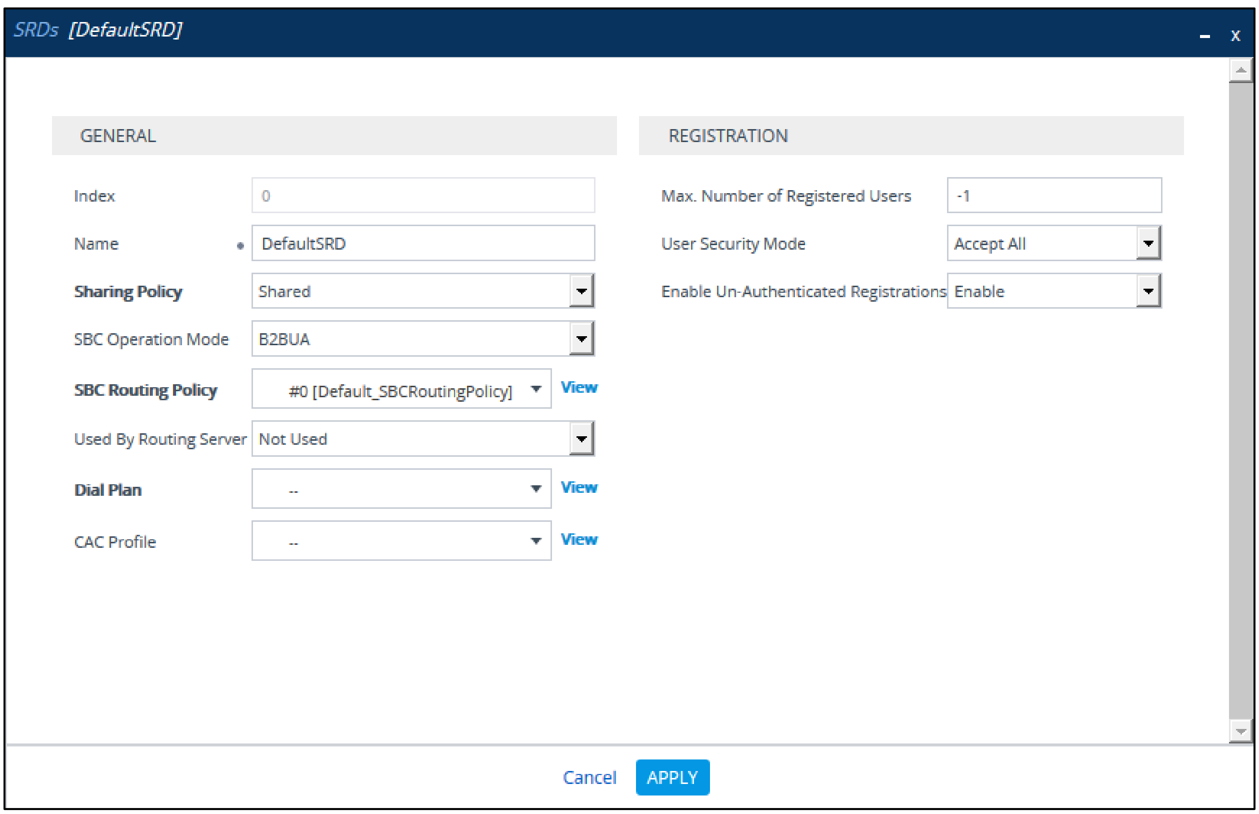

Figure 31: SRD Table Details

4.3.4 SIP Interface configuration

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*CORE ENTITIES*' and select '*Sip Interfaces*'. Two SIP Interfaces are created, one is for Skype for Business and the other is for Amazon Chime Voice Connector.

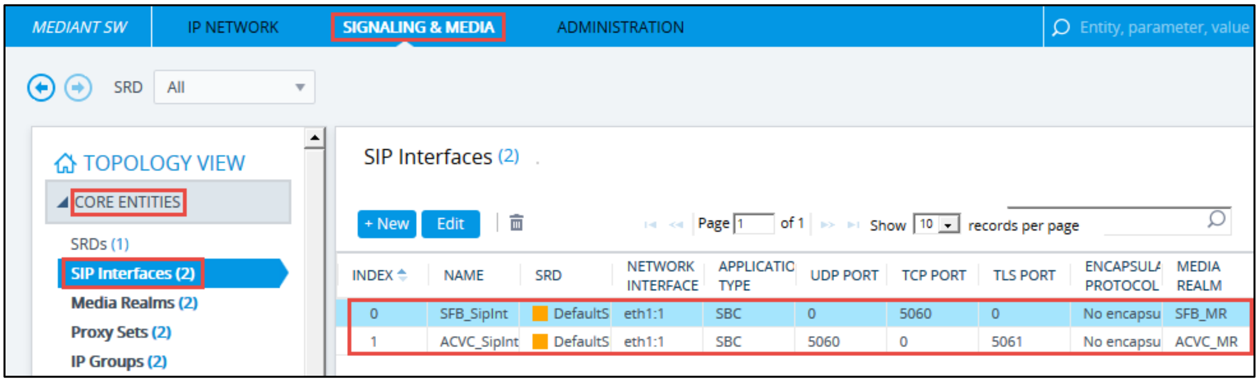

Figure 32: SIP Interfaces

Network Interface, Media Realm, SRD and *Port numbers* are associated to Skype for Business SIP Interface and the remaining parameters are set to default.

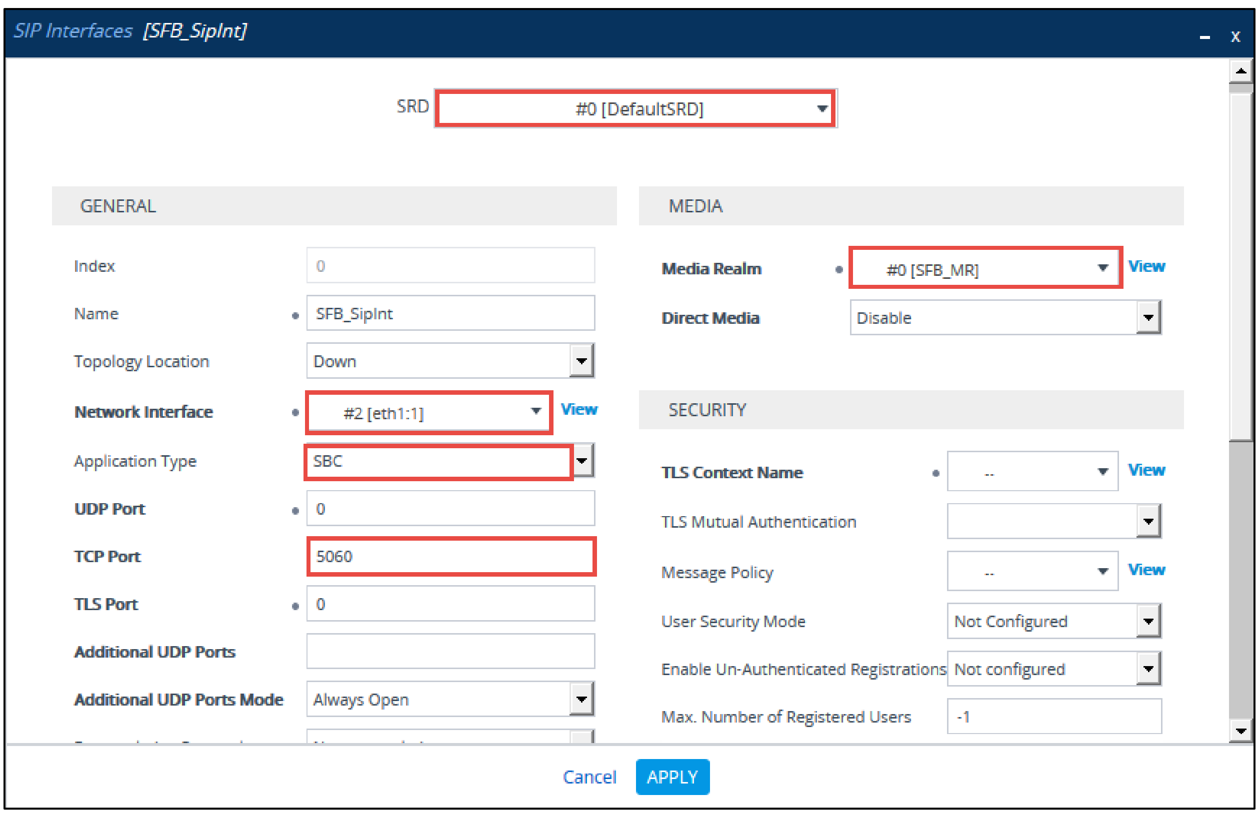

Figure 33: SIP Interface for Skype for Business

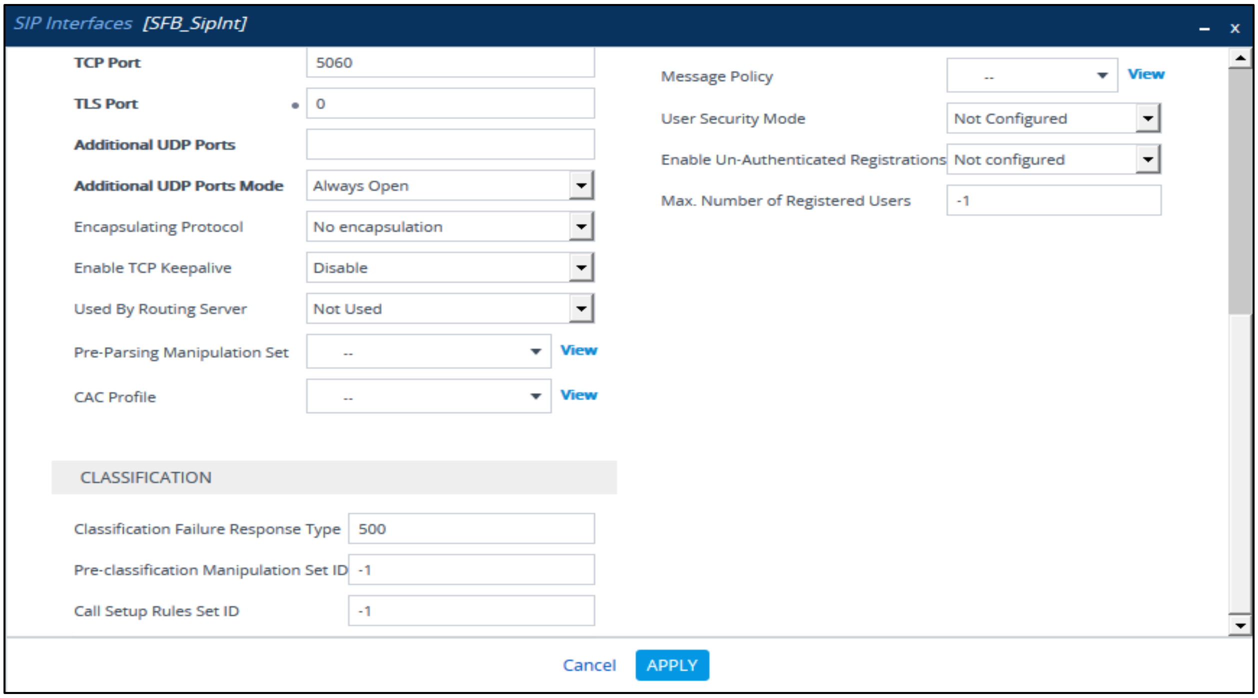

Figure 34: SIP Interface for Skype for Business Continuation

Network Interface, Media Realm, SRD and *Port numbers* are associated to Amazon Chime Voice Connector SIP Interface and the remaining parameters are set to default.

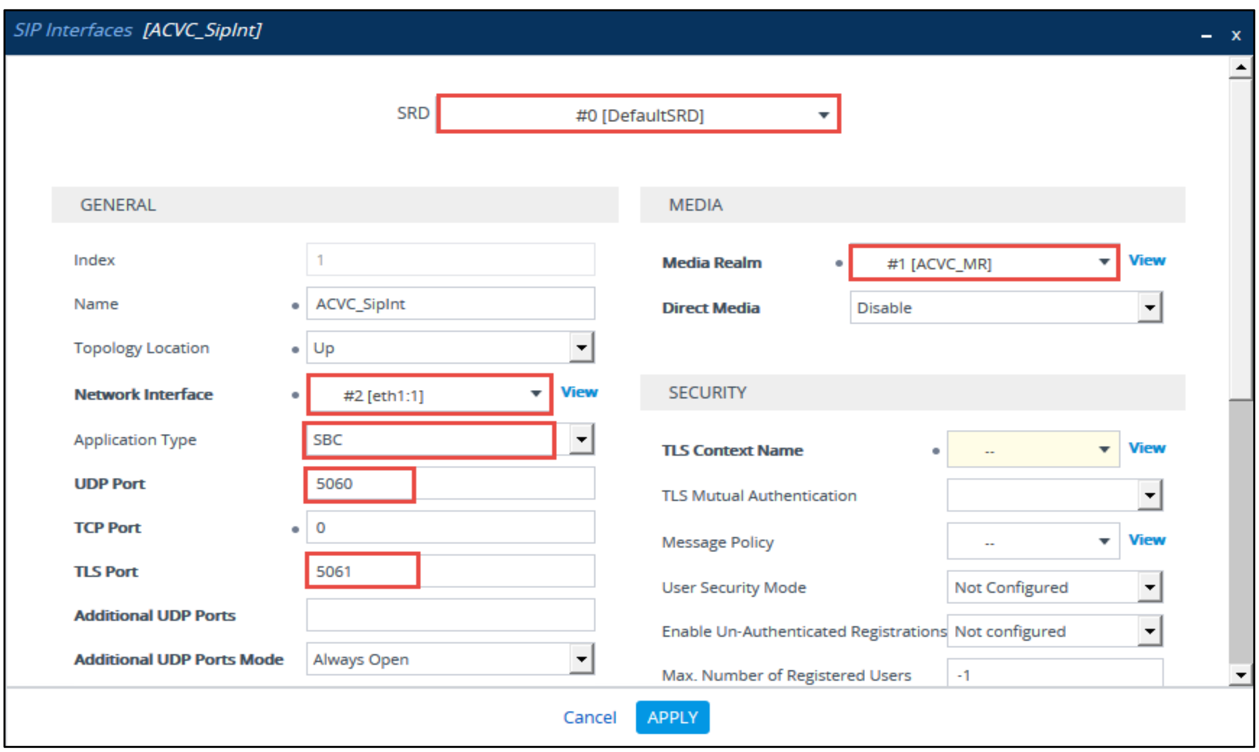

Figure 35: SIP Interface for Amazon Chime Voice Connector

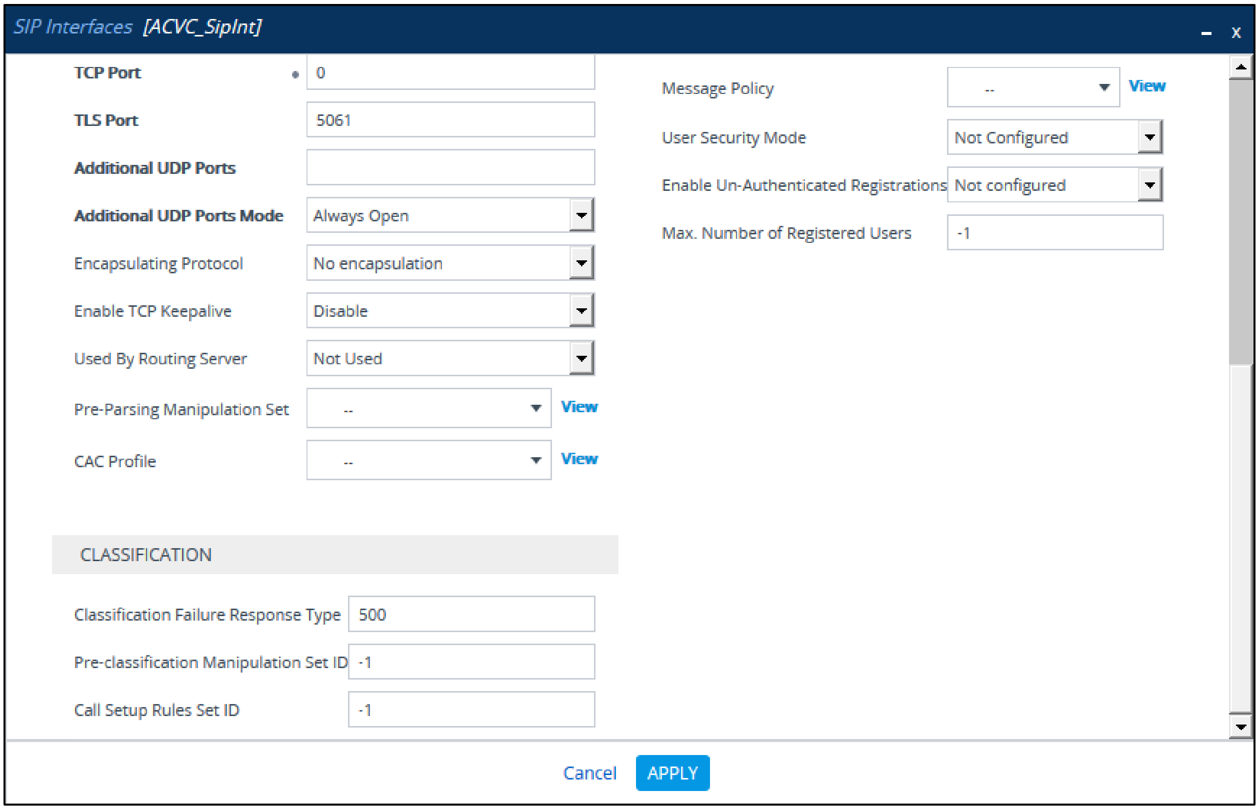

Figure 36: SIP Interface for Amazon Chime Voice Connector Continuation

4.3.5 Proxy Sets configuration

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*CORE ENTITIES*' and select '*Proxy Sets*'. Destination address or FQDN is configured in Proxy Sets. Two Proxy Sets are created, one for Skype for Business and other for Amazon Chime Voice Connector.

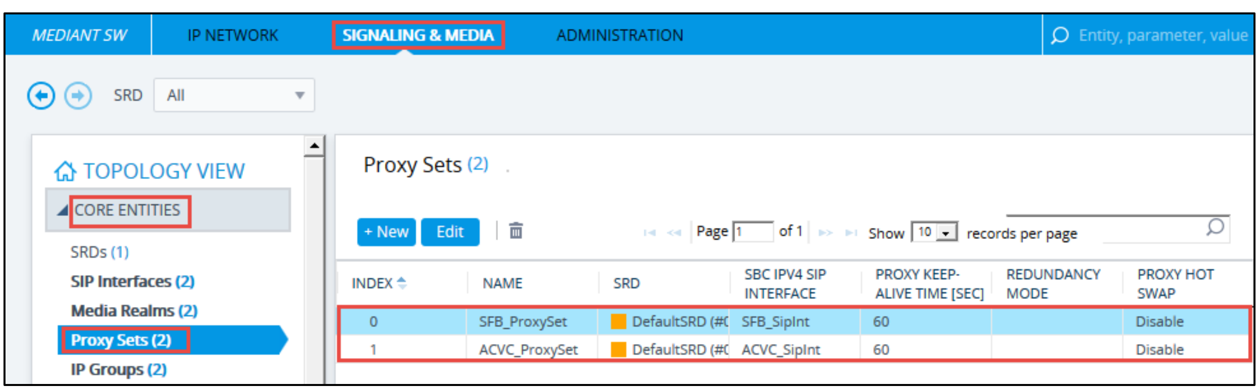

Figure 37: Proxy Sets table

Select *SBC IPv4 SIP Interface* and enable *Proxy Keep-Alive* for Skype for Business Proxy Set.

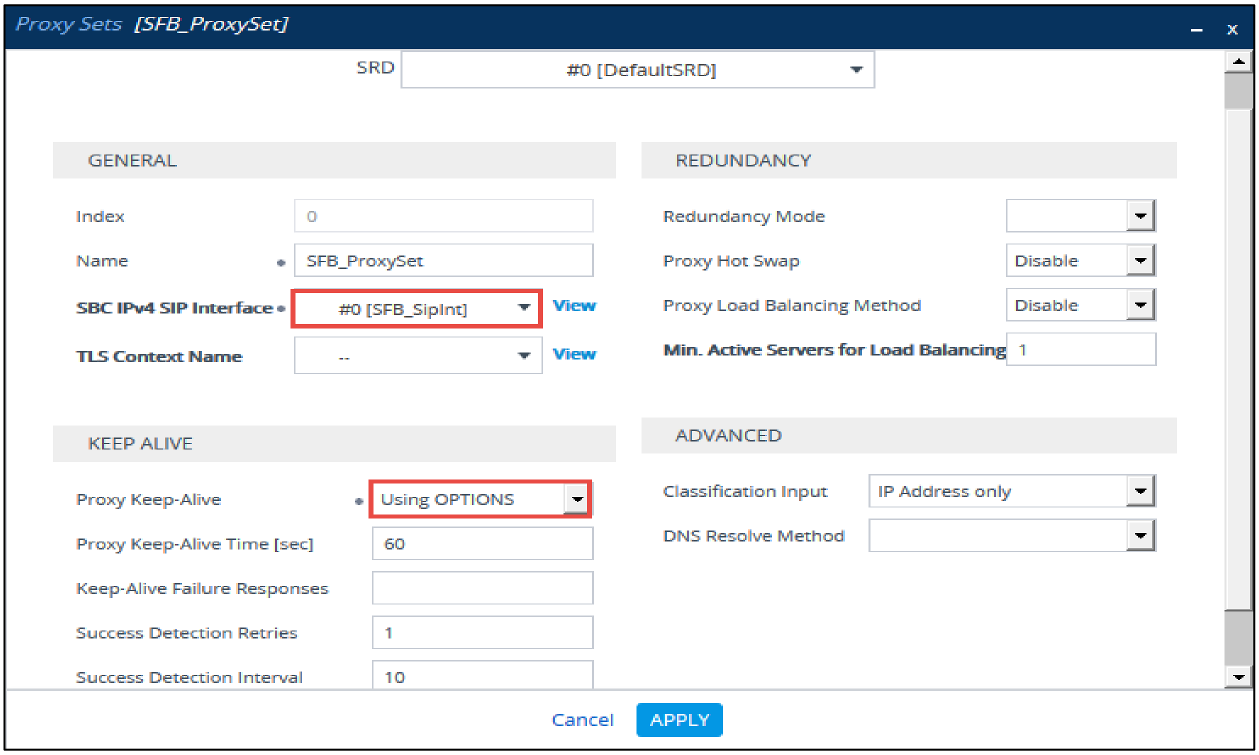

Figure 38: Proxy Set table for Skype for Business

Click on '*Proxy Address 0 items*' link in bottom to add *Proxy Address* and *Transport Type*.

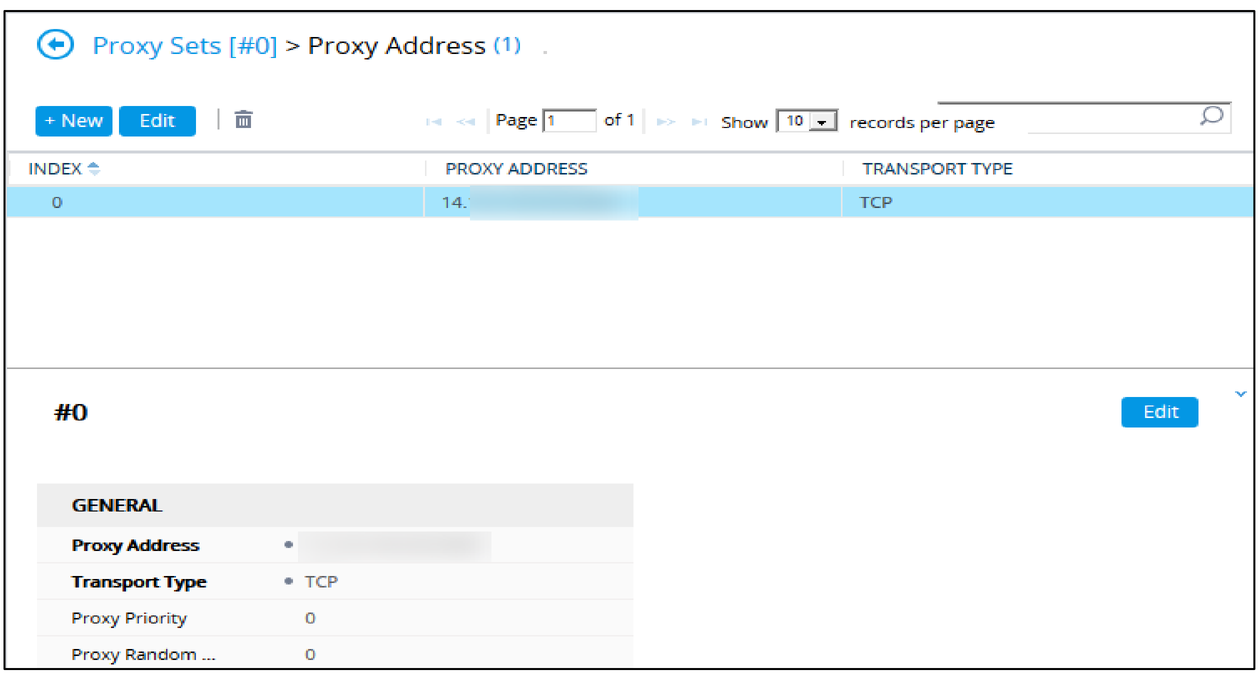

Figure 39: Proxy Address for Skype for Business

Select *SBC IPv4 SIP Interface* and enable *Proxy Keep-Alive* for Amazon Chime Voice Connector Proxy Set.

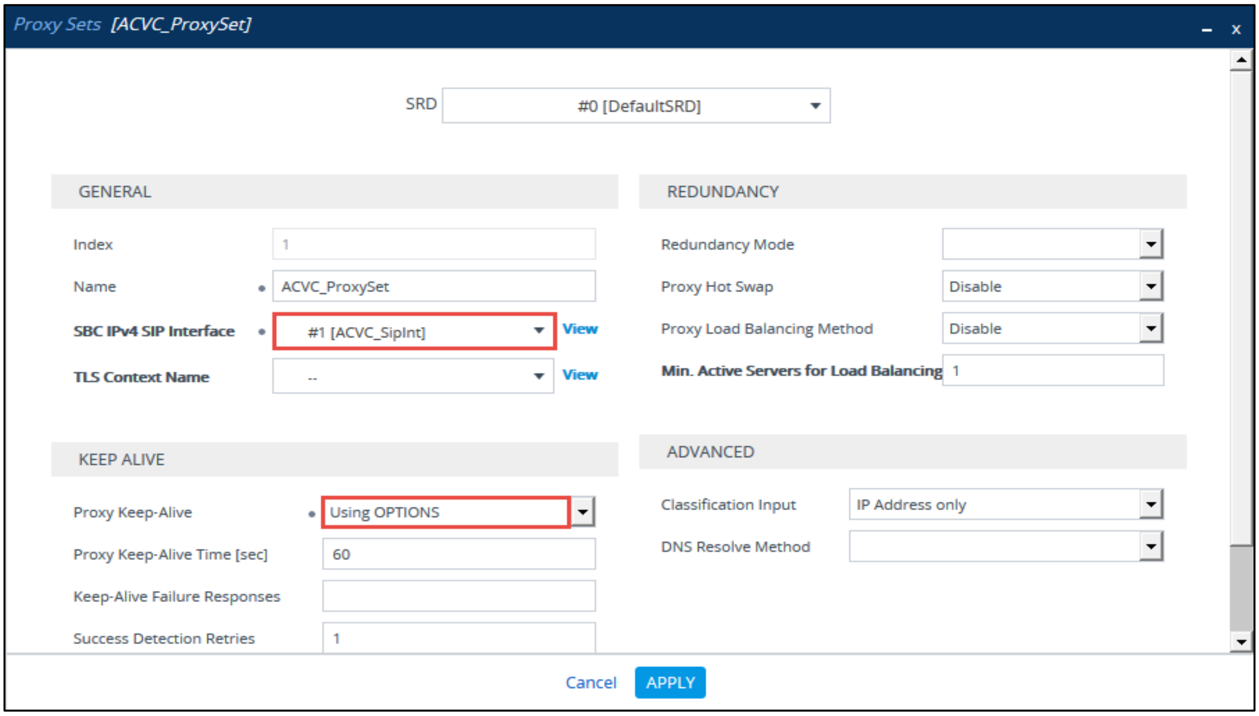

Figure 40: Proxy Set table for Amazon Chime Voice Connector

Click on '*Proxy Address 0 items*' link in bottom to add Proxy Address and Transport Type.

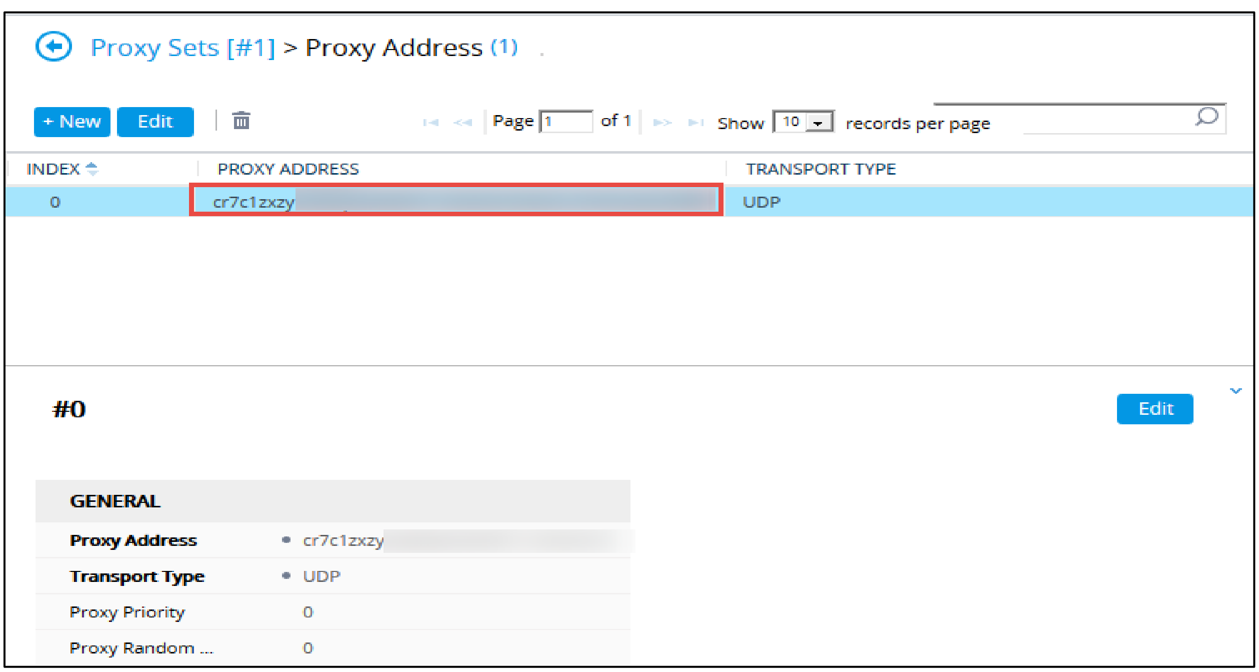

Figure 41: Proxy Address for Amazon Chime Voice Connector

4.3.6 IP Group Table configuration

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*CORE ENTITIES*' and select '*IP Groups*'. IP Groups are configured for denoting source and destination in IP-to-IP routing rules. IP Groups created for Skype for Business and AudioCodes CE.

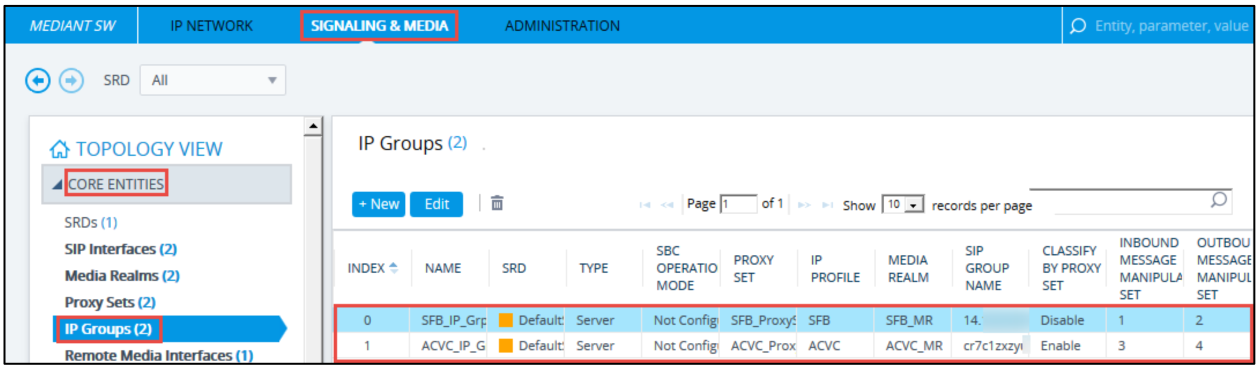

Figure 42: IP Group Table

Enter the name of the IP Groups for Skype for Business and associate *Proxy Set, IP Profile, Media Realm* and the remaining parameters are set to default.

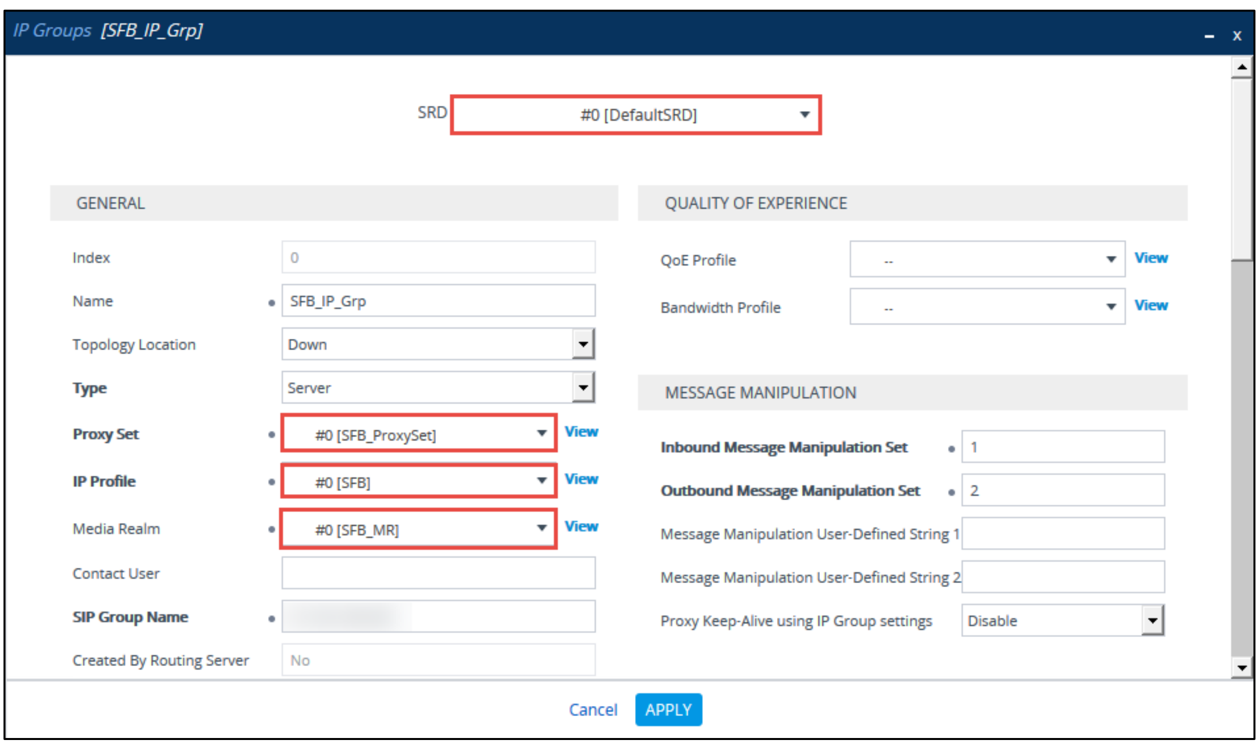

Figure 43: IP Group Table for Skype for Business

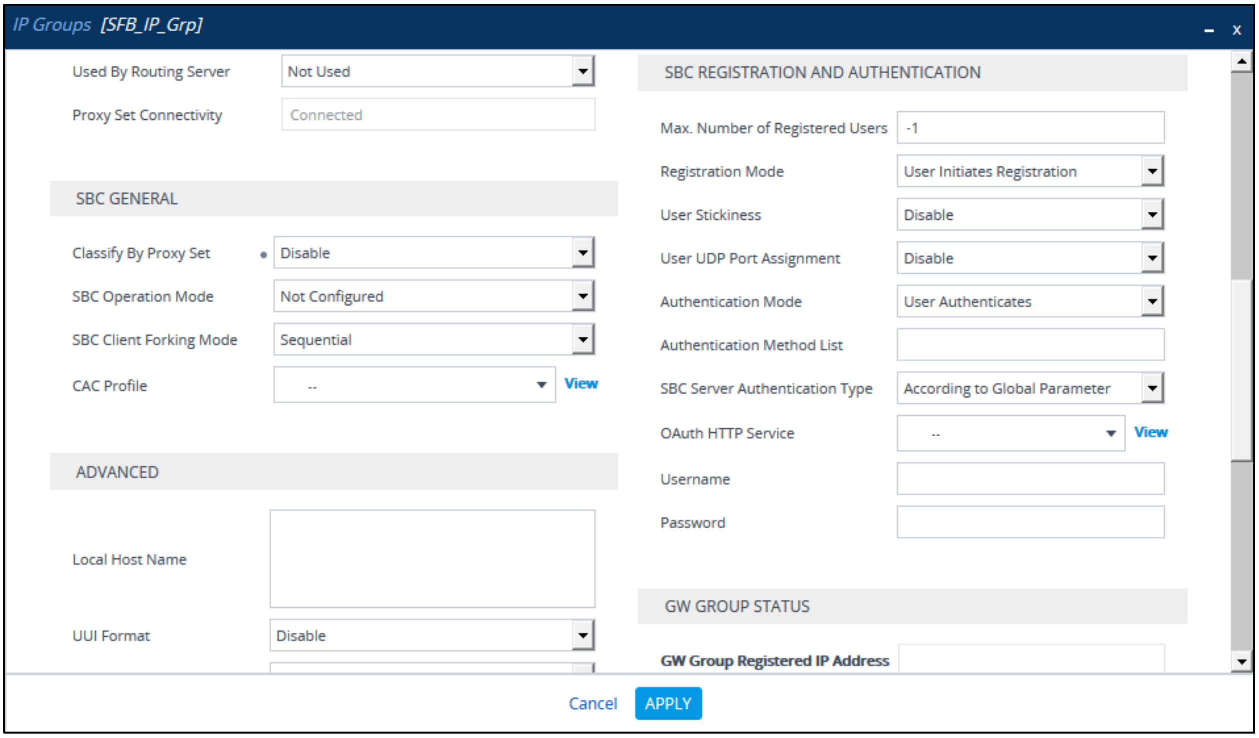

Figure 44: IP Group table for Skype for Business Continuation

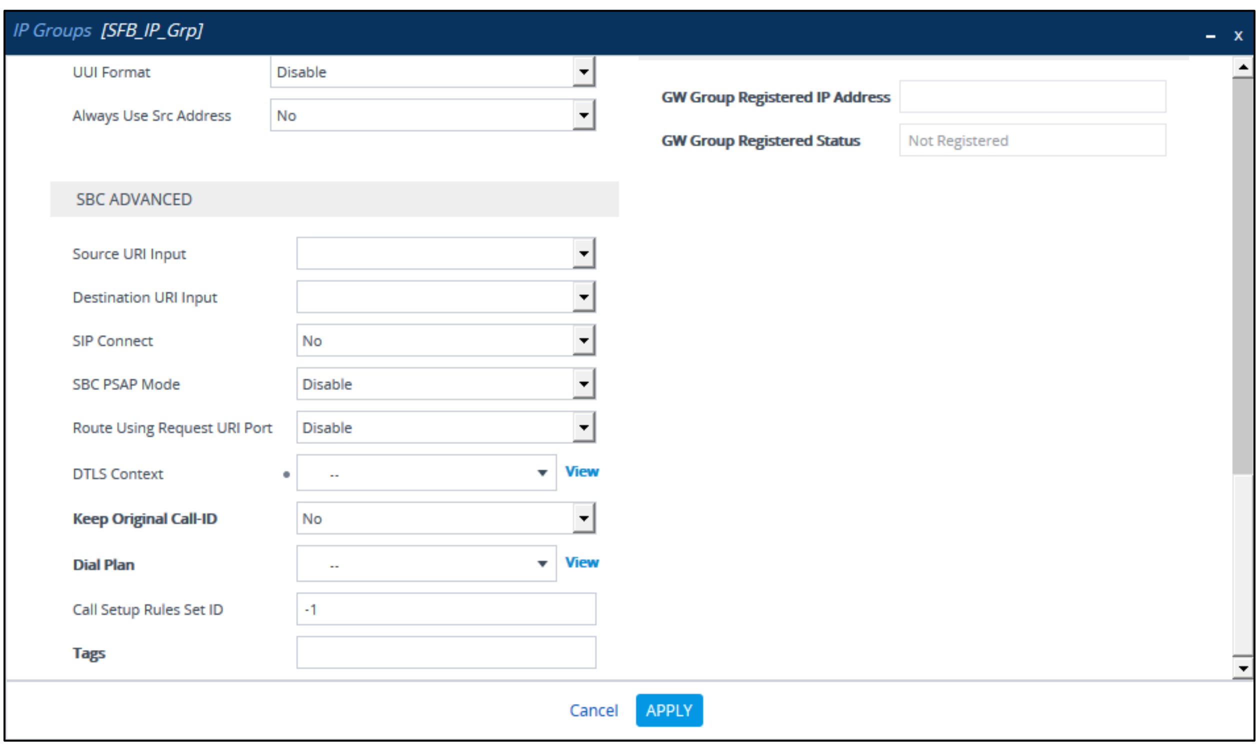

Figure 45: IP Group table for Skype for Business Continuation

Enter the name of the IP Groups for Amazon Chime Voice Connector and associate *Proxy Set, IP Profile, Media Realm* and the remaining parameters are set to default.

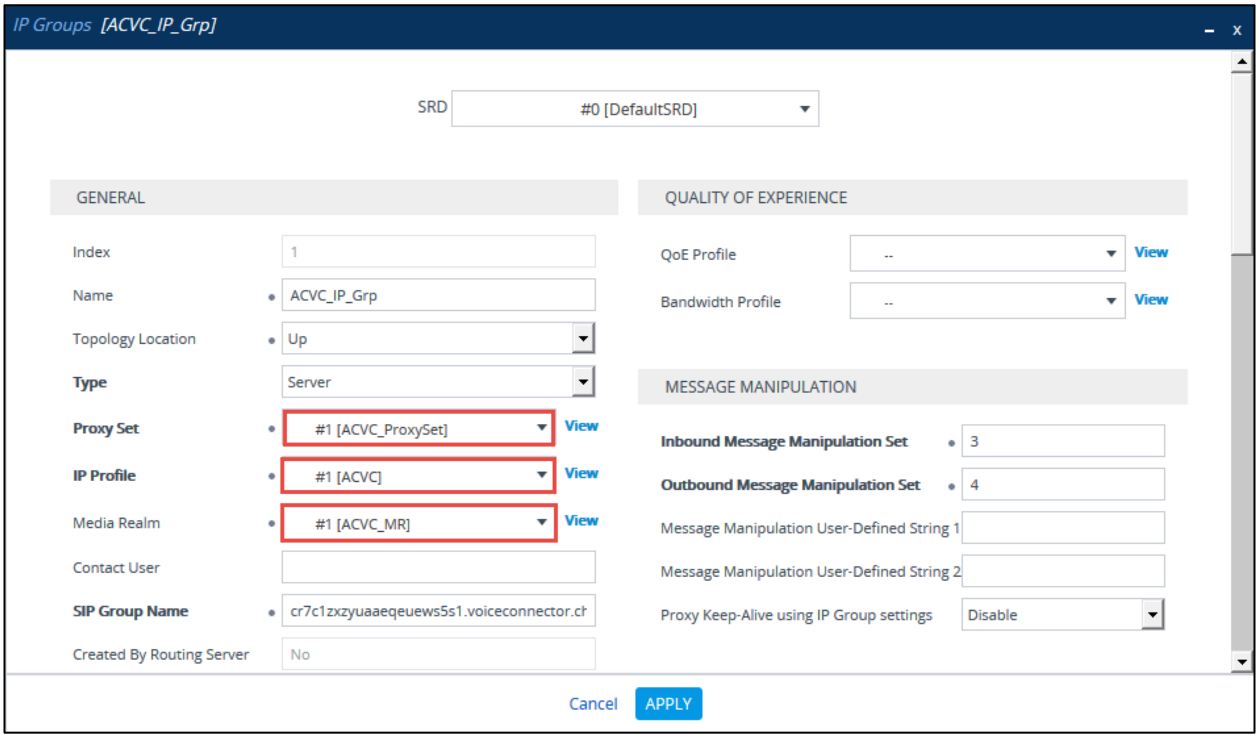

Figure 46: IP Group table for Amazon Chime Voice Connector

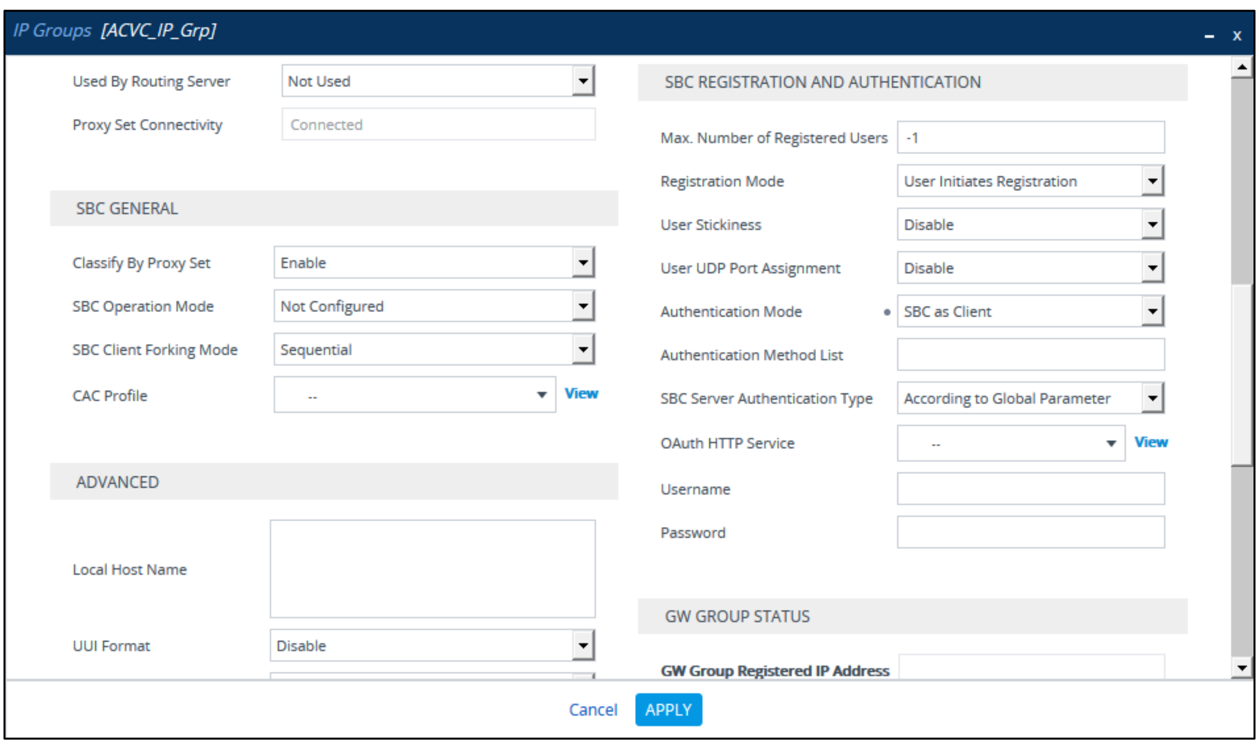

Figure 47: IP Group table for Amazon Chime Voice Connector Continuation

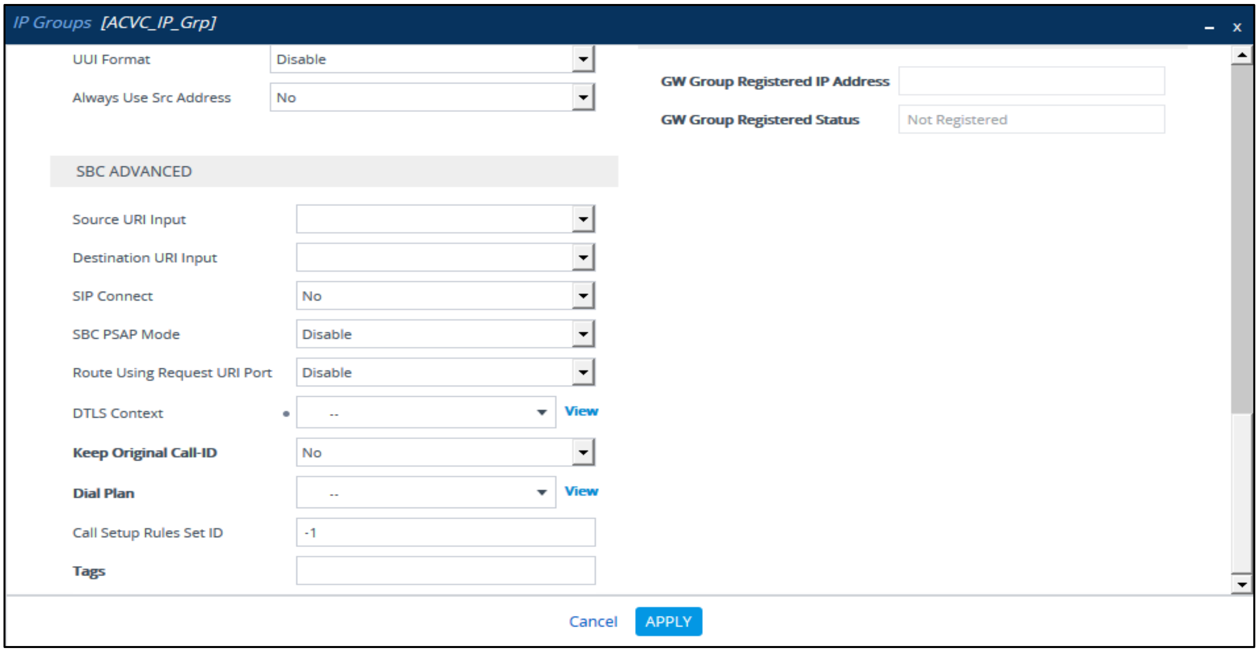

Figure 48: IP Group table for Amazon Chime Voice Connector Continuation

4.3.7 Coder Groups configuration

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*CODERS & PROFILES*' and select '*Coder Groups*'. G711 U-law is configured in Coder Groups.

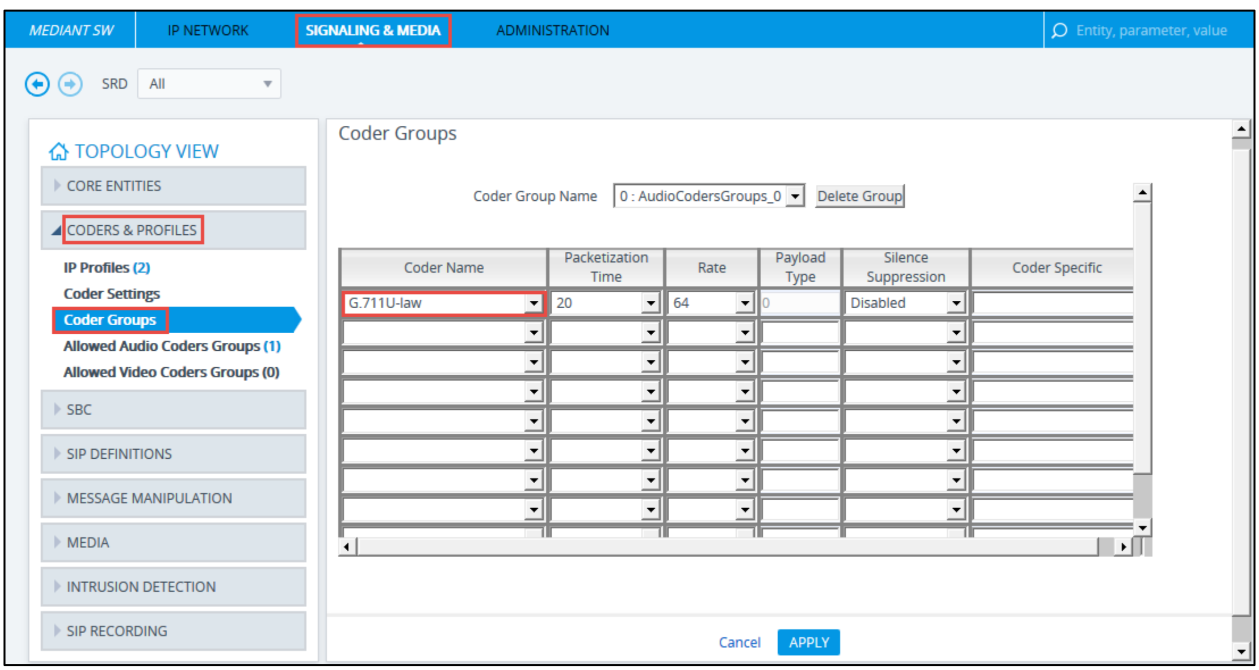

Figure 49: Coder Groups

Navigate to '*SETUP', 'SIGNALING & MEDIA', 'CODERS & PROFILES'* and select '*Allowed Audio Coders Groups*'. Click on '*New*' button to create Allowed Audio

Coders Group and then Click on 'Allowed Audio Coders 0 items' link and click 'New' to add the coders.

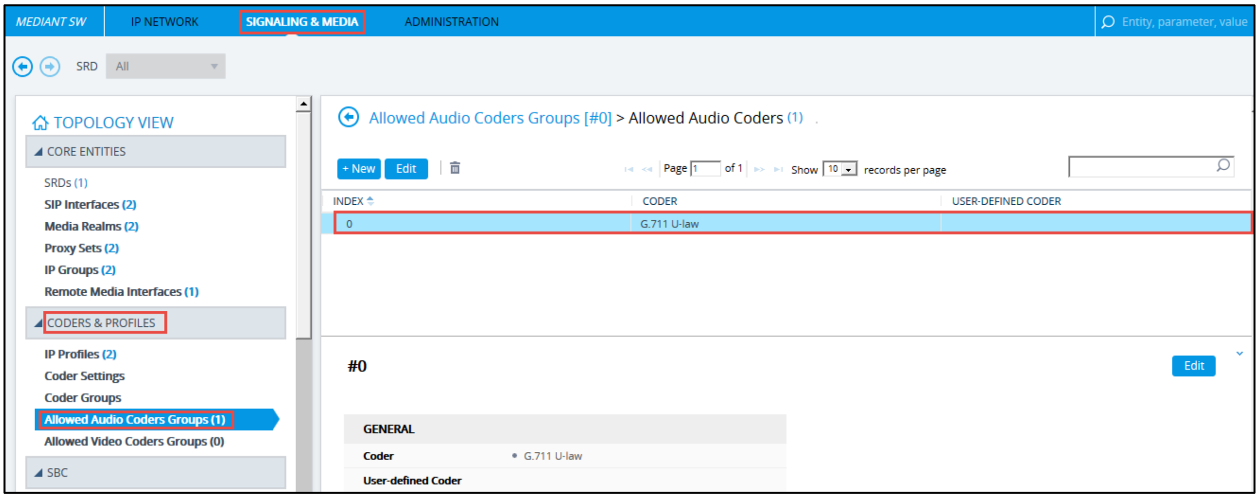

Figure 50: Allowed Audio Coders

4.3.8 IP Profile configuration

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand *'CODERS & PROFILES'* and select '*IP Profiles'*. Two IP Profiles are created, one for Skype for Business and other for Amazon Chime Voice Connector.

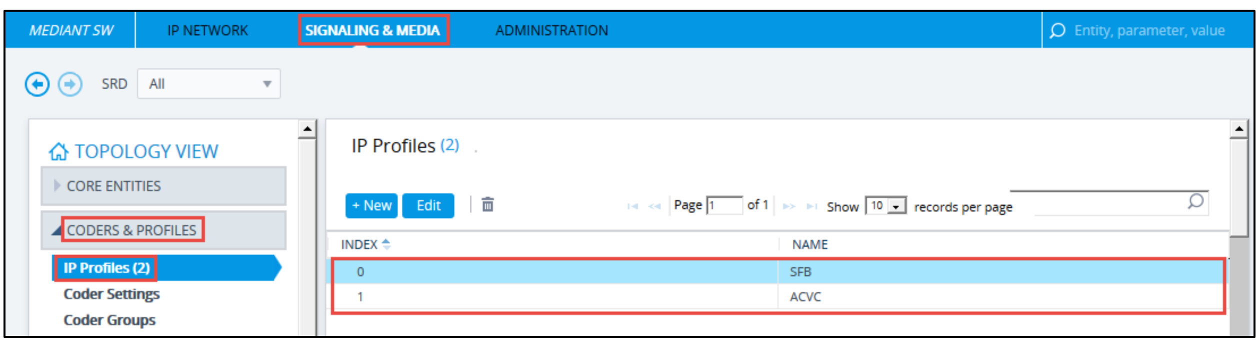

Figure 51: IP Profiles

In the IP Profile for Skype for Business, select the PRACK Mode as '*Optional*', Session Expire Mode as '*Supported*' and Remote Early Media RTP Detection Mode as '*By Media*'. *Extension Coder Group* and *Allowed Audio Coders* are associated appropriately.

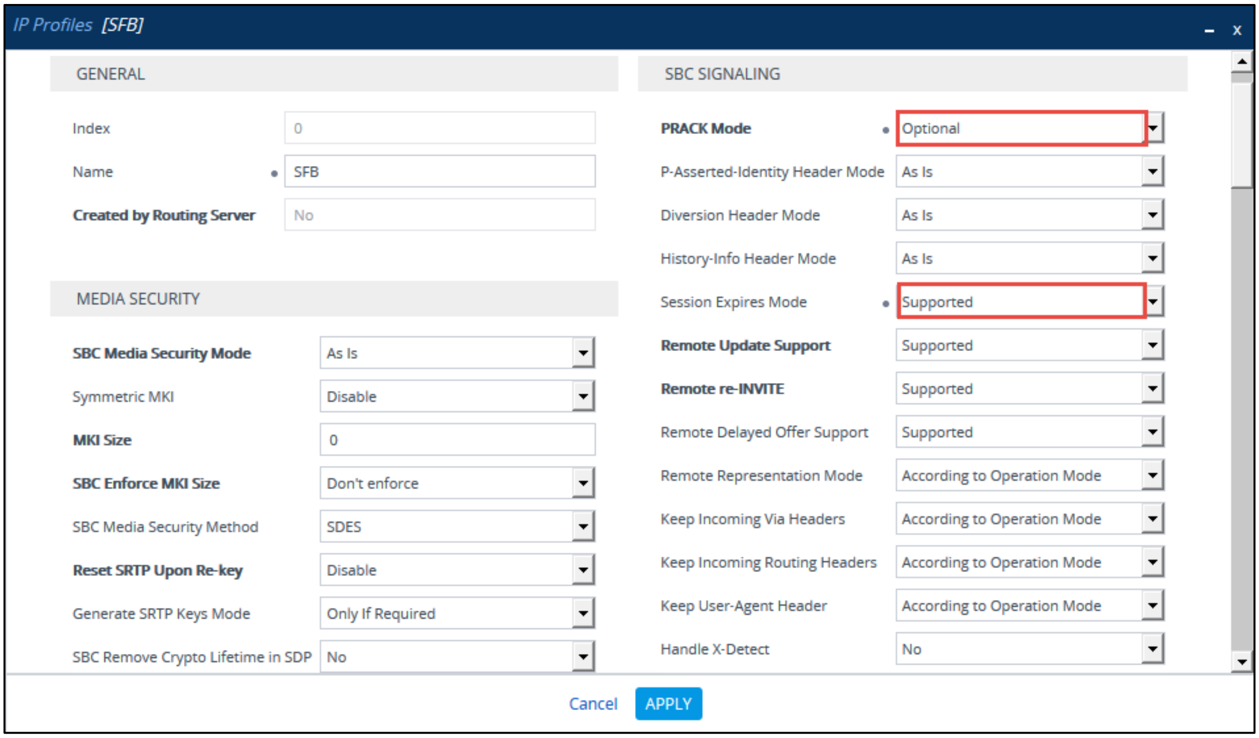

Figure 52: IP Profile for Skype for Business

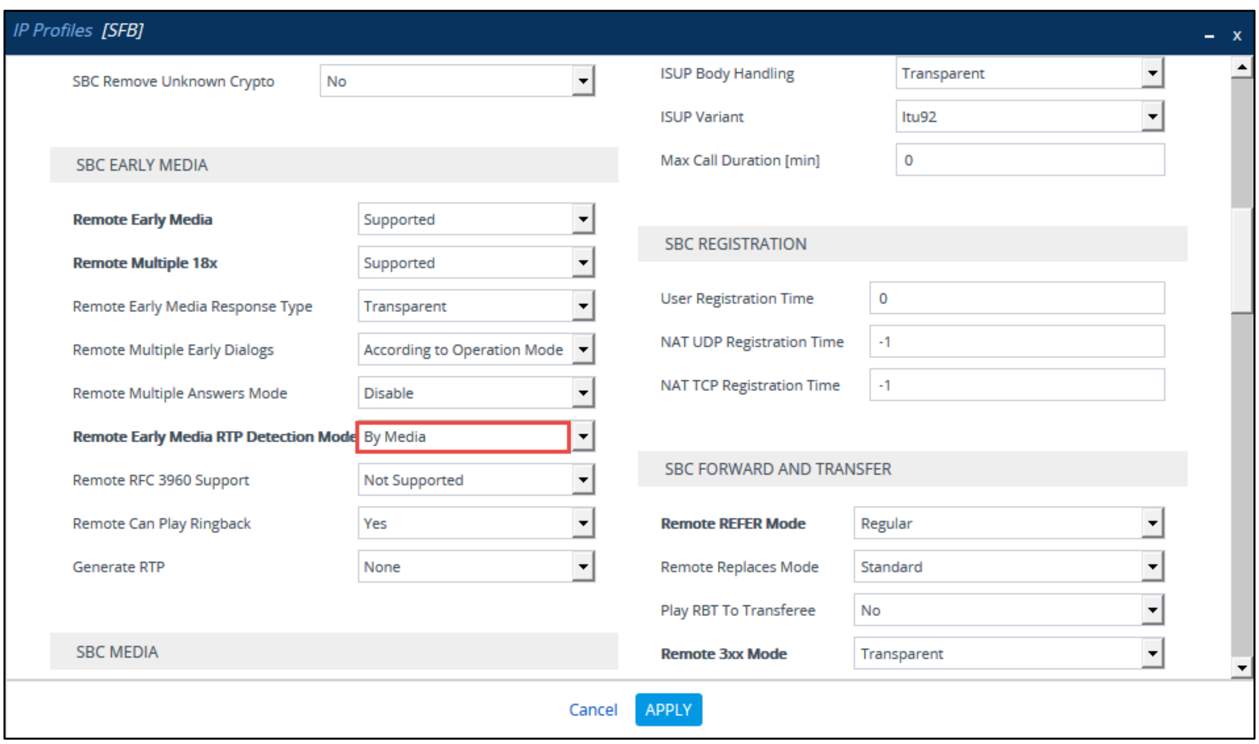

Figure 53: IP Profile for Skype for Business Continuation

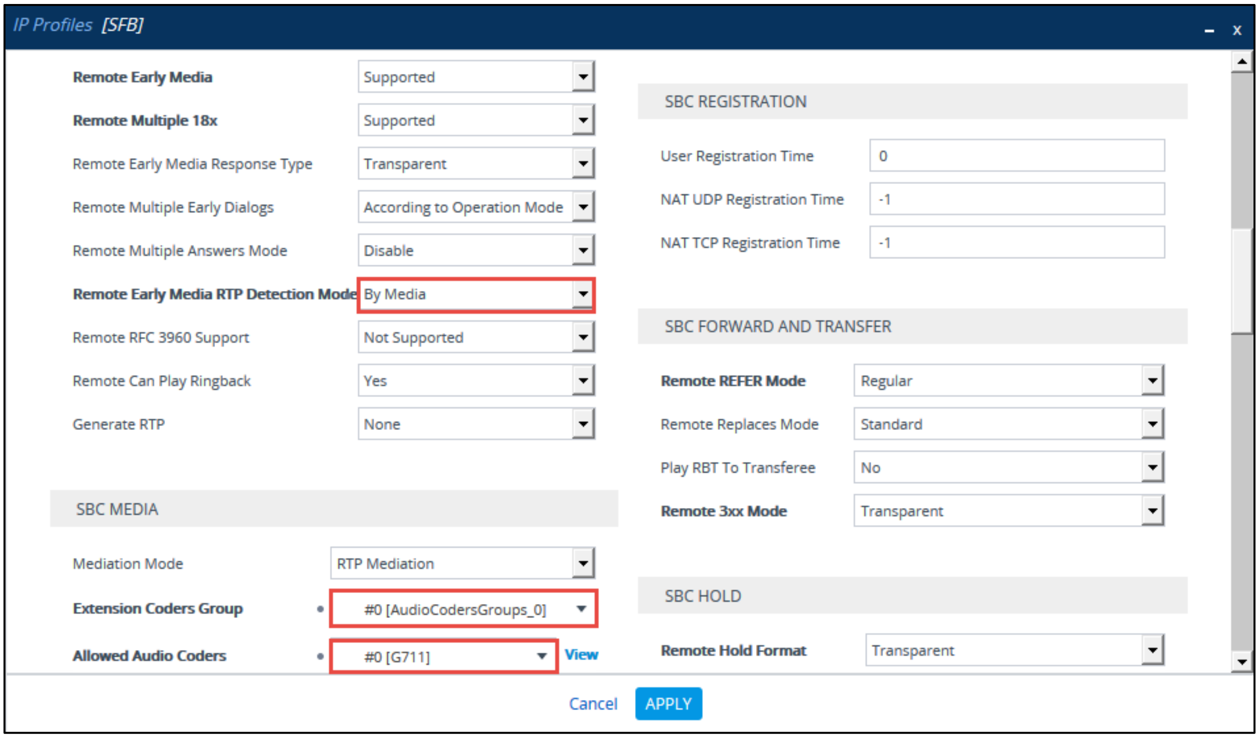

Figure 54: IP Profile for Skype for Business Continuation

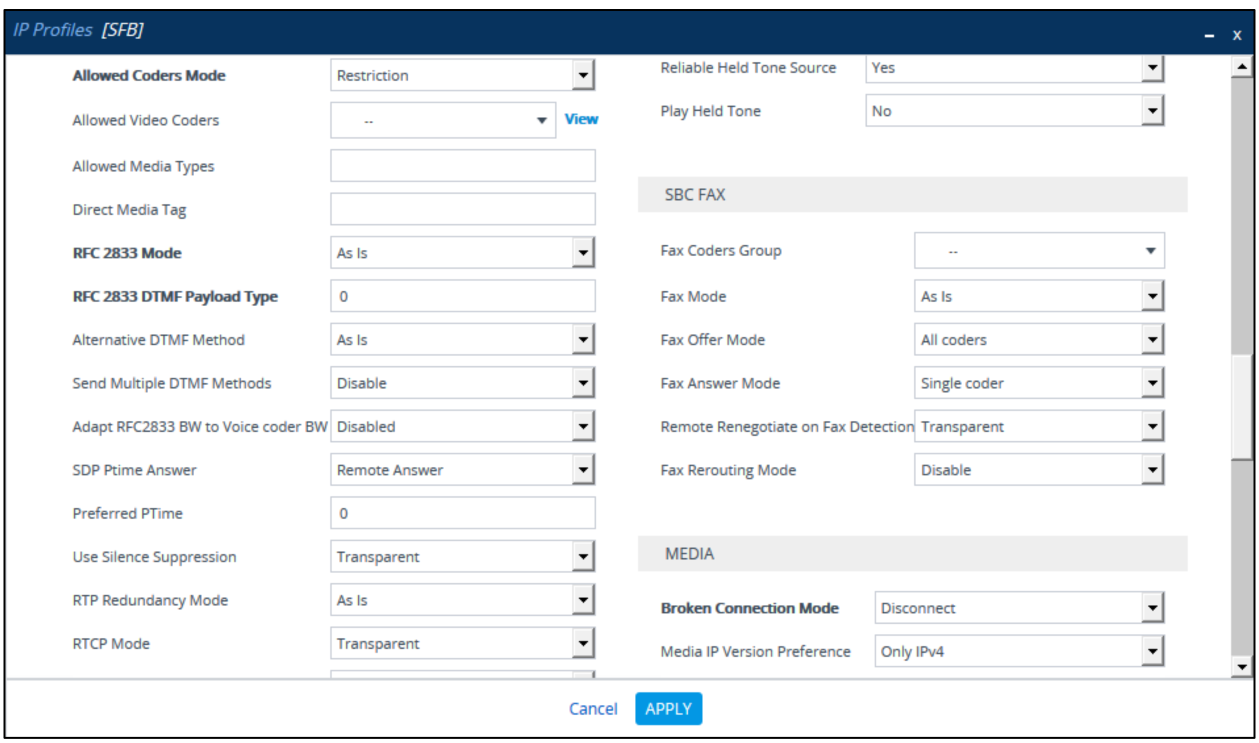

Figure 55: IP Profile for Skype for Business Continuation

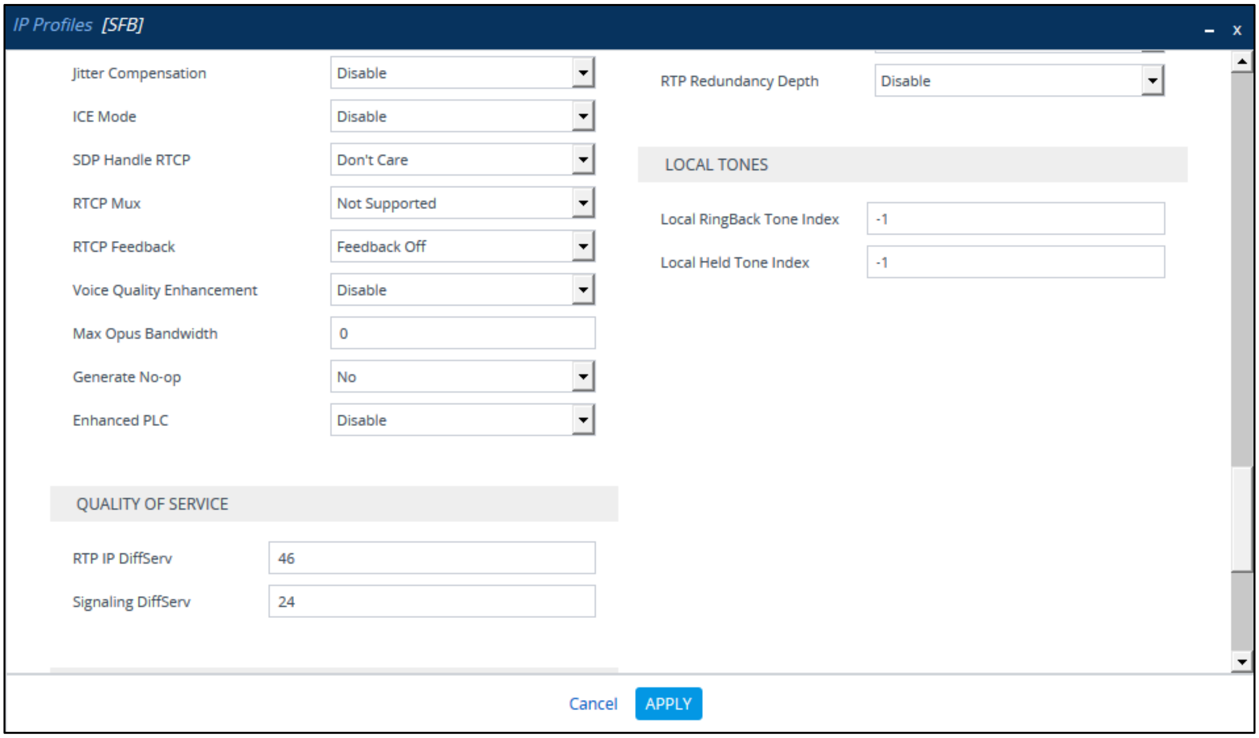

Figure 56: IP Profile for Skype for Business Continuation

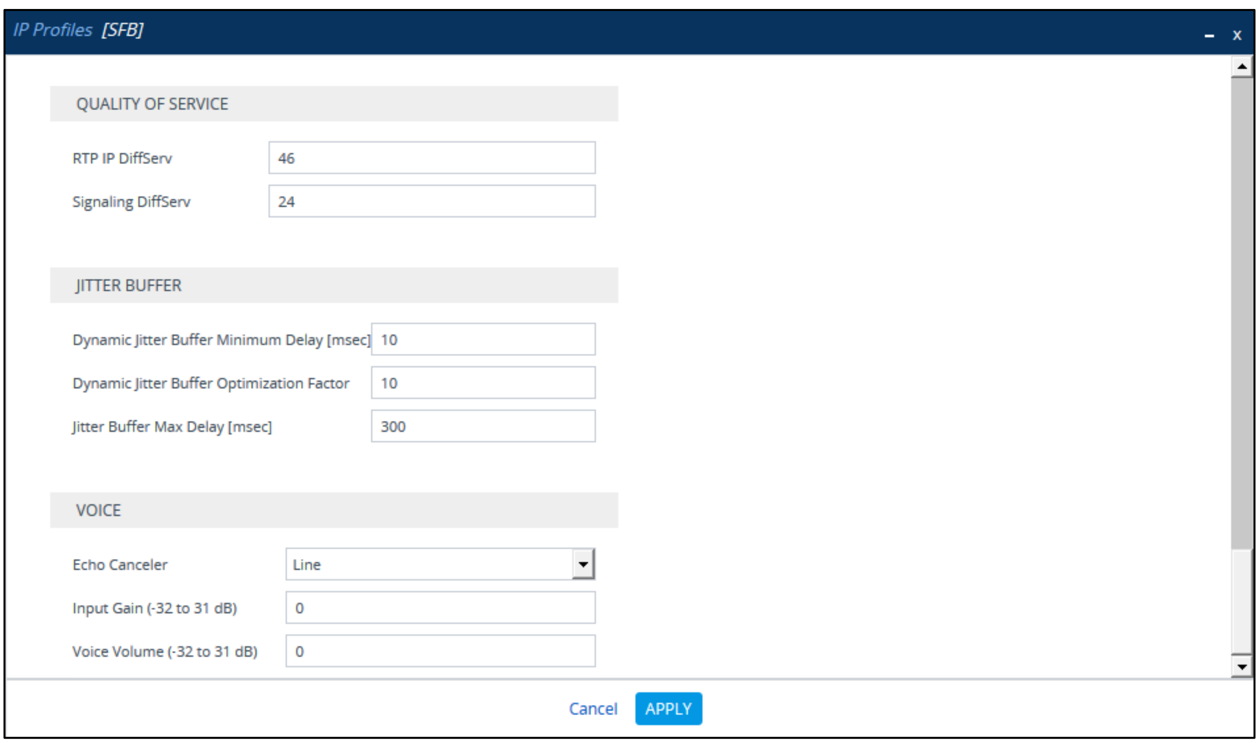

Figure 57: IP Profile for Skype for Business Continuation

In the IP profile for Amazon Chime Voice Connector, select Session Expires Mode as '*Supported*' and Remote Update Support as '*Not Supported*'. *Extension Coder Group* and *Allowed Audio Coders* are associated appropriately.

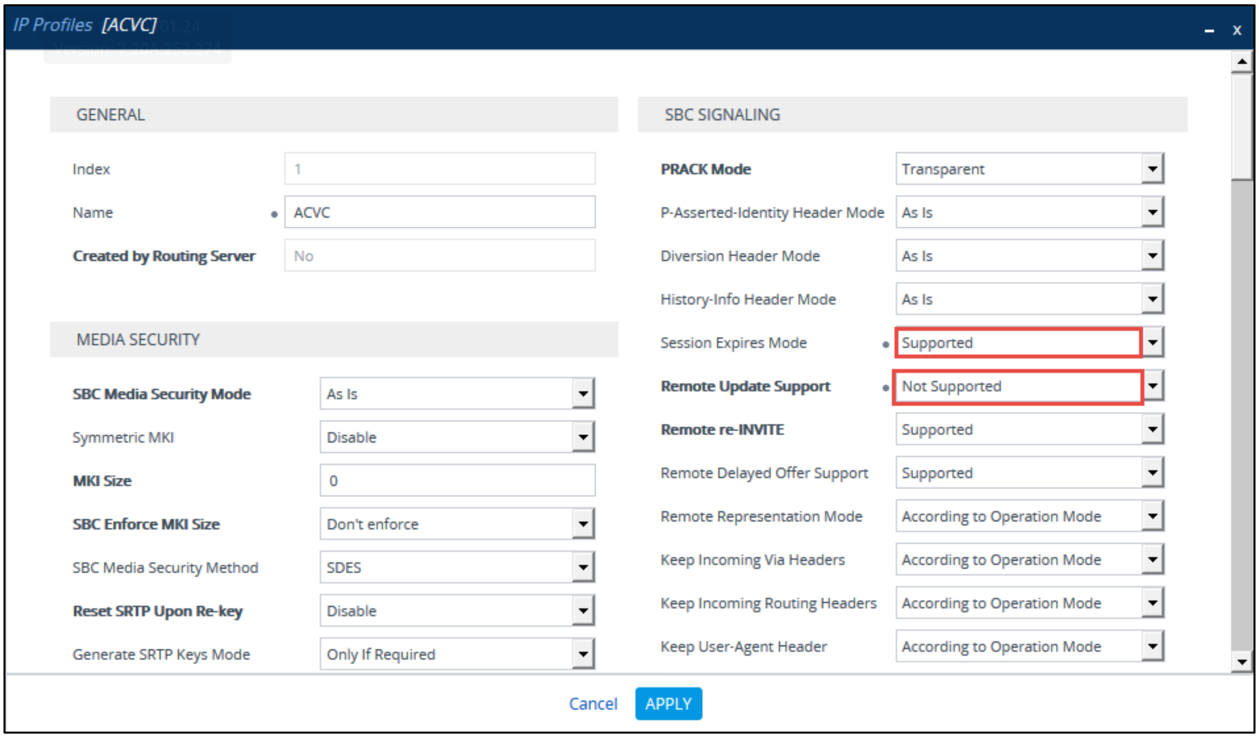

Figure 58: IP Profile for Amazon Chime Voice Connector

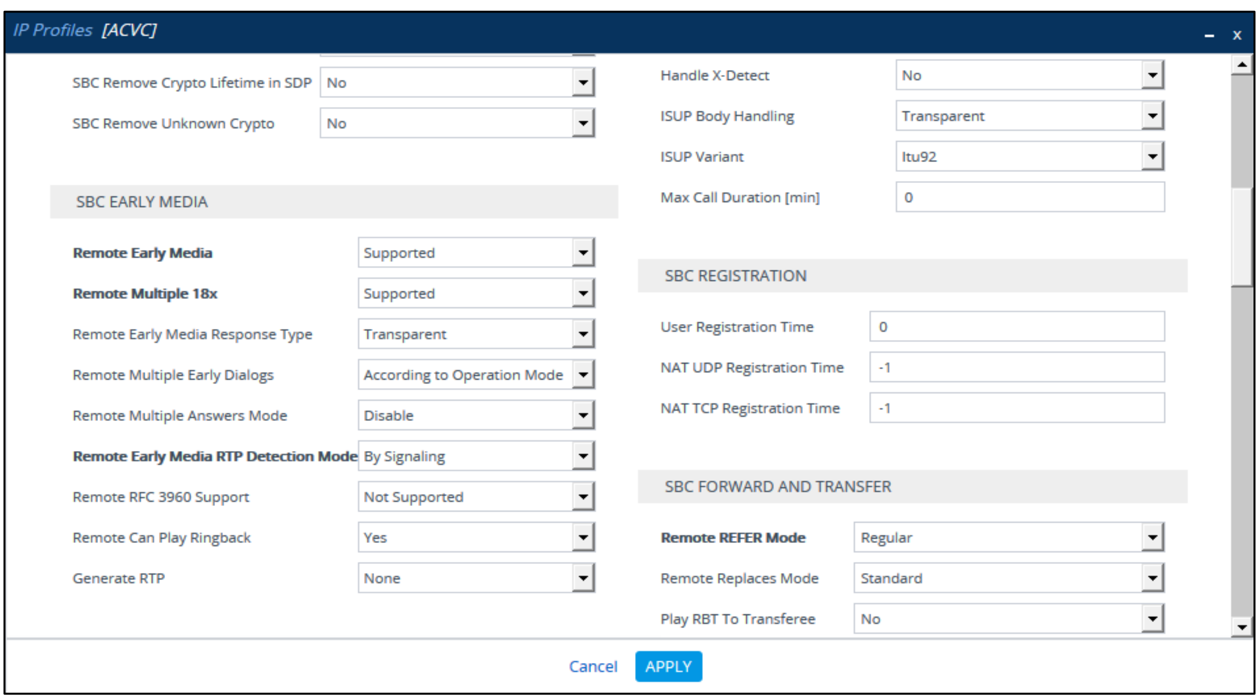

Figure 59: IP Profile for Amazon Chime Voice Connector Continuation

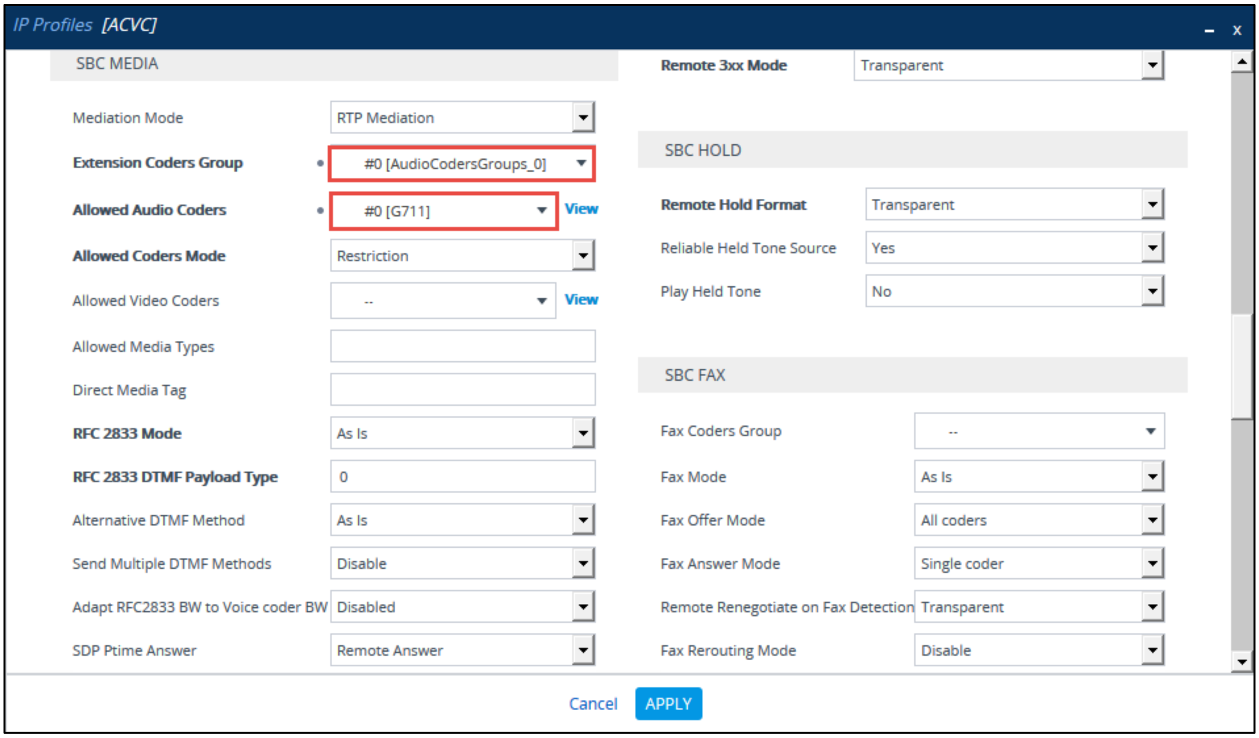

Figure 60: IP Profile for Amazon Chime Voice Connector Continuation

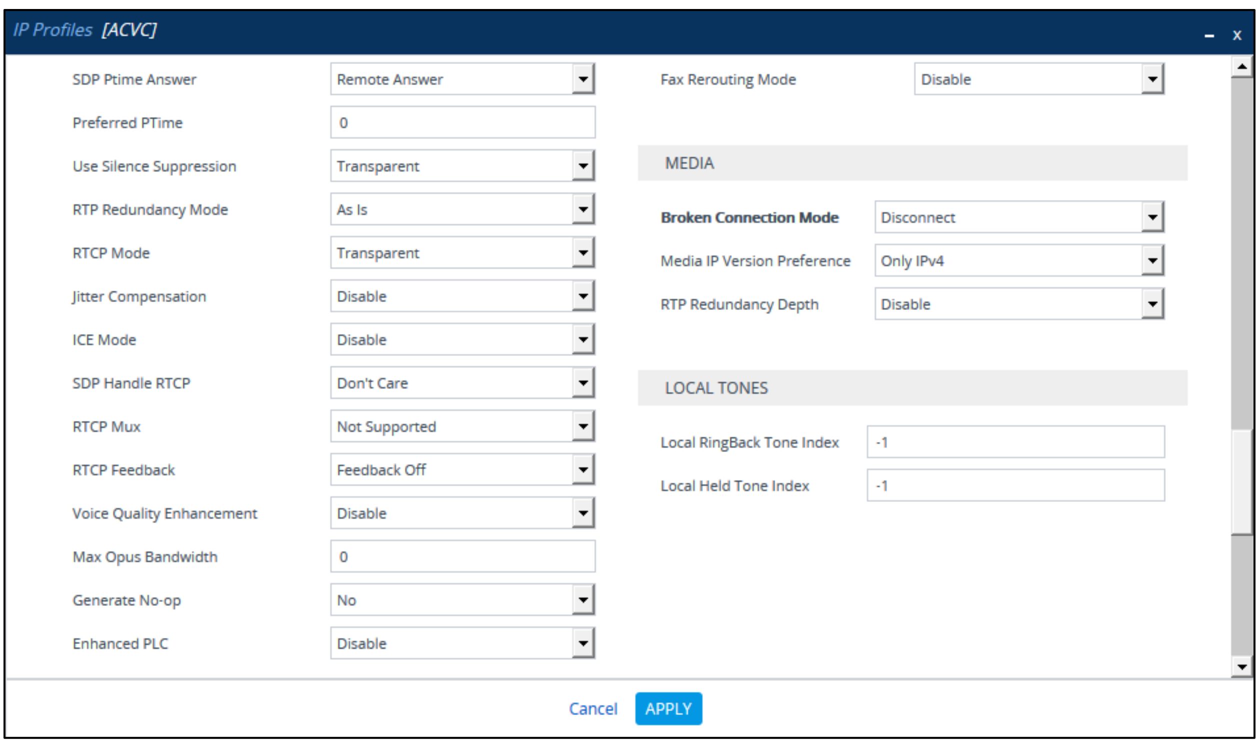

Figure 61: IP Profile for Amazon Chime Voice Connector Continuation

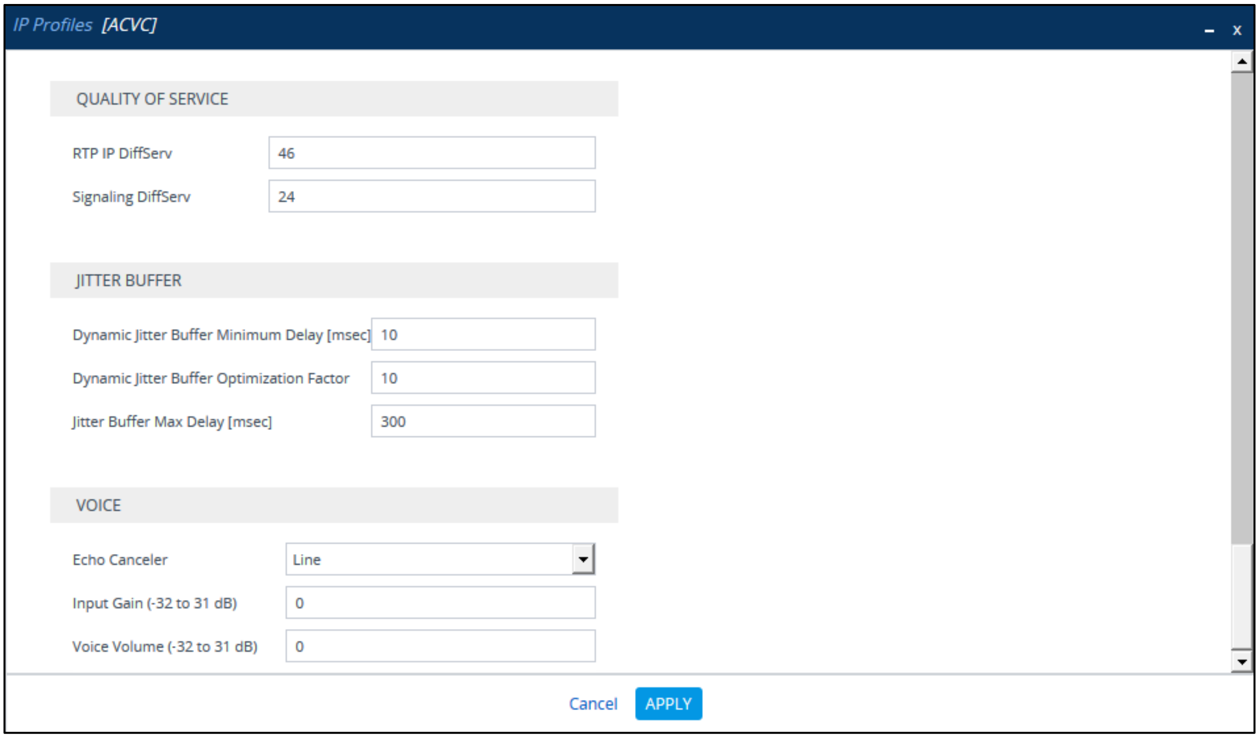

Figure 62: IP Profile for Amazon Chime Voice Connector Continuation

4.3.9 IP-to-IP Routing

Navigate to '*SETUP*' and select '*SIGNALING & MEDIA*'. Expand '*SBC*' and select '*IP-to-IP Routing*'. Routing rules are defined for forwarding SIP messages based on IP Groups from source to destination.

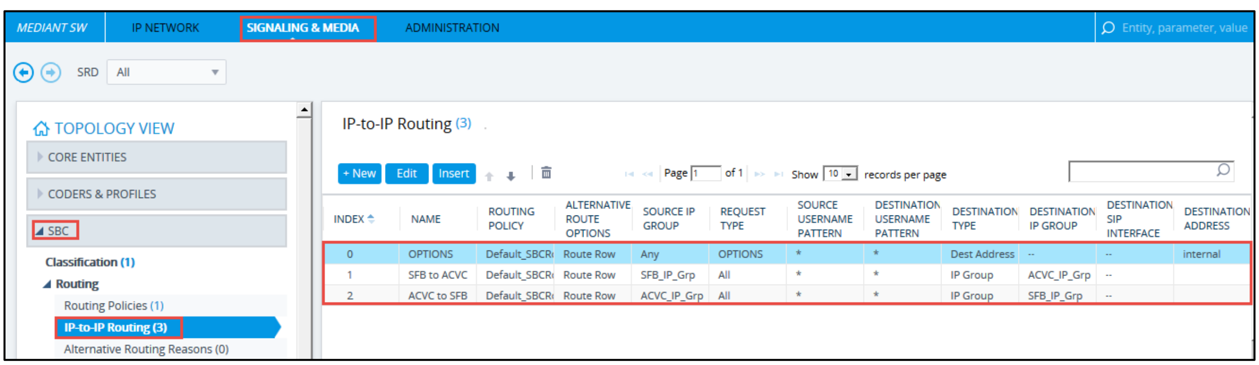

Figure 63: IP-to-IP Routing

IP to IP routing for OPTIONS message

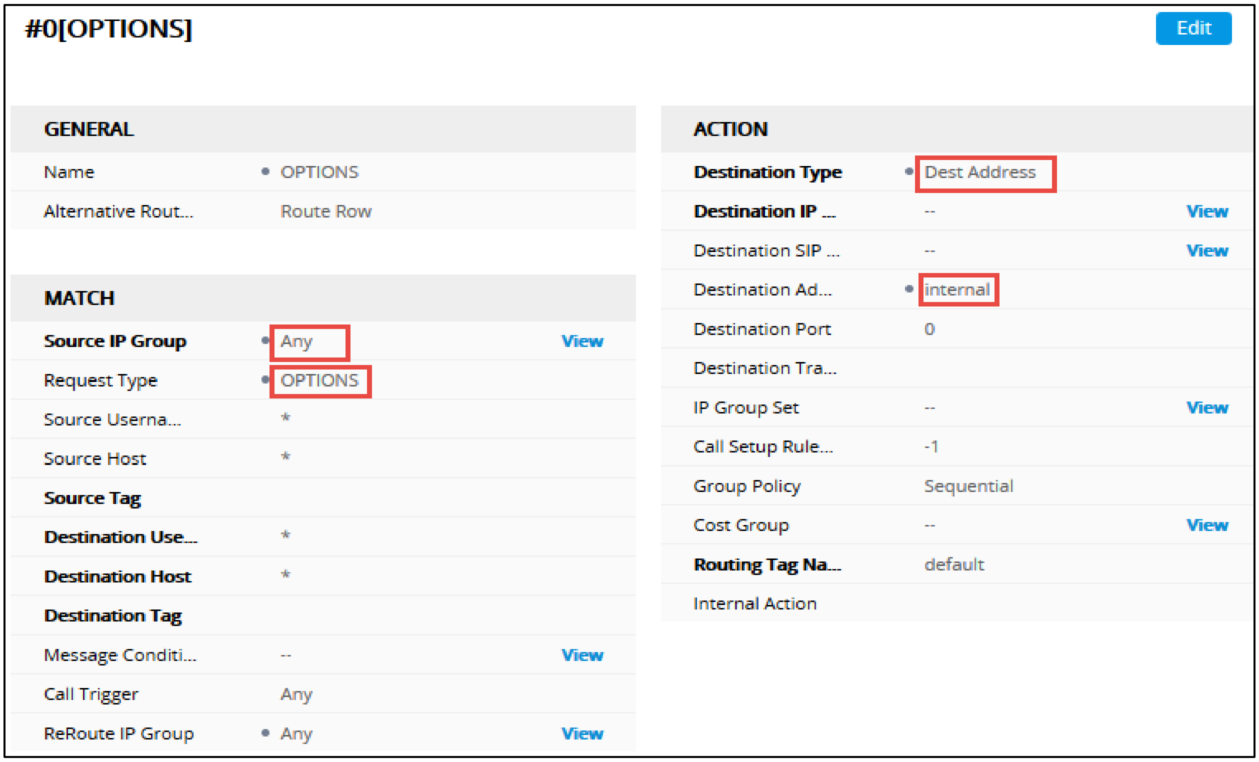

Figure 64: IP-to-IP Routing for OPTIONS

IP to IP routing from Skype for Business to Amazon Chime Voice Connector.

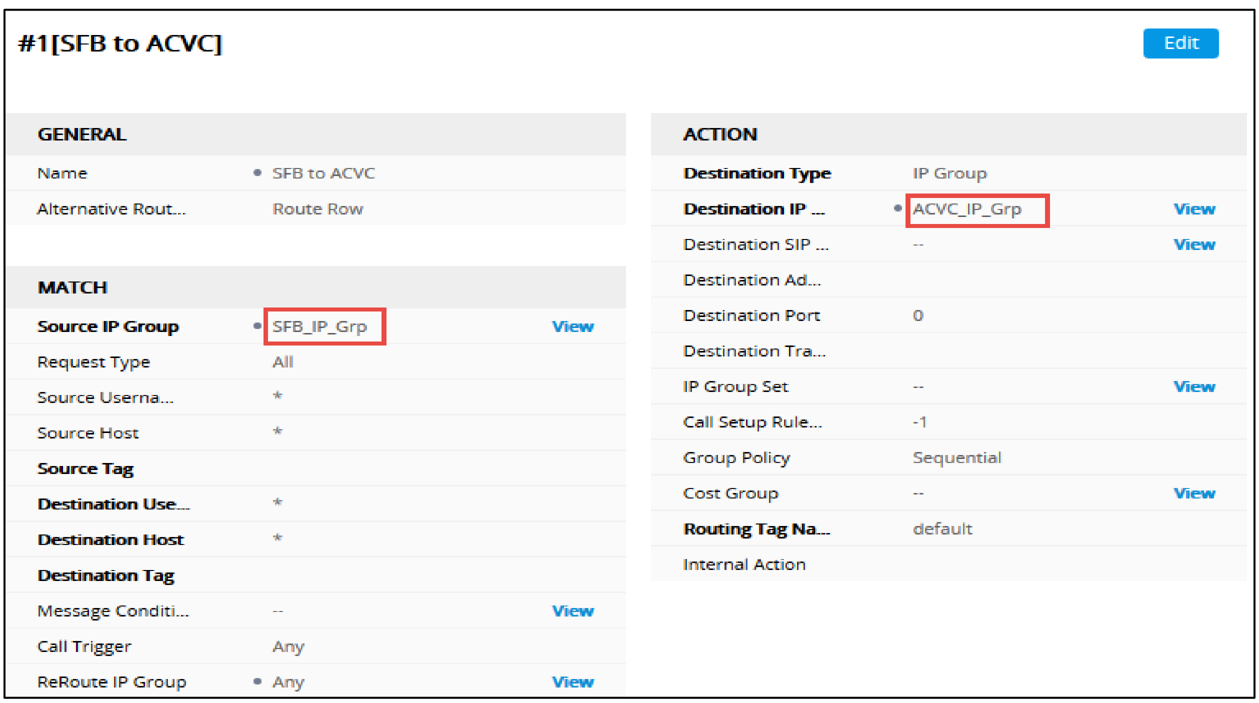

Figure 65: IP-to-IP Routing from Skype for Business to Amazon Chime Voice Connector

IP to IP routing from Amazon Chime Voice Connector to Skype for Business.

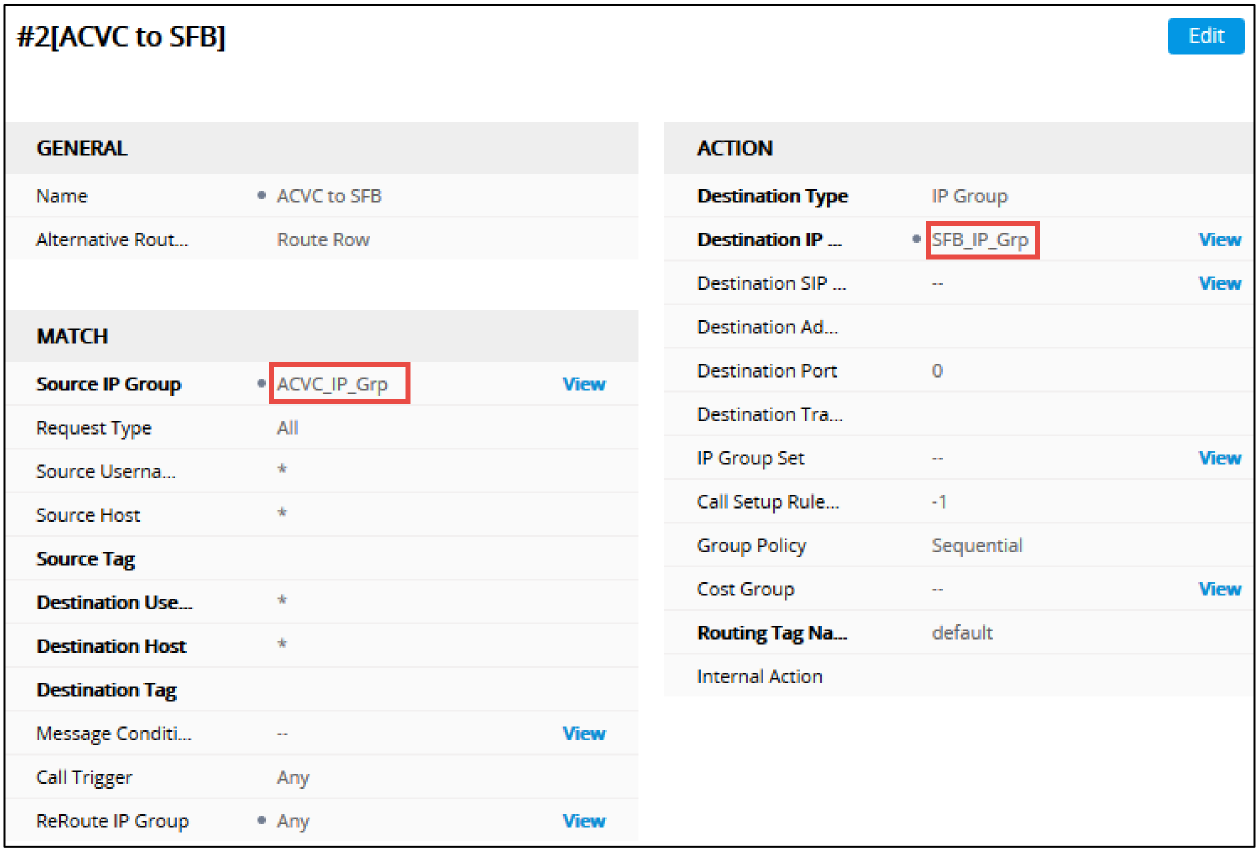

Figure 66: IP-to-IP Routing from Amazon Chime Voice Connector to Skype for Business

4.3.10 TLS Configuration

TLS is configured between AudioCodes CE and Amazon Chime Voice Connector. Navigate to '*SETUP*' and select '*IP NETWORK*'. Expand '*SECURITY*' and click on '*TLS Contexts*'.

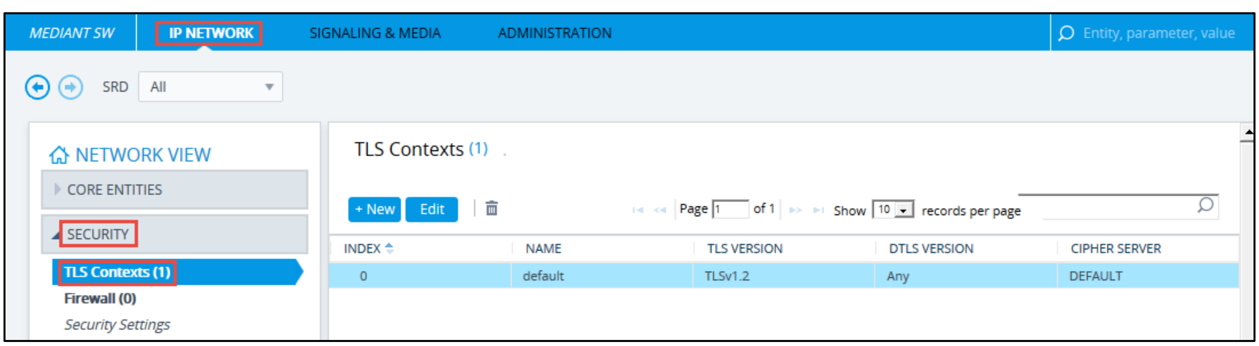

Figure 67: TLS Context list

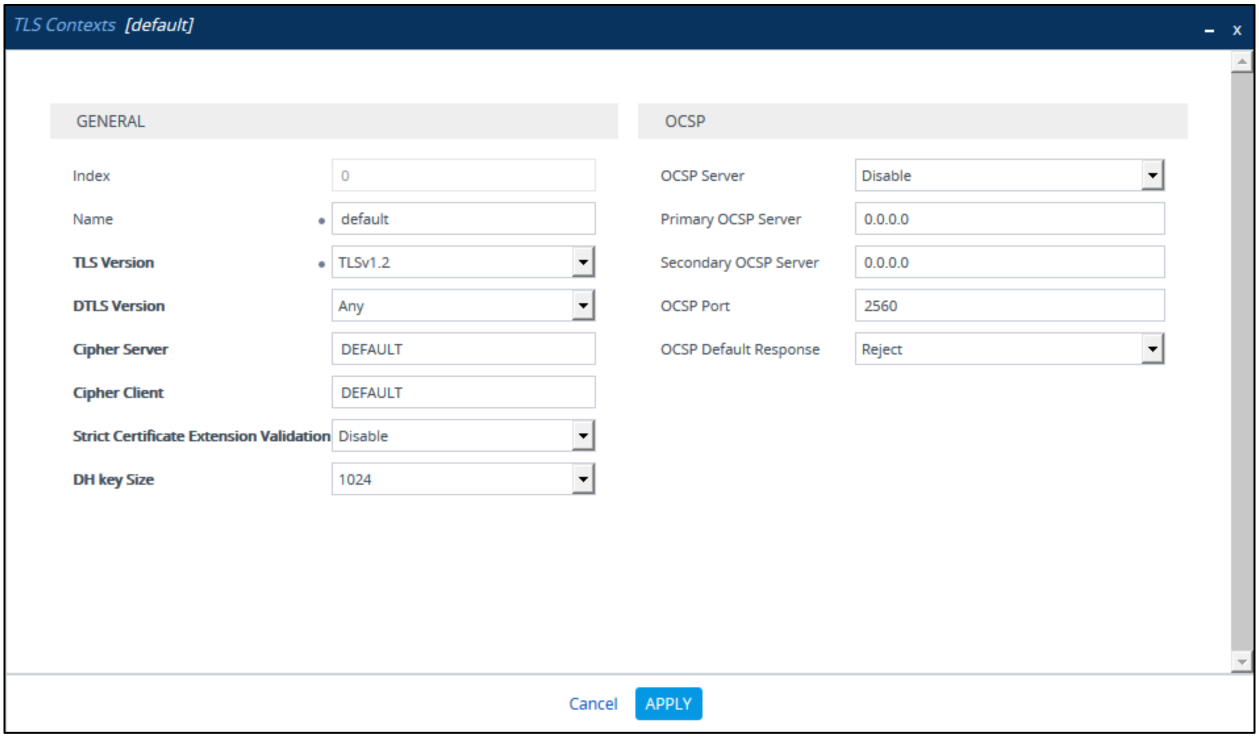

Figure 68: TLS Context for Amazon Chime Voice Connector

Amazon Trust Root Certificate is to be installed in the Trusted Root Certificates list under TLS Context. In the TLS Context page, select the *TLS Context* for Amazon Chime Voice Connector and click '*Trusted Root Certificates*' link located in the bottom. Click on *Import* button and select the certificate file.

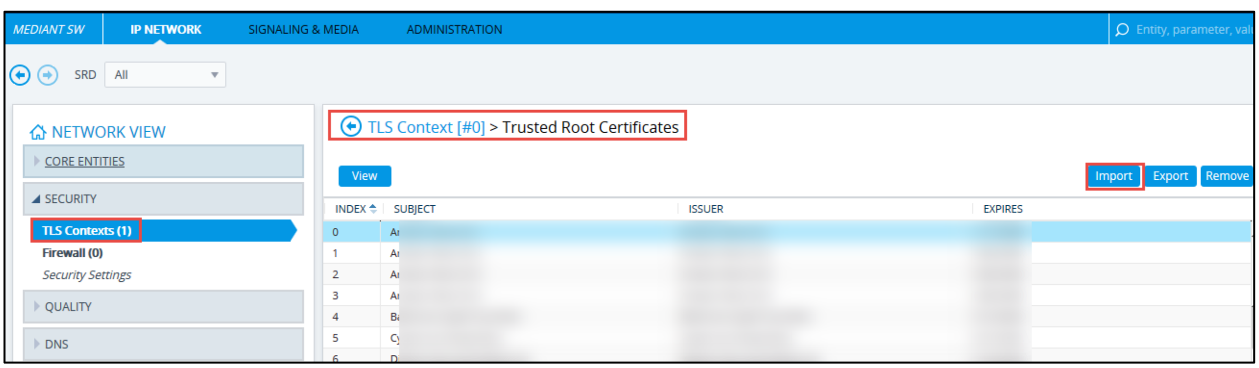

Figure 69: Trusted Root Certificate Import option

Amazon Chime Voice Connector Root Certificate can be downloaded from Amazon Chime Voice Connector account.

To configure media security, navigate to '*SETUP*' and select '*SIGNALING & MEDIA'*. Expand '*MEDIA*' and click on '*Media Security'*. Under General section, set *Media Security* as Enable.

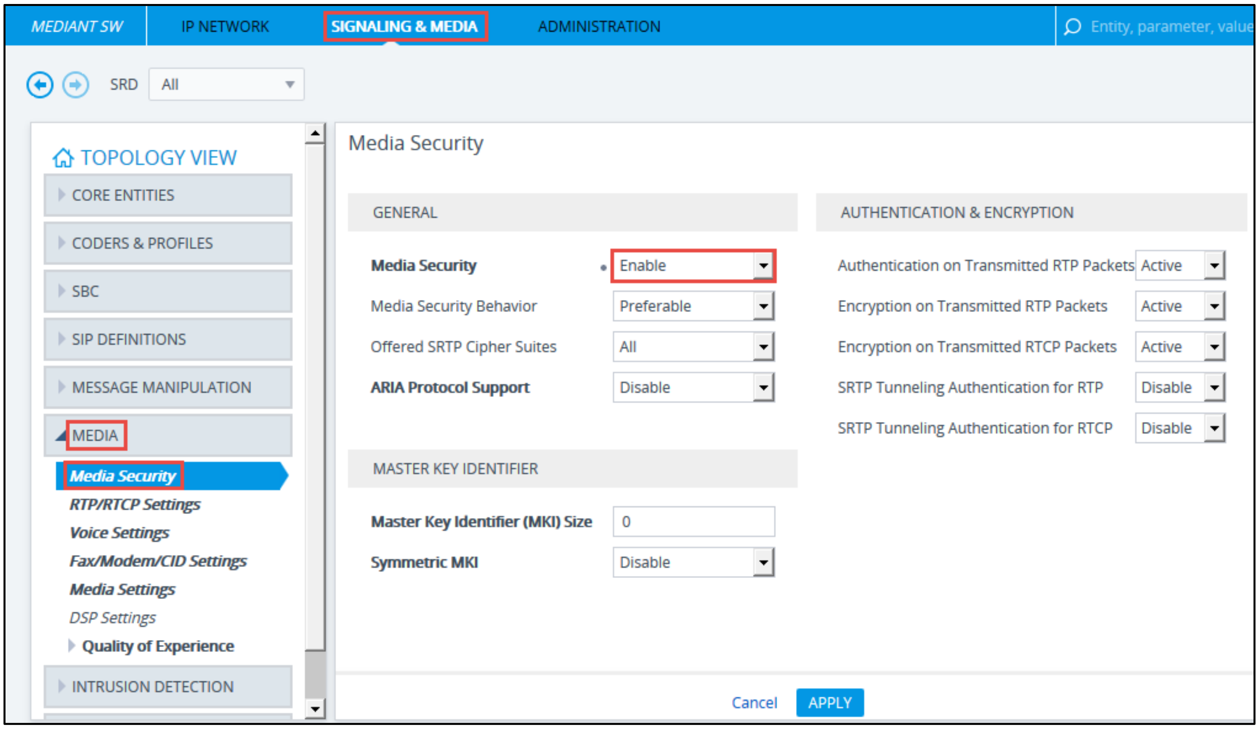

Figure 70: Media Security

In the IP Profile for Amazon Chime Voice Connector SRTP has to be enabled.

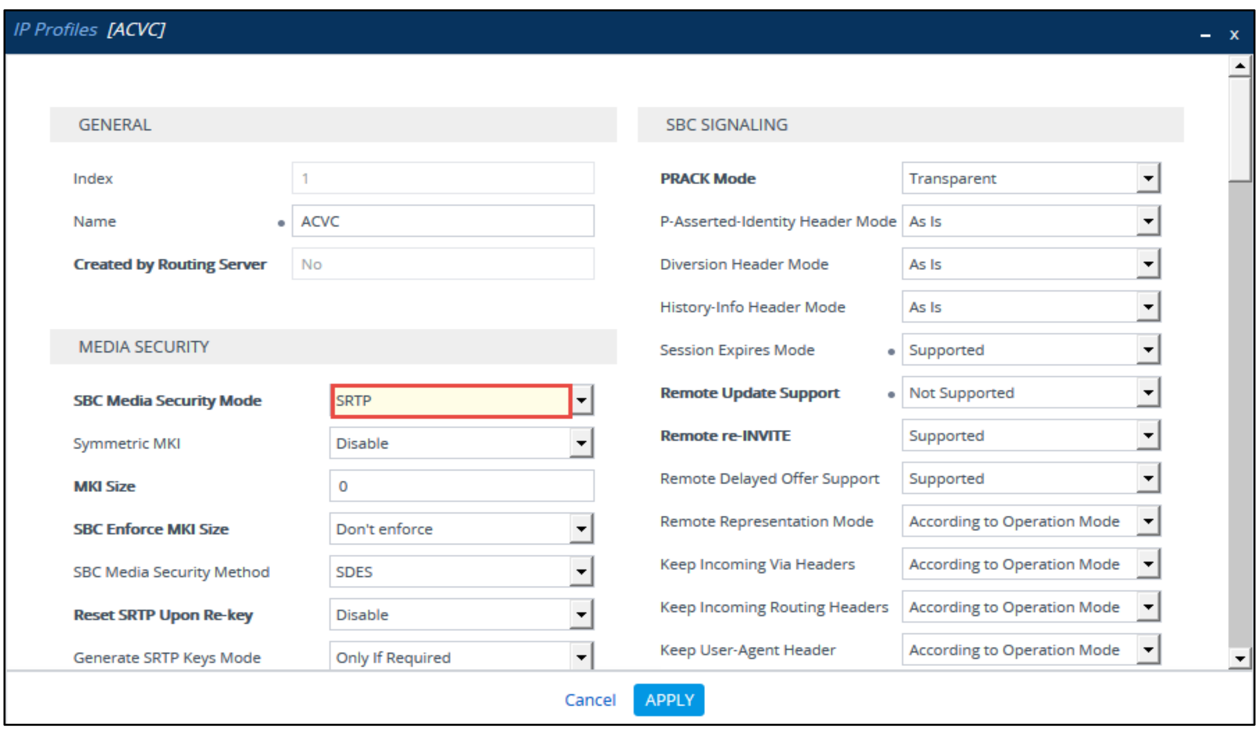

Figure 71: SRTP option in IP Profile

4.3.11 Message Manipulation configuration

SIP message manipulation rules are created to modify SIP headers for each IP entity based on manipulation sets enabled in IP Groups. The following are the message manipulation created for interoperability between Skype for Business and Amazon Chime Voice Connector.

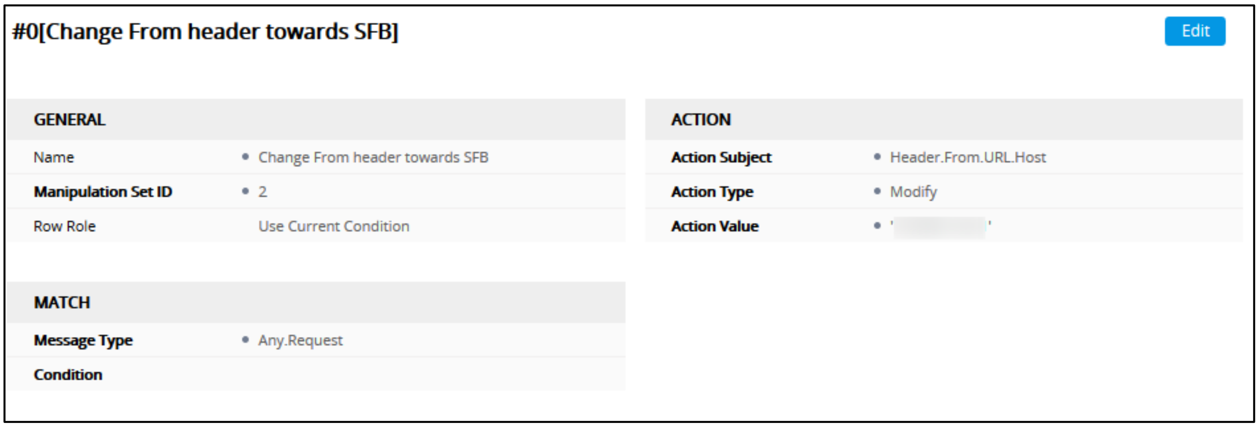

Figure 72: From header modification Skype for Business

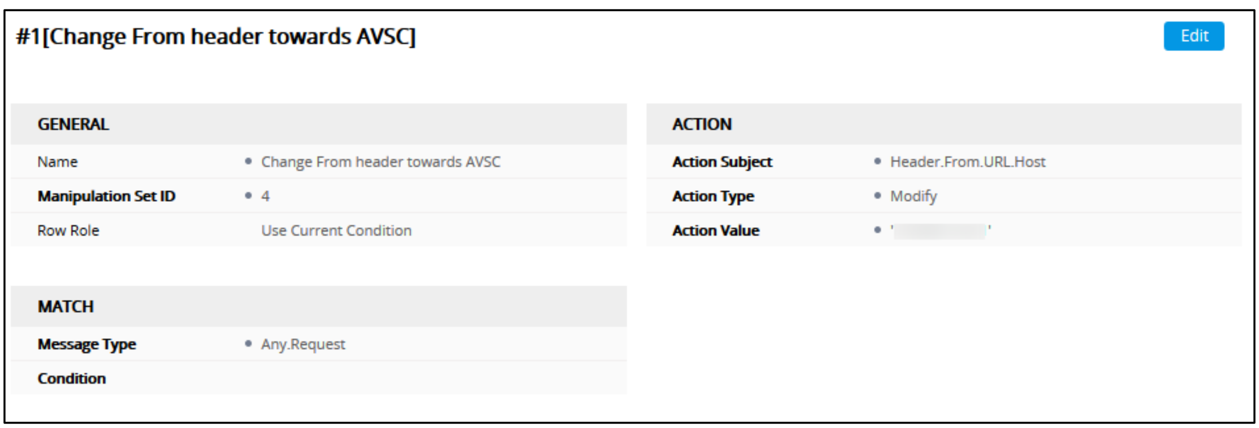

Figure 73: From header Modification Amazon Chime Voice Connector

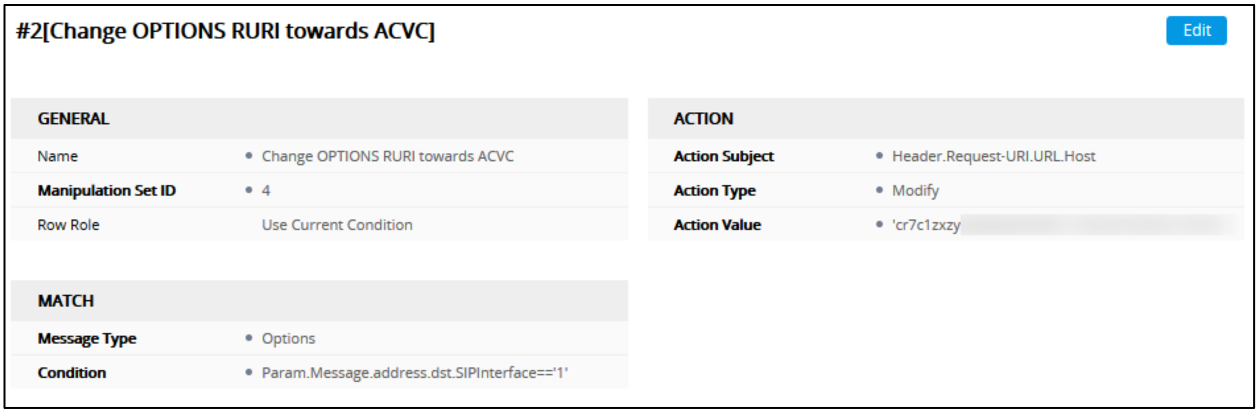

Figure 74: OPTIONS RURI modification

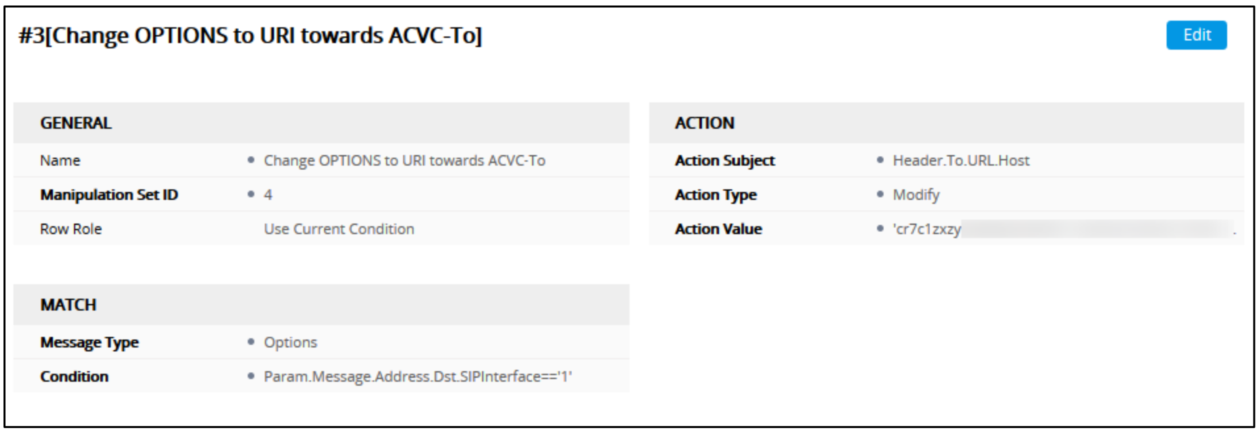

Figure 75: OPTIONS To header modification

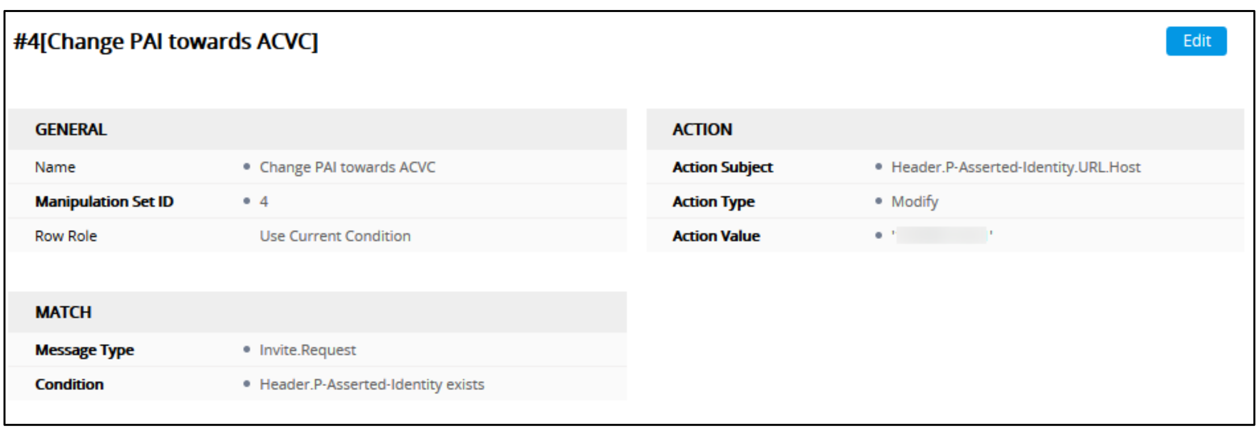

Figure 76: PAI header modification

#5[Add UPDATE support] Edit

GENERAL	
Name	Add UPDATE support
Manipulation Set ID	2
Row Role	Use Current Condition

ACTION	
Action Subject	Header.Allow
Action Type	Add
Action Value	'UPDATE'

MATCH	
Message Type	invite
Condition	header.Allow !exists

Figure 77: Add Allow header-UPDATE

#6[Modify Session Expires] Edit

GENERAL	
Name	Modify Session Expires
Manipulation Set ID	2
Row Role	Use Current Condition

ACTION	
Action Subject	Header.Session-Expires.Time
Action Type	Modify
Action Value	'900'

MATCH	
Message Type	Invite.Response.2xx
Condition	Header.Session-Expires exists

Figure 78: Session Expires Timer modification